



Vincotech

| <i>flow</i> SOL 1 BI (TL) | 650 V / 30 A |
|---|---|
| <div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> Booster + H6.5 Bridge S5 IGBT Chipset in Booster part Inverter part is equipped with S5 IGBT Chipset for higher efficiency Integrated NTC | <div style="background-color: #eee; padding: 2px; margin-bottom: 5px;"><i>flow</i> 1 12 mm housing</div> <div style="display: flex; justify-content: space-around;"> </div> <div style="display: flex; justify-content: space-around; font-size: small;"> Press-fit pin Solder pin </div> |
| <div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Solar Inverters | <div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> |
| <div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-PY07BVA030S5-LF42E08Y 10-FY07BVA030S5-LF42E08 | |

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|------------|--|-------|------|
| Low Buck Switch / High Buck Switch | | | | |
| Collector-emitter voltage | V_{CES} | | 650 | V |
| Collector current | I_C | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 35 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 90 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 59 | W |
| Gate-emitter voltage | V_{GES} | | ±20 | V |
| Maximum junction temperature | T_{jmax} | | 175 | °C |



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|------------|---------------------------------------|-------|------|
| Buck Diode | | | | |
| Peak repetitive reverse voltage | V_{RRM} | | 650 | V |
| Continuous (direct) forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 28 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 40 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 51 | W |
| Maximum junction temperature | T_{jmax} | | 175 | °C |
| Boost Switch | | | | |
| Collector-emitter voltage | V_{CES} | | 650 | V |
| Collector current | I_C | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 28 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 60 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 59 | W |
| Gate-emitter voltage | V_{GES} | | ±20 | V |
| Short circuit ratings | V_{CC} | $V_{GE} = 15\text{ V}$ | 360 | V |
| Maximum junction temperature | T_{jmax} | | 175 | °C |
| Low Buck Diode / High Buck Diode | | | | |
| Peak repetitive reverse voltage | V_{RRM} | | 650 | V |
| Continuous (direct) forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 28 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 40 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 51 | W |
| Maximum junction temperature | T_{jmax} | | 175 | °C |
| Input Boost Switch | | | | |
| Collector-emitter voltage | V_{CES} | | 650 | V |
| Collector current | I_C | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 35 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 90 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 59 | W |
| Gate-emitter voltage | V_{GES} | | ±20 | V |
| Maximum junction temperature | T_{jmax} | | 175 | °C |



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|-------------------------------------|------------|---------------------------------------|-------|------|
| Input Boost Diode | | | | |
| Peak Repetitive Reverse Voltage | V_{RRM} | | 650 | V |
| Continuous (direct) forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 33 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 60 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 50 | W |
| Maximum Junction Temperature | T_{jmax} | | 175 | °C |

ByPass Diode

| | | | | |
|--|------------|---|------|------------------|
| Peak Repetitive Reverse Voltage | V_{RRM} | | 1600 | V |
| Continuous (direct) forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 46 | A |
| Surge (non-repetitive) forward current | I_{FSM} | 50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$ | 270 | A |
| Surge current capability | I^2t | | 370 | A ² s |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 56 | W |
| Maximum Junction Temperature | T_{jmax} | | 150 | °C |

Input Boost Sw. Protection Diode

| | | | | |
|-------------------------------------|------------|---------------------------------------|-----|----|
| Peak repetitive reverse voltage | V_{RRM} | | 650 | V |
| Continuous (direct) forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 14 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 20 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 33 | W |
| Maximum junction temperature | T_{jmax} | | 175 | °C |



Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|-----------|--------|-----------|-------|------|
|-----------|--------|-----------|-------|------|

Module Properties

Thermal Properties

| | | | | |
|---|-----------|--|-------------------------------|----|
| Storage temperature | T_{stg} | | -40...+125 | °C |
| Operation temperature under switching condition | T_{top} | | -40...(T _{max} - 25) | °C |

Isolation Properties

| | | | | |
|----------------------------|------------|-------------------------------------|-----------|----|
| Isolation voltage | V_{isol} | DC Test Voltage* $t_p = 2\text{ s}$ | 6000 | V |
| | | AC Voltage $t_p = 1\text{ min}$ | 2500 | V |
| Creepage distance | | | min. 12,7 | mm |
| Clearance | | | 7,93 | mm |
| Comparative Tracking Index | CTI | | > 200 | |

*100 % tested in production



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|--------------|--------------|--------------|-----------|------------|-------|-----|-----|------|
| | | V_{GS} [V] | V_{GE} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | |

Low Buck Switch / High Buck Switch

Static

| Parameter | Symbol | $V_{GE} = V_{CE}$ | V_{GS} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | Unit |
|--------------------------------------|--------------|-------------------|--------------|--------------|-----------|------------------|-----|----------------------|------|------|
| Gate-emitter threshold voltage | $V_{GE(th)}$ | | | | 0,0003 | 25 | 3,2 | 4 | 4,8 | V |
| Collector-emitter saturation voltage | V_{CEsat} | | 15 | | 30 | 25 125 150 | | 1,35 1,54 1,57 | 1,75 | V |
| Collector-emitter cut-off current | I_{CES} | | 0 | 650 | | 25 | | | 50 | μA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | 25 | | | 100 | nA |
| Internal gate resistance | r_g | | | | | | | none | | Ω |
| Input capacitance | C_{ies} | | | | | | | 1800 | | pF |
| Output capacitance | C_{oes} | $f = 1$ MHz | 0 | 25 | | 25 | | 55 | | |
| Reverse transfer capacitance | C_{res} | | | | | | | 7 | | |
| Gate charge | Q_g | | 15 | 520 | 30 | 25 | | 70 | | nC |

Thermal

| Parameter | Symbol | $\lambda_{paste} = 3,4$ W/mK (PSX) | V_{GS} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | Unit |
|-------------------------------------|---------------|------------------------------------|--------------|--------------|-----------|------------|-----|------|-----|------|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | | | | | | | 1,61 | | K/W |

Dynamic

| Parameter | Symbol | $R_{goff} = 16$ Ω $R_{gon} = 16$ Ω | V_{GS} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | Unit |
|-----------------------------|--------------|---|--------------|--------------|-----------|------------------|-----|-------------------------|-----|------|
| Turn-on delay time | $t_{d(on)}$ | | | | | 25 125 150 | | 56 56 56 | | ns |
| Rise time | t_r | | | | | 25 125 150 | | 9 10 11 | | |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25 125 150 | | 84 101 107 | | |
| Fall time | t_f | | | | | 25 125 150 | | 16 31 46 | | |
| Turn-on energy (per pulse) | E_{on} | $Q_{tFWD} = 0,9$ μC $Q_{tFWD} = 1,7$ μC $Q_{tFWD} = 1,8$ μC | | | | 25 125 150 | | 0,571 0,698 0,739 | | mWs |
| Turn-off energy (per pulse) | E_{off} | | | | | 25 125 150 | | 0,197 0,377 0,430 | | |



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|--------------|--------------|-----------|------------|-----|-------|-----|--|------|
| | | V_{GE} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | | |

Buck Diode

Static

| Parameter | Symbol | V_{GS} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit |
|-------------------------|--------|--------------|--------------|-----------|------------------|-----|----------------------|------|------|
| Forward voltage | V_F | | | 20 | 25 125 150 | | 1,56 1,51 1,51 | 1,92 | V |
| Reverse leakage current | I_R | | 650 | | 25 | | | 1,28 | μA |

Thermal

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|---------------|------------------------------------|-------|------|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | 1,88 | K/W |

Dynamic

| Parameter | Symbol | di/dt | V_{GS} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit |
|---------------------------------------|----------------------|---------------------|--------------|--------------|-----------|------------------|-----|-------------------------|-----|------|
| Peak recovery current | I_{RRM} | | | | | 25 125 150 | | 25 33 35 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 68 110 117 | | ns |
| Recovered charge | Q_r | $di/dt = 3243$ A/μs | ±15 | 350 | 30 | 25 125 150 | | 0,888 1,656 1,834 | | μC |
| Reverse recovered energy | E_{rec} | $di/dt = 3146$ A/μs | | | | 25 125 150 | | 0,154 0,330 0,373 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 1330 341 407 | | A/μs |



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|--------------|--------------|--------------|-----------|------------|-------|-----|-----|------|
| | | V_{GS} [V] | V_{GE} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | |

Boost Switch

Static

| Parameter | Symbol | Conditions | V_{GS} [V] | V_{GE} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit |
|--------------------------------------|--------------|-------------------|--------------|--------------|--------------|-----------|------------------|------|----------------------|------|------|
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $V_{GE} = V_{CE}$ | | | | 0,00029 | 25 | 5,1 | 5,8 | 6,4 | V |
| Collector-emitter saturation voltage | V_{CEsat} | | 15 | | | 20 | 25 125 150 | 1,03 | 1,49 1,67 1,71 | 1,87 | V |
| Collector-emitter cut-off current | I_{CES} | | 0 | 650 | | | 25 | | | 1 | μA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | | 25 | | | 150 | nA |
| Input capacitance | C_{ies} | $f = 1$ Mhz | 0 | 25 | | | 25 | | 1100 | | pF |
| Reverse transfer capacitance | C_{res} | | | | | | | | 32 | | |
| Gate-emitter leakage current | Q_g | | 15 | 480 | 20 | | 25 | | 120 | | nC |

Thermal

| Parameter | Symbol | Conditions | V_{GS} [V] | V_{GE} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit |
|-------------------------------------|---------------|------------------------------------|--------------|--------------|--------------|-----------|------------|-----|------|-----|------|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | | 1,60 | | K/W |

Dynamic

| Parameter | Symbol | Conditions | V_{GS} [V] | V_{GE} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit | |
|-----------------------------|--------------|---|--------------|--------------|--------------|-----------|------------------|---|-------------------|-------------------------|------|-----|
| Turn-on delay time | $t_{d(on)}$ | $R_{goff} = 16 \Omega$ $R_{gon} = 16 \Omega$ | ± 15 | 350 | 20 | | 25 125 150 | | 62 | | ns | |
| Rise time | t_r | | | | | | | 25 125 150 | 22 21 20 | | | |
| Turn-off delay time | $t_{d(off)}$ | | | | | | | 25 125 150 | 131 150 154 | | | |
| Fall time | t_f | | | | | | | 25 125 150 | 72 105 115 | | | |
| Turn-on energy (per pulse) | E_{on} | | | | | | | $Q_{t-FWD} = 0,6 \mu C$ $Q_{t-FWD} = 1,2 \mu C$ $Q_{t-FWD} = 1,4 \mu C$ | 25 125 150 | 0,524 0,705 0,765 | | mWs |
| Turn-off energy (per pulse) | E_{off} | | | | | | | | 25 125 150 | 0,431 0,607 0,643 | | |



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|---|----------------------|--------------|--|-----------|------------|------------------|-------|-------------------------|------|------|
| | | V_{GE} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | | |
| | | V_{GS} [V] | V_{DS} [V] | I_D [A] | I_F [A] | | | | | |
| Low Buck Diode / High Buck Diode | | | | | | | | | | |
| Static | | | | | | | | | | |
| Forward voltage | V_F | | | 20 | | 25 125 150 | | 1,56 1,51 1,51 | 1,92 | V |
| Reverse leakage current | I_R | | | 650 | | 25 | | | 1,28 | μA |
| Thermal | | | | | | | | | | |
| Thermal resistance junction to sink | $R_{th(j-s)}$ | | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | 1,88 | | K/W |
| Dynamic | | | | | | | | | | |
| Peak recovery current | I_{RRM} | | | | | 25 125 150 | | 13 17 18 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 72 114 127 | | ns |
| Recovered charge | Q_r | | $di/dt = 1272$ A/μs $di/dt = 868$ A/μs $di/dt = 1011$ A/μs | ±15 | 350 | 20 | | 0,614 1,203 1,382 | | μC |
| Reverse recovered energy | E_{rec} | | | | | 25 125 150 | | 0,093 0,197 0,234 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 221 184 147 | | A/μs |



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|------------------------------|---|-------------------------------------|------------|-----|-------|-----|--|------|
| | | V_{GE} [V] V_{GS} [V] | V_{CE} [V] V_{DS} [V] V_F [V] | I_C [A] I_D [A] I_F [A] | T_j [°C] | Min | Typ | Max | | |

Input Boost Switch

Static

| | | | | | | | | | | |
|--------------------------------------|--------------|-------------------|----|-----|--------|------------------|-----|----------------------|------|----|
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $V_{GE} = V_{CE}$ | | | 0,0003 | 25 | 3,2 | 4 | 4,8 | V |
| Collector-emitter saturation voltage | V_{CESat} | | 15 | | 30 | 25 125 150 | | 1,35 1,54 1,57 | 1,75 | V |
| Collector-emitter cut-off current | I_{CES} | | 0 | 650 | | 25 | | | 50 | μA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | 25 | | | 100 | nA |
| Internal gate resistance | r_g | | | | | | | none | | Ω |
| Input capacitance | C_{ies} | | | | | | | 1800 | | pF |
| Output capacitance | C_{oes} | $f = 1$ MHz | 0 | 25 | | 25 | | 55 | | |
| Reverse transfer capacitance | C_{res} | | | | | | | 7 | | |
| Gate charge | Q_g | | 15 | 520 | 30 | 25 | | 70 | | nC |

Thermal

| | | | | | | | | | | |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 1,61 | | K/W |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

Dynamic

| | | | | | | | | | | |
|-----------------------------|--------------|---|-----|-----|----|------------------|--|-------------------------|--|----|
| Turn-on delay time | $t_{d(on)}$ | | | | | 25 125 150 | | 65 66 66 | | ns |
| Rise time | t_r | $R_{goff} = 16$ Ω $R_{gon} = 16$ Ω | | | | 25 125 150 | | 8 9 10 | | |
| Turn-off delay time | $t_{d(off)}$ | | ±15 | 350 | 30 | 25 125 150 | | 87 106 111 | | |
| Fall time | t_f | | | | | 25 125 150 | | 15 33 45 | | |
| Turn-on energy (per pulse) | E_{on} | $Q_{tFWD} = 0,9$ μC $Q_{tFWD} = 1,7$ μC $Q_{tFWD} = 2$ μC | | | | 25 125 150 | | 0,421 0,541 0,579 |  |  | mWs |
| Turn-off energy (per pulse) | E_{off} | | | | | 25 125 150 | | 0,300 0,478 0,529 | | |



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|--------------|--------------|--------------|--------------|-----------|-----------|------------|-----|------|
| | | V_{GE} [V] | V_{GS} [V] | V_{CE} [V] | V_{DS} [V] | I_C [A] | I_D [A] | T_j [°C] | Min |  | Typ | Max |

Input Boost Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|--|--|-----|----|------------------|--|----------------------|------|---------|
| Forward voltage | V_F | | | | 30 | 25 125 150 | | 1,52 1,46 1,44 | 1,92 | V |
| Reverse leakage current | I_r | | | 650 | | 25 | | | 1,6 | μ A |

Thermal

| | | | | | | | | | | |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 1,92 | | K/W |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

Dynamic

| | | | | | | | | | | |
|---------------------------------------|----------------------|---|----------|-----|----|------------------|--|-------------------------|--|------------|
| Peak recovery current | I_{RRM} | | | | | 25 125 150 | | 31 44 49 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 54 79 95 | | ns |
| Recovered charge | Q_r | $di/dt = 4199$ A/ μ s $di/dt = 3916$ A/ μ s $di/dt = 3772$ A/ μ s | ± 15 | 350 | 30 | 25 125 150 | | 0,867 1,706 1,998 | | μ C |
| Reverse recovered energy | E_{rec} | | | | | 25 125 150 | | 0,206 0,431 0,516 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 1540 650 780 | | A/ μ s |

ByPass Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|--|--|------|----|-----------|-----|--------------|------------|---------|
| Forward voltage | V_F | | | | 35 | 25 125 | 0,8 | 1,17 1,13 | 1,6 | V |
| Reverse leakage current | I_r | | | 1600 | | 25 145 | | | 50 1100 | μ A |

Thermal

| | | | | | | | | | | |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 1,25 | | K/W |
|-------------------------------------|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|



Characteristic Values

| Parameter | Symbol | Conditions | | | | | Value | | | Unit |
|-----------|--------|--------------|--------------|-----------|------------|-----|-------|-----|--|------|
| | | V_{GE} [V] | V_{CE} [V] | I_C [A] | T_j [°C] | Min | Typ | Max | | |

Input Boost Sw. Protection Diode

Static

| Parameter | Symbol | V_{GS} [V] | V_{DS} [V] | I_D [A] | T_j [°C] | Min | Typ | Max | Unit |
|-------------------------|--------|--------------|--------------|-----------|------------|-----|--------------|------|------|
| Forward voltage | V_F | | | 10 | 25 125 | | 1,67 1,56 | 1,87 | V |
| Reverse leakage current | I_R | | 650 | | 25 | | | 0,14 | μA |

Thermal

| Parameter | Symbol | Conditions | T_j [°C] | Min | Typ | Max | Unit |
|-------------------------------------|---------------|---------------------------------------|------------|-----|------|-----|------|
| Thermal resistance junction to sink | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | 2,87 | | K/W |

Thermistor

| Parameter | Symbol | Conditions | T_j [°C] | Min | Typ | Max | Unit |
|----------------------------|----------------|--------------------|------------|-----|------|-----|------|
| Rated resistance | R | | 25 | | 22 | | kΩ |
| Deviation of R_{100} | $\Delta_{R/R}$ | $R_{100} = 1484$ Ω | 100 | -5 | | 5 | % |
| Power dissipation | P | | 25 | | 5 | | mW |
| Power dissipation constant | | | 25 | | 1,5 | | mW/K |
| B-value | $B_{(25/50)}$ | Tol. ±1 % | 25 | | 3962 | | K |
| B-value | $B_{(25/100)}$ | Tol. ±1 % | 25 | | 4000 | | K |
| Vincotech NTC Reference | | | | | | I | |

