



Vincotech

| VINcoNPC X8 | | 1500 V / 1200 A |
|--|--|---|
| Features | | VINco X8 12 mm housing |
| <ul style="list-style-type: none">• NPC topology up to 2400Vdc• High efficiency• Low inductive package | | A photograph of the VINco X8 module in its 12 mm wide housing, showing the green printed circuit board with component markings and heat sinks. |
| Target applications | | Schematic |
| <ul style="list-style-type: none">• Industrial Drives• UPS | | A detailed schematic diagram showing the internal power electronic circuit. It features a central vertical bus with four parallel branches. Each branch contains a series of switches (likely IGBTs or MOSFETs) connected in a NPC (Neutral Point Clamped) topology. Diodes are also present in the circuit. On the right side, there is a feedback loop with a switch and a voltage-controlled voltage source. |
| Types | | |
| <ul style="list-style-type: none">• 70-W424NIA1K2M702-LD07FP70 | | |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Maximum Ratings

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

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------|------------|--|----------|------------------|
| Buck Switch | | | | |
| Collector-emitter voltage | V_{CES} | | 1200 | V |
| Collector current (DC current) | I_C | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 960 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 2400 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 1667 | W |
| Gate-emitter voltage | V_{GES} | | ± 20 | V |
| Short circuit ratings | t_{SC} | $V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150^\circ\text{C}$ | 9,5 | μs |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |

Buck Diode

| | | | | |
|---------------------------------|------------|---|------|------------------|
| Peak repetitive reverse voltage | V_{RRM} | | 1200 | V |
| Forward current (DC current) | I_F | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 683 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 2400 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 1038 | W |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |

Buck Sw. Protection Diode

| | | | | |
|--|------------|--|------|----------------------|
| Peak repetitive reverse voltage | V_{RRM} | | 1200 | V |
| Forward current (DC current) | I_F | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 68 | A |
| Surge (non-repetitive) forward current | I_{FSM} | Single Half Sine Wave, $t_p = 10\text{ ms}$ | 260 | A |
| Surge current capability | I^2t | $T_j = 25^\circ\text{C}$ | 336 | A^2s |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 181 | W |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Maximum Ratings

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

| Parameter | Symbol | Conditions | Value | Unit |
|-----------------------------------|------------|--|----------|------------------|
| Boost Switch | | | | |
| Collector-emitter voltage | V_{CES} | | 1200 | V |
| Collector current (DC current) | I_C | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 960 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 2400 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 1667 | W |
| Gate-emitter voltage | V_{GES} | | ± 20 | V |
| Short circuit ratings | t_{SC} | $V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150^\circ\text{C}$ | 9,5 | μs |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |

Boost Diode

| | | | | |
|---------------------------------|------------|---|------|------------------|
| Peak repetitive reverse voltage | V_{RRM} | | 1200 | V |
| Forward current (DC current) | I_F | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 661 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 2400 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 990 | W |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |

Boost Sw. Inv. Diode

| | | | | |
|---------------------------------|------------|---|------|------------------|
| Peak repetitive reverse voltage | V_{RRM} | | 1200 | V |
| Forward current (DC current) | I_F | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 661 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 2400 | A |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$ | 990 | W |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Maximum Ratings

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

| Parameter | Symbol | Conditions | Value | Unit |
|--|------------|---|-------|----------------------|
| Boost Sw. Protection Diode | | | | |
| Peak repetitive reverse voltage | V_{RRM} | | 1200 | V |
| Forward current (DC current) | I_F | $T_j = T_{jmax}$ | 68 | A |
| Surge (non-repetitive) forward current | I_{FSM} | Single Half Sine Wave, $t_p = 10 \text{ ms}$ | 260 | A |
| Surge current capability | P_t | $T_j = 25^\circ\text{C}$ | 336 | A^2s |
| Total power dissipation | P_{tot} | $T_j = T_{jmax}$ | 181 | W |
| Maximum junction temperature | T_{jmax} | | 175 | $^\circ\text{C}$ |

Module Properties

Thermal Properties

| | | | | |
|---|-----------|--|----------------------------|------------------|
| Storage temperature | T_{stg} | | -40...+125 | $^\circ\text{C}$ |
| Operation temperature under switching condition | T_{jop} | | -40...+($T_{jmax} - 25$) | $^\circ\text{C}$ |

Isolation Properties

| | | | | | |
|----------------------------|------------|------------------|---------------------|------------|----|
| Isolation voltage | V_{isol} | DC Test Voltage* | $t_p = 2 \text{ s}$ | 4000 | V |
| Creepage distance | | | | >12,7 | mm |
| Clearance | | | | >12,7 | mm |
| Comparative Tracking Index | CTI | | | ≥ 200 | |

*100 % tested in production



Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | Values | | | 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 | | |

Buck Switch

Static

| | | | | | | | | | | |
|--------------------------------------|---------------|------------------|----|------|------|------------------|--------|----------------------|---------------------|----|
| Gate-emitter threshold voltage | $V_{GE(th)}$ | | | 10 | 0,12 | 25 | 5,4 | 6 | 6,6 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 15 | | 1200 | 25 125 150 | | 1,53 1,78 1,86 | 1,85 ⁽¹⁾ | V |
| Collector-emitter cut-off current | I_{CES} | | 0 | 1200 | | 25 | | | 800 | µA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | 25 | | | 4000 | nA |
| Internal gate resistance | r_g | | | | | | 0,375 | | | Ω |
| Input capacitance | C_{res} | | 0 | 10 | 25 | | 240000 | | | pF |
| Output capacitance | C_{des} | | | | | | 7040 | | | pF |
| Reverse transfer capacitance | C_{res} | | | | | | 2560 | | | pF |
| Gate charge | Q_g | $V_{CC} = 600$ V | 15 | | 1200 | 25 | | 8000 | | nC |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,06 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

Dynamic

| | | | | | | | | | | |
|-----------------------------|--------------|--|-------|-----|------|-----|--|--------|--|-----|
| Turn-on delay time | $t_{d(on)}$ | $R_{gon} = 0,5 \Omega$ $R_{goff} = 0,5 \Omega$ | -8/16 | 600 | 1000 | 25 | | 320 | | |
| Rise time | t_r | | | | | 125 | | 315 | | |
| | | | | | | 150 | | 317 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25 | | 76 | | |
| | | | | | | 125 | | 77 | | |
| Fall time | t_f | | | | | 150 | | 77 | | ns |
| Turn-on energy (per pulse) | E_{on} | $Q_{fFWD}=99,96 \mu C$ $Q_{rfFWD}=163,06 \mu C$ $Q_{ffFWD}=182,49 \mu C$ | | | | 25 | | 349 | | |
| | | | | | | 125 | | 365 | | |
| | | | | | | 150 | | 378 | | ns |
| Turn-off energy (per pulse) | E_{off} | | | | | 25 | | 74,72 | | |
| | | | | | | 125 | | 96,05 | | |
| | | | | | | 150 | | 105,29 | | ns |
| | | | | | | 25 | | 116,08 | | |
| | | | | | | 125 | | 132,14 | | |
| | | | | | | 150 | | 139,61 | | mWs |
| | | | | | | 25 | | 73,24 | | |
| | | | | | | 125 | | 96,92 | | |
| | | | | | | 150 | | 103,59 | | mWs |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | | Values | | | 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 |

Buck Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|----------------|--|--|------|------------------|--|--------------------|--------------------|----|
| Forward voltage | V_F | | | | 1200 | 25 125 150 | | 1,8 1,9 1,89 | 2,1 ⁽¹⁾ | V |
| Reverse leakage current | I_R | $V_F = 1200$ V | | | | 25 | | | 320 | µA |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,09 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

Dynamic

| | | | | | | | | | | |
|---------------------------------------|----------------------|--|-------|-----|------|------------------|--|---------------------------|--|------|
| Peak recovery current | I_{RRM} | $di/dt=12125$ A/µs $di/dt=13125$ A/µs $di/dt=12093$ A/µs | -8/16 | 600 | 1000 | 25 125 150 | | 640,2 795,24 812,57 | | A |
| Reverse recovery time | t_{rr} | | | | | 25 125 150 | | 329,25 443,1 489,19 | | ns |
| Recovered charge | Q_r | | | | | 25 125 150 | | 99,96 163,06 182,49 | | µC |
| Reverse recovered energy | E_{rec} | | | | | 25 125 150 | | 31,11 56,5 64,27 | | mWs |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 25 125 150 | | 2667 3440 3436 | | A/µs |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | | Values | | | 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 |

Buck Sw. Protection Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|----------------|--|--|----|------------------|--|--------------|--|----|
| Forward voltage | V_F | | | | 60 | 25 125 150 | | 2,37 2,47 | 2,71 ⁽¹⁾ 2,77 ⁽¹⁾ | V |
| Reverse leakage current | I_R | $V_T = 1200$ V | | | | 25 150 | | 3600 | 240 7200 | μA |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,52 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|



