



Vincotech

**10-FZ07NIA100S502-P927F58**  
datasheet

*flowNPC 0*

**1200 V / 100 A**

**Features**

- High switching frequency
- High efficiency
- Easy controllability

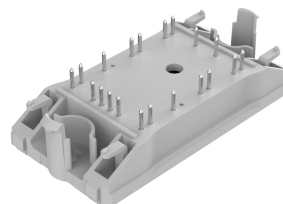
**Target applications**

- Solar Inverters
- UPS

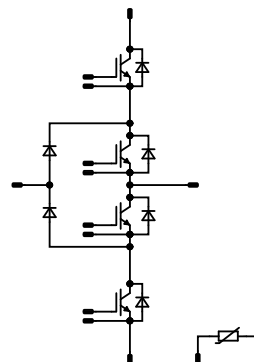
**Types**

- 10-FZ07NIA100S502-P927F58

**flow 0 12 mm housing**



**Schematic**





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## Maximum Ratings

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

| Parameter | Symbol | Conditions | Value | Unit |
|-----------|--------|------------|-------|------|
|-----------|--------|------------|-------|------|

### Buck Switch

|                                   |            |                                       |          |    |
|-----------------------------------|------------|---------------------------------------|----------|----|
| Collector-emitter voltage         | $V_{CES}$  |                                       | 650      | V  |
| Collector current                 | $I_C$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 82       | A  |
| Repetitive peak collector current | $I_{CRM}$  | $t_p$ limited by $T_{jmax}$           | 300      | A  |
| Total power dissipation           | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 117      | W  |
| Gate-emitter voltage              | $V_{GES}$  |                                       | $\pm 20$ | V  |
| Maximum junction temperature      | $T_{jmax}$ |                                       | 175      | °C |

### Buck Diode

|                                     |            |                                       |     |    |
|-------------------------------------|------------|---------------------------------------|-----|----|
| Peak repetitive reverse voltage     | $V_{RRM}$  |                                       | 650 | V  |
| Continuous (direct) forward current | $I_F$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 70  | A  |
| Repetitive peak forward current     | $I_{FRM}$  | $t_p$ limited by $T_{jmax}$           | 200 | A  |
| Total power dissipation             | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 95  | W  |
| Maximum junction temperature        | $T_{jmax}$ |                                       | 175 | °C |

### Boost Switch

|                                   |            |                                       |          |    |
|-----------------------------------|------------|---------------------------------------|----------|----|
| Collector-emitter voltage         | $V_{CES}$  |                                       | 650      | V  |
| Collector current                 | $I_C$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 82       | A  |
| Repetitive peak collector current | $I_{CRM}$  | $t_p$ limited by $T_{jmax}$           | 300      | A  |
| Total power dissipation           | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 117      | W  |
| Gate-emitter voltage              | $V_{GES}$  |                                       | $\pm 20$ | V  |
| Maximum junction temperature      | $T_{jmax}$ |                                       | 175      | °C |



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datasheet

## Maximum Ratings

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

| Parameter                           | Symbol     | Conditions                            | Value | Unit |
|-------------------------------------|------------|---------------------------------------|-------|------|
| <b>Boost Diode</b>                  |            |                                       |       |      |
| Peak repetitive reverse voltage     | $V_{RRM}$  |                                       | 650   | V    |
| Continuous (direct) forward current | $I_F$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 70    | A    |
| Repetitive peak forward current     | $I_{FRM}$  | $t_p$ limited by $T_{jmax}$           | 200   | A    |
| Total power dissipation             | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 95    | W    |
| Maximum junction temperature        | $T_{jmax}$ |                                       | 175   | °C   |

## Boost Sw. Inv. Diode

|                                     |            |                                       |     |    |
|-------------------------------------|------------|---------------------------------------|-----|----|
| Peak repetitive reverse voltage     | $V_{RRM}$  |                                       | 650 | V  |
| Continuous (direct) forward current | $I_F$      | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 70  | A  |
| Repetitive peak forward current     | $I_{FRM}$  | $t_p$ limited by $T_{jmax}$           | 200 | A  |
| Total power dissipation             | $P_{tot}$  | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 95  | W  |
| Maximum junction temperature        | $T_{jmax}$ |                                       | 175 | °C |

## Module Properties

### Thermal Properties

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

### Isolation Properties

|                            |            |                                     |           |    |
|----------------------------|------------|-------------------------------------|-----------|----|
| Isolation voltage          | $V_{isol}$ | DC Test Voltage* $t_p = 2\text{ s}$ | 6000      | V  |
| Isolation voltage          | $V_{isol}$ | AC Voltage $t_p = 1\text{ min}$     | 2500      | V  |
| Creepage distance          |            |                                     | min. 12,7 | mm |
| Clearance                  |            |                                     | 9,15      | mm |
| Comparative Tracking Index | CTI        |                                     | ≥ 200     |    |

\*100 % tested in production



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## Characteristic Values

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

### Buck Switch

#### Static

|                                      |               |                          |    |     |       |                  |     |                      |      |    |
|--------------------------------------|---------------|--------------------------|----|-----|-------|------------------|-----|----------------------|------|----|
| Gate-emitter threshold voltage       | $V_{GE(th)}$  | $V_{CE} = V_{GE}$        |    |     | 0,001 | 25               | 3,2 | 4                    | 4,8  | V  |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ |                          | 15 |     | 100   | 25<br>125<br>150 |     | 1,39<br>1,48<br>1,51 | 1,75 | V  |
| Collector-emitter cut-off current    | $I_{CES}$     |                          | 0  | 650 |       | 25               |     |                      | 100  | µA |
| Gate-emitter leakage current         | $I_{GES}$     |                          | 20 | 0   |       | 25               |     |                      | 200  | nA |
| Internal gate resistance             | $r_g$         |                          |    |     |       |                  |     | None                 |      | Ω  |
| Input capacitance                    | $C_{ies}$     | $f = 1 \text{ Mhz}$      | 0  | 25  |       | 25               |     | 6200                 |      | pF |
| Output capacitance                   | $C_{oes}$     |                          |    |     |       |                  |     | 176                  |      | pF |
| Reverse transfer capacitance         | $C_{res}$     |                          |    |     |       |                  |     | 24                   |      | pF |
| Gate charge                          | $Q_g$         | $V_{CC} = 520 \text{ V}$ | 15 |     | 100   | 25               |     | 240                  |      | nC |

#### Thermal

|                                      |               |   |  |  |  |  |  |      |  |     |
|--------------------------------------|---------------|---|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink* | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4 \text{ W/mK}$<br>(PSX) |  |  |  |  |  | 0,81 |  | K/W |
|--------------------------------------|---------------|---|--|--|--|--|--|------|--|-----|

\*Only valid with pre-applied Vincotech thermal interface material.

#### Dynamic

|                             |              |   |          |     |     |                  |  |                         |  |     |
|-----------------------------|--------------|---|----------|-----|-----|------------------|--|-------------------------|--|-----|
| Turn-on delay time          | $t_{d(on)}$  | $R_{gon} = 4 \Omega$<br>$R_{goff} = 4 \Omega$ | $\pm 15$ | 350 | 100 | 25<br>125<br>150 |  | 64,5<br>65,5<br>66      |  | ns  |
| Rise time                   | $t_r$        |   |          |     |     | 25<br>125<br>150 |  | 8,5<br>9,5<br>10        |  | ns  |
| Turn-off delay time         | $t_{d(off)}$ |   |          |     |     | 25<br>125<br>150 |  | 87,5<br>105,5<br>110    |  | ns  |
| Fall time                   | $t_f$        |   |          |     |     | 25<br>125<br>150 |  | 13,94<br>22,72<br>50,59 |  | ns  |
| Turn-on energy (per pulse)  | $E_{on}$     |   |          |     |     | 25<br>125<br>150 |  | 0,981<br>1,34<br>1,37   |  | mWs |
| Turn-off energy (per pulse) | $E_{off}$    |   |          |     |     | 25<br>125<br>150 |  | 0,676<br>1,19<br>1,37   |  | mWs |





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## Characteristic Values

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

### Buck Diode

#### Static

|                         |       |               |  |     |                  |  |  |                     |      |    |
|-------------------------|-------|---------------|--|-----|------------------|--|--|---------------------|------|----|
| Forward voltage         | $V_F$ |               |  | 100 | 25<br>125<br>150 |  |  | 1,6<br>1,58<br>1,57 | 1,92 | V  |
| Reverse leakage current | $I_R$ | $V_i = 650$ V |  |     | 25               |  |  |                     | 5,3  | μA |

#### Thermal

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

\*Only valid with pre-applied Vincotech thermal interface material.