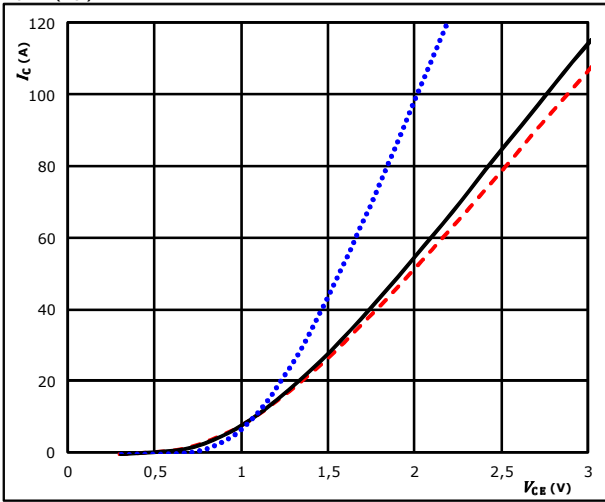


Low Buck Switch / High Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

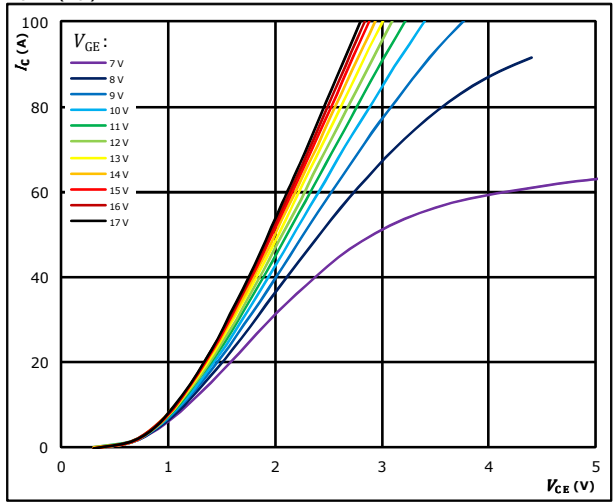


$t_p = 250 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $V_{GE} = 15 \text{ V}$ $125 \text{ }^\circ\text{C}$ (solid black)
 $150 \text{ }^\circ\text{C}$ (dashed red)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

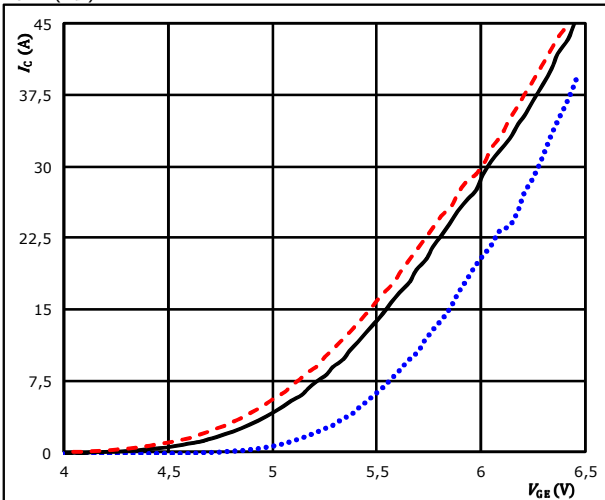


$t_p = 250 \mu\text{s}$
 $T_j = 150 \text{ }^\circ\text{C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

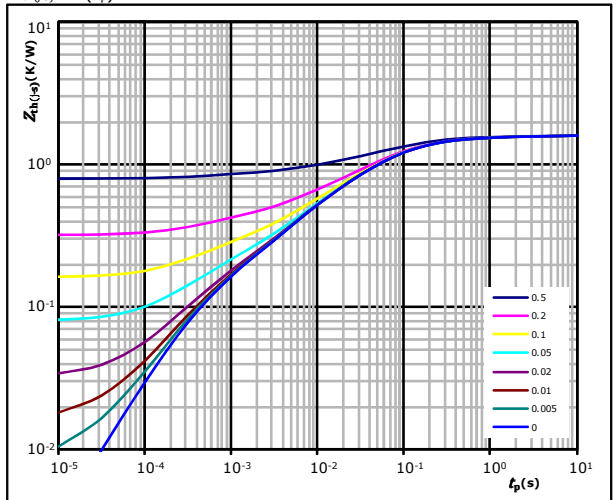


$t_p = 100 \mu\text{s}$ $T_j: 25 \text{ }^\circ\text{C}$ (dotted blue)
 $V_{CE} = 10 \text{ V}$ $125 \text{ }^\circ\text{C}$ (solid black)
 $150 \text{ }^\circ\text{C}$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,61 \text{ K/W}$

IGBT thermal model values

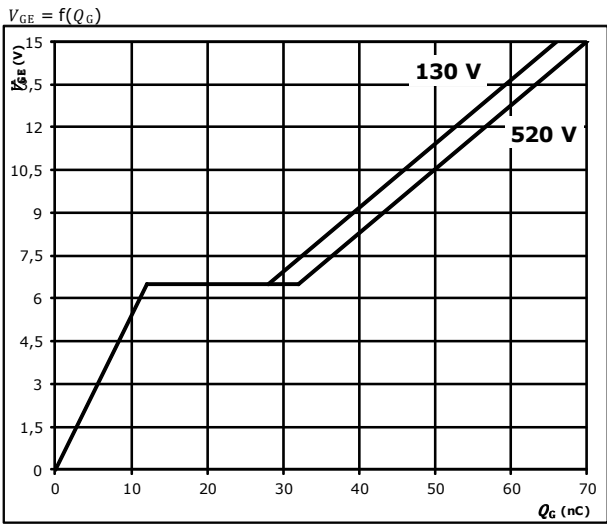
| R (K/W) | τ (s) |
|-----------|------------|
| 8,39E-02 | 2,23E+00 |
| 2,20E-01 | 2,63E-01 |
| 7,21E-01 | 6,39E-02 |
| 3,37E-01 | 1,40E-02 |
| 1,50E-01 | 3,28E-03 |
| 1,00E-01 | 4,05E-04 |



Low Buck Switch / High Buck Switch Characteristics

figure 5. IGBT

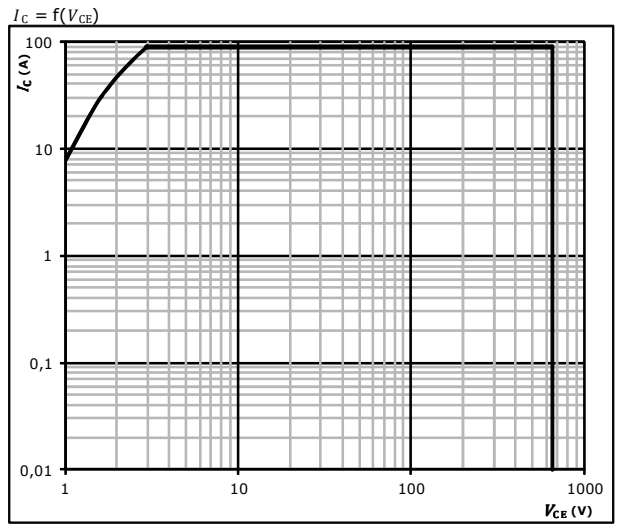
Gate voltage vs gate charge



$I_C = 30$ A

figure 6. IGBT

Safe operating area



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

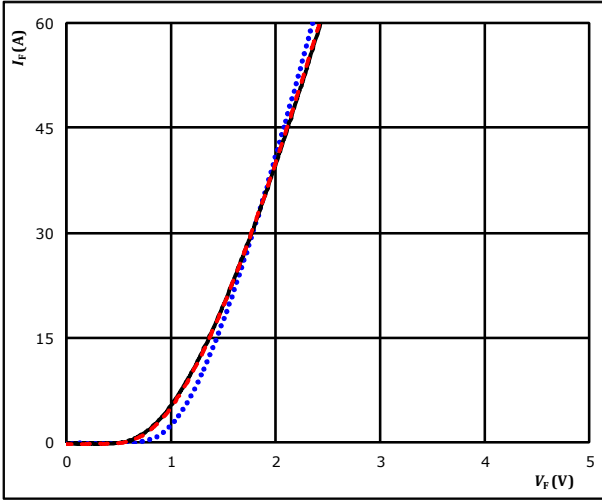


Buck Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



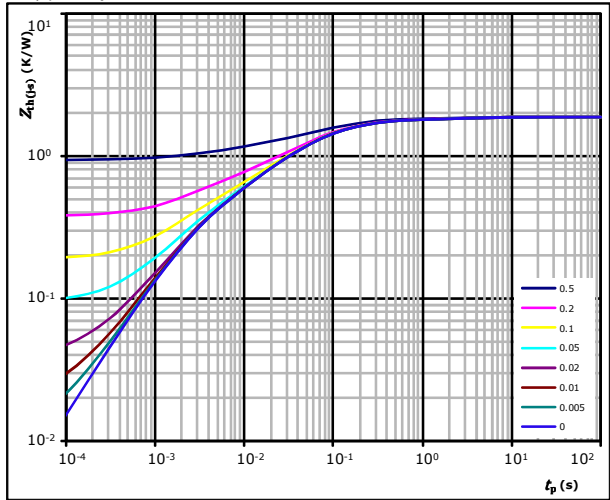
$t_p = 250 \mu s$

T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(\theta-s)} = f(t_p)$$



$D = \frac{t_p}{T}$

$R_{th(\theta-s)} = 1,88 \text{ K/W}$

FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 8,42E-02 | 3,60E+00 |
| 1,79E-01 | 3,95E-01 |
| 8,86E-01 | 7,08E-02 |
| 4,50E-01 | 1,69E-02 |
| 2,75E-01 | 2,45E-03 |

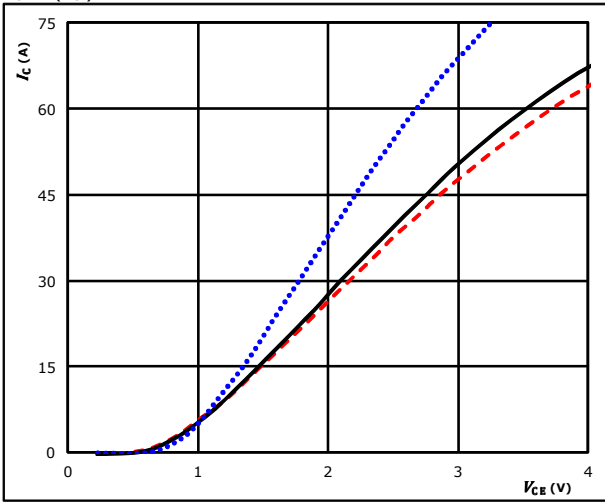


Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

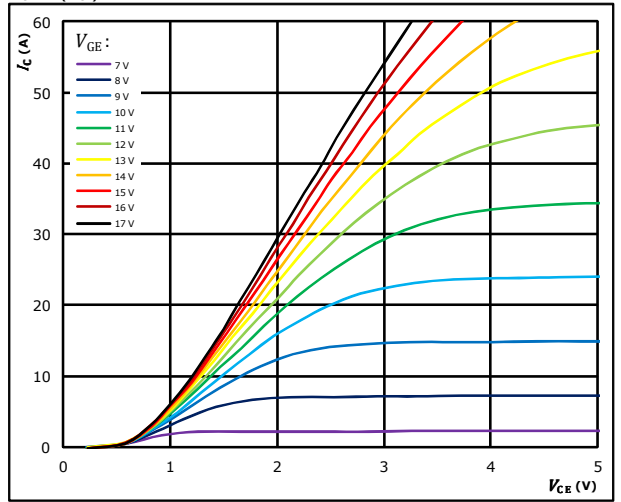


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$ (blue dotted line)
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ C$ (black solid line)
 $T_j: 150 \text{ }^\circ C$ (red dashed line)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

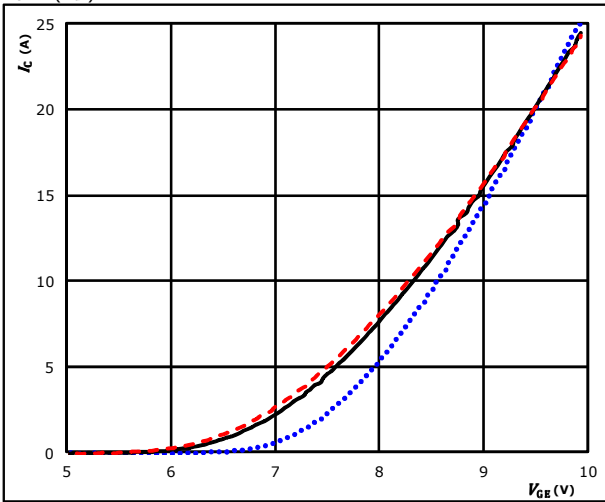


$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

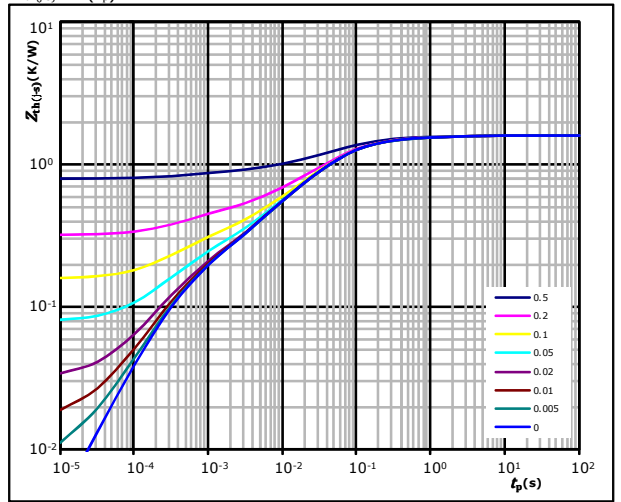


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$ (blue dotted line)
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ C$ (black solid line)
 $T_j: 150 \text{ }^\circ C$ (red dashed line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$Z_{th(j-s)} = f(t_p)$



$D = t_p / T$
 $R_{th(j-s)} = 1,60 \text{ K/W}$

IGBT thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 8,72E-02 | 1,64E+00 |
| 2,19E-01 | 2,09E-01 |
| 7,41E-01 | 5,24E-02 |
| 3,11E-01 | 1,19E-02 |
| 1,15E-01 | 2,56E-03 |
| 1,31E-01 | 3,71E-04 |



Boost Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

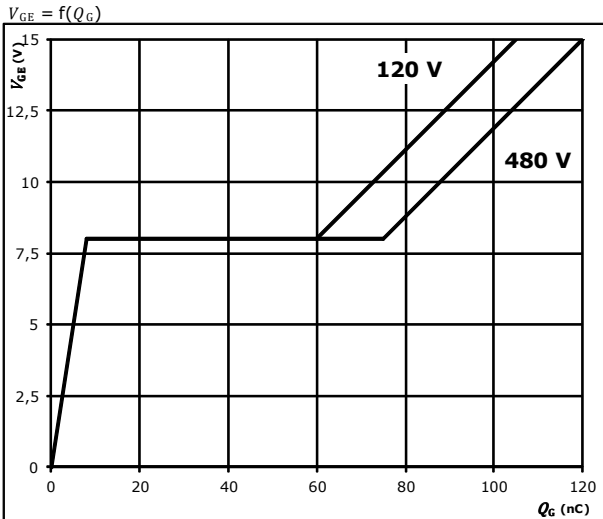
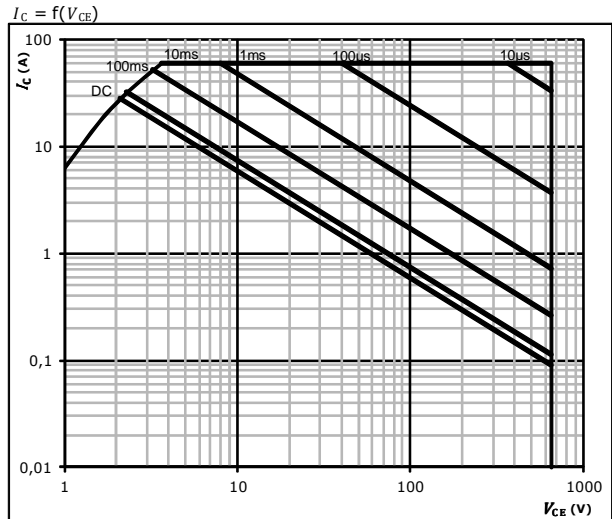


figure 6. IGBT

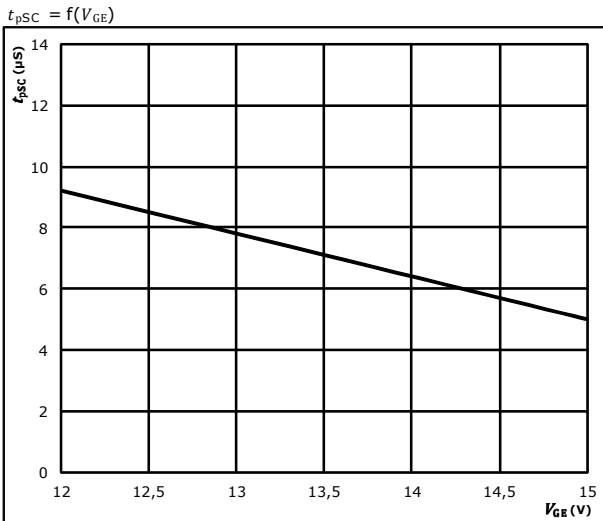
Safe operating area



$D =$ single pulse
 $T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = \pm 15 \text{ V}$
 $T_j = T_{jmax}$

figure 7. IGBT

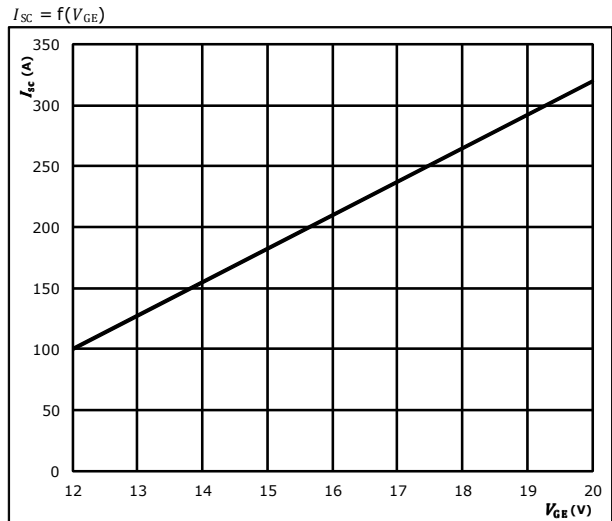
Short circuit duration as a function of V_{CE}