Vincotech

Characteristic Values

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

Boost Switch

Static

| | | | | | | | | | | |
|--------------------------------------|---------------|------------------|----|------|------|------------------|--------|----------------------|---------------------|----|
| Gate-emitter threshold voltage | $V_{GE(th)}$ | | | 10 | 0,12 | 25 | 5,4 | 6 | 6,6 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 15 | | 1200 | 25 125 150 | | 1,53 1,78 1,86 | 1,85 ⁽¹⁾ | V |
| Collector-emitter cut-off current | I_{CES} | | 0 | 1200 | | 25 | | | 800 | μA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | 25 | | | 4000 | nA |
| Internal gate resistance | r_g | | | | | | 0,375 | | | Ω |
| Input capacitance | C_{res} | | 0 | 10 | 25 | | 240000 | | | pF |
| Output capacitance | C_{des} | | | | | | 7040 | | | pF |
| Reverse transfer capacitance | C_{res} | | | | | | 2560 | | | pF |
| Gate charge | Q_g | $V_{CC} = 600$ V | 15 | | 1200 | 25 | | 8000 | | nC |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,06 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|

Dynamic

| | | | | | | | | | | |
|-----------------------------|--------------|--|-------|-----|------|-----|--|--------|--|-----|
| Turn-on delay time | $t_{d(on)}$ | $R_{gon} = 0,5 \Omega$ $R_{goff} = 0,5 \Omega$ | -8/16 | 600 | 1000 | 25 | | 308 | | |
| Rise time | t_r | | | | | 125 | | 316 | | ns |
| | | | | | | 150 | | 314 | | |
| Turn-off delay time | $t_{d(off)}$ | | | | | 25 | | 76 | | |
| Fall time | t_f | | | | | 125 | | 69 | | ns |
| | | | | | | 150 | | 75 | | |
| Turn-on energy (per pulse) | E_{on} | $Q_{fFWD}=98,92 \mu C$ $Q_{rfFWD}=179,27 \mu C$ $Q_{ffFWD}=193,41 \mu C$ | | | | 25 | | 351 | | |
| Turn-off energy (per pulse) | E_{off} | | | | | 125 | | 378 | | ns |
| | | | | | | 150 | | 390 | | |
| | | | | | | 25 | | 76,26 | | |
| | | | | | | 125 | | 93,93 | | ns |
| | | | | | | 150 | | 104,83 | | |
| | | | | | | 25 | | 105,28 | | |
| | | | | | | 125 | | 123,01 | | mWs |
| | | | | | | 150 | | 131,51 | | |
| | | | | | | 25 | | 72,32 | | |
| | | | | | | 125 | | 96,19 | | mWs |
| | | | | | | 150 | | 103 | | |



Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | Values | | | 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 | | |

Boost Diode

Static

| | | | | | | | | | |
|-------------------------|-------|----------------|--|------|------------------|--|--------------------|--------------------|----|
| Forward voltage | V_F | | | 1200 | 25 125 150 | | 1,8 1,9 1,89 | 2,1 ⁽¹⁾ | V |
| Reverse leakage current | I_R | $V_F = 1200$ V | | | 25 | | | 320 | µA |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|-----|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,1 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|-----|--|-----|

Dynamic

| | | | | | | | | | | |
|---------------------------------------|----------------------|---|-------|-----|------|-----|--|--------|--|------|
| Peak recovery current | I_{RRM} | $di/dt=8132$ A/µs $di/dt=11625$ A/µs $di/dt=10500$ A/µs | -8/16 | 600 | 1000 | 25 | | 563,68 | | A |
| Reverse recovery time | t_{rr} | | | | | 125 | | 711,9 | | |
| Recovered charge | Q_r | | | | | 150 | | 732,24 | | |
| Reverse recovered energy | E_{rec} | | | | | 25 | | 334,56 | | ns |
| Reverse recovered energy | E_{rec} | | | | | 125 | | 466 | | |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | 150 | | 518,02 | | |
| | | | | | | 25 | | 98,92 | | µC |
| | | | | | | 125 | | 179,27 | | |
| | | | | | | 150 | | 193,41 | | |
| | | | | | | 25 | | 31,65 | | mWs |
| | | | | | | 125 | | 64,47 | | |
| | | | | | | 150 | | 69,26 | | |
| | | | | | | 25 | | 3011 | | A/µs |
| | | | | | | 125 | | 2978 | | |
| | | | | | | 150 | | 2883 | | |



70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

Characteristic Values

| Parameter | Symbol | Conditions | | | | | | Values | | | 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 |

Boost Sw. Inv. Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|----------------|--|--|------|------------------|--|--------------------|--------------------|----|
| Forward voltage | V_F | | | | 1200 | 25 125 150 | | 1,8 1,9 1,89 | 2,1 ⁽¹⁾ | V |
| Reverse leakage current | I_R | $V_r = 1200$ V | | | | 25 | | | 320 | µA |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|-----|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,1 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|-----|--|-----|

Boost Sw. Protection Diode

Static

| | | | | | | | | | | |
|-------------------------|-------|----------------|--|--|----|------------------|--|-------------------------------------|---------------------|----|
| Forward voltage | V_F | | | | 60 | 25 125 150 | | 2,37 2,47 2,77 ⁽¹⁾ | 2,71 ⁽¹⁾ | V |
| Reverse leakage current | I_R | $V_r = 1200$ V | | | | 25 150 | | 3600 | 240 7200 | µA |

Thermal

| | | | | | | | | | | |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink ⁽²⁾ | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4$ W/mK (PSX) | | | | | | 0,52 | | K/W |
|--|---------------|---------------------------------------|--|--|--|--|--|------|--|-----|



Vincotech

Characteristic Values

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

Thermistor

Static

| | | | | | | | | | | |
|--------------------------------|----------------|-------------------------|--|--|--|-----|----|------|---|------|
| Rated resistance | R | | | | | 25 | | 11 | | kΩ |
| Deviation of R_{100} | $A_{R/R}$ | $R_{100} = 1484 \Omega$ | | | | 100 | -5 | | 5 | % |
| Power dissipation | P | | | | | | | 10 | | mW |
| Power dissipation constant | d | | | | | 25 | | 3 | | mW/K |
| B-value | $B_{(25/50)}$ | Tol. ±1 % | | | | | | 3962 | | K |
| B-value | $B_{(25/100)}$ | Tol. ±1 % | | | | | | 4000 | | K |
| Vincotech Thermistor Reference | | | | | | | | | I | |

(¹) Value at chip level

(²) Only valid with pre-applied Vincotech thermal interface material.



Vincotech

Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

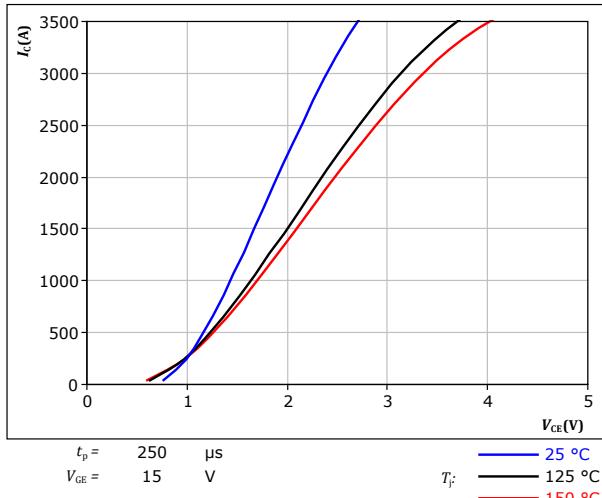


figure 2. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

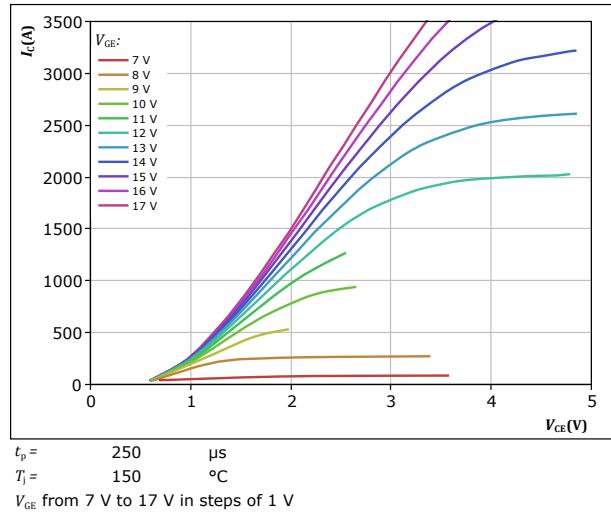


figure 3. IGBT

Typical transfer characteristics
 $I_C = f(V_{GE})$

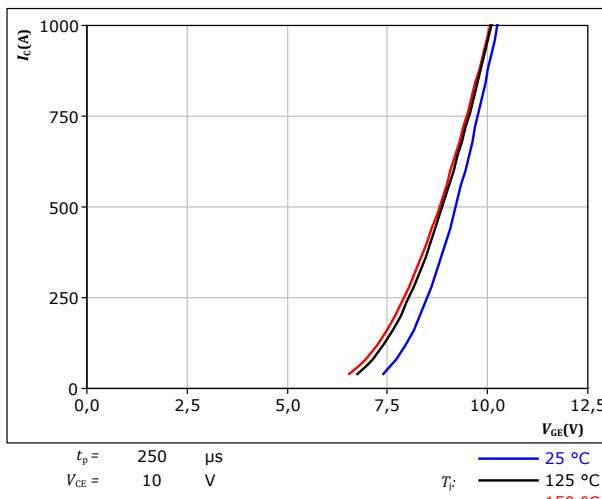
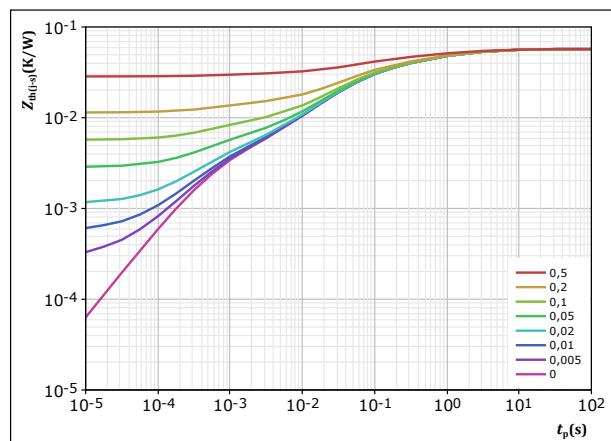