#### Dynamic

|                                       |                      |   |          |     |     |                  |  |                            |  |      |
|---------------------------------------|----------------------|---|----------|-----|-----|------------------|--|----------------------------|--|------|
| Peak recovery current                 | $I_{RRM}$            | $di/dt=9150$ A/μs<br>$di/dt=7920$ A/μs<br>$di/dt=7488$ A/μs | $\pm 15$ | 350 | 100 | 25<br>125<br>150 |  | 112,21<br>137,32<br>144,14 |  | A    |
| Reverse recovery time                 | $t_{rr}$             |   |          |     |     | 25<br>125<br>150 |  | 60,32<br>98,6<br>109,83    |  | ns   |
| Recovered charge                      | $Q_r$                |   |          |     |     | 25<br>125<br>150 |  | 3,18<br>5,91<br>6,72       |  | μC   |
| Reverse recovered energy              | $E_{rec}$            |   |          |     |     | 25<br>125<br>150 |  | 0,486<br>1<br>1,18         |  | mWs  |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ |   |          |     |     | 25<br>125<br>150 |  | 8293<br>2829<br>3138       |  | A/μs |



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## Characteristic Values

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

### Boost Switch

#### Static

|                                      |               |                          |    |     |       |                  |     |                      |      |    |
|--------------------------------------|---------------|--------------------------|----|-----|-------|------------------|-----|----------------------|------|----|
| Gate-emitter threshold voltage       | $V_{GE(th)}$  | $V_{CE} = V_{GE}$        |    |     | 0,001 | 25               | 3,2 | 4                    | 4,8  | V  |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ |                          | 15 |     | 100   | 25<br>125<br>150 |     | 1,39<br>1,48<br>1,51 | 1,75 | V  |
| Collector-emitter cut-off current    | $I_{CES}$     |                          | 0  | 650 |       | 25               |     |                      | 100  | µA |
| Gate-emitter leakage current         | $I_{GES}$     |                          | 20 | 0   |       | 25               |     |                      | 200  | nA |
| Internal gate resistance             | $r_g$         |                          |    |     |       |                  |     | None                 |      | Ω  |
| Input capacitance                    | $C_{ies}$     | $f = 1 \text{ Mhz}$      | 0  | 25  |       | 25               |     | 6200                 |      | pF |
| Output capacitance                   | $C_{oes}$     |                          |    |     |       |                  |     | 176                  |      | pF |
| Reverse transfer capacitance         | $C_{res}$     |                          |    |     |       |                  |     | 24                   |      | pF |
| Gate charge                          | $Q_g$         | $V_{CC} = 520 \text{ V}$ | 15 |     | 100   | 25               |     | 240                  |      | nC |

#### Thermal

|                                      |               |   |  |  |  |  |  |      |  |     |
|--------------------------------------|---------------|---|--|--|--|--|--|------|--|-----|
| Thermal resistance junction to sink* | $R_{th(j-s)}$ | $\lambda_{paste} = 3,4 \text{ W/mK}$<br>(PSX) |  |  |  |  |  | 0,81 |  | K/W |
|--------------------------------------|---------------|---|--|--|--|--|--|------|--|-----|

\*Only valid with pre-applied Vincotech thermal interface material.

#### Dynamic

|                             |              |   |          |     |     |                  |  |                         |  |     |
|-----------------------------|--------------|---|----------|-----|-----|------------------|--|-------------------------|--|-----|
| Turn-on delay time          | $t_{d(on)}$  | $R_{gon} = 4 \Omega$<br>$R_{goff} = 4 \Omega$ | $\pm 15$ | 350 | 100 | 25<br>125<br>150 |  | 63,68<br>64,96<br>65,6  |  | ns  |
| Rise time                   | $t_r$        |   |          |     |     | 25<br>125<br>150 |  | 12,96<br>15,2<br>15,36  |  | ns  |
| Turn-off delay time         | $t_{d(off)}$ |   |          |     |     | 25<br>125<br>150 |  | 74,72<br>92,48<br>96,8  |  | ns  |
| Fall time                   | $t_f$        |   |          |     |     | 25<br>125<br>150 |  | 11,99<br>32,11<br>35,87 |  | ns  |
| Turn-on energy (per pulse)  | $E_{on}$     |   |          |     |     | 25<br>125<br>150 |  | 0,756<br>0,97<br>1,02   |  | mWs |
| Turn-off energy (per pulse) | $E_{off}$    |   |          |     |     | 25<br>125<br>150 |  | 1,14<br>1,8<br>1,96     |  | mWs |



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## Characteristic Values

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

### Boost Diode

#### Static

|                         |       |               |  |     |                  |  |  |                     |      |    |
|-------------------------|-------|---------------|--|-----|------------------|--|--|---------------------|------|----|
| Forward voltage         | $V_F$ |               |  | 100 | 25<br>125<br>150 |  |  | 1,6<br>1,58<br>1,57 | 1,92 | V  |
| Reverse leakage current | $I_R$ | $V_i = 650$ V |  |     | 25               |  |  |                     | 5,3  | µA |

#### Thermal

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

\*Only valid with pre-applied Vincotech thermal interface material.

#### Dynamic

|                                       |                      |   |          |     |     |                  |  |                            |  |      |
|---------------------------------------|----------------------|---|----------|-----|-----|------------------|--|----------------------------|--|------|
| Peak recovery current                 | $I_{RRM}$            | $di/dt=5941$ A/µs<br>$di/dt=5631$ A/µs<br>$di/dt=5557$ A/µs | $\pm 15$ | 350 | 100 | 25<br>125<br>150 |  | 68,01<br>95,94<br>103,75   |  | A    |
| Reverse recovery time                 | $t_{rr}$             |   |          |     |     | 25<br>125<br>150 |  | 105,58<br>154,58<br>174,64 |  | ns   |
| Recovered charge                      | $Q_r$                |   |          |     |     | 25<br>125<br>150 |  | 2,6<br>5,44<br>6,33        |  | µC   |
| Reverse recovered energy              | $E_{rec}$            |   |          |     |     | 25<br>125<br>150 |  | 0,701<br>1,52<br>1,78      |  | mWs  |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ |   |          |     |     | 25<br>125<br>150 |  | 2647<br>2417<br>2609       |  | A/µs |



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## Characteristic Values

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

### Boost Sw. Inv. Diode

#### Static

|                         |       |               |  |     |                  |  |  |                     |      |    |
|-------------------------|-------|---------------|--|-----|------------------|--|--|---------------------|------|----|
| Forward voltage         | $V_F$ |               |  | 100 | 25<br>125<br>150 |  |  | 1,6<br>1,58<br>1,57 | 1,92 | V  |
| Reverse leakage current | $I_R$ | $V_i = 650$ V |  |     | 25               |  |  |                     | 5,3  | µA |

#### Thermal

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

\*Only valid with pre-applied Vincotech thermal interface material.

### Thermistor

#### Static

|                                |                |                    |  |  |     |    |  |      |   |      |
|--------------------------------|----------------|--------------------|--|--|-----|----|--|------|---|------|
| Rated resistance               | $R$            |                    |  |  | 25  |    |  | 22   |   | kΩ   |
| Deviation of $R_{100}$         | $\Delta_{R/R}$ | $R_{100} = 1484$ Ω |  |  | 100 | -5 |  |      | 5 | %    |
| Power dissipation              | $P$            |                    |  |  |     |    |  | 5    |   | mW   |
| Power dissipation constant     | $d$            |                    |  |  | 25  |    |  | 1,5  |   | mW/K |
| B-value                        | $B_{(25/50)}$  | Tol. $\pm 1$ %     |  |  |     |    |  | 3962 |   | K    |
| B-value                        | $B_{(25/100)}$ | Tol. $\pm 1$ %     |  |  |     |    |  | 4000 |   | K    |
| Vincotech Thermistor Reference |                |                    |  |  |     |    |  |      | I |      |



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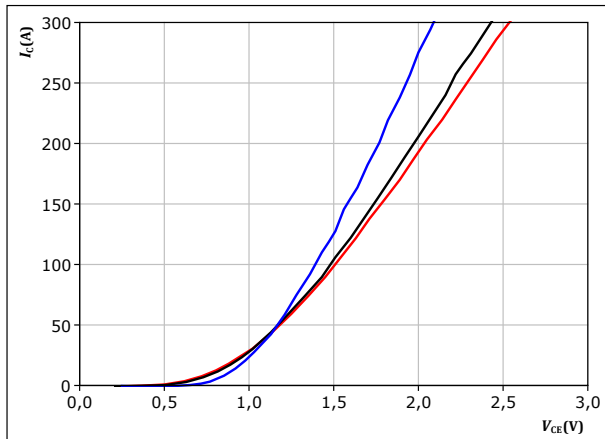
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## Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