$V_{CE} = 650 \text{ V}$
 $T_j \leq 175 \text{ } ^\circ\text{C}$

figure 8. IGBT

Typical short circuit current as a function of V_{CE}



$V_{CE} \leq 650 \text{ V}$
 $T_j \leq 175 \text{ } ^\circ\text{C}$

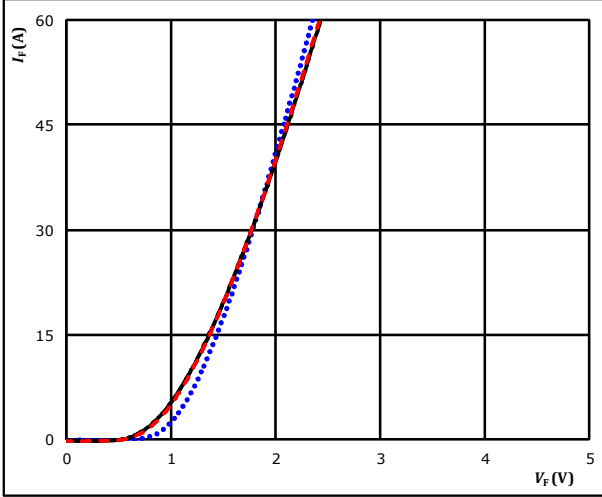


Low Buck Diode / High Buck Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

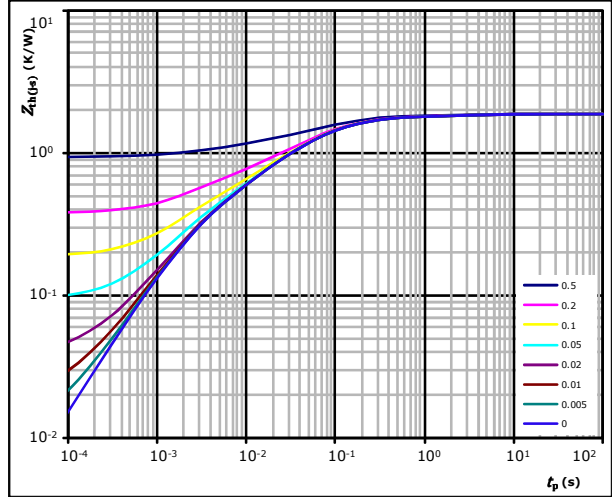


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,88 \text{ K/W}$
 FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 8,42E-02 | 3,60E+00 |
| 1,79E-01 | 3,95E-01 |
| 8,86E-01 | 7,08E-02 |
| 4,50E-01 | 1,69E-02 |
| 2,75E-01 | 2,45E-03 |

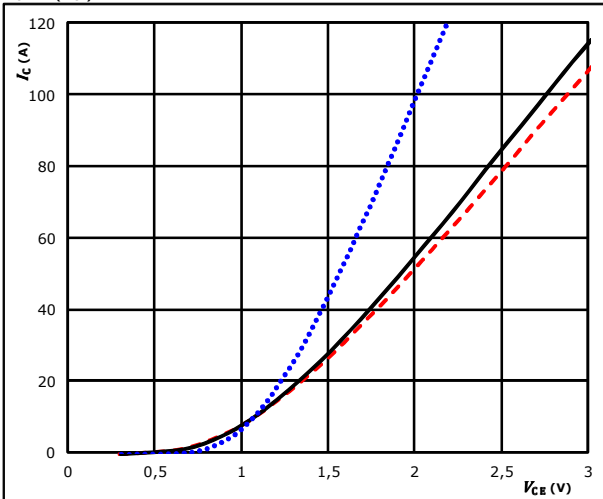


Input Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

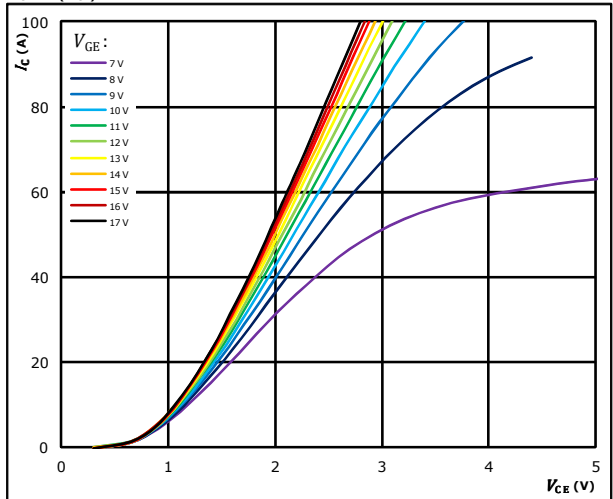


$t_p = 250 \mu\text{s}$
 $V_{GE} = 15 \text{ V}$
 $T_j:$ 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

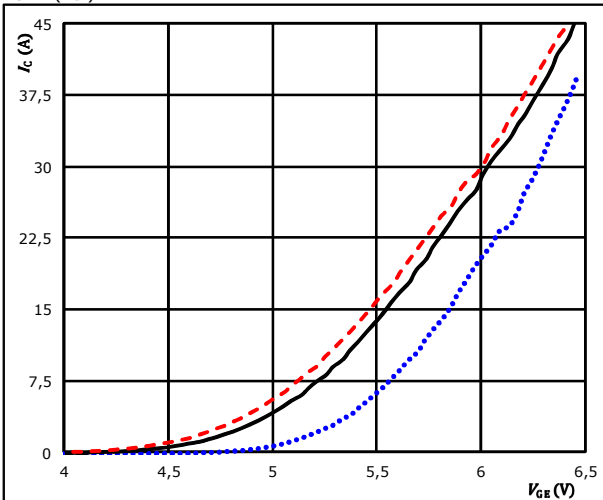


$t_p = 250 \mu\text{s}$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

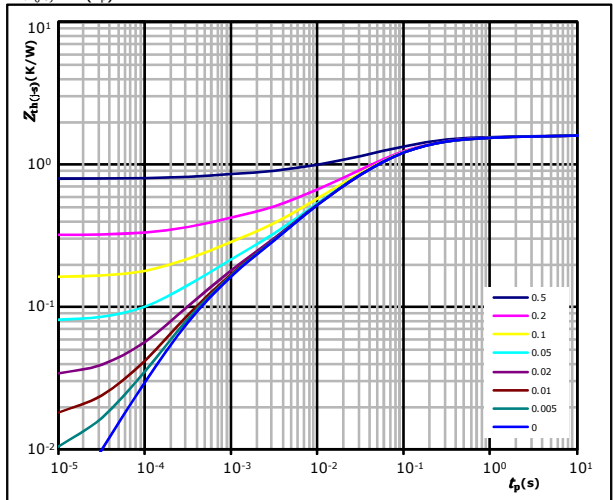


$t_p = 100 \mu\text{s}$
 $V_{CE} = 10 \text{ V}$
 $T_j:$ 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$$Z_{th(j-s)} = f(t_p)$$



$$D = t_p / T$$

$$R_{th(j-s)} = 1,61 \text{ K/W}$$

IGBT thermal model values

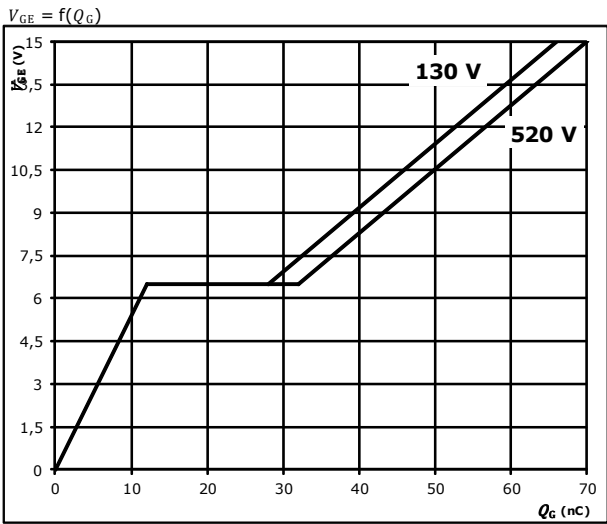
| R (K/W) | τ (s) |
|-----------|------------|
| 8,39E-02 | 2,23E+00 |
| 2,20E-01 | 2,63E-01 |
| 7,21E-01 | 6,39E-02 |
| 3,37E-01 | 1,40E-02 |
| 1,50E-01 | 3,28E-03 |
| 1,00E-01 | 4,05E-04 |



Input Boost Switch Characteristics

figure 5. IGBT

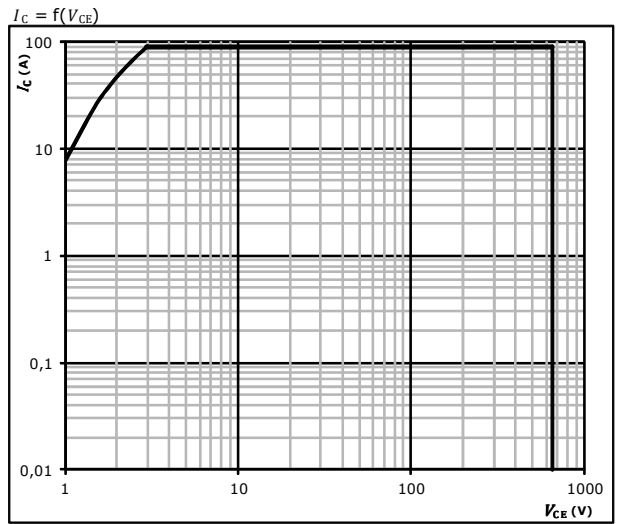
Gate voltage vs gate charge



$I_C = 30$ A

figure 6. IGBT

Safe operating area



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

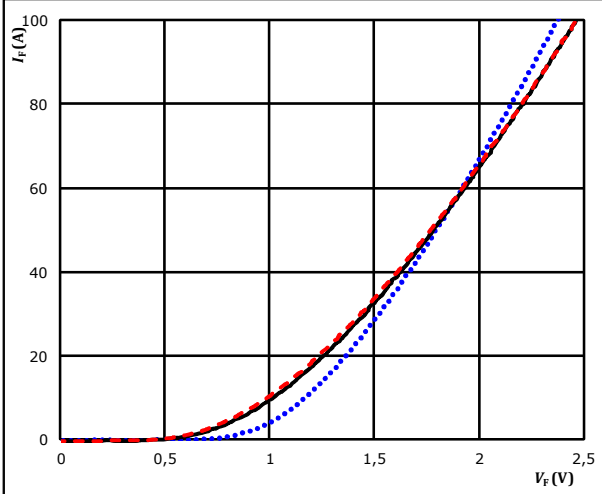


Input Boost Diode Characteristics

figure 1. Inverse Diode

Typical forward characteristics

$$I_F = f(V_F)$$

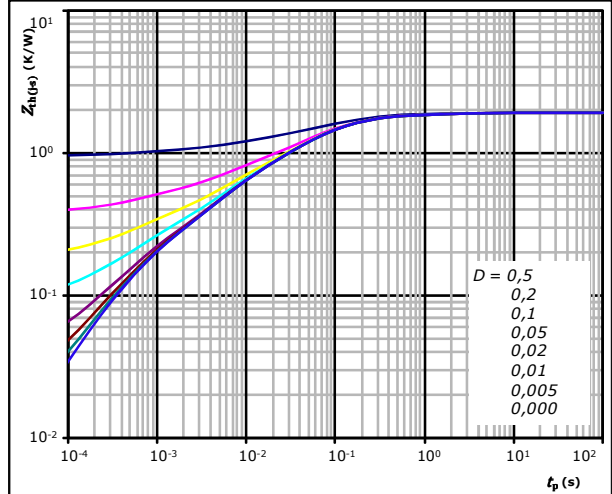


$t_p =$ 250 μ s
 T_j : 25 °C (blue dotted line)
 125 °C (black solid line)
 150 °C (red dashed line)

figure 2. Inverse Diode

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D =$ t_p / T
 $R_{th(j-s)} =$ 1,92 K/W

Inverse Diode thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 9,41E-02 | 2,25E+00 |
| 3,44E-01 | 2,12E-01 |
| 8,56E-01 | 5,84E-02 |
| 3,61E-01 | 9,83E-03 |
| 1,37E-01 | 2,89E-03 |
| 1,27E-01 | 4,79E-04 |



ByPass Diode Characteristics

figure 1. ByPass Diode
 Typical forward characteristics

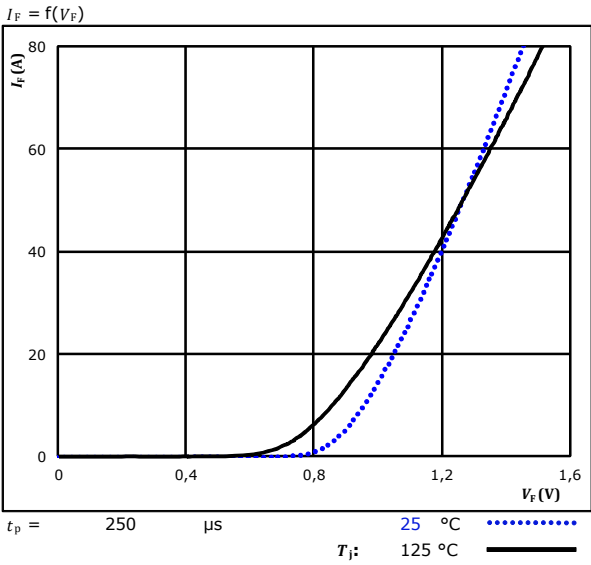
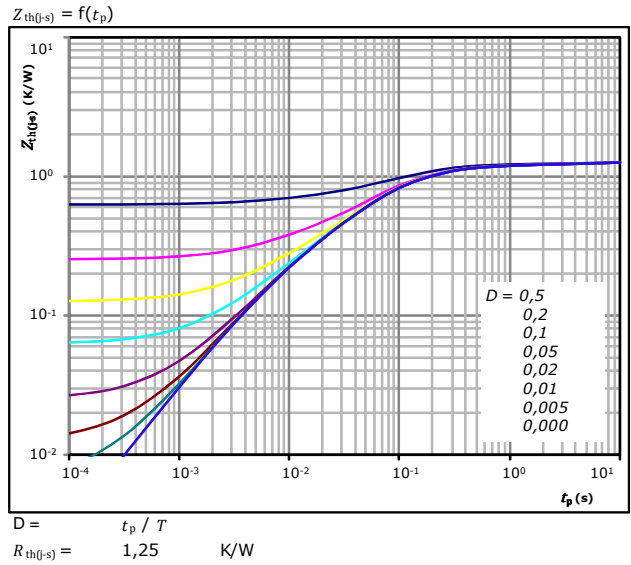


figure 2. ByPass Diode
 Transient thermal impedance as a function of pulse width



ByPass Diode thermal model values

| R (K/W) | τ (s) |
|----------|------------|
| 8,00E-02 | 5,22E+00 |
| 1,56E-01 | 4,18E-01 |
| 6,95E-01 | 8,82E-02 |
| 2,23E-01 | 3,07E-02 |
| 9,97E-02 | 5,99E-03 |

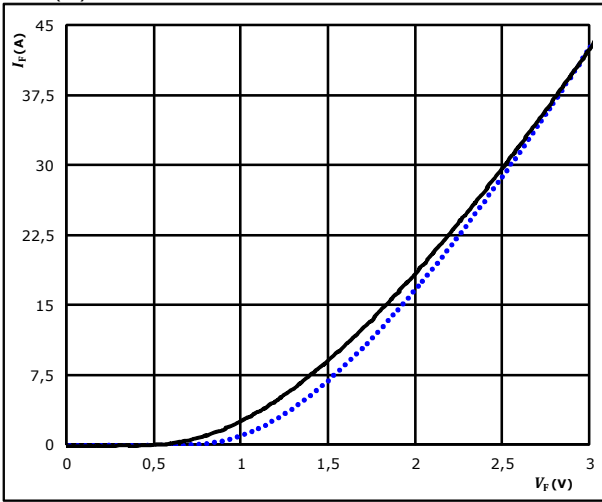


Input Boost Sw. Protection Diode Characteristics

figure 1. Prot. Diode

Typical forward characteristics

$$I_F = f(V_F)$$

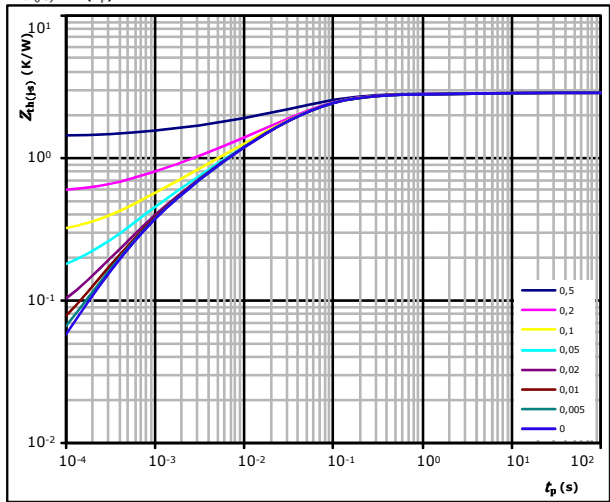


$t_p = 250 \mu s$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)

figure 2. Prot. Diode

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 2,87 \text{ K/W}$
 Prot. Diode thermal model values