figure 4. IGBT

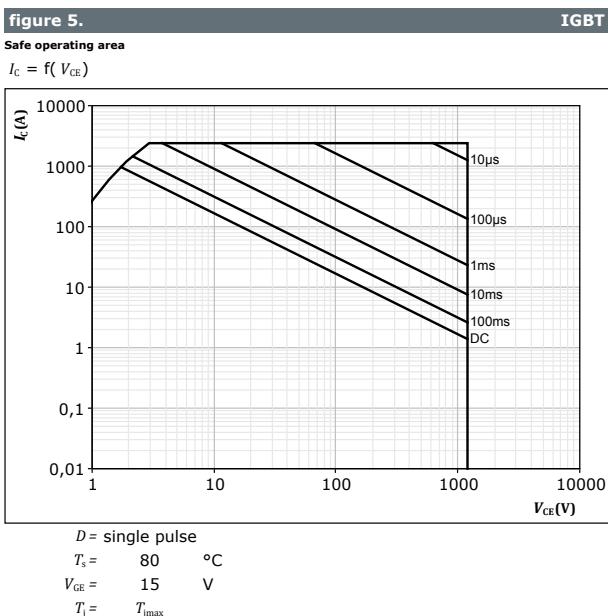
Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$



| $R_{th(j-s)}$ (K/W) | t_p / T (s) |
|---------------------|---------------|
| 5,19E-03 | 5,72E+00 |
| 9,87E-03 | 1,19E+00 |
| 1,27E-02 | 3,03E-01 |
| 1,64E-02 | 6,32E-02 |
| 8,59E-03 | 2,04E-02 |
| 1,84E-03 | 2,67E-03 |
| 2,47E-03 | 5,00E-04 |

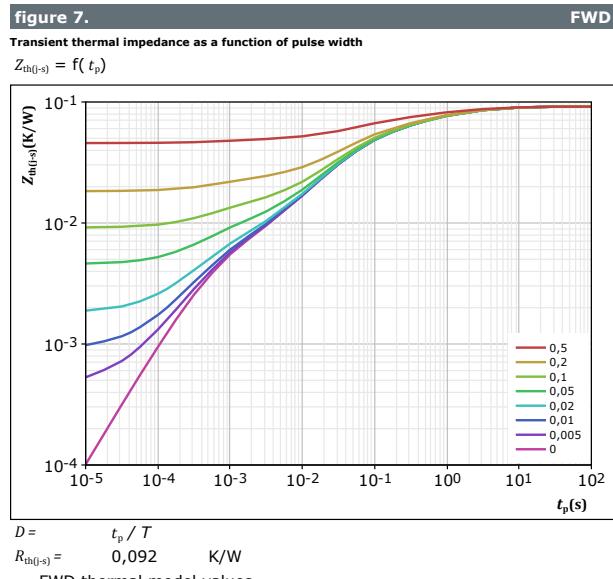
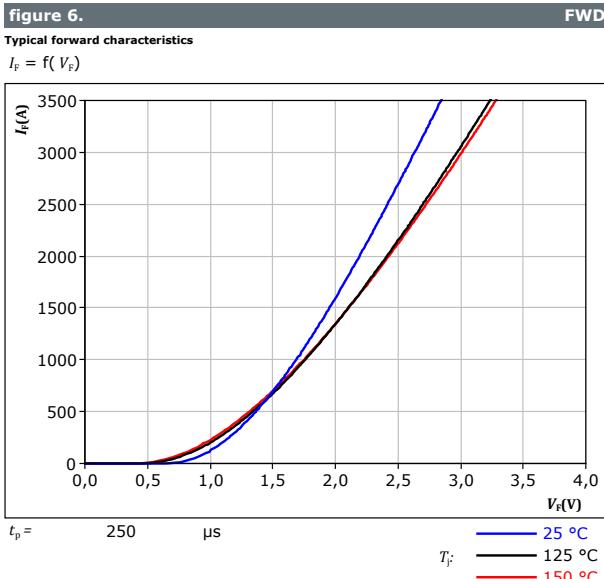


Buck Switch Characteristics





Buck Diode Characteristics





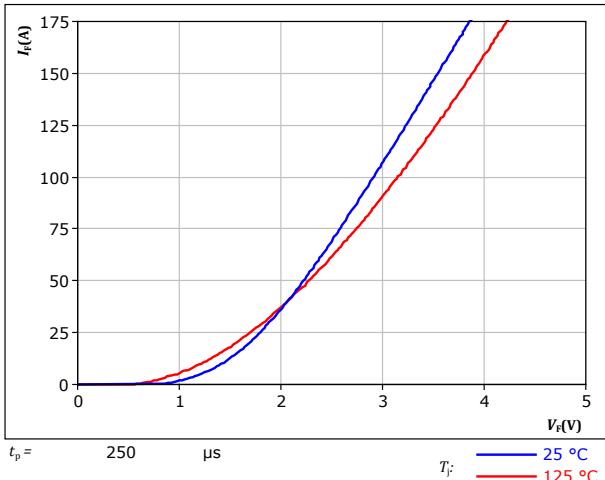
Vincotech

Buck Sw. Protection Diode Characteristics

figure 8.

Typical forward characteristics

$$I_F = f(V_F)$$

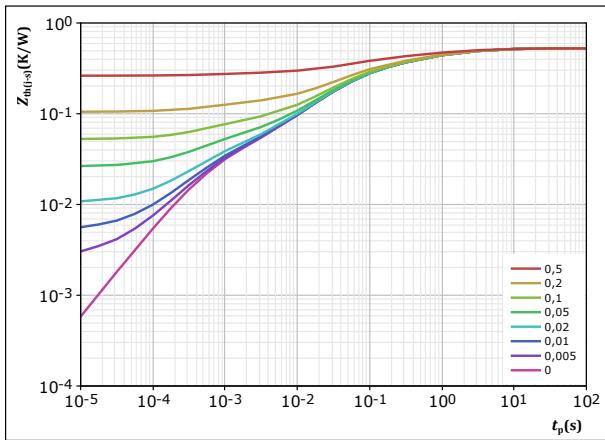


FWD

figure 9.

Transient thermal impedance as a function of pulse width

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



FWD

$$D = \frac{t_p / T}{0,525} \quad K/W$$

FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 4,78E-02 | 5,72E+00 |
| 9,08E-02 | 1,19E+00 |
| 1,17E-01 | 3,03E-01 |
| 1,51E-01 | 6,32E-02 |
| 7,91E-02 | 2,04E-02 |
| 1,69E-02 | 2,67E-03 |
| 2,28E-02 | 5,00E-04 |