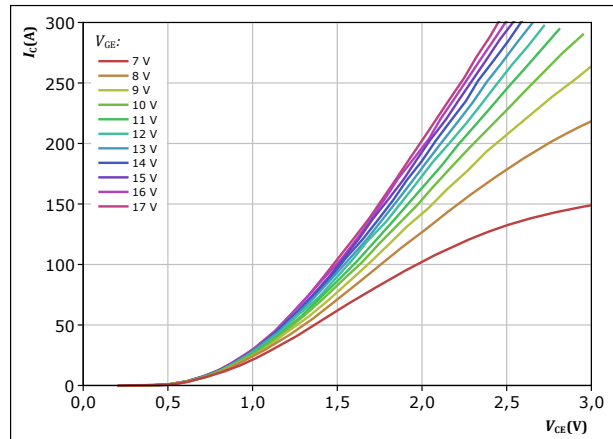


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25^\circ C$   
 $125^\circ C$   
 $150^\circ C$

figure 2. IGBT

Typical output characteristics

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

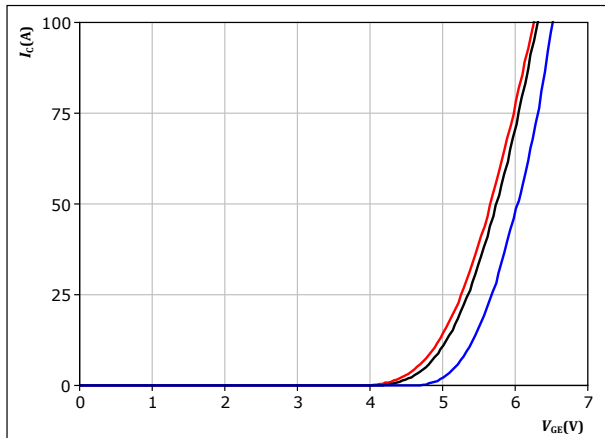


$t_p = 250 \mu s$   
 $T_j = 150^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

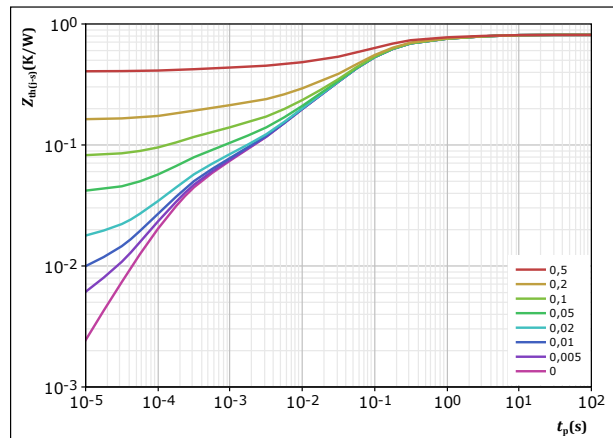


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25^\circ C$   
 $125^\circ C$   
 $150^\circ C$

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0.812 K/W$   
IGBT thermal model values  

| $R (K/W)$ | $\tau (s)$ |
|-----------|------------|
| 4,67E-02  | 3,86E+00   |
| 8,18E-02  | 7,09E-01   |
| 3,18E-01  | 1,25E-01   |
| 2,26E-01  | 4,22E-02   |
| 8,12E-02  | 5,84E-03   |
| 2,54E-02  | 5,78E-04   |
| 3,27E-02  | 1,79E-04   |



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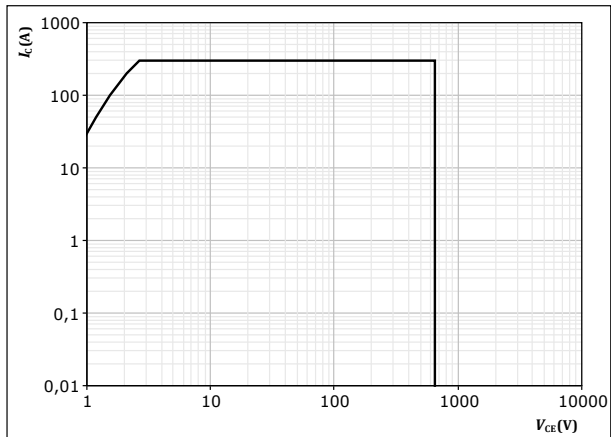
**10-FZ07NIA100S502-P927F58**  
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## Buck Switch Characteristics

**figure 5.** IGBT

Safe operating area

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



$D = \text{single pulse}$

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



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## Buck Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

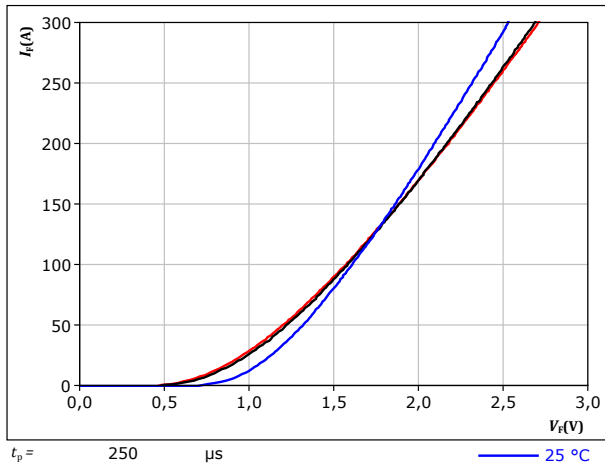
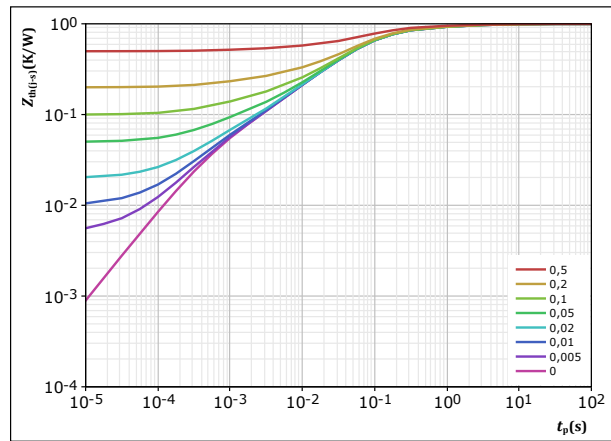


figure 7.

FWD

Transient thermal impedance as a function of pulse width

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



|                           |            |     |
|---------------------------|------------|-----|
| $D =$                     | $t_p / T$  |     |
| $R_{th(j-s)} =$           | 0,997      | K/W |
| IGBT thermal model values |            |     |
| $R$ (K/W)                 | $\tau$ (s) |     |
| 4,57E-02                  | 5,23E+00   |     |
| 1,09E-01                  | 8,02E-01   |     |
| 3,92E-01                  | 1,26E-01   |     |
| 3,47E-01                  | 3,68E-02   |     |
| 7,19E-02                  | 4,16E-03   |     |
| 3,26E-02                  | 5,44E-04   |     |



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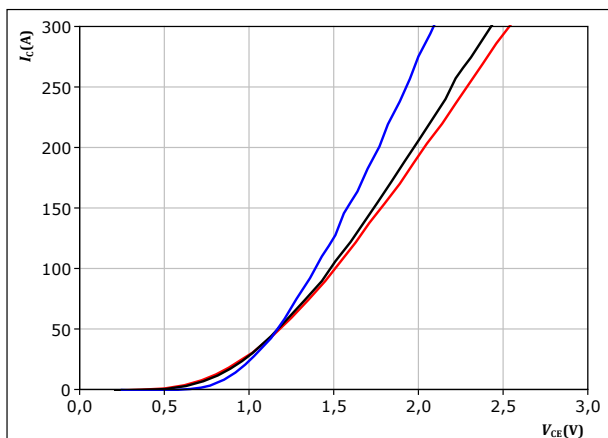
## Boost Switch Characteristics

figure 8.

IGBT

Typical output characteristics

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



$t_p = 250 \mu s$   
 $V_{GE} = 15 V$

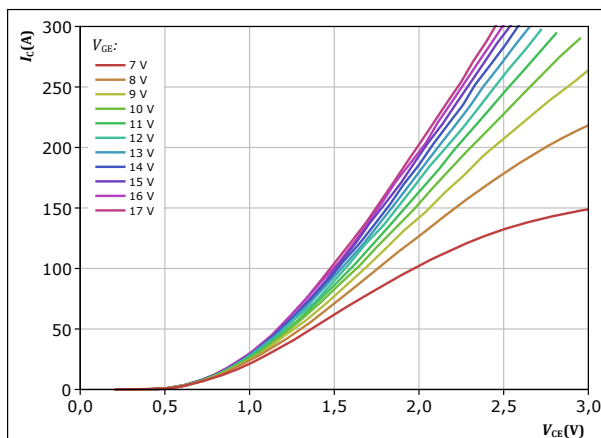
$T_j:$   
— 25 °C  
— 125 °C  
— 150 °C

figure 9.