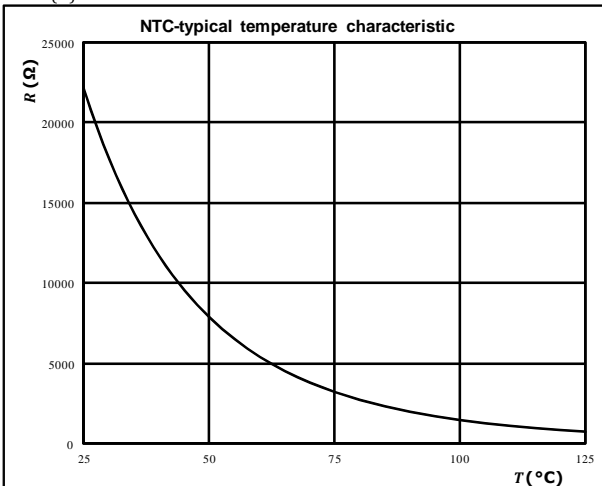
| $R \text{ (K/W)}$ | $\tau \text{ (s)}$ |
|-------------------|--------------------|
| 6,53E-02 | 3,94E+00 |
| 1,48E-01 | 4,48E-01 |
| 1,31E+00 | 5,96E-02 |
| 7,32E-01 | 1,36E-02 |
| 4,04E-01 | 2,79E-03 |
| 2,11E-01 | 5,37E-04 |

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

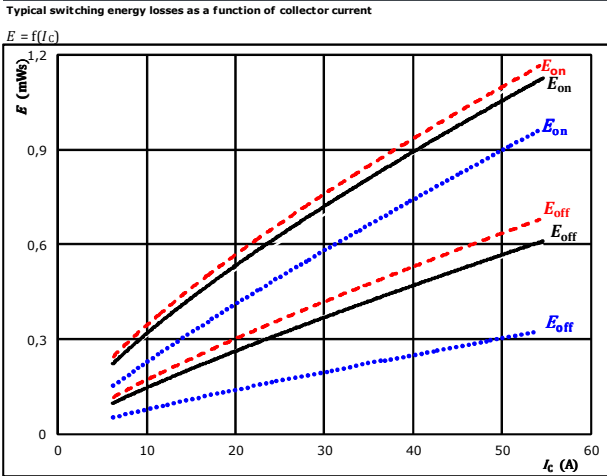
$$R = f(T)$$





Buck Switching Characteristics

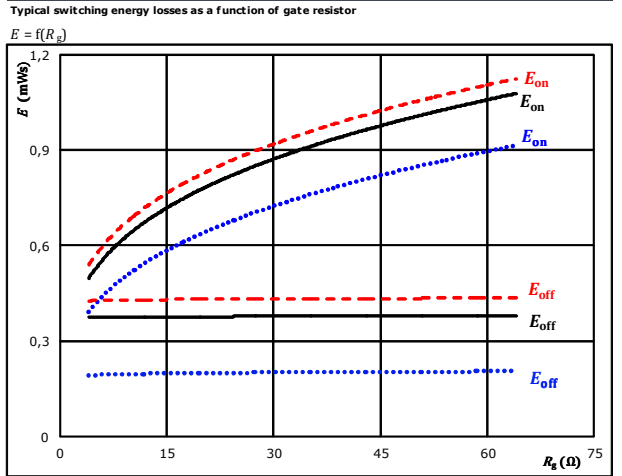
figure 1. IGBT



With an inductive load at

| | | |
|--------------------------|--------------|---------|
| $V_{CE} = 350$ V | $T_j: 25$ °C | ..... |
| $V_{GE} = \pm 15$ V | 125 °C | ———— |
| $R_{g\text{on}} = 16$ Ω | 150 °C | - - - - |
| $R_{g\text{off}} = 16$ Ω | | |

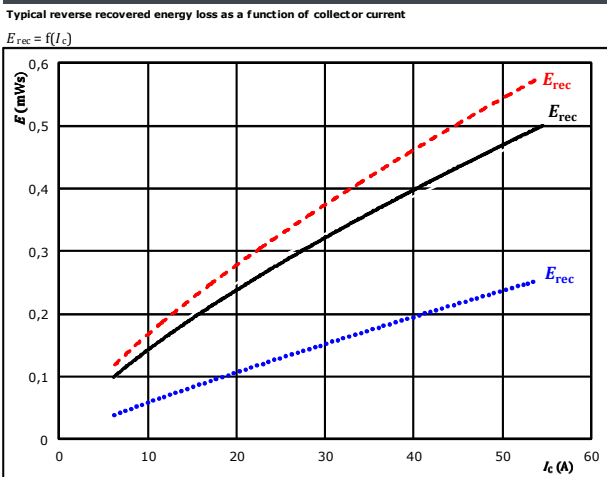
figure 2. IGBT



With an inductive load at

| | | |
|---------------------|--------------|---------|
| $V_{CE} = 350$ V | $T_j: 25$ °C | ..... |
| $V_{GE} = \pm 15$ V | 125 °C | ———— |
| $I_c = 30$ A | 150 °C | - - - - |

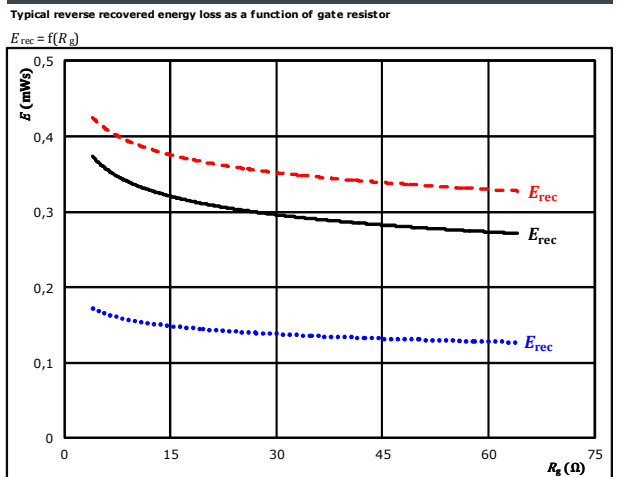
figure 3. FWD



With an inductive load at

| | | |
|-------------------------|--------------|---------|
| $V_{CE} = 350$ V | $T_j: 25$ °C | ..... |
| $V_{GE} = \pm 15$ V | 125 °C | ———— |
| $R_{g\text{on}} = 16$ Ω | 150 °C | - - - - |

figure 4. FWD



With an inductive load at

| | | |
|---------------------|--------------|---------|
| $V_{CE} = 350$ V | $T_j: 25$ °C | ..... |
| $V_{GE} = \pm 15$ V | 125 °C | ———— |
| $I_c = 30$ A | 150 °C | - - - - |

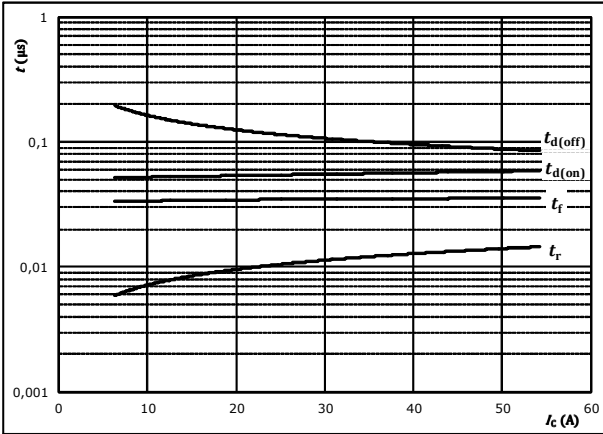


Buck Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



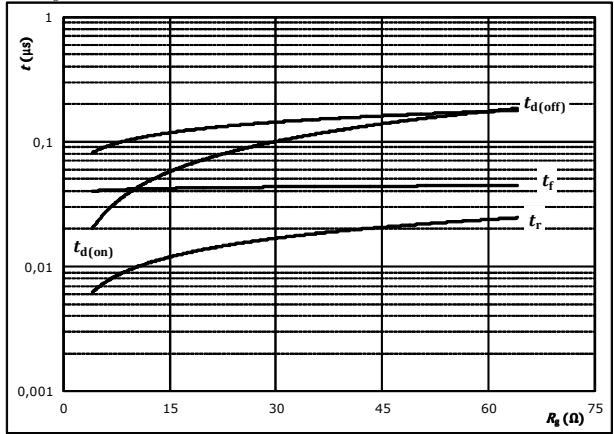
With an inductive load at

| | | |
|----------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{g(on)} =$ | 16 | Ω |
| $R_{g(off)} =$ | 16 | Ω |

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



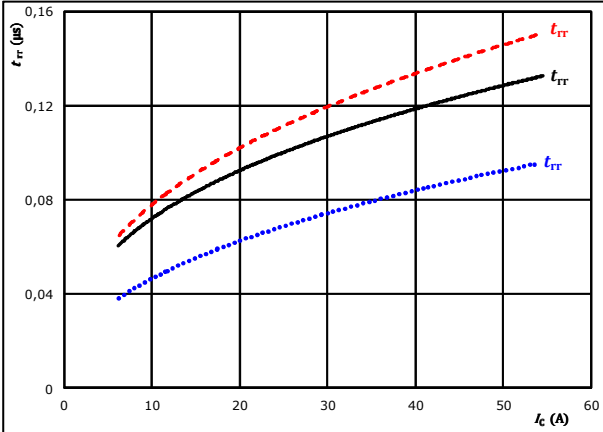
With an inductive load at

| | | |
|------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $I_c =$ | 30 | A |

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

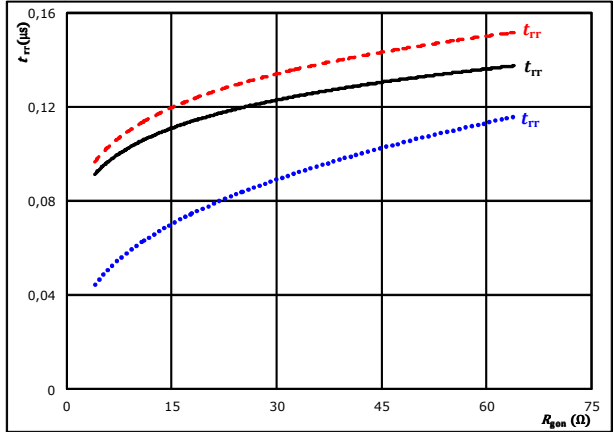


| | | | | | | |
|----|---------------|-----|---|--------|--------|-------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $R_{g(on)} =$ | 16 | Ω | | 150 °C | ----- |

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{g(on)})$$



| | | | | | | |
|----|------------|-----|---|--------|--------|-------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $I_c =$ | 30 | A | | 150 °C | ----- |

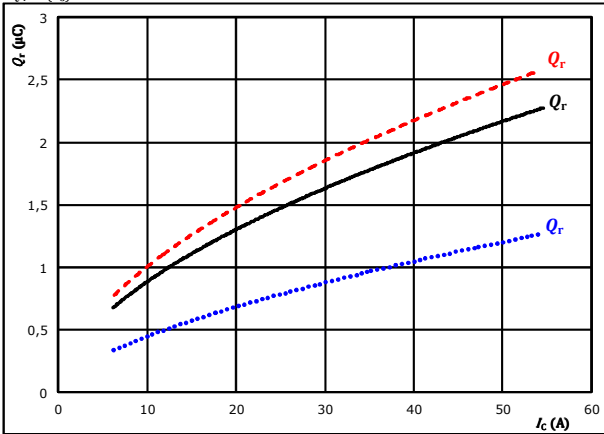


Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

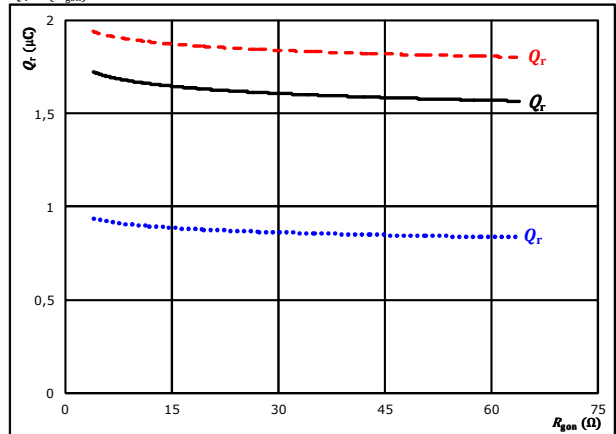


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gdn} = 16$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

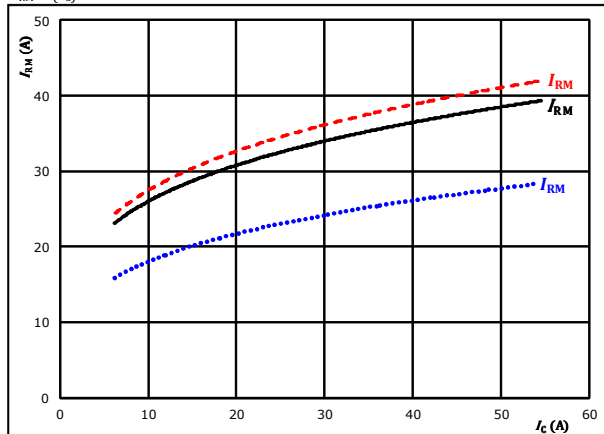


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

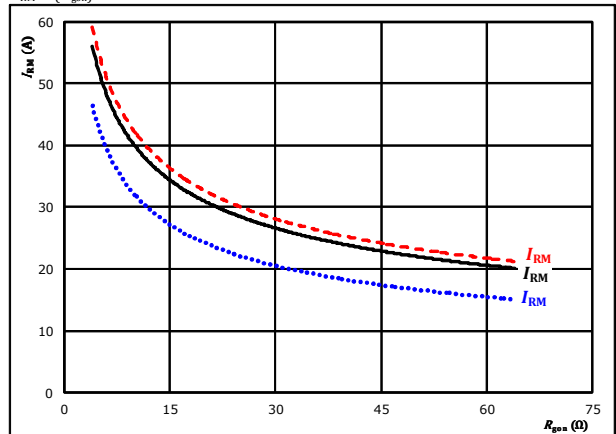


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gdn} = 16$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

figure 12. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



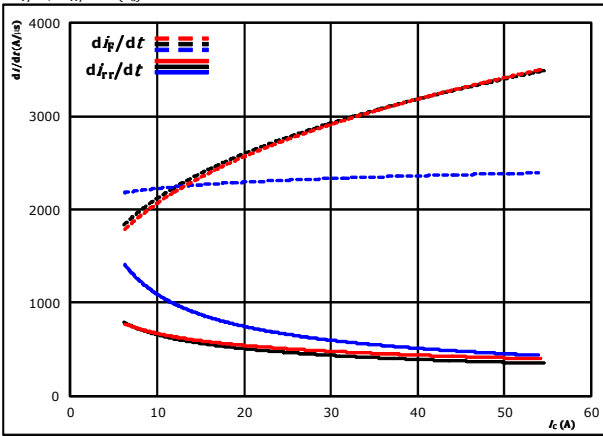
At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)



Buck Switching Characteristics

figure 13. FWD

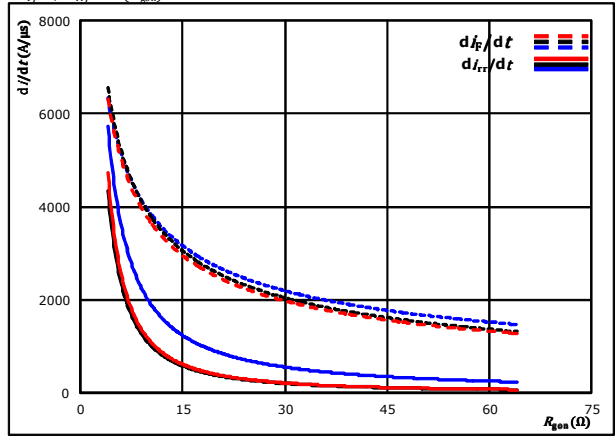
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{g(on)} = 16$ Ω $T_j = 150$ °C - - - - -

figure 14. FWD

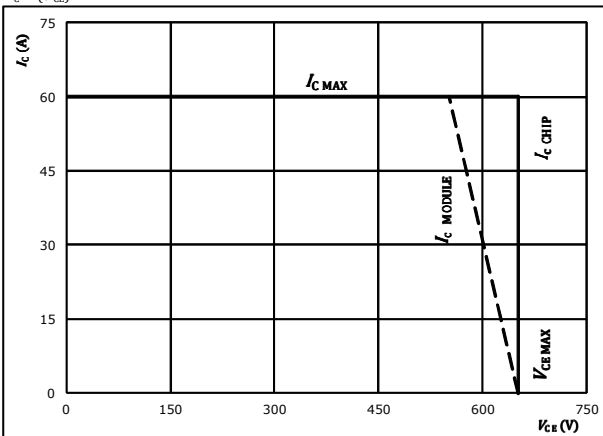
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 30$ A $T_j = 150$ °C - - - - -