Vincotech

Boost Switch Characteristics

figure 10. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

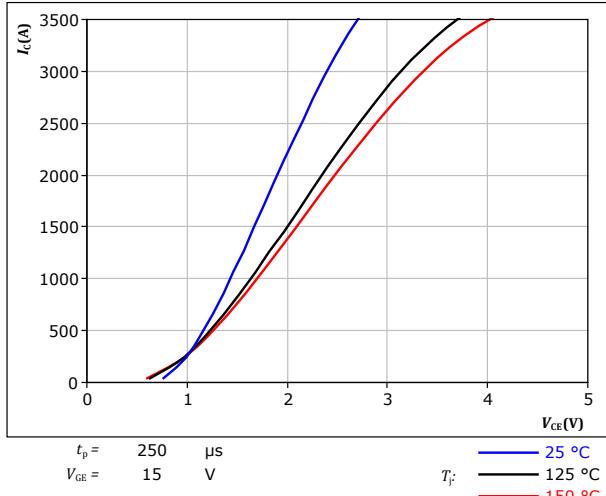


figure 11. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

figure 11. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

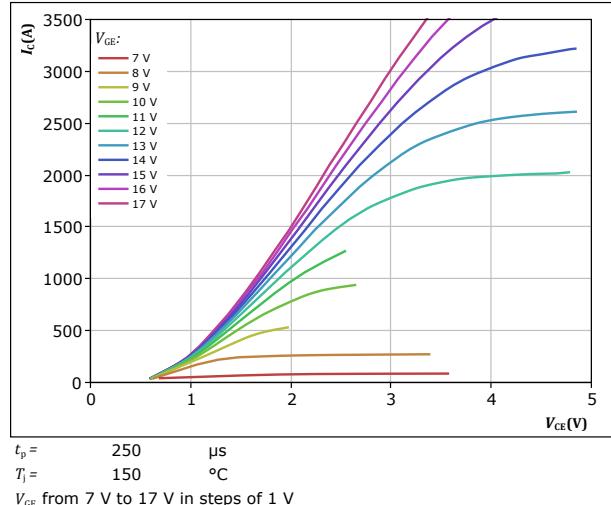


figure 12. IGBT

Typical transfer characteristics
 $I_C = f(V_{GE})$

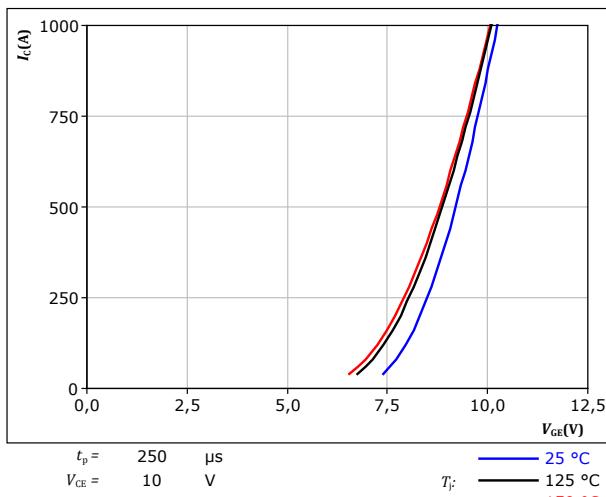
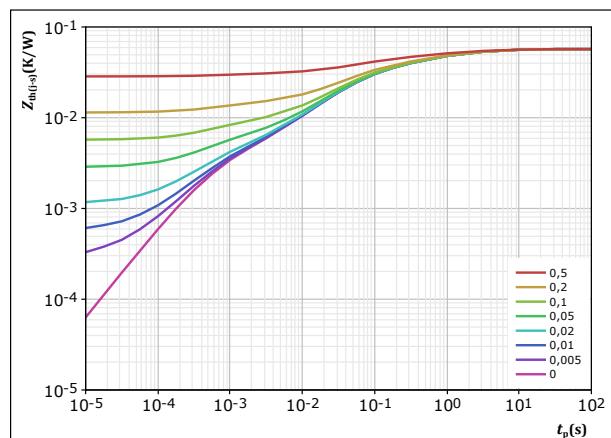


figure 13. IGBT

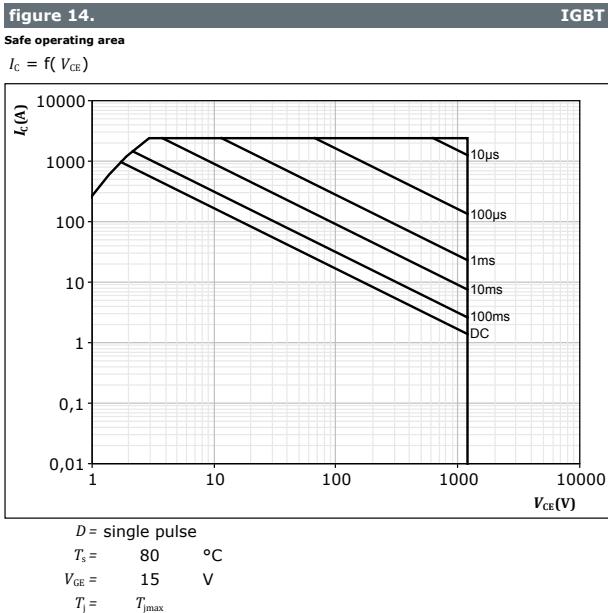
Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$



| R (K/W) | τ (s) |
|-----------|------------|
| 5,19E-03 | 5,72E+00 |
| 9,87E-03 | 1,19E+00 |
| 1,27E-02 | 3,03E-01 |
| 1,64E-02 | 6,32E-02 |
| 8,59E-03 | 2,04E-02 |
| 1,84E-03 | 2,67E-03 |
| 2,47E-03 | 5,00E-04 |



Boost Switch Characteristics





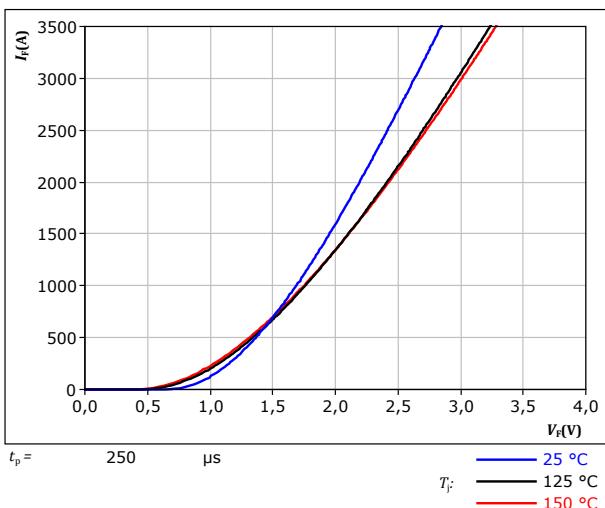
Boost Diode Characteristics

figure 15.

Typical forward characteristics

$$I_F = f(V_F)$$

FWD



$$t_p = 250 \mu\text{s}$$

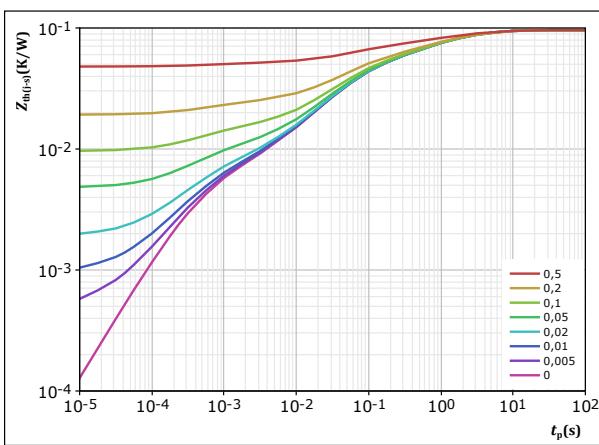
T_F :
— 25 °C
— 125 °C
— 150 °C

figure 16.

Transient thermal impedance as a function of pulse width

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

FWD



$$D = \frac{t_p}{T} = 0,096$$

$$R_{th(f-s)} = 0,096 \text{ K/W}$$

FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 1,42E-02 | 4,37E+00 |
| 2,44E-02 | 1,03E+00 |
| 2,03E-02 | 2,32E-01 |
| 2,67E-02 | 4,58E-02 |
| 4,42E-03 | 1,04E-02 |
| 3,31E-03 | 1,02E-03 |
| 2,72E-03 | 3,18E-04 |



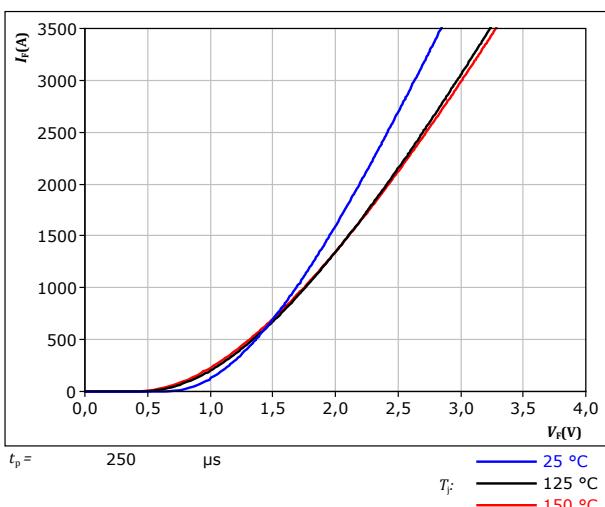
Boost Sw. Inv. Diode Characteristics

figure 17.

Typical forward characteristics

$$I_F = f(V_F)$$

FWD



$$t_p = 250 \mu\text{s}$$

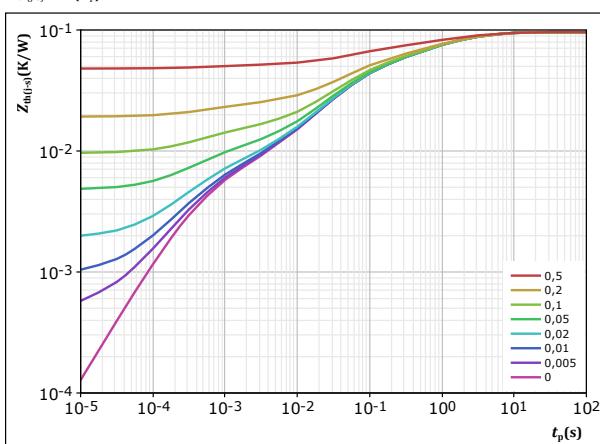
T_F :
— 25 °C
— 125 °C
— 150 °C

figure 18.