IGBT

Typical output characteristics

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



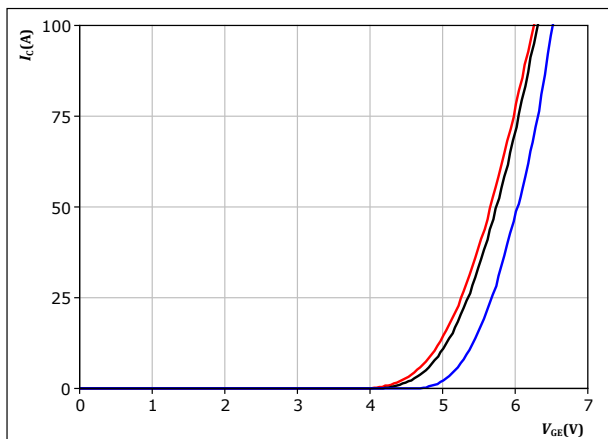
$t_p = 250 \mu s$   
 $T_j = 150 ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 10.

IGBT

Typical transfer characteristics

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



$t_p = 250 \mu s$   
 $V_{CE} = 10 V$

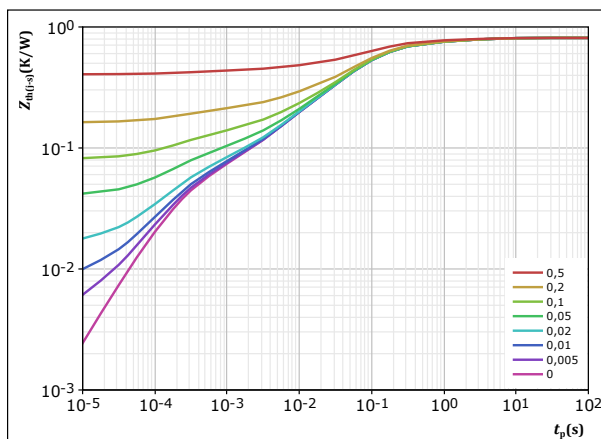
$T_j:$   
— 25 °C  
— 125 °C  
— 150 °C

figure 11.

IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,812 K/W$   
IGBT thermal model values  

| $R (K/W)$ | $\tau (s)$ |
|-----------|------------|
| 4,67E-02  | 3,86E+00   |
| 8,18E-02  | 7,09E-01   |
| 3,18E-01  | 1,25E-01   |
| 2,26E-01  | 4,22E-02   |
| 8,12E-02  | 5,84E-03   |
| 2,54E-02  | 5,78E-04   |
| 3,27E-02  | 1,79E-04   |





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datasheet

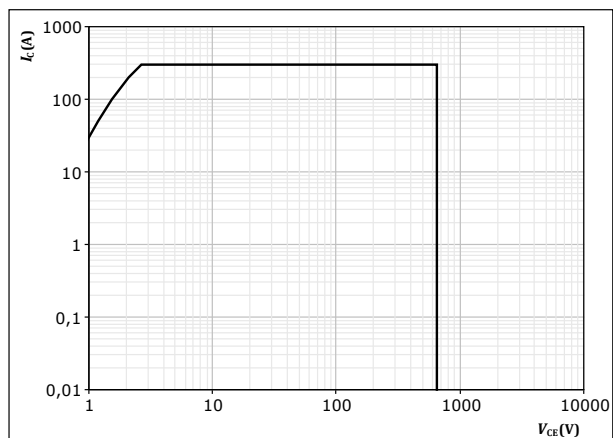
## Boost Switch Characteristics

figure 12.

IGBT

Safe operating area

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



$D = \text{single pulse}$

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



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## Boost Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

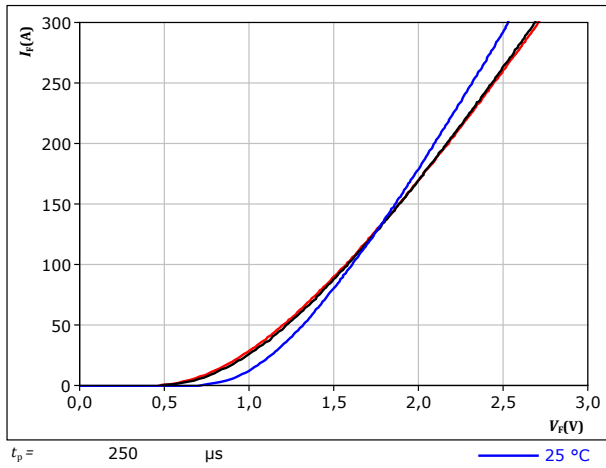
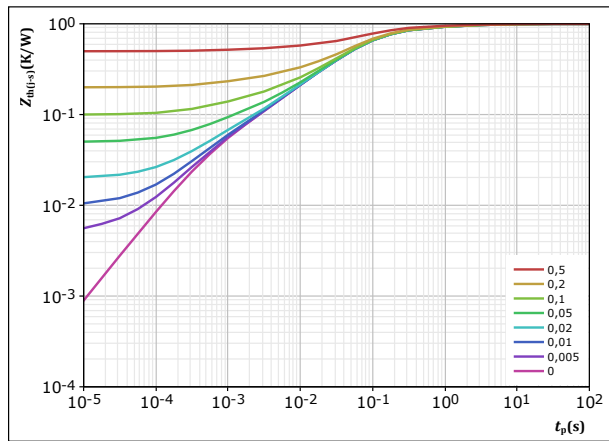


figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



|                           |            |     |
|---------------------------|------------|-----|
| $D =$                     | $t_p / T$  |     |
| $R_{th(j-s)} =$           | 0,997      | K/W |
| IGBT thermal model values |            |     |
| $R$ (K/W)                 | $\tau$ (s) |     |
| 4,57E-02                  | 5,23E+00   |     |
| 1,09E-01                  | 8,02E-01   |     |
| 3,92E-01                  | 1,26E-01   |     |
| 3,47E-01                  | 3,68E-02   |     |
| 7,19E-02                  | 4,16E-03   |     |
| 3,26E-02                  | 5,44E-04   |     |



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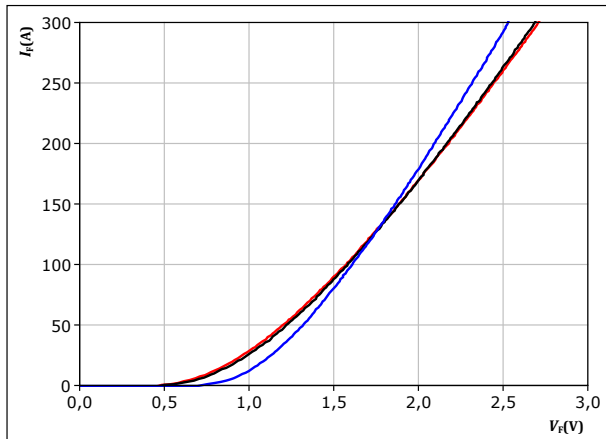
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## Boost Sw. Inv. Diode Characteristics

figure 15. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



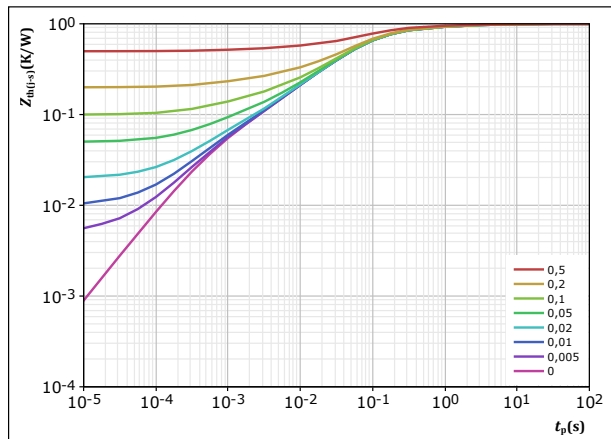
$t_p = 250 \mu s$

$T_j$ : 25 °C, 125 °C, 150 °C

figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 0,997 \text{ K/W}$

IGBT thermal model values

| $R \text{ (K/W)}$ | $\tau \text{ (s)}$ |
|-------------------|--------------------|
| 4,57E-02          | 5,23E+00           |
| 1,09E-01          | 8,02E-01           |
| 3,92E-01          | 1,26E-01           |
| 3,47E-01          | 3,68E-02           |
| 7,19E-02          | 4,16E-03           |
| 3,26E-02          | 5,44E-04           |