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g(on)} = 16$ Ω
 $R_{g(off)} = 16$ Ω



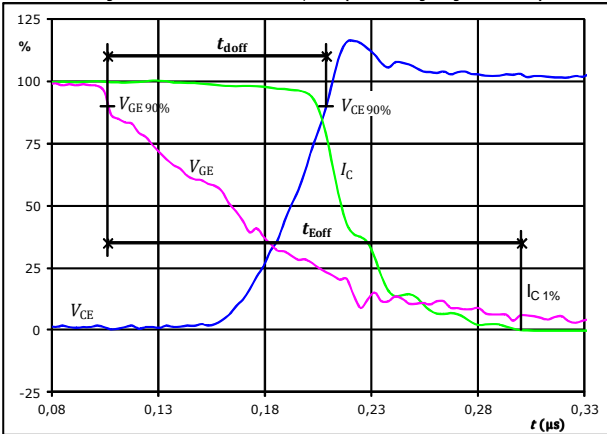
Buck Switching Definitions

General conditions

| | | |
|------------|---|--------|
| T_j | = | 125 °C |
| R_{gon} | = | 16 Ω |
| R_{goff} | = | 16 Ω |

figure 1. IGBT

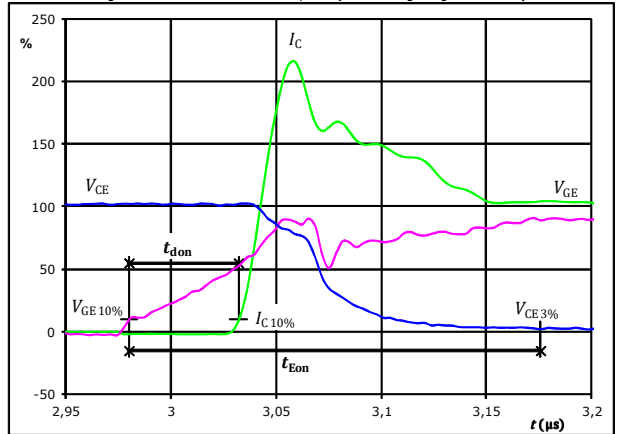
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for Eoff)



| | | | |
|-----------------|---|-------|----|
| $V_{GE}(0\%)$ | = | -15 | V |
| $V_{GE}(100\%)$ | = | 15 | V |
| $V_C(100\%)$ | = | 350 | V |
| $I_C(100\%)$ | = | 30 | A |
| t_{doff} | = | 0,101 | μs |
| t_{Eoff} | = | 0,194 | μs |

figure 2. IGBT

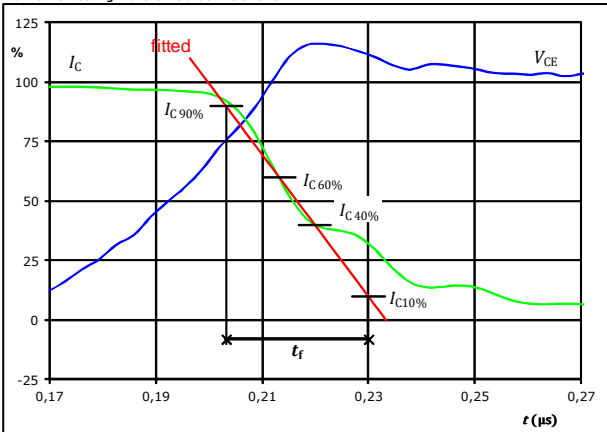
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for Eon)



| | | | |
|-----------------|---|-------|----|
| $V_{GE}(0\%)$ | = | -15 | V |
| $V_{GE}(100\%)$ | = | 15 | V |
| $V_C(100\%)$ | = | 350 | V |
| $I_C(100\%)$ | = | 30 | A |
| t_{don} | = | 0,056 | μs |
| t_{Eon} | = | 0,196 | μs |

figure 3. IGBT

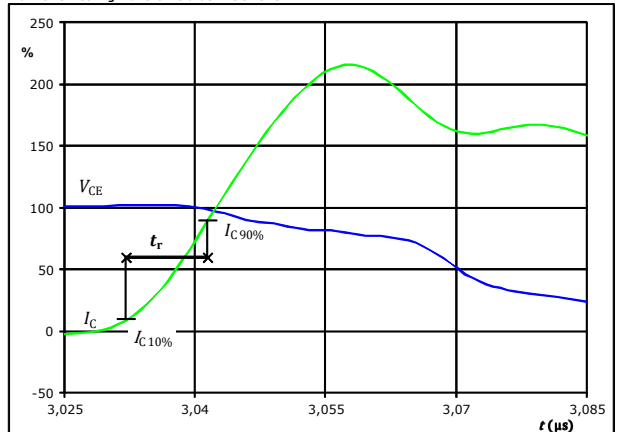
Turn-off Switching Waveforms & definition of t_f



| | | | |
|--------------|---|-------|----|
| $V_C(100\%)$ | = | 350 | V |
| $I_C(100\%)$ | = | 30 | A |
| t_f | = | 0,031 | μs |

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



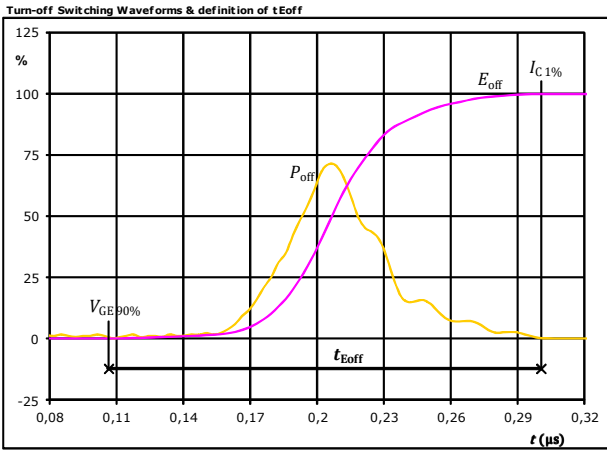
| | | | |
|--------------|---|-------|----|
| $V_C(100\%)$ | = | 350 | V |
| $I_C(100\%)$ | = | 30 | A |
| t_r | = | 0,010 | μs |



Vincotech

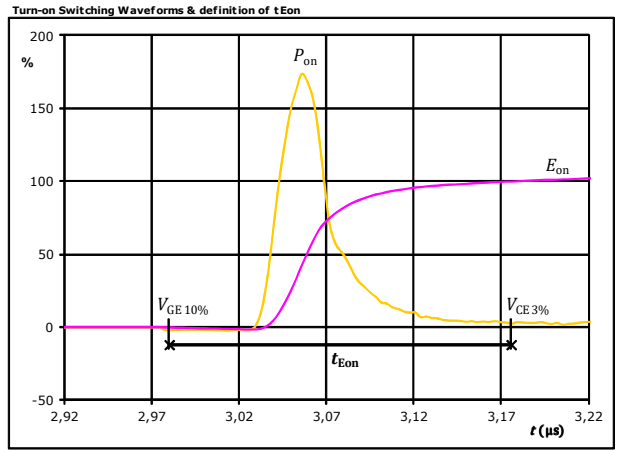
Buck Switching Characteristics

figure 5. IGBT



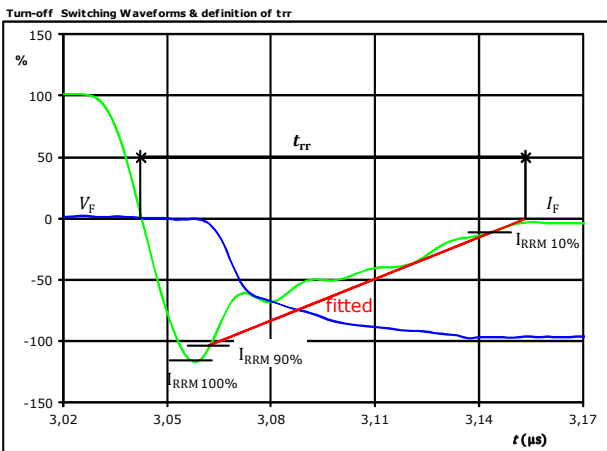
$P_{off}(100\%) = 10,57$ kW
 $E_{off}(100\%) = 0,38$ mJ
 $t_{Eoff} = 0,19$ µs

figure 6. IGBT



$P_{on}(100\%) = 10,57$ kW
 $E_{on}(100\%) = 0,70$ mJ
 $t_{Eon} = 0,20$ µs

figure 7. FWD



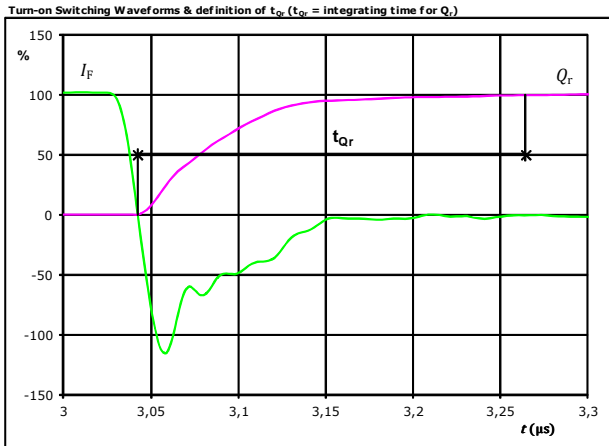
$V_F(100\%) = 350$ V
 $I_F(100\%) = 30$ A
 $I_{RRM}(100\%) = -33$ A
 $t_{rr} = 0,110$ µs



Vincotech

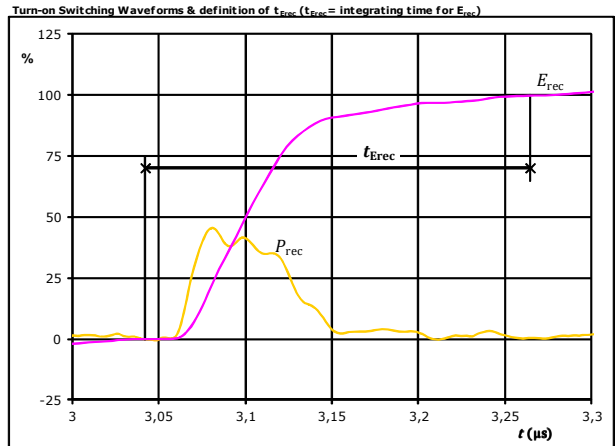
Buck Switching Characteristics

figure 8. FWD



| | | |
|----------------|------|---------------|
| I_F (100%) = | 30 | A |
| Q_r (100%) = | 1,66 | μC |
| t_{Qr} = | 0,22 | μs |

figure 9. FWD



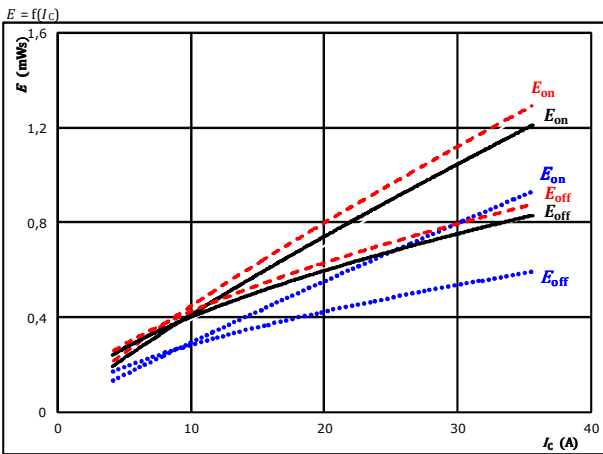
| | | |
|--------------------|-------|---------------|
| P_{rec} (100%) = | 10,57 | kW |
| E_{rec} (100%) = | 0,33 | mJ |
| t_{Erec} = | 0,22 | μs |



Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

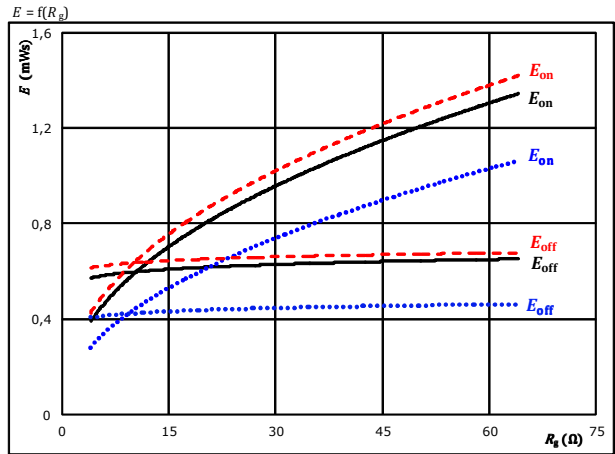


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

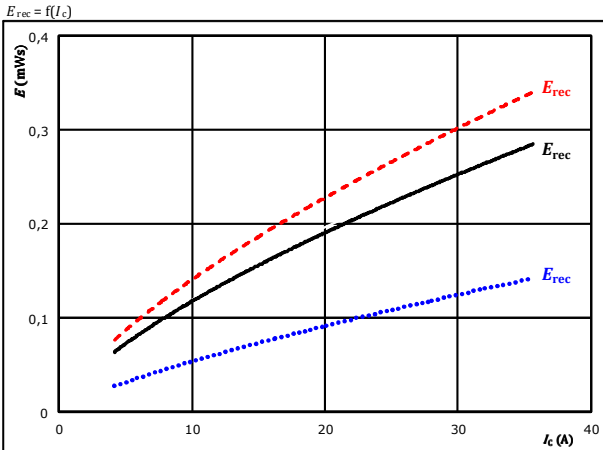


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 20$ A

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

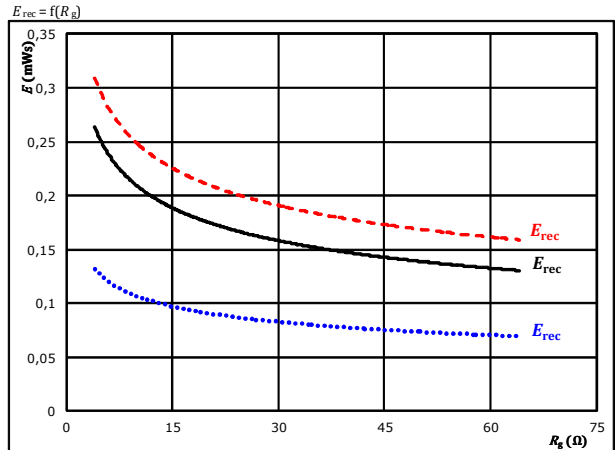


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 20$ A

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

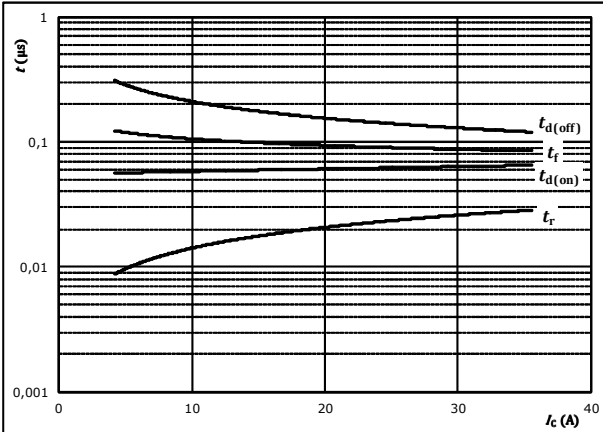


Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



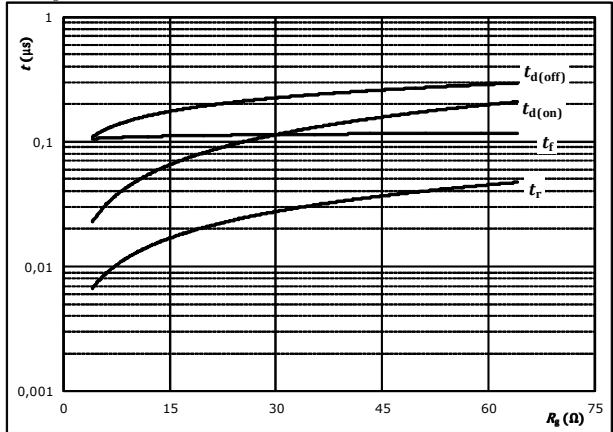
With an inductive load at

| | | |
|----------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{g(on)} =$ | 16 | Ω |
| $R_{g(off)} =$ | 16 | Ω |

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



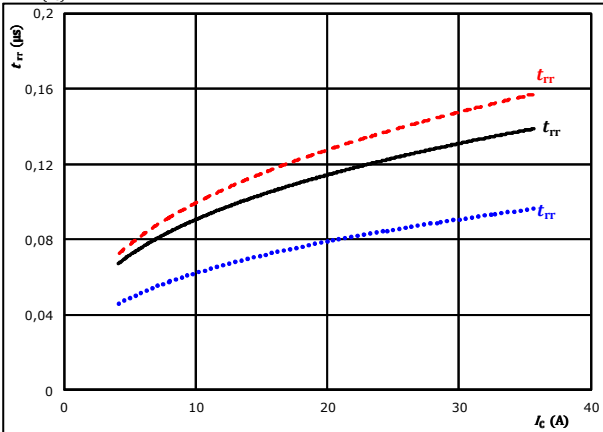
With an inductive load at

| | | |
|------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $I_c =$ | 20 | A |