Transient thermal impedance as a function of pulse width

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

FWD



$$D = \frac{t_p}{T} = 0,096 \quad \text{K/W}$$

FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 1,42E-02 | 4,37E+00 |
| 2,44E-02 | 1,03E+00 |
| 2,03E-02 | 2,32E-01 |
| 2,67E-02 | 4,58E-02 |
| 4,42E-03 | 1,04E-02 |
| 3,31E-03 | 1,02E-03 |
| 2,72E-03 | 3,18E-04 |



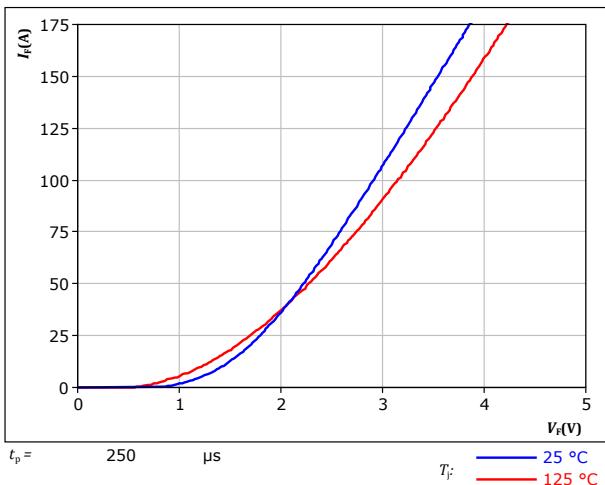
Vincotech

Boost Sw. Protection Diode Characteristics

figure 19.

Typical forward characteristics

$$I_F = f(V_F)$$

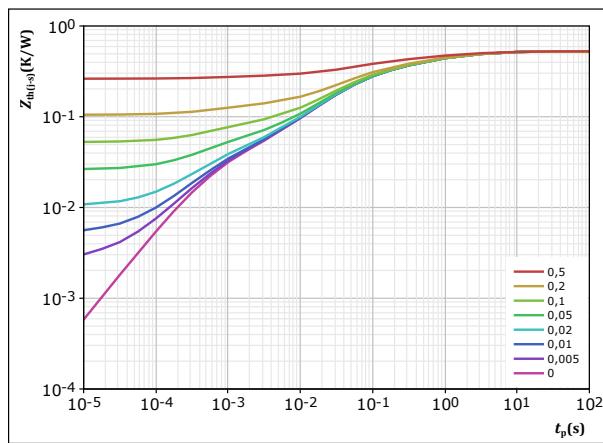


FWD

figure 20.

Transient thermal impedance as a function of pulse width

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



FWD

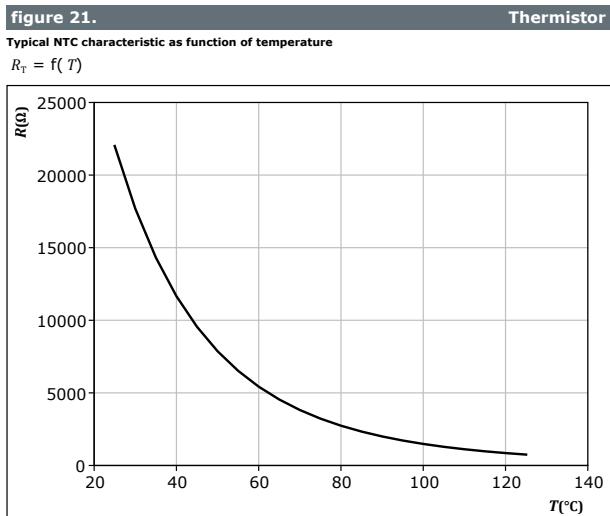
$$D = \frac{t_p / \tau}{0,525} \quad K/W$$

FWD thermal model values

| R (K/W) | τ (s) |
|-----------|------------|
| 4,78E-02 | 5,72E+00 |
| 9,08E-02 | 1,19E+00 |
| 1,17E-01 | 3,03E-01 |
| 1,51E-01 | 6,32E-02 |
| 7,91E-02 | 2,04E-02 |
| 1,69E-02 | 2,67E-03 |
| 2,28E-02 | 5,00E-04 |



Thermistor Characteristics





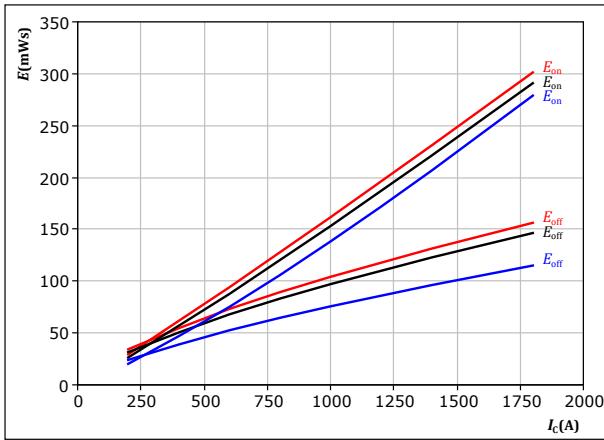
Vincotech

Buck Switching Characteristics

figure 22. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

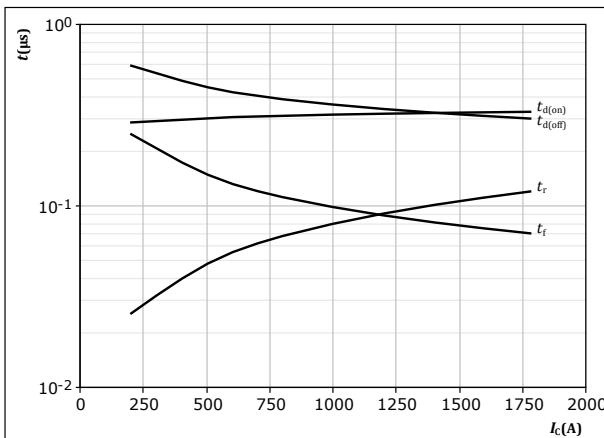
$$\begin{aligned} V_{CE} &= 600 \text{ V} \\ V_{GE} &= -8/16 \text{ V} \\ R_{gon} &= 0,5 \Omega \\ R_{goff} &= 0,5 \Omega \end{aligned}$$

$$T_f: \quad \begin{cases} 25^\circ\text{C} & \text{blue line} \\ 125^\circ\text{C} & \text{black line} \\ 150^\circ\text{C} & \text{red line} \end{cases}$$

figure 24. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



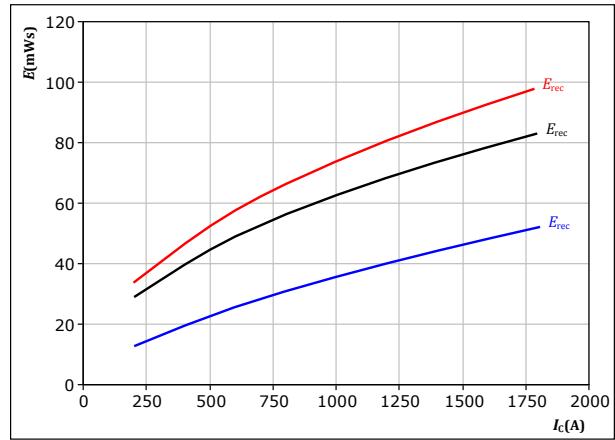
With an inductive load at

$$\begin{aligned} T_f &= 150^\circ\text{C} \\ V_{CE} &= 600 \text{ V} \\ V_{GE} &= -8/16 \text{ V} \\ R_{gon} &= 0,5 \Omega \\ R_{goff} &= 0,5 \Omega \end{aligned}$$

figure 23. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



With an inductive load at

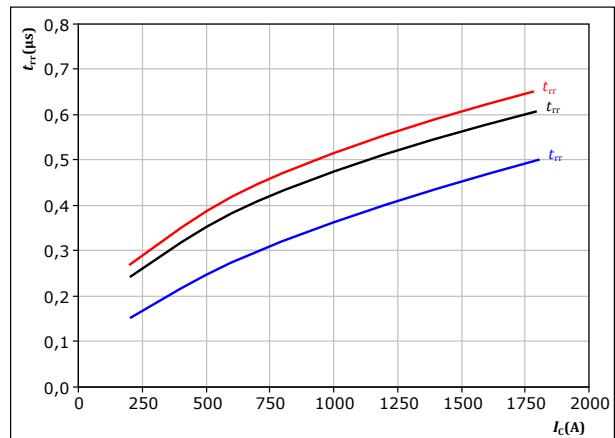
$$\begin{aligned} V_{CE} &= 600 \text{ V} \\ V_{GE} &= -8/16 \text{ V} \\ R_{gon} &= 0,5 \Omega \end{aligned}$$

$$T_f: \quad \begin{cases} 25^\circ\text{C} & \text{blue line} \\ 125^\circ\text{C} & \text{black line} \\ 150^\circ\text{C} & \text{red line} \end{cases}$$

figure 25. FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \text{ V} \\ V_{GE} &= -8/16 \text{ V} \\ R_{gon} &= 0,5 \Omega \end{aligned}$$

$$T_f: \quad \begin{cases} 25^\circ\text{C} & \text{blue line} \\ 125^\circ\text{C} & \text{black line} \\ 150^\circ\text{C} & \text{red line} \end{cases}$$



Vincotech

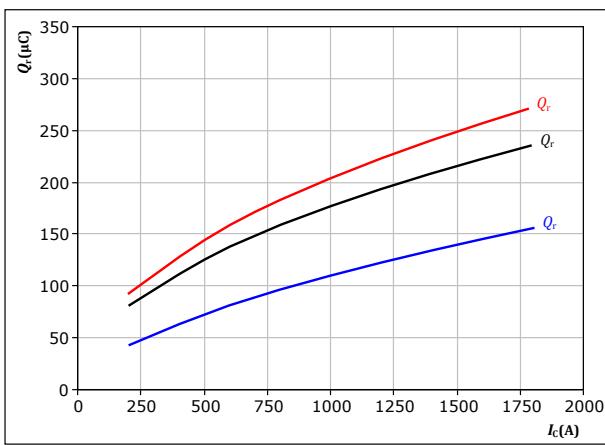
Buck Switching Characteristics

figure 26.