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## Thermistor Characteristics

figure 17.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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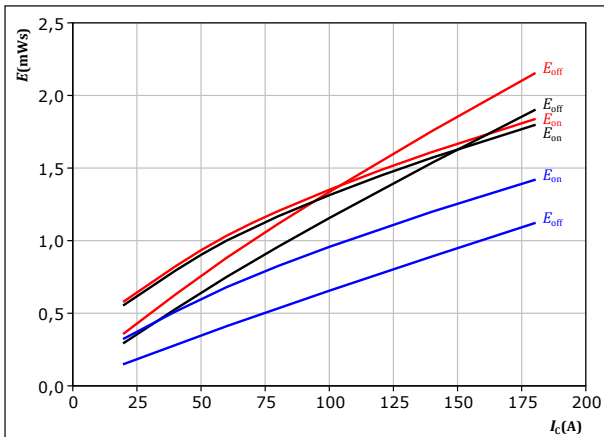
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## Buck Switching Characteristics

figure 18. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



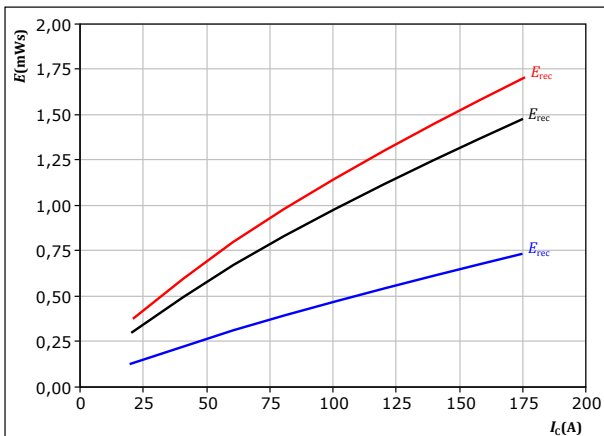
With an inductive load at

|              |     |   |        |        |
|--------------|-----|---|--------|--------|
| $V_{CE} =$   | 350 | V | $T_j:$ | 25 °C  |
| $V_{GE} =$   | ±15 | V |        | 125 °C |
| $R_{gon} =$  | 4   | Ω |        | 150 °C |
| $R_{goff} =$ | 4   | Ω |        |        |

figure 20. FWD

Typical reverse recovered energy loss as a function of collector current

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



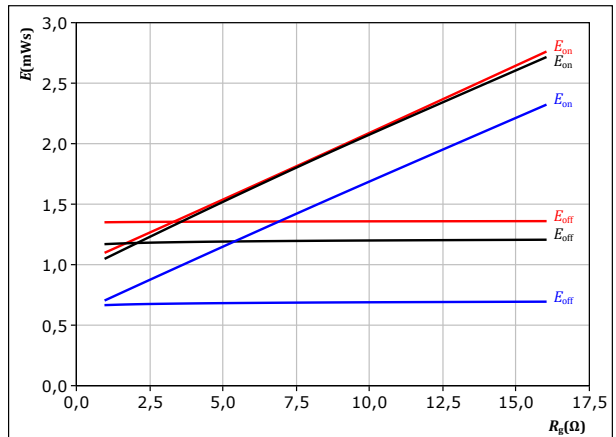
With an inductive load at

|             |     |   |        |        |
|-------------|-----|---|--------|--------|
| $V_{CE} =$  | 350 | V | $T_j:$ | 25 °C  |
| $V_{GE} =$  | ±15 | V |        | 125 °C |
| $R_{gon} =$ | 4   | Ω |        | 150 °C |

figure 19. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



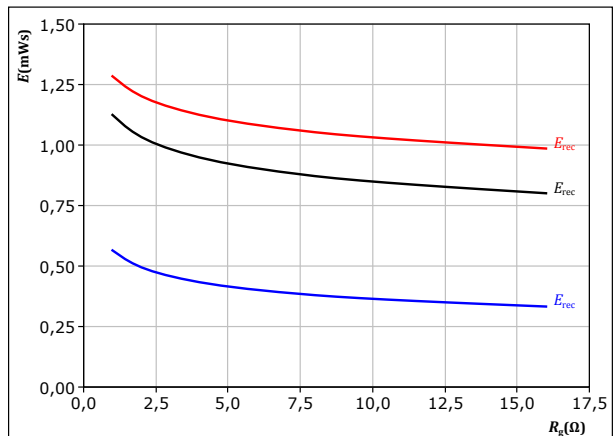
With an inductive load at

|            |     |   |        |        |
|------------|-----|---|--------|--------|
| $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C  |
| $V_{GE} =$ | ±15 | V |        | 125 °C |
| $I_C =$    | 100 | A |        | 150 °C |

figure 21. FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

|            |     |   |        |        |
|------------|-----|---|--------|--------|
| $V_{CE} =$ | 350 | V | $T_j:$ | 25 °C  |
| $V_{GE} =$ | ±15 | V |        | 125 °C |
| $I_C =$    | 100 | A |        | 150 °C |



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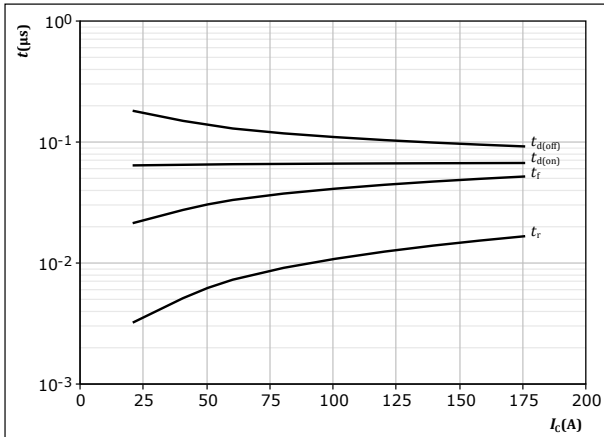
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datasheet

## Buck Switching Characteristics

figure 22.

IGBT

Typical switching times as a function of collector current  
 $t = f(I_c)$



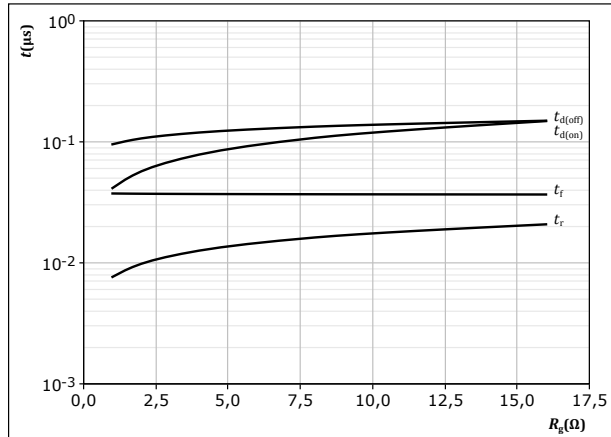
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω  
 $R_{goff} = 4$  Ω

figure 23.

IGBT

Typical switching times as a function of gate resistor  
 $t = f(R_g)$



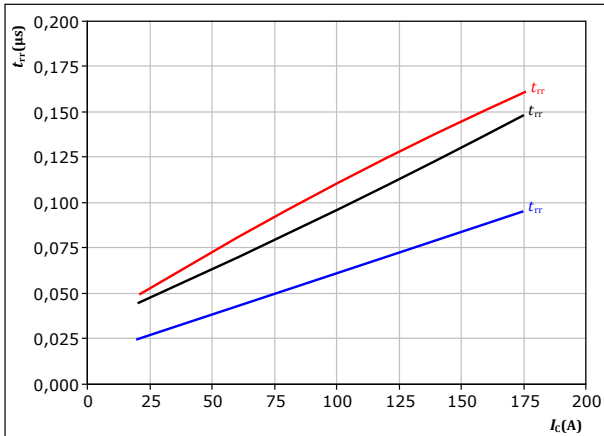
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

figure 24.