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

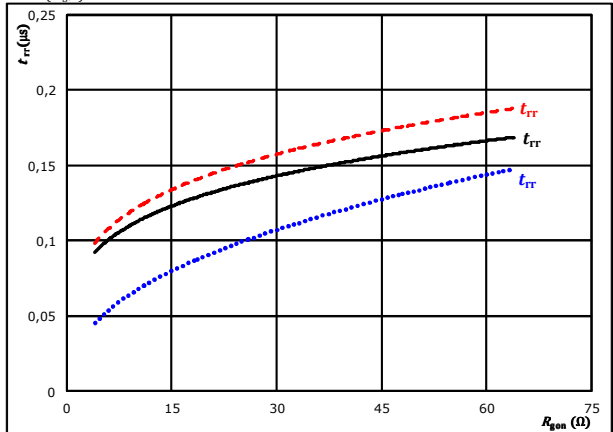


| | | | | | | |
|----|---------------|-----|---|--------|--------|---------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $R_{g(on)} =$ | 16 | Ω | | 150 °C | - - - - |

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{g(on)})$$



| | | | | | | |
|----|------------|-----|---|--------|--------|---------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $I_c =$ | 20 | A | | 150 °C | - - - - |

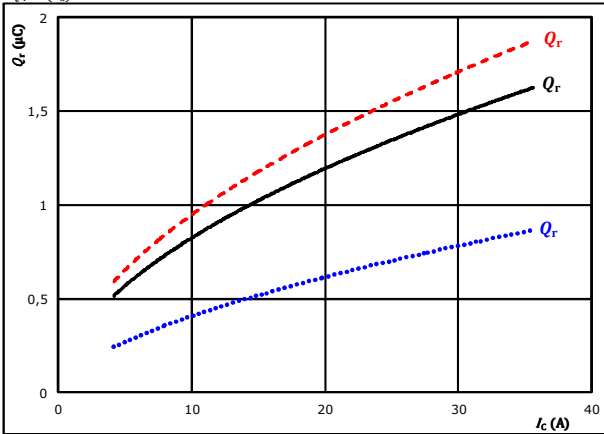


Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

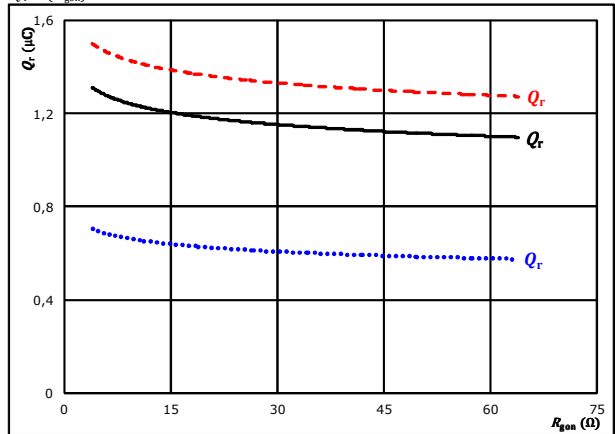


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gdn} = 16$ Ω
 $T_j: 25$ °C
 125 °C
 150 °C

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gdn})$$

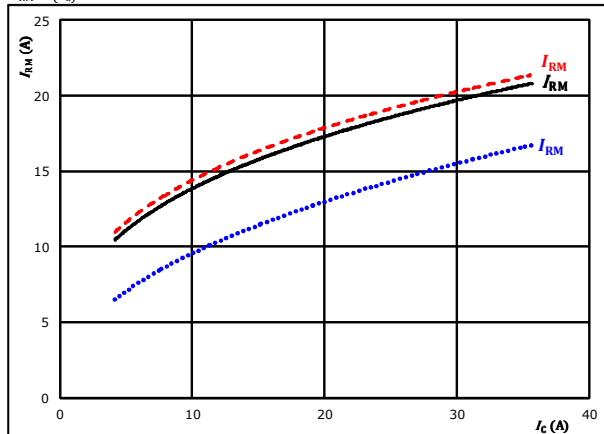


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 20$ A
 $T_j: 25$ °C
 125 °C
 150 °C

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

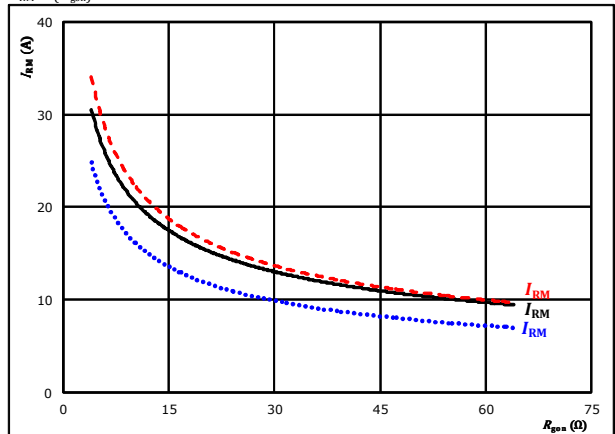


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gdn} = 16$ Ω
 $T_j: 25$ °C
 125 °C
 150 °C

figure 12. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gdn})$$



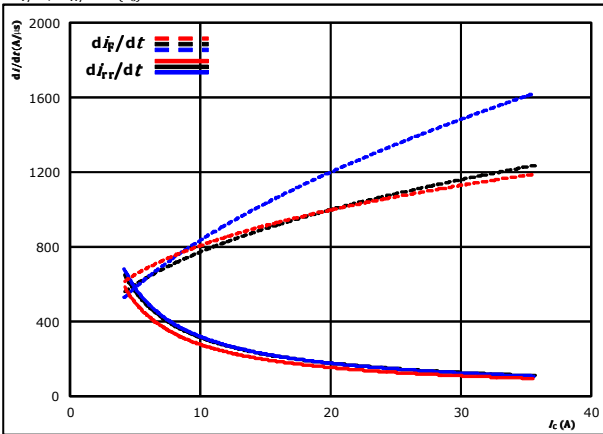
At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 20$ A
 $T_j: 25$ °C
 125 °C
 150 °C



Boost Switching Characteristics

figure 13. FWD

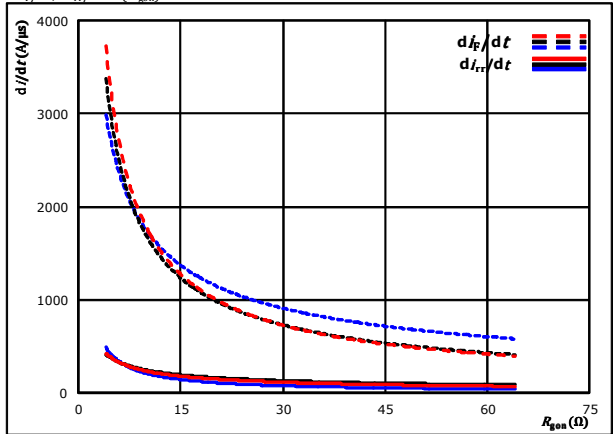
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C (dotted)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid)
 $R_{g0n} = 16$ Ω $T_j = 150$ °C (dashed)

figure 14. FWD

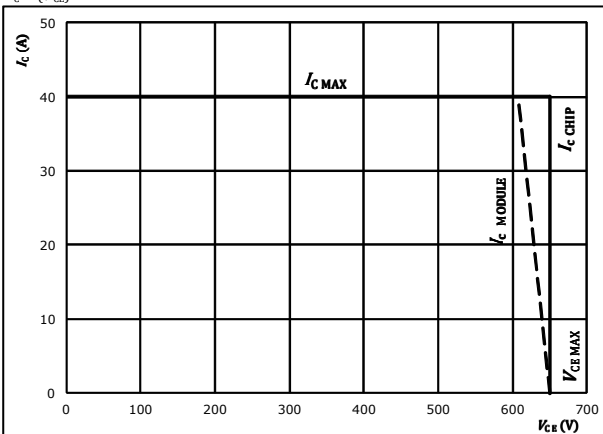
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g0n})$



At $V_{CE} = 350$ V $T_j = 25$ °C (dotted)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (solid)
 $I_c = 20$ A $T_j = 150$ °C (dashed)

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g0n} = 16$ Ω
 $R_{g0ff} = 16$ Ω



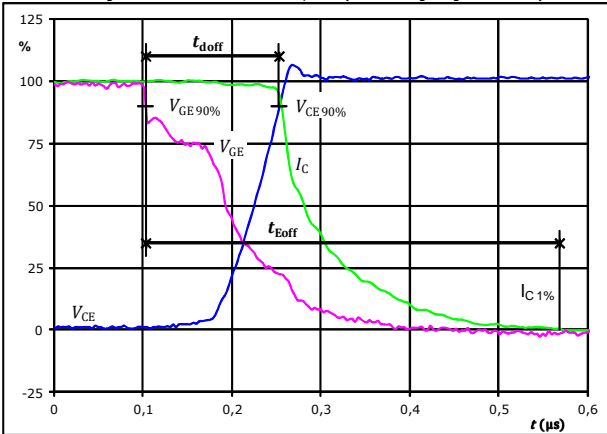
Boost Switching Definitions

General conditions

| | | |
|------------|---|-------------|
| T_j | = | 125 °C |
| R_{gon} | = | 16 Ω |
| R_{goff} | = | 16 Ω |

figure 1. IGBT

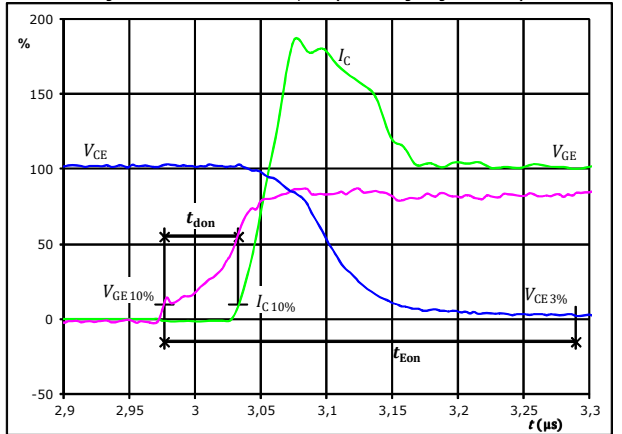
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for Eoff)



| | | |
|-------------------|-------|---------|
| $V_{CE}(0\%) =$ | -15 | V |
| $V_{GE}(100\%) =$ | 15 | V |
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 20 | A |
| $t_{doff} =$ | 0,150 | μs |
| $t_{Eoff} =$ | 0,465 | μs |

figure 2. IGBT

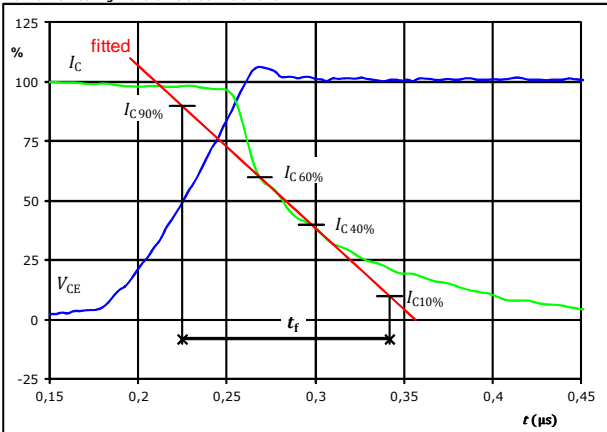
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for Eon)



| | | |
|-------------------|-------|---------|
| $V_{CE}(0\%) =$ | -15 | V |
| $V_{GE}(100\%) =$ | 15 | V |
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 20 | A |
| $t_{don} =$ | 0,061 | μs |
| $t_{Eon} =$ | 0,313 | μs |

figure 3. IGBT

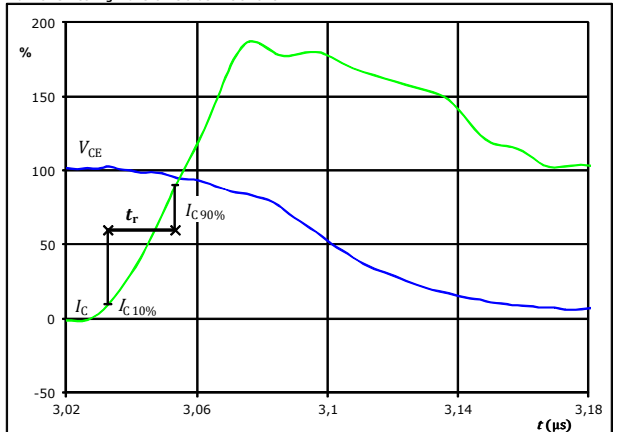
Turn-off Switching Waveforms & definition of t_f



| | | |
|----------------|-------|---------|
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 20 | A |
| $t_f =$ | 0,105 | μs |

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



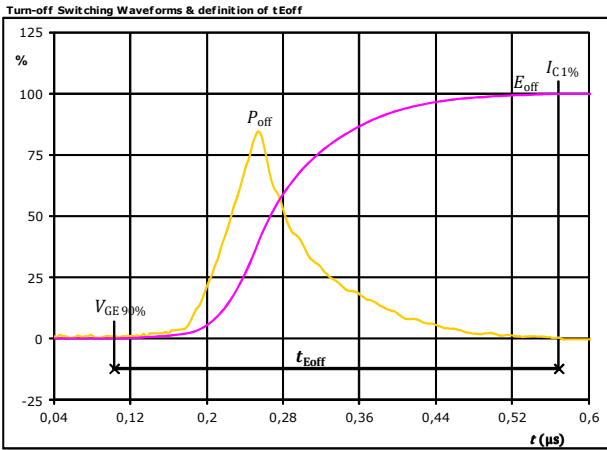
| | | |
|----------------|-------|---------|
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 20 | A |
| $t_r =$ | 0,021 | μs |



Vincotech

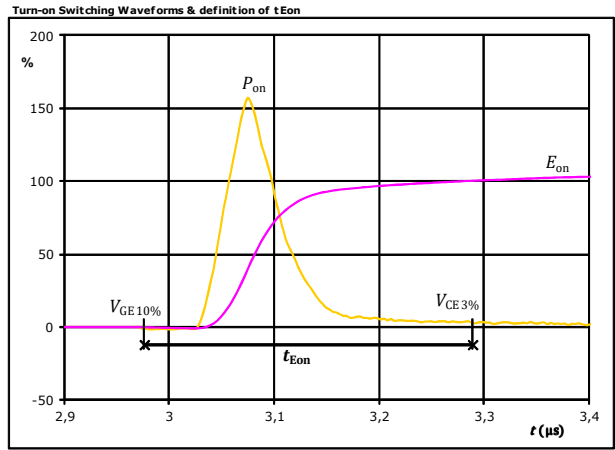
Boost Switching Characteristics

figure 5. IGBT



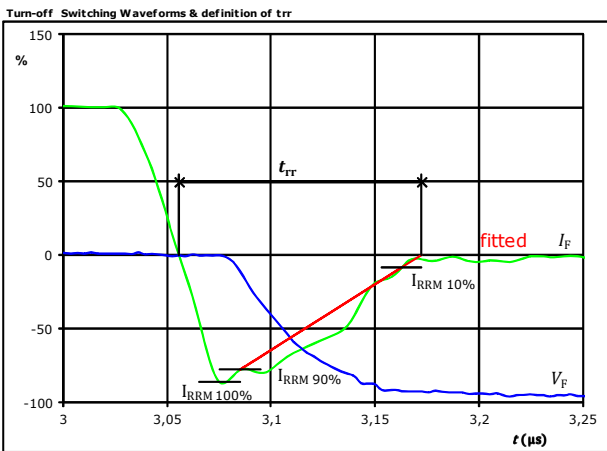
$P_{off}(100\%) = 7,03$ kW
 $E_{off}(100\%) = 0,61$ mJ
 $t_{Eoff} = 0,47$ μs

figure 6. IGBT



$P_{on}(100\%) = 7,03$ kW
 $E_{on}(100\%) = 0,71$ mJ
 $t_{Eon} = 0,31$ μs

figure 7. FWD



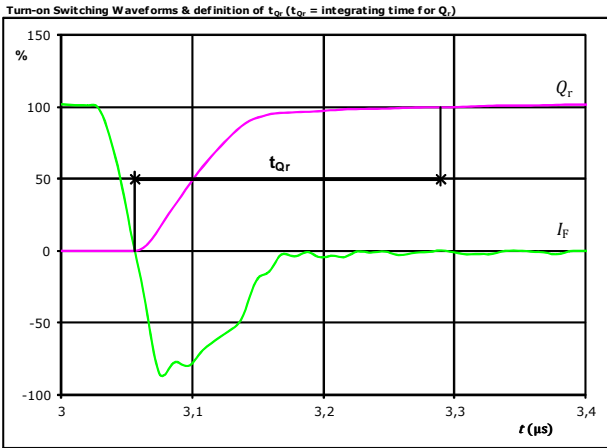
$V_F(100\%) = 350$ V
 $I_F(100\%) = 20$ A
 $I_{RRM}(100\%) = -17$ A
 $t_{rr} = 0,114$ μs