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

FWD



With an inductive load at

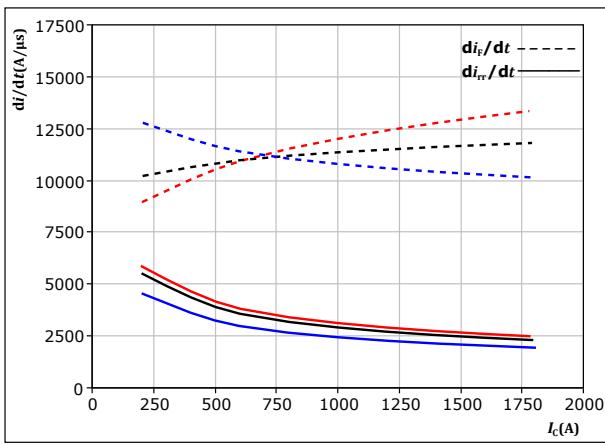
$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & \\ R_{gon} &= 0,5 \quad \Omega & T_j &= 125^\circ\text{C} \\ & & & \\ & & & T_j = 150^\circ\text{C} \end{aligned}$$

figure 28.

Typical rate of fall of forward and reverse recovery current as a function of collector current

$$di_f/dt, di_r/dt = f(I_c)$$

FWD



With an inductive load at

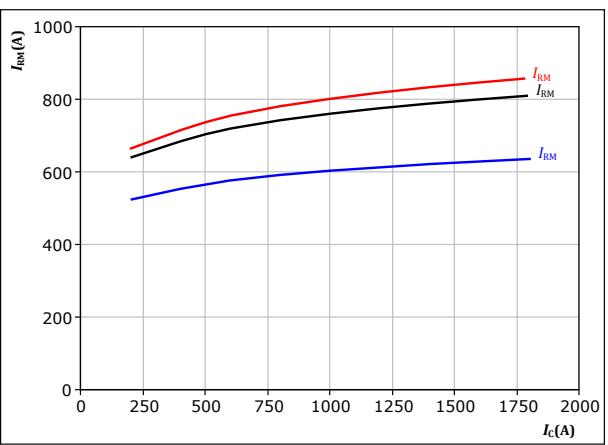
$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & \\ R_{gon} &= 0,5 \quad \Omega & T_j &= 125^\circ\text{C} \\ & & & \\ & & & T_j = 150^\circ\text{C} \end{aligned}$$

figure 27.

Typical peak reverse recovery current as a function of collector current

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

FWD



With an inductive load at

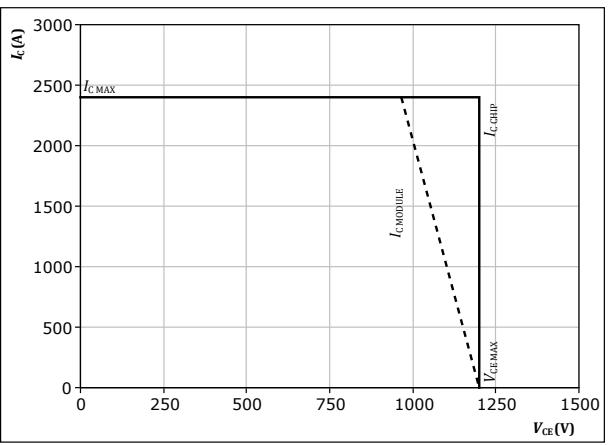
$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & \\ R_{gon} &= 0,5 \quad \Omega & T_j &= 125^\circ\text{C} \\ & & & \\ & & & T_j = 150^\circ\text{C} \end{aligned}$$

figure 29.

Reverse bias safe operating area

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

IGBT



At $T_j = 150^\circ\text{C}$

$$\begin{aligned} R_{gon} &= 0,5 \quad \Omega \\ R_{goff} &= 0,5 \quad \Omega \end{aligned}$$



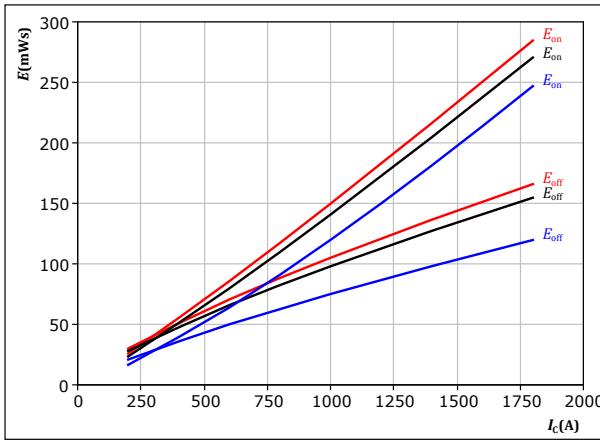
Vincotech

Boost Switching Characteristics

figure 30. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \text{ V} & T_f &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \text{ V} & & \\ R_{gon} &= 0,5 \Omega & & \\ R_{goff} &= 0,5 \Omega & & \end{aligned}$$

figure 31. FWD

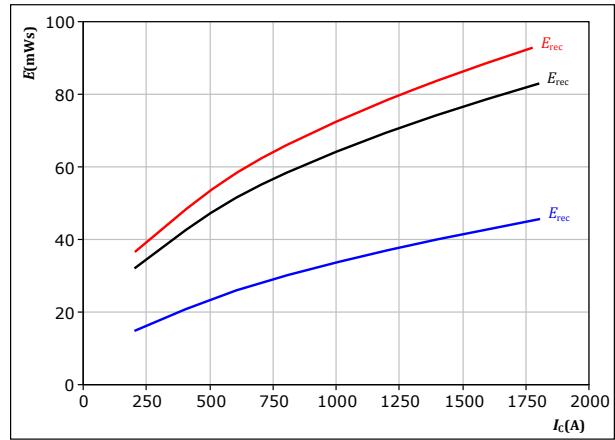
Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$

figure 31. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



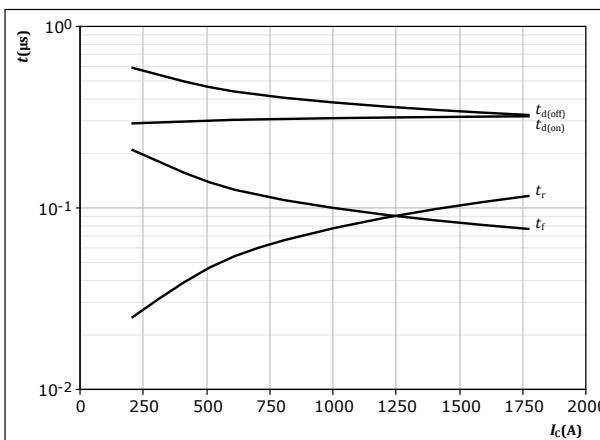
With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \text{ V} & T_f &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \text{ V} & & \\ R_{gon} &= 0,5 \Omega & & \\ R_{goff} &= 0,5 \Omega & & \end{aligned}$$

figure 32. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



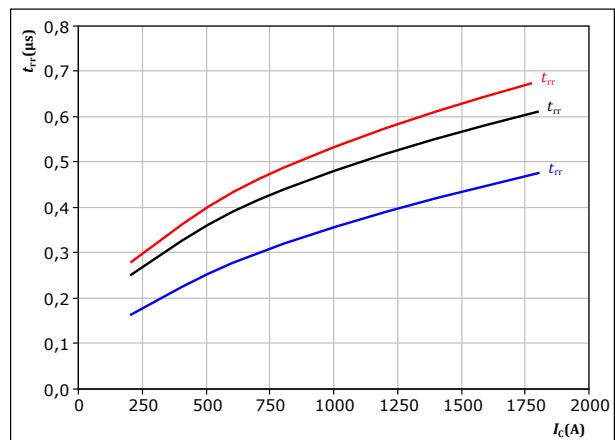
With an inductive load at

$$\begin{aligned} T_f &= 150^\circ\text{C} \\ V_{CE} &= 600 \text{ V} \\ V_{GE} &= -8/16 \text{ V} \\ R_{gon} &= 0,5 \Omega \\ R_{goff} &= 0,5 \Omega \end{aligned}$$

figure 33. FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \text{ V} & T_f &= 25^\circ\text{C} \\ V_{GE} &= -8/16 \text{ V} & & \\ R_{gon} &= 0,5 \Omega & & \end{aligned}$$