FWD

Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at

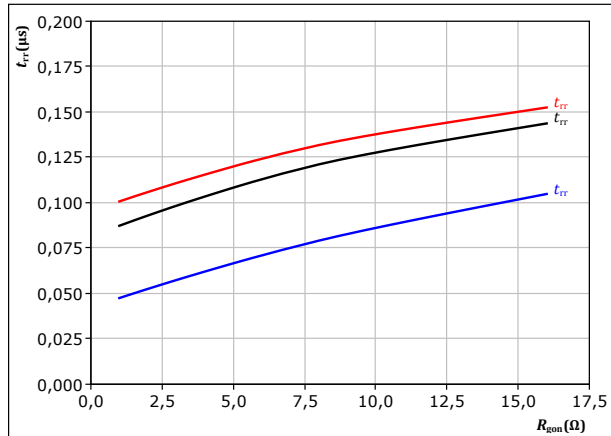
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω

$T_j$ : 25 °C (blue)  
125 °C (black)  
150 °C (red)

figure 25.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor  
 $t_{rr} = f(R_{gon})$



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

$T_j$ : 25 °C (blue)  
125 °C (black)  
150 °C (red)



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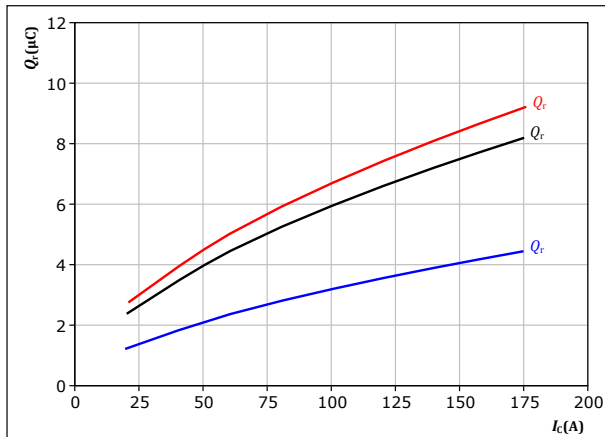
## Buck Switching Characteristics

figure 26.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω

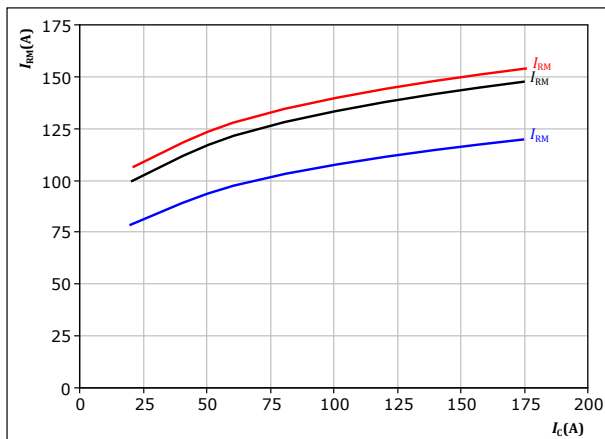
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 28.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω

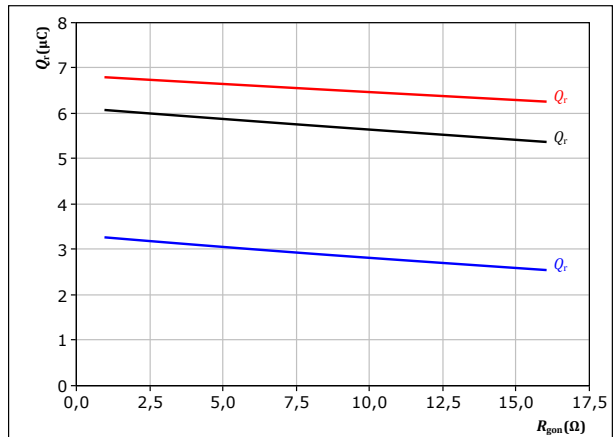
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 27.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

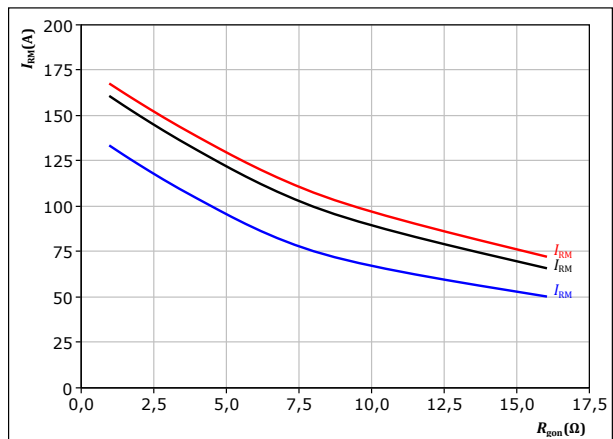
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 29.

FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

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



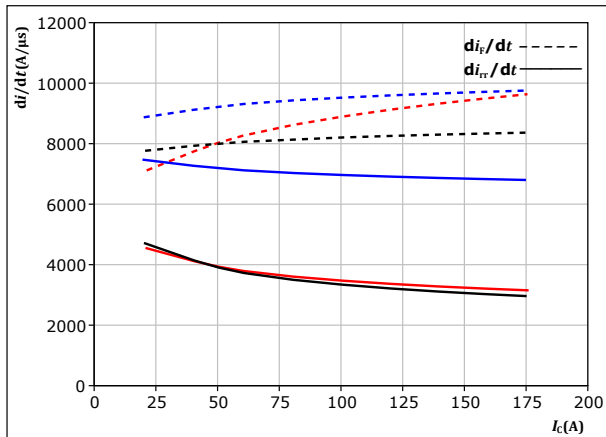
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datasheet

## Buck Switching Characteristics

figure 30. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_r/dt = f(I_C)$

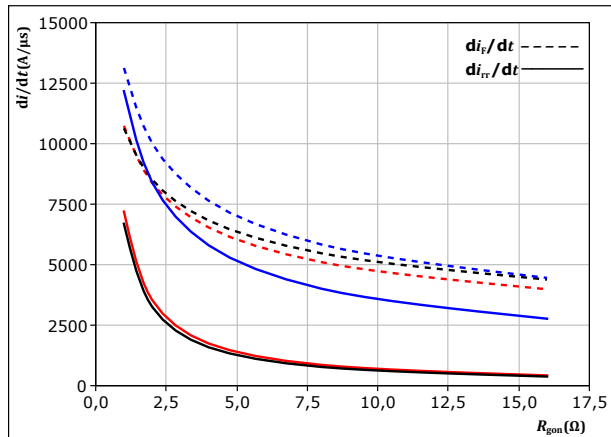


With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $T_j: 25$  °C  
 $125$  °C  
 $150$  °C

figure 31. FWD

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



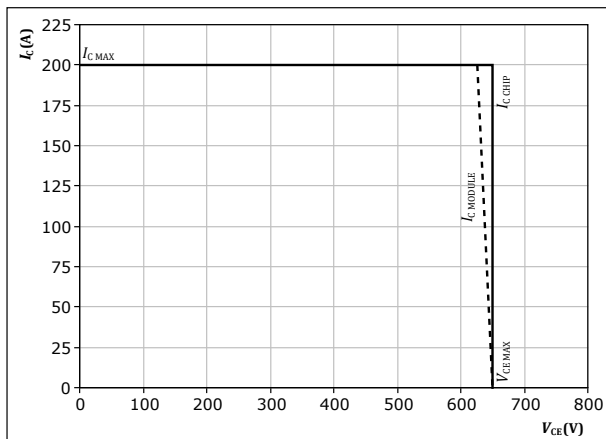
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 100$  A  
 $T_j: 25$  °C  
 $125$  °C  
 $150$  °C

figure 32. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$





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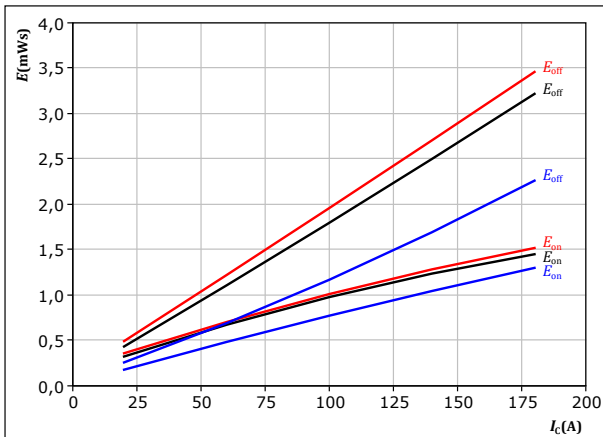
## Boost Switching Characteristics