Vincotech

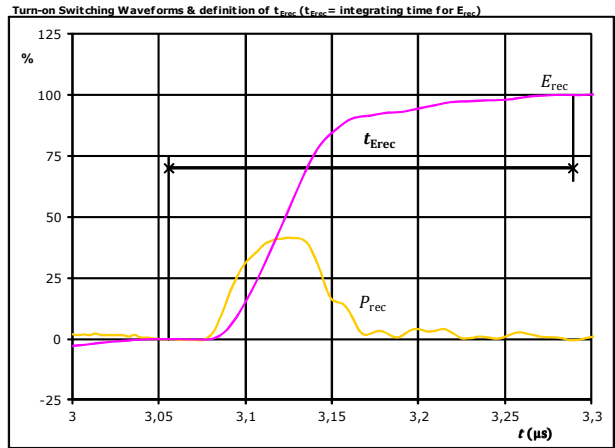
Boost Switching Characteristics

figure 8. FWD



| | | |
|----------------|------|---------------|
| $I_F(100\%) =$ | 20 | A |
| $Q_r(100\%) =$ | 1,20 | μC |
| $t_{Qr} =$ | 0,23 | μs |

figure 9. FWD



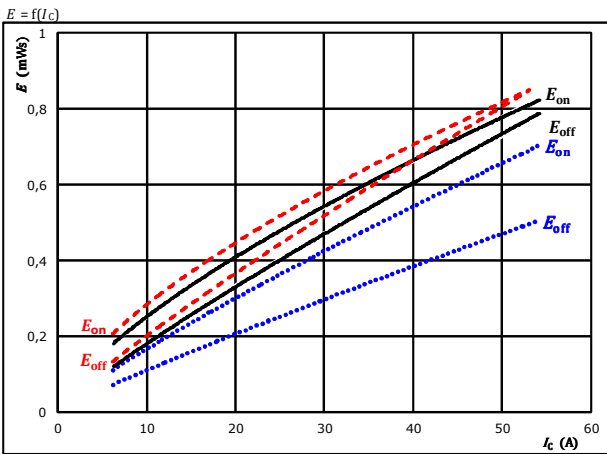
| | | |
|--------------------|------|---------------|
| $P_{rec}(100\%) =$ | 7,03 | kW |
| $E_{rec}(100\%) =$ | 0,20 | mJ |
| $t_{Erec} =$ | 0,23 | μs |



Input Boost Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

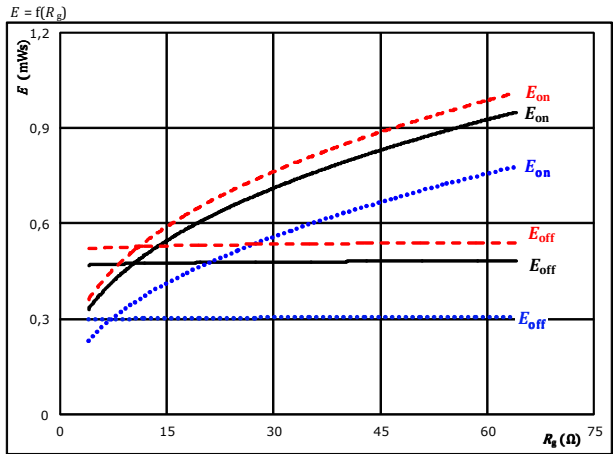


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 16$ Ω
 $R_{g\text{off}} = 16$ Ω

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

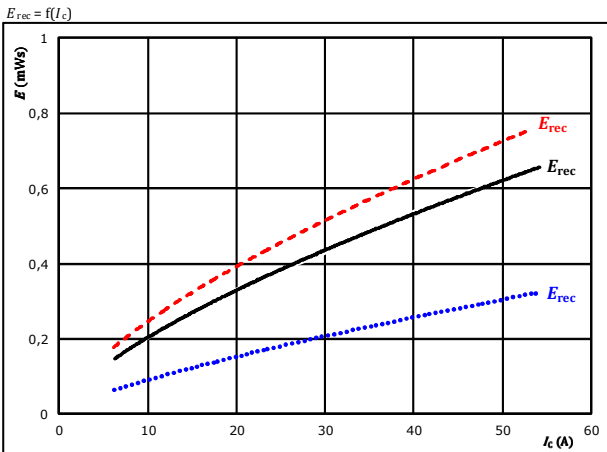


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 30$ A

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

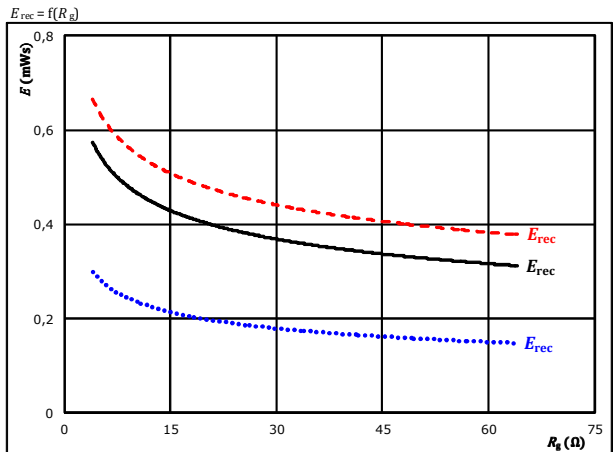


With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{g\text{on}} = 16$ Ω

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 30$ A

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

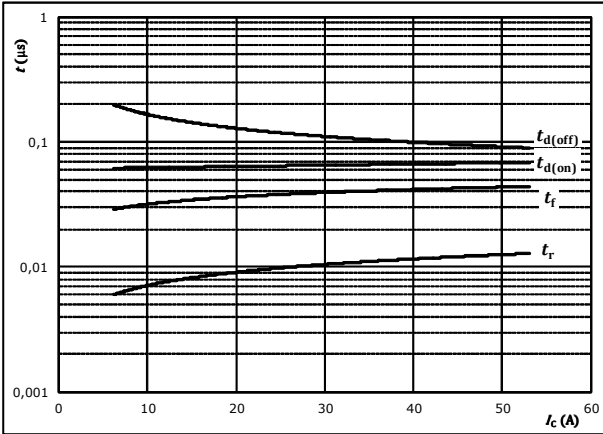


Input Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



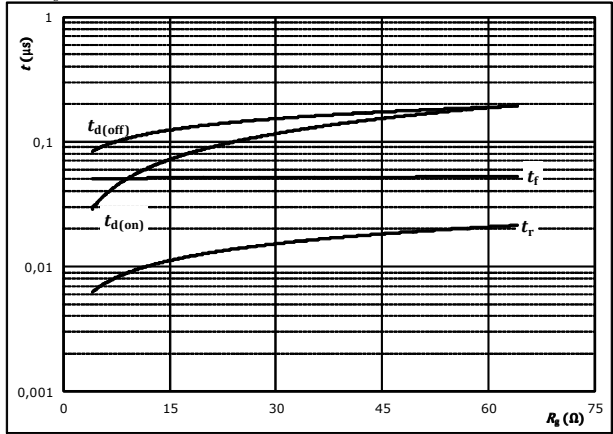
With an inductive load at

| | | |
|--------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 16 | Ω |
| $R_{goff} =$ | 16 | Ω |

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



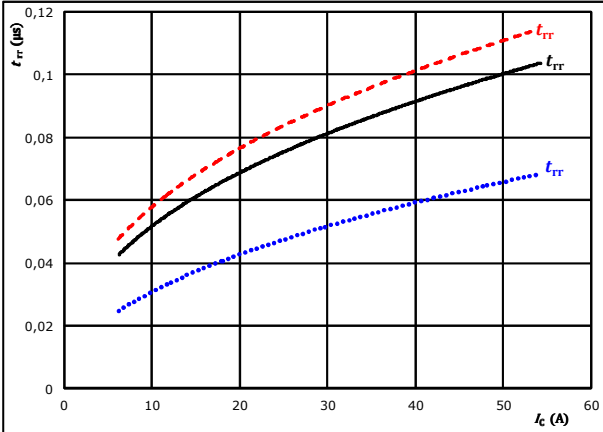
With an inductive load at

| | | |
|------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 350 | V |
| $V_{GE} =$ | ±15 | V |
| $I_C =$ | 30 | A |

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$

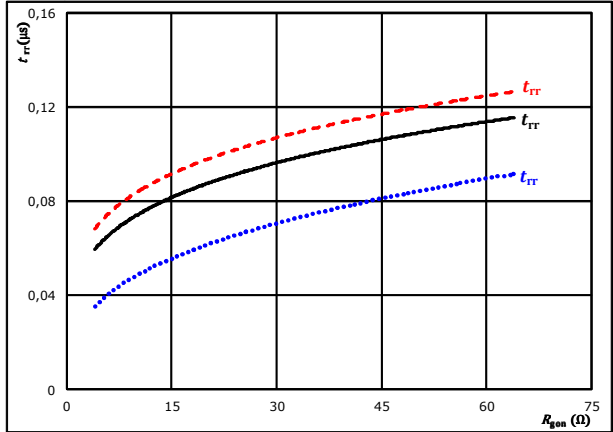


| | | | | | | |
|----|-------------|-----|---|--------|--------|-------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $R_{gon} =$ | 16 | Ω | | 150 °C | ----- |

figure 8. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{gon})$$



| | | | | | | |
|----|------------|-----|---|--------|--------|-------|
| At | $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C | ..... |
| | $V_{GE} =$ | ±15 | V | | 125 °C | ———— |
| | $I_C =$ | 30 | A | | 150 °C | ----- |

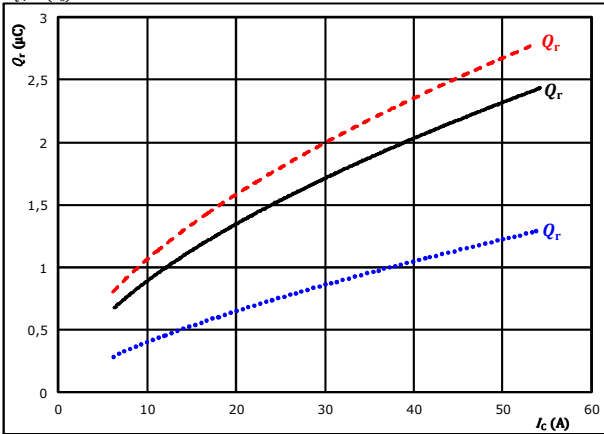


Input Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

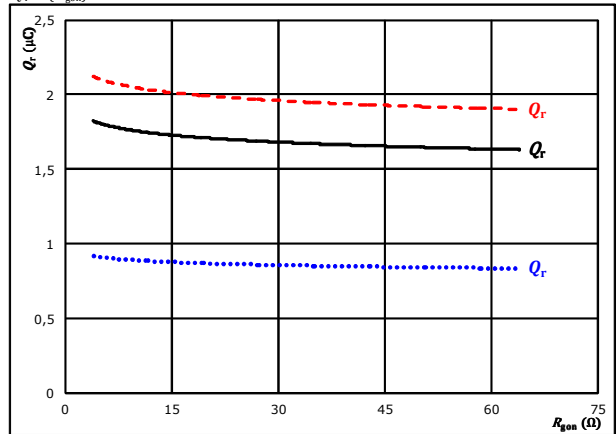


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gpn} = 16$ Ω
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)
 150 °C (dashed red line)

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gpn})$$

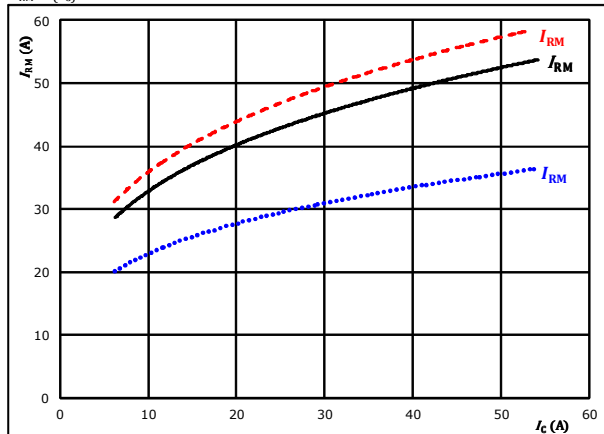


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)
 150 °C (dashed red line)

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$$I_{RM} = f(I_c)$$

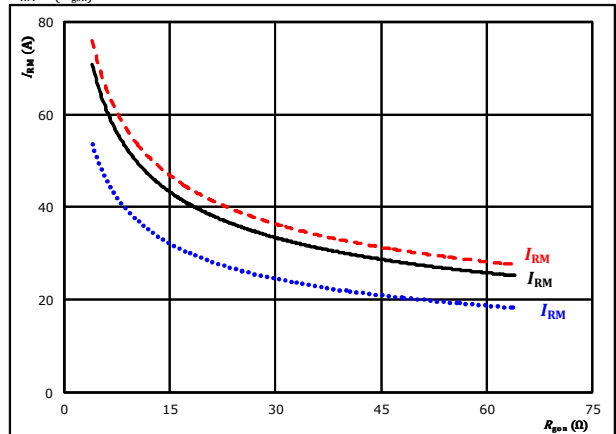


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gpn} = 16$ Ω
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)
 150 °C (dashed red line)

figure 12. FWD

Typical peak reverse recovery current current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gpn})$$



At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)
 150 °C (dashed red line)

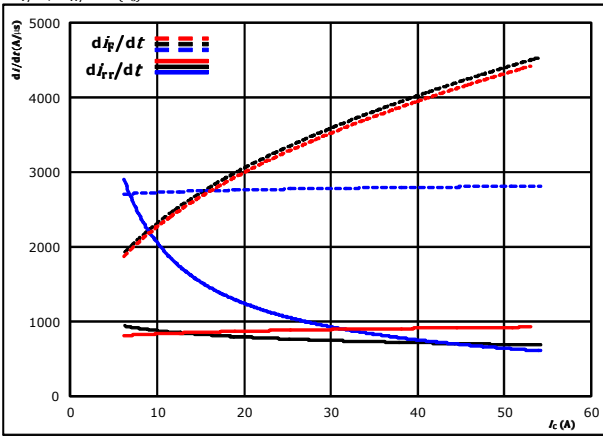


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Input Boost Switching Characteristics

figure 13. FWD

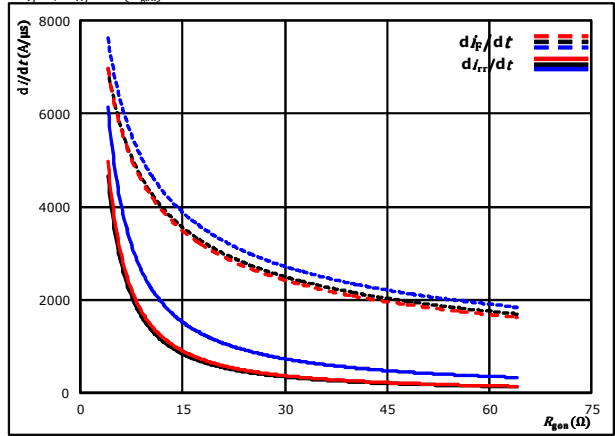
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{g0n} = 16$ Ω $T_j = 150$ °C - - - -

figure 14. FWD

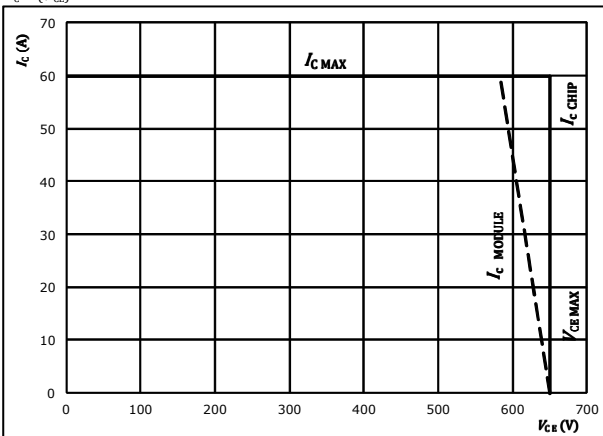
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g0n})$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 30$ A $T_j = 150$ °C - - - -

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g0n} = 16$ Ω
 $R_{g0ff} = 16$ Ω