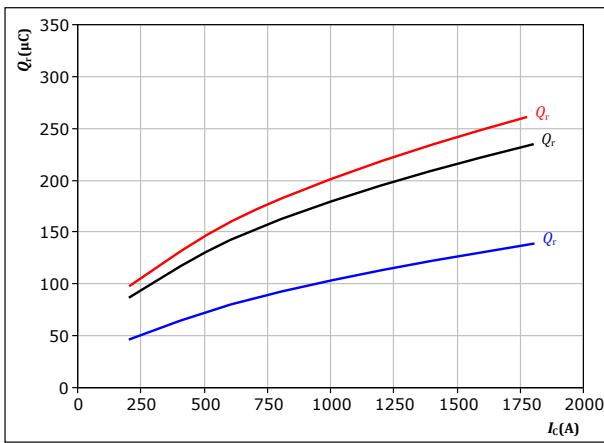
Vincotech

Boost Switching Characteristics

figure 34. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



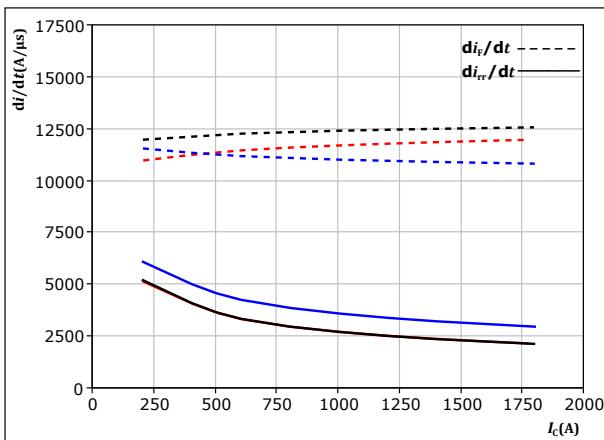
With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j: & 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & 125^\circ\text{C} \\ R_{gon} &= 0,5 \quad \Omega & & 150^\circ\text{C} \end{aligned}$$

figure 36. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$$di_f/dt, di_r/dt = f(I_c)$$



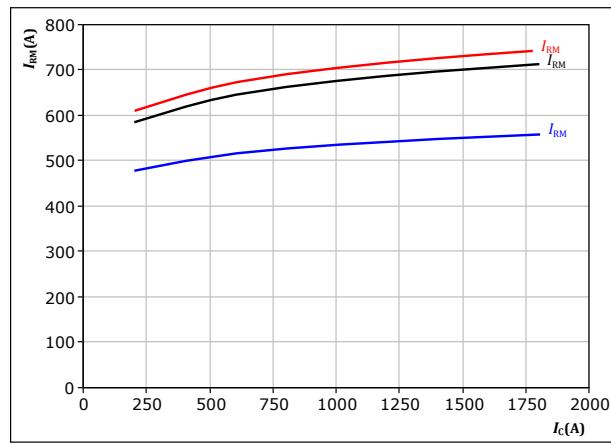
With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j: & 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & 125^\circ\text{C} \\ R_{gon} &= 0,5 \quad \Omega & & 150^\circ\text{C} \end{aligned}$$

figure 35. FWD

Typical peak reverse recovery current as a function of collector current

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



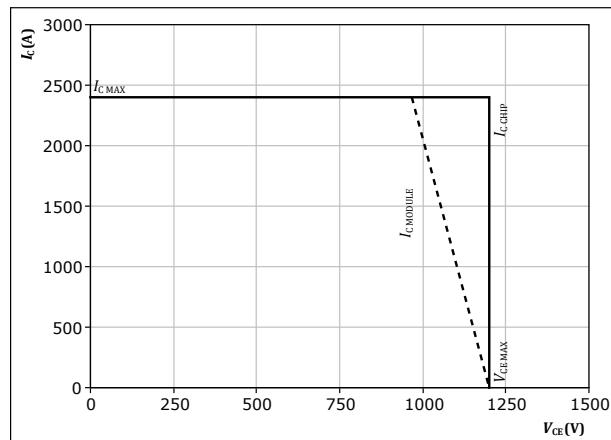
With an inductive load at

$$\begin{aligned} V_{CE} &= 600 \quad \text{V} & T_j: & 25^\circ\text{C} \\ V_{GE} &= -8/16 \quad \text{V} & & 125^\circ\text{C} \\ R_{gon} &= 0,5 \quad \Omega & & 150^\circ\text{C} \end{aligned}$$

figure 37. IGBT

Reverse bias safe operating area

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



At $T_j = 150^\circ\text{C}$

$$\begin{aligned} R_{gon} &= 0,5 \quad \Omega \\ R_{goff} &= 0,5 \quad \Omega \end{aligned}$$



Vincotech

Switching Definitions

figure 38. IGBT

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

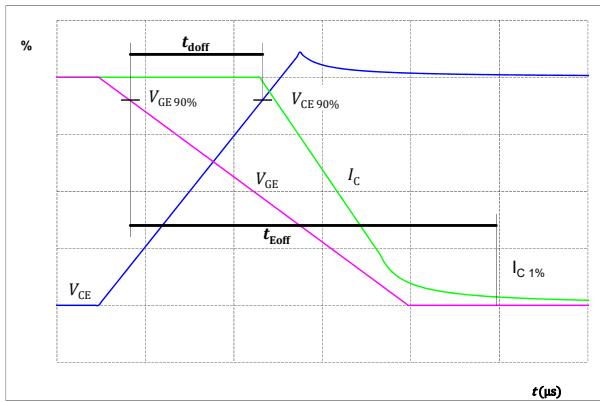


figure 40. IGBT

Turn-off Switching Waveforms & definition of t_f

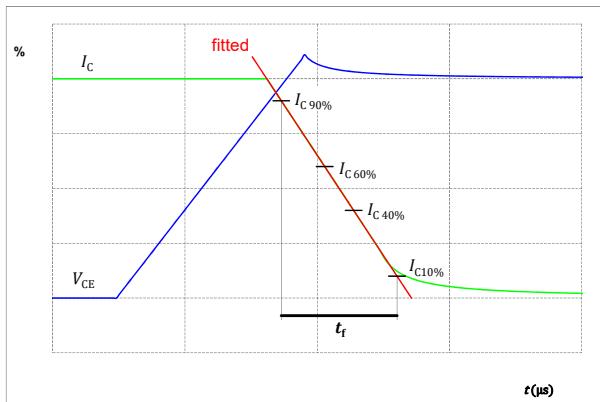


figure 39. IGBT

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

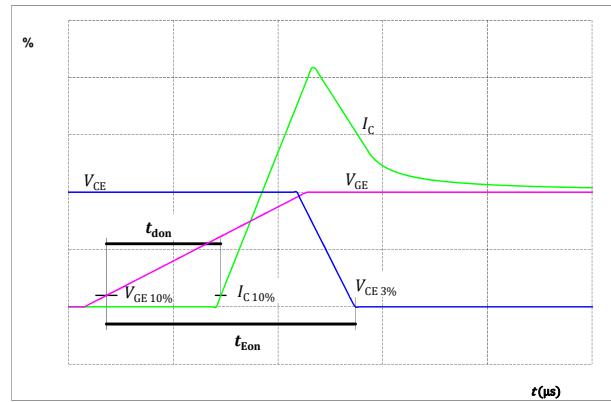
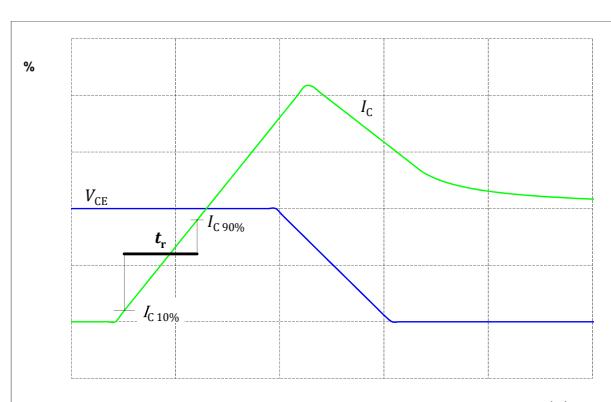


figure 41. IGBT

Turn-on Switching Waveforms & definition of t_r





Switching Definitions

figure 42.

Turn-off Switching Waveforms & definition of t_{tr}

FWD

Turn-off Switching Waveforms & definition of t_{tr}

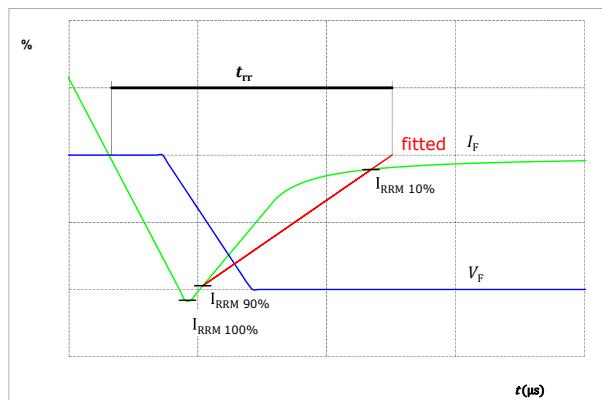
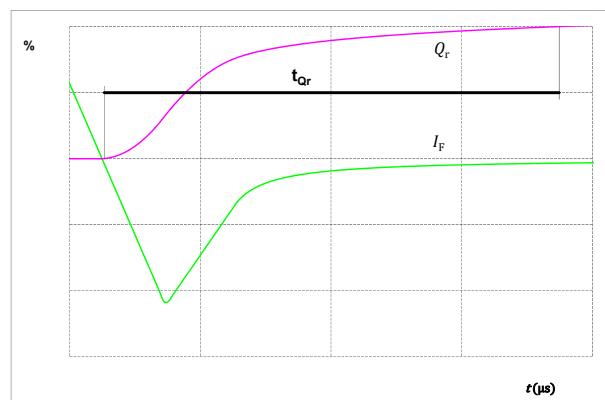


figure 43.