figure 33.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$

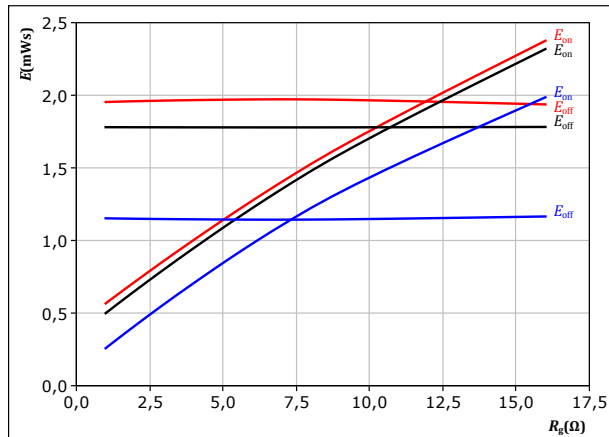
$T_j$ : 25 °C  
125 °C  
150 °C

figure 34.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 100 \text{ A}$

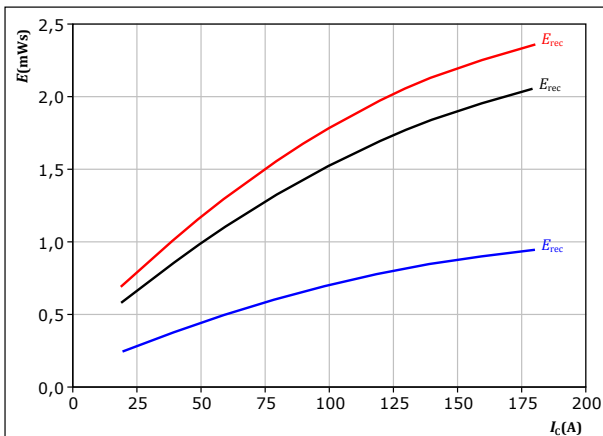
$T_j$ : 25 °C  
125 °C  
150 °C

figure 35.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$

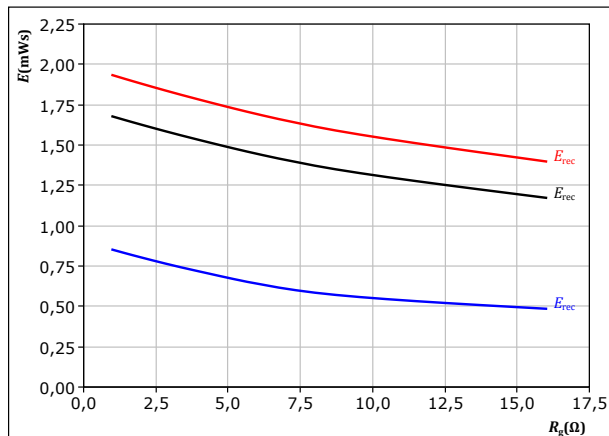
$T_j$ : 25 °C  
125 °C  
150 °C

figure 36.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 100 \text{ A}$

$T_j$ : 25 °C  
125 °C  
150 °C



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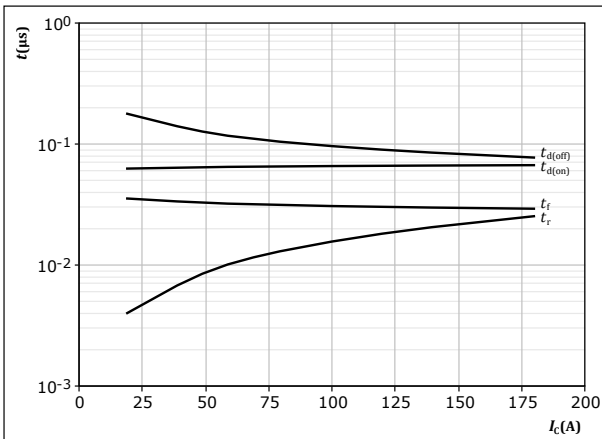
10-FZ07NIA100S502-P927F58  
datasheet

## Boost Switching Characteristics

figure 37.

IGBT

Typical switching times as a function of collector current  
 $t = f(I_C)$



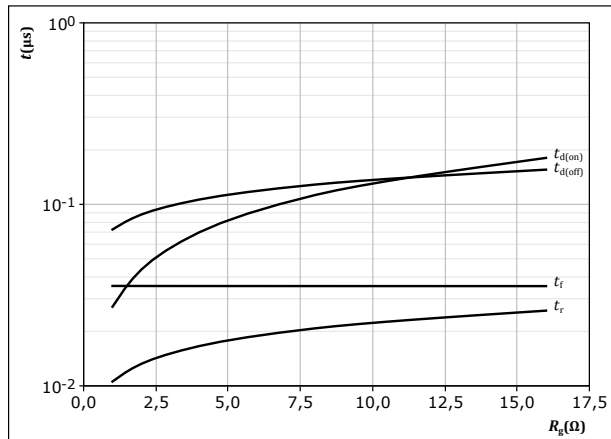
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$

figure 38.

IGBT

Typical switching times as a function of gate resistor  
 $t = f(R_g)$



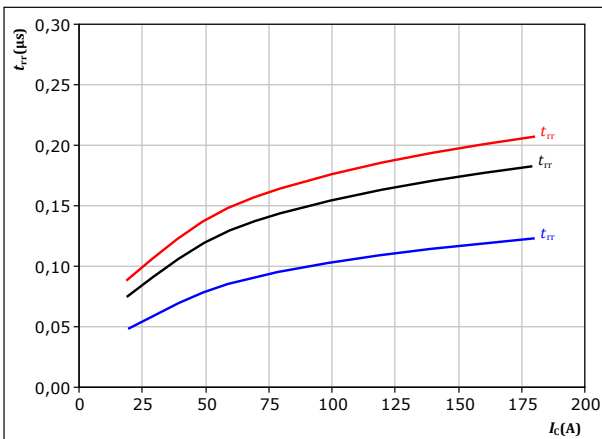
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$   
 $V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 100 \text{ A}$

figure 39.

FWD

Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_C)$



With an inductive load at

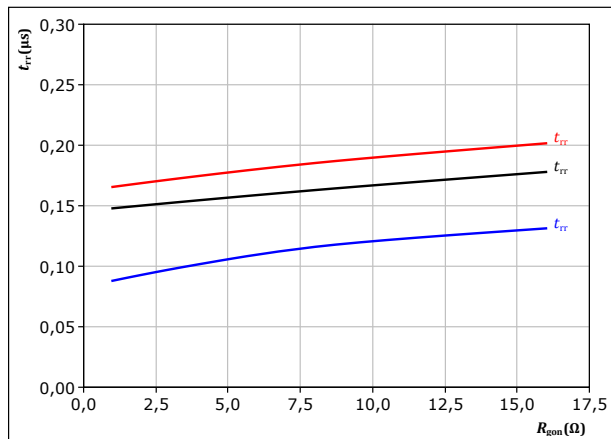
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C

figure 40.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor  
 $t_{rr} = f(R_{gon})$



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 100 \text{ A}$

$T_j:$  — 25 °C  
— 125 °C  
— 150 °C



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datasheet

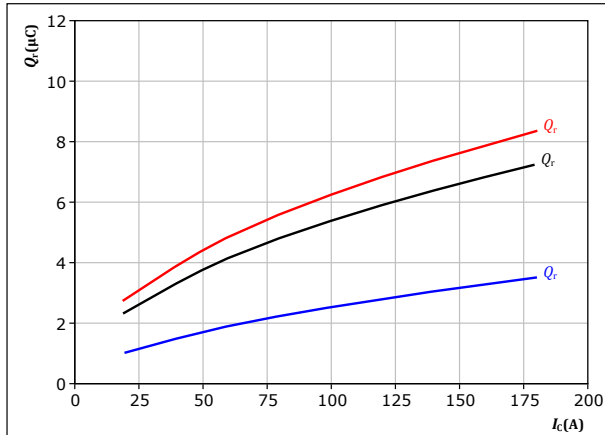
## Boost Switching Characteristics

figure 41.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω

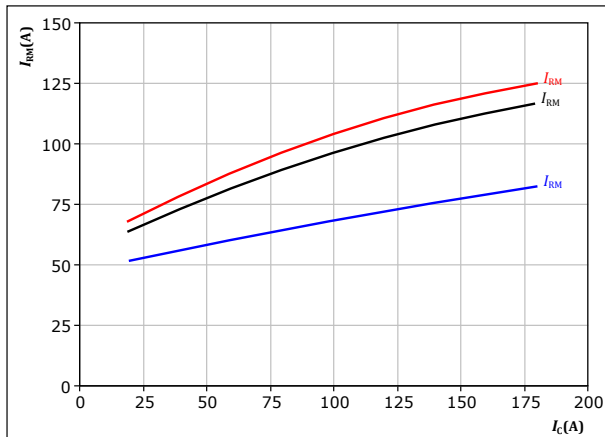
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 43.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω