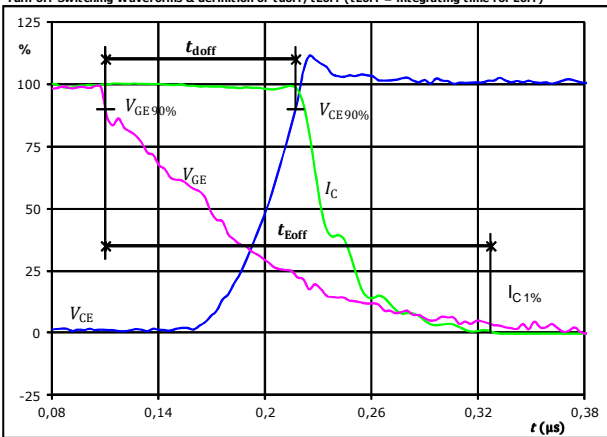
Input Boost Switching Definitions

General conditions

| | | |
|------------|---|-------------|
| T_j | = | 125 °C |
| R_{gon} | = | 16 Ω |
| R_{goff} | = | 16 Ω |

figure 1. IGBT

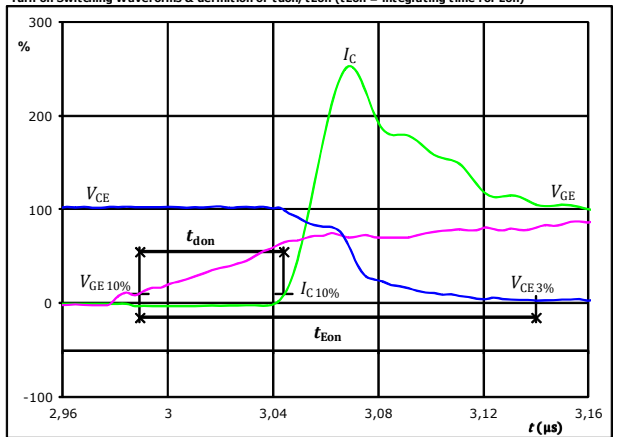
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for Eoff)



| | | |
|-------------------|-------|---------|
| $V_{GE}(0\%) =$ | -15 | V |
| $V_{GE}(100\%) =$ | 15 | V |
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 30 | A |
| $t_{doff} =$ | 0,106 | μ s |
| $t_{Eoff} =$ | 0,217 | μ s |

figure 2. IGBT

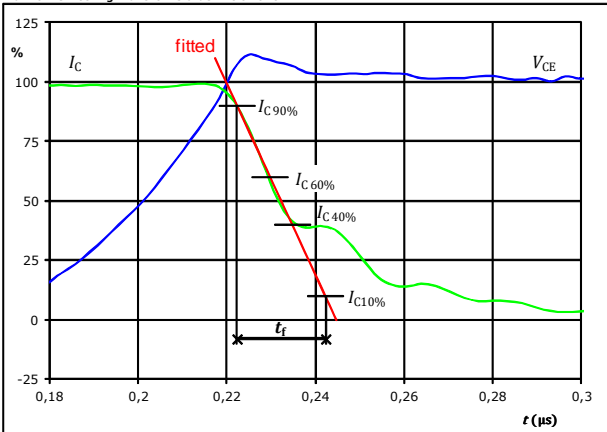
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for Eon)



| | | |
|-------------------|-------|---------|
| $V_{GE}(0\%) =$ | -15 | V |
| $V_{GE}(100\%) =$ | 15 | V |
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 30 | A |
| $t_{don} =$ | 0,066 | μ s |
| $t_{Eon} =$ | 0,151 | μ s |

figure 3. IGBT

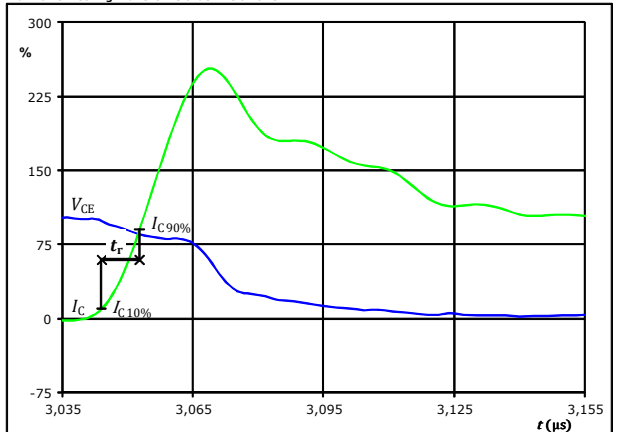
Turn-off Switching Waveforms & definition of t_f



| | | |
|----------------|-------|---------|
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 30 | A |
| $t_f =$ | 0,033 | μ s |

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



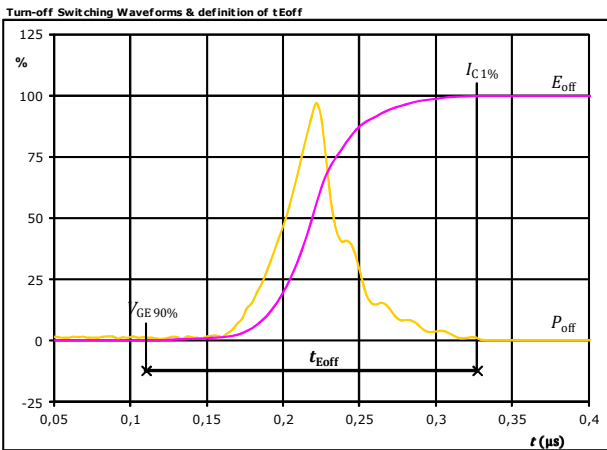
| | | |
|----------------|-------|---------|
| $V_C(100\%) =$ | 350 | V |
| $I_C(100\%) =$ | 30 | A |
| $t_r =$ | 0,009 | μ s |



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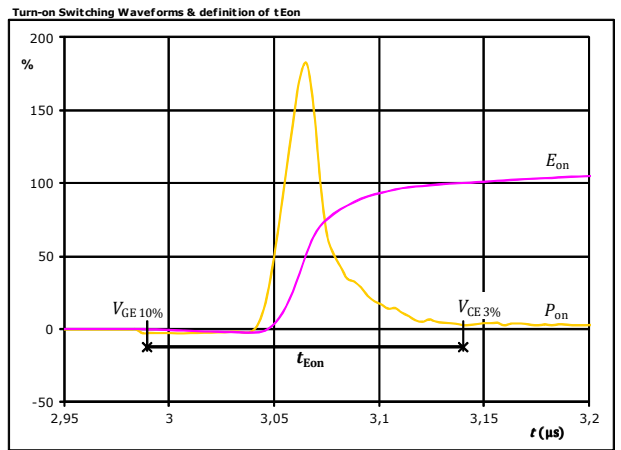
Input Boost Switching Characteristics

figure 5. IGBT



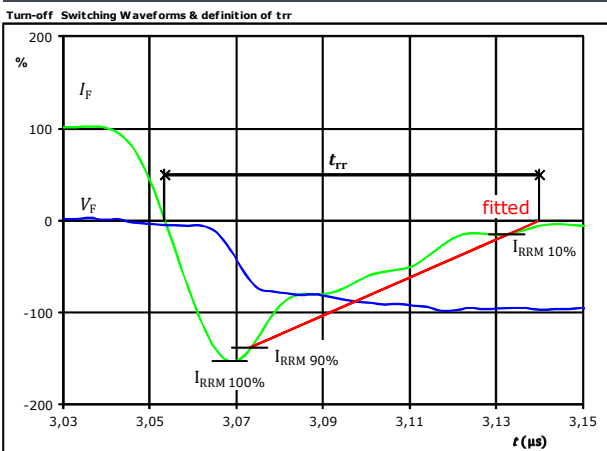
$P_{off}(100\%) = 10,59$ kW
 $E_{off}(100\%) = 0,48$ mJ
 $t_{Eoff} = 0,22$ μs

figure 6. IGBT



$P_{on}(100\%) = 10,59$ kW
 $E_{on}(100\%) = 0,54$ mJ
 $t_{Eon} = 0,15$ μs

figure 7. FWD



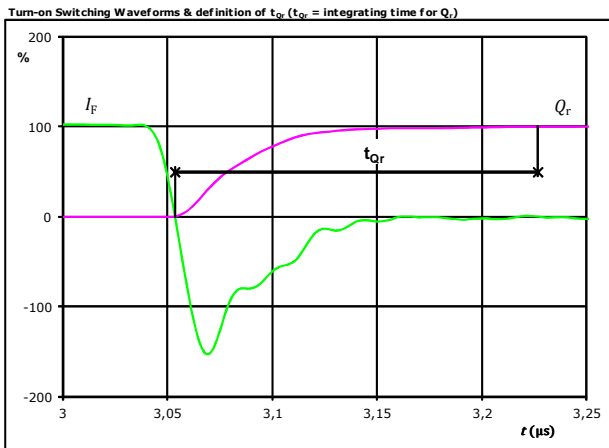
$V_F(100\%) = 350$ V
 $I_F(100\%) = 30$ A
 $I_{RRM}(100\%) = -44$ A
 $t_{rr} = 0,079$ μs



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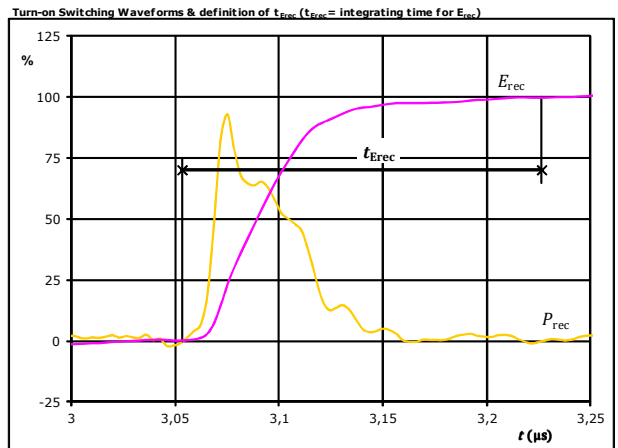
Input Boost Switching Characteristics

figure 8. FWD



| | | |
|----------------|------|---------------|
| I_F (100%) = | 30 | A |
| Q_r (100%) = | 1,71 | μC |
| t_{Qr} = | 0,17 | μs |

figure 9. FWD



| | | |
|--------------------|-------|---------------|
| P_{rec} (100%) = | 10,59 | kW |
| E_{rec} (100%) = | 0,43 | mJ |
| t_{Erec} = | 0,17 | μs |



10-PY07BVA030S5-LF42E08Y
10-FY07BVA030S5-LF42E08
 datasheet

Vincotech

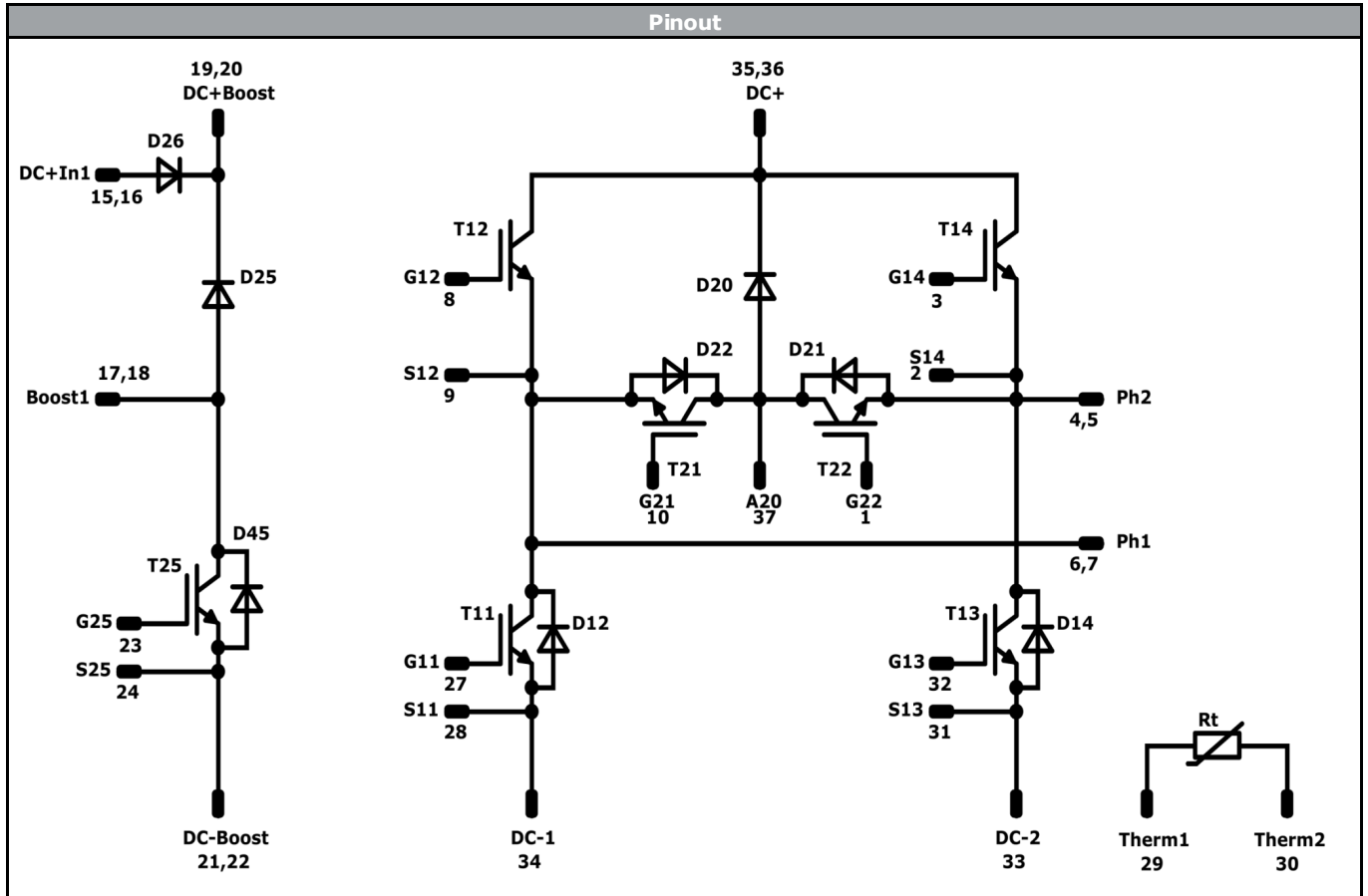
| Ordering Code & Marking | | | | | | | | |
|---|--|--|------------------------------|------------------------|-------------------|---------------------|------------------|---------------|
| Version | | | Ordering Code | | | | | |
| without thermal paste 12 mm housing with Press-fit pins | | | 10-PY07BVA030S5-LF42E08Y | | | | | |
| with thermal paste 12 mm housing with Press-fit pins | | | 10-PY07BVA030S5-LF42E08Y-/3/ | | | | | |
| without thermal paste 12 mm housing with Solder pins | | | 10-FY07BVA030S5-LF42E08 | | | | | |
| with thermal paste 12 mm housing with Solder pins | | | 10-FY07BVA030S5-LF42E08-/3/ | | | | | |
| NN-NNNNNNNNNNNN TTTTIV WWYY UL VIN LLLLL SSSS | | | Text | Name | Date code | UL & VIN | Lot | Serial |
| | | | | NN-NNNNNNNNNNNN-TTTTIV | WWYY | UL VIN | LLLLL | SSSS |
| | | | Datamatrix | Type&Ver | Lot number | Serial | Date code | |
| | | | TTTTTIV | LLLLL | SSSS | WWYY | | |

| Pin table | | | | Outline | |
|-----------|---------------|------|----------|---------|----------|
| Pin | X | Y | Function | | LF42E08 |
| 1 | 52,3 | 9 | G22 | | |
| 2 | 52,3 | 6 | S14 | | LF42E08Y |
| 3 | 52,3 | 3 | G14 | | |
| 4 | 49,3 | 0 | Ph2 | | |
| 5 | 46,8 | 0 | Ph2 | | |
| 6 | 30,75 | 0 | Ph1 | | |
| 7 | 28,25 | 0 | Ph1 | | |
| 8 | 25,25 | 3 | G12 | | |
| 9 | 25,25 | 6 | S12 | | |
| 10 | 25,25 | 9 | G21 | | |
| 11 | Not assembled | | | | |
| 12 | Not assembled | | | | |
| 13 | Not assembled | | | | |
| 14 | Not assembled | | | | |
| 15 | 7,1 | 0 | DC+In1 | | |
| 16 | 7,1 | 2,5 | DC+In1 | | |
| 17 | 0 | 0 | Boost1 | | |
| 18 | 0 | 2,5 | Boost1 | | |
| 19 | 11,1 | 15,1 | DC+Boost | | |
| 20 | 11,1 | 17,6 | DC+Boost | | |
| 21 | 11,1 | 26 | DC-Boost | | |
| 22 | 11,1 | 28,3 | DC-Boost | | |
| 23 | 0 | 28,3 | G25 | | |
| 24 | 3 | 28,3 | S25 | | |
| 25 | Not assembled | | | | |
| 26 | Not assembled | | | | |
| 27 | 26,4 | 28,3 | G11 | | |
| 28 | 31,3 | 28,3 | S11 | | |
| 29 | 36,8 | 28,3 | Therm1 | | |
| 30 | 41,9 | 28,3 | Therm2 | | |
| 31 | 47,4 | 28,3 | S13 | | |
| 32 | 52,3 | 28,3 | G13 | | |
| 33 | 40,85 | 17,7 | DC-2 | | |
| 34 | 37,85 | 17,7 | DC-1 | | |
| 35 | 39,35 | 11,2 | DC+ | | |
| 36 | 39,35 | 8,7 | DC+ | | |
| 37 | 52,3 | 17,3 | A20 | | |

Tolerance of pinpositions: ±0.5mm at the end of pins
 Dimension of coordinate axis is only offset without tolerance



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Identification

| ID | Component | Voltage | Current | Function | Comment |
|--------------------|-----------|---------|---------|------------------------------------|---------|
| T11, T12, T13, T14 | IGBT | 650 V | 30 A | Low Buck Switch / High Buck Switch | |
| D21, D22 | FWD | 650 V | 20 A | Buck Diode | |
| T21, T22 | IGBT | 650 V | 20 A | Boost Switch | |
| D12, D14, D20 | FWD | 650 V | 20 A | Low Buck Diode / High Buck Diode | |
| T25 | IGBT | 650 V | 30 A | Input Boost Switch | |
| D25 | Diode | 650 V | 30 A | Input Boost Diode | |
| D26 | Diode | 1600 V | 35 A | ByPass Diode | |
| D45 | Diode | 650 V | 10 A | Input Boost Sw. Protection Diode | |
| Rt | NTC | | | Thermistor | |




Vincotech

10-PY07BVA030S5-LF42E08Y
10-FY07BVA030S5-LF42E08
datasheet

| Packaging instruction | | | |
|---------------------------------------|------|----------|-------------|
| Standard packaging quantity (SPQ) 100 | >SPQ | Standard | <SPQ Sample |

| Handling instruction |
|---|
| Handling instructions for <i>flow</i> 1 packages see vincotech.com website. |

| Package data |
|--|
| Package data for <i>flow</i> 1 packages see vincotech.com website. |

| UL recognition and file number |
|---|
| This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.  |

| Document No.: | Date: | Modification: | Pages |
|--------------------------------|--------------|--|---------------|
| 10-xY07BVA030S5-LF42E08x-D3-14 | 07 May. 2019 | Correction of I_c/I_f values Added Solder pin variant | 1,2,3 1,44 |

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.