Turn-on Switching Waveforms & definition of t_{qr} (t_{qr} = integrating time for Q_r)

FWD

Turn-on Switching Waveforms & definition of t_{qr} (t_{qr} = integrating time for Q_r)





70-W424NIA1K2M702-LD07FP70

datasheet

Vincotech

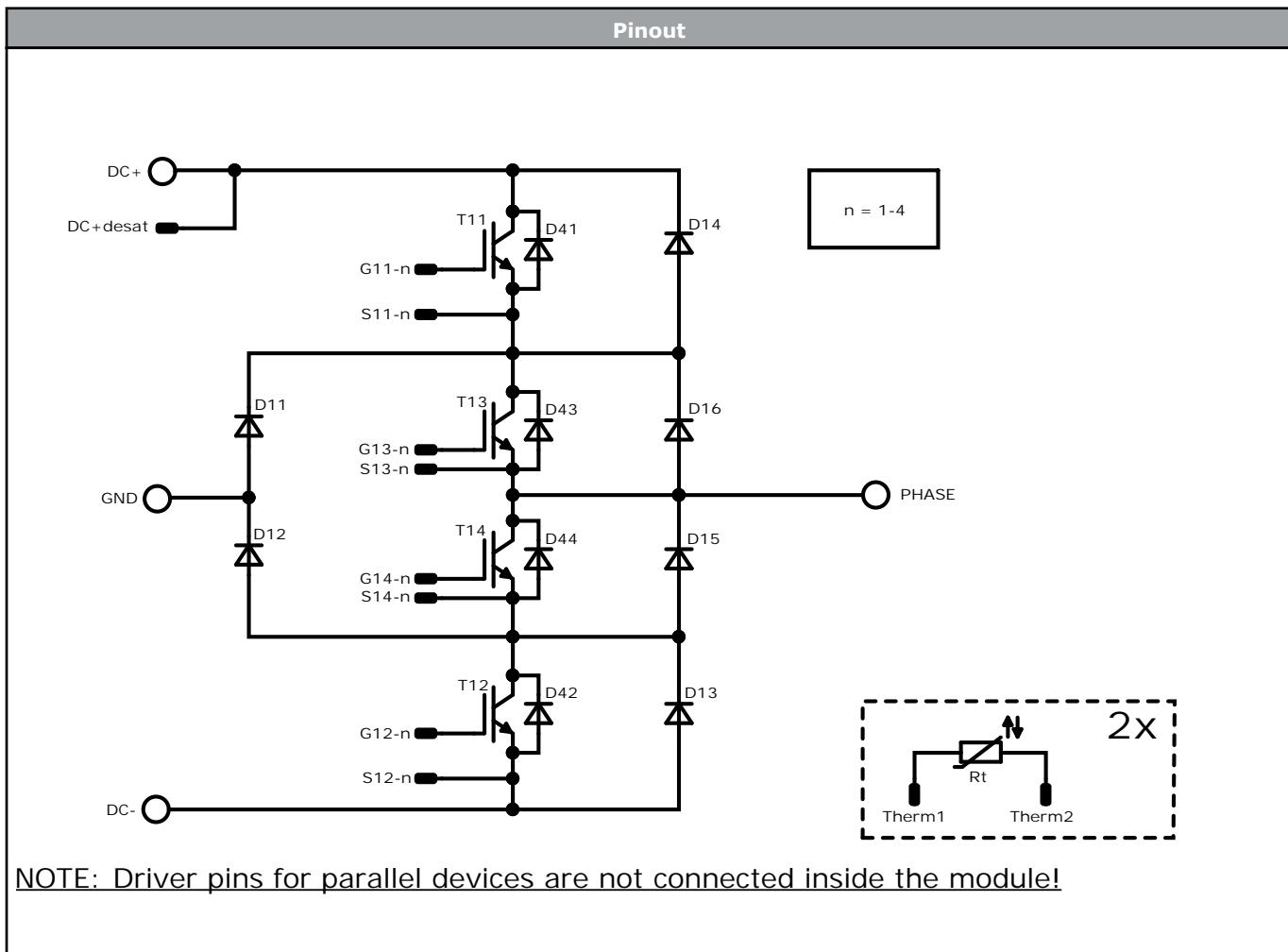
| Ordering Code | |
|---------------------------------------|--------------------------------|
| Version | Ordering Code |
| Without thermal paste | 70-W424NIA1K2M702-LD07FP70 |
| With thermal paste (3,4 W/mK, PSX-P7) | 70-W424NIA1K2M702-LD07FP70-/3/ |

| Marking | | | | | | |
|--|------------|--------------------------------|-----------|-----------|-------|--------|
| Name Date code Lot Serial Vincotech UL | Text | Name | Date code | UL & VIN | Lot | Serial |
| | Datamatrix | NN-NNNNNNNNNNNNNN- TTTTTTVV | WWYY | UL VIN | LLLLL | SSSS |
| | Type&Ver | Lot number | Serial | Date code | | |
| | TTTTTTVV | LLLLL | SSSS | WWYY | | |

| Outline | | | | | | |
|----------------|--------|-------|----------|----|---------------|-------|
| Pin table [mm] | | | | | | |
| Pin | X | Y | Function | 28 | 95,95 | 27,7 |
| 1 | -5,85 | 82,8 | G11-1 | 29 | 150,05 | 30,7 |
| 2 | -5,85 | 79,8 | S11-1 | 30 | 150,05 | 27,7 |
| 3 | 49,85 | 82,8 | G11-2 | 31 | 95,95 | 17,85 |
| 4 | 49,85 | 79,8 | S11-2 | 32 | 95,95 | 14,85 |
| 5 | -7,65 | 69,85 | G13-1 | 33 | 150,05 | 17,85 |
| 6 | -7,65 | 66,85 | S13-1 | 34 | 150,05 | 14,85 |
| 7 | 51,65 | 69,85 | G13-2 | 35 | 168,65 | 89,8 |
| 8 | 51,65 | 66,85 | S13-2 | 36 | 168,65 | 86,7 |
| 9 | -5,05 | 30,7 | G14-1 | 37 | -17,45 | 85 |
| 10 | -5,05 | 27,7 | S14-1 | 38 | 83,55 | 85 |
| 11 | 49,05 | 30,7 | G14-2 | 39 | not assembled | |
| 12 | 49,05 | 27,7 | S14-2 | 40 | not assembled | |
| 13 | -5,05 | 17,85 | G12-1 | 41 | X2 | Y2 |
| 14 | -5,05 | 14,85 | S12-1 | 42 | 0 | 0 |
| 15 | 49,05 | 17,85 | G12-2 | 43 | 22 | 0 |
| 16 | 49,05 | 14,85 | S12-2 | 44 | 44 | 0 |
| 17 | 67,65 | 89,8 | Therm1-1 | 45 | 0 | 110,4 |
| 18 | 67,65 | 86,7 | Therm2-1 | 46 | 22 | 110,4 |
| 19 | 95,15 | 82,8 | G11-3 | 47 | 44 | 110,4 |
| 20 | 95,15 | 79,8 | S11-3 | 48 | 101 | 0 |
| 21 | 150,85 | 82,8 | G11-4 | 49 | 123 | 0 |
| 22 | 150,85 | 79,8 | S11-4 | 50 | 145 | 0 |
| 23 | 93,35 | 69,85 | G13-3 | 51 | 101 | 110,4 |
| 24 | 93,35 | 66,85 | S13-3 | 52 | 123 | 110,4 |
| 25 | 152,65 | 69,85 | G13-4 | 53 | 145 | 110,4 |
| 26 | 152,65 | 66,85 | S13-4 | | | |
| 27 | 95,95 | 30,7 | G14-3 | | | |



Vincotech



| Identification | | | | | |
|----------------|-----------|---------|---------|----------------------------|---------|
| ID | Component | Voltage | Current | Function | Comment |
| T11, T12 | IGBT | 1200 V | 1200 A | Buck Switch | |
| D11, D12 | FWD | 1200 V | 1200 A | Buck Diode | |
| D41, D42 | FWD | 1200 V | 60 A | Buck Sw. Protection Diode | |
| T13, T14 | IGBT | 1200 V | 1200 A | Boost Switch | |
| D13, D14 | FWD | 1200 V | 1200 A | Boost Diode | |
| D15, D16 | FWD | 1200 V | 1200 A | Boost Sw. Inv. Diode | |
| D43, D44 | FWD | 1200 V | 60 A | Boost Sw. Protection Diode | |
| Rt | NTC | | | Thermistor | |

**70-W424NIA1K2M702-LD07FP70**

datasheet

Vincotech**Packaging instruction**

| | | | | |
|-------------------------------------|------|----------|------|--------|
| Standard packaging quantity (SPQ) 4 | >SPQ | Standard | <SPQ | Sample |
|-------------------------------------|------|----------|------|--------|

Handling instruction

Handling instructions for VINco X8 packages see vincotech.com website.

Package data

Package data for VINco X8 packages see vincotech.com website.

Vincotech thermistor reference

See Vincotech thermistor reference table at 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 |
|----------------------------------|--------------|--|-------|
| 70-W424NIA1K2M702-LD07FP70-D4-14 | 30 Sep. 2021 | Change of Buck Switch and Diode static characteristics Change of Boost Switch and Diode static characteristics Change of Boost Sw. Inv. Diode static characteristics | |

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.