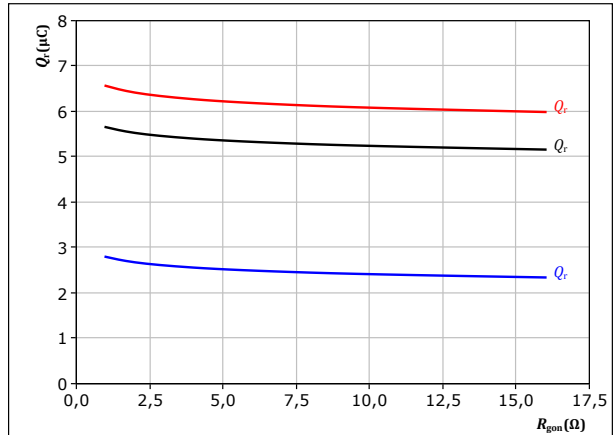
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 42.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

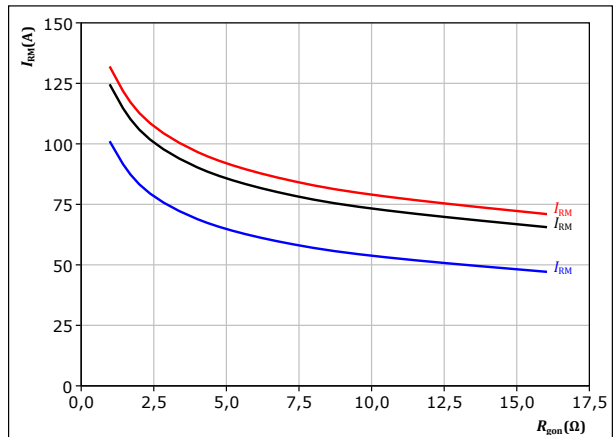
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 44.

FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

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



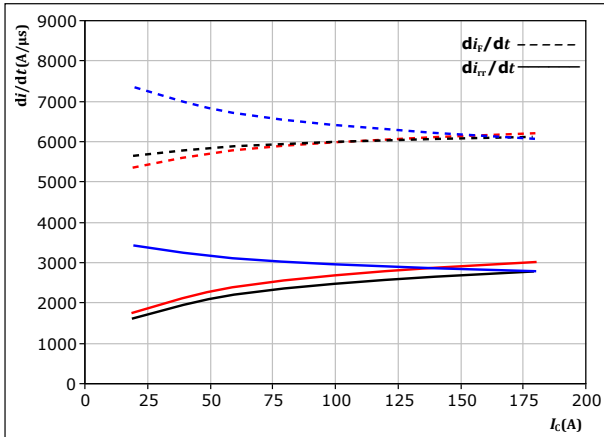
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datasheet

## Boost Switching Characteristics

figure 45. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_r/dt = f(I_C)$



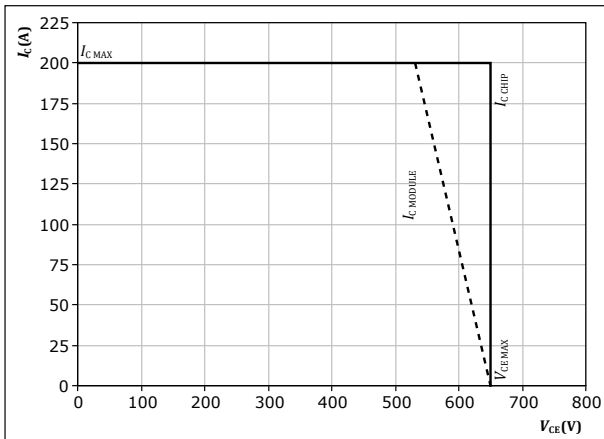
With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$   
 $T_j = 25$  °C  
 $T_j = 125$  °C  
 $T_j = 150$  °C

figure 47. IGBT

Reverse bias safe operating area

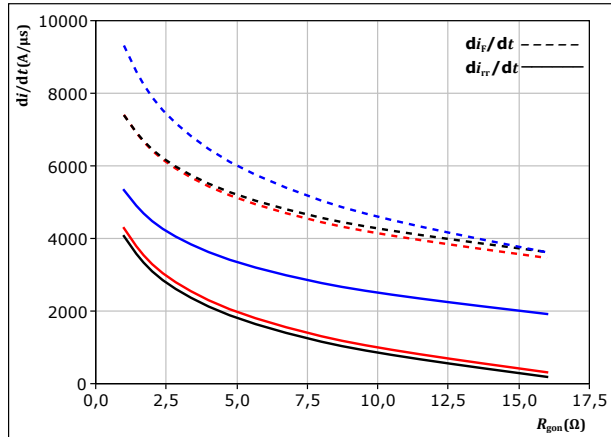
$I_C = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

figure 46. FWD

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 100$  A  
 $T_j = 25$  °C  
 $T_j = 125$  °C  
 $T_j = 150$  °C



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## Switching Definitions

figure 48. IGBT

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



figure 49. IGBT

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



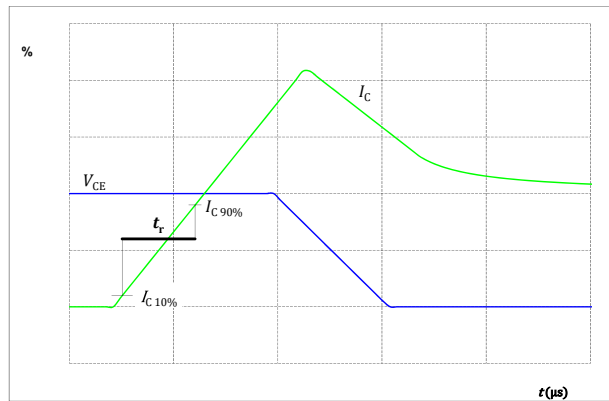
figure 50. IGBT

Turn-off Switching Waveforms & definition of  $t_f$



figure 51. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





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## Switching Definitions

figure 52.

FWD

Turn-off Switching Waveforms & definition of  $t_{rr}$

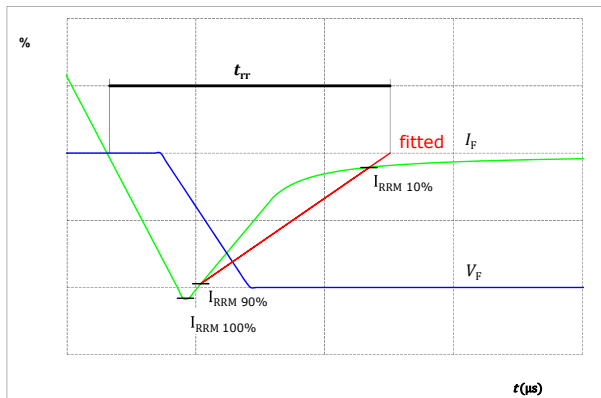
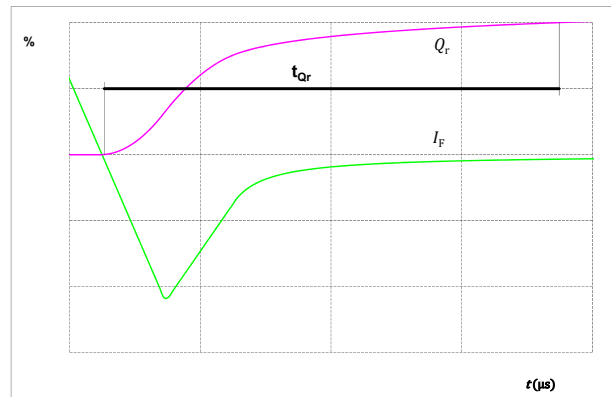


figure 53.

FWD

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





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| Ordering Code         |                               |
|-----------------------|-------------------------------|
| Version               | Ordering Code                 |
| Without thermal paste | 10-FZ07NIA100S502-P927F58     |
| With thermal paste    | 10-FZ07NIA100S502-P927F58-/3/ |

| Marking |            |                              |            |          |           |        |
|---------|------------|------------------------------|------------|----------|-----------|--------|
|         | Text       | Name                         | Date code  | UL & VIN | Lot       | Serial |
|         |            | NN-NNNNNNNNNNNNNNNN- TTTTIVV | WWYY       | UL VIN   | LLLLL     | SSSS   |
|         | Datamatrix | Type&Ver                     | Lot number | Serial   | Date code |        |
|         |            | TTTTTIVV                     | LLLLL      | SSSS     | WWYY      |        |

## Outline

Pin table [mm]

| Pin | X             | Y    | Function |
|-----|---------------|------|----------|
| 1   | 33,6          | 0    | G12      |
| 2   | 30,8          | 0    | S12      |
| 3   | 22            | 0    | DC-      |
| 4   | 19,2          | 0    | DC-      |
| 5   | 10,1          | 0    | GND      |
| 6   | 2,8           | 0    | S14      |
| 7   | 0             | 0    | G14      |
| 8   | 0             | 7,1  | Ph       |
| 9   | 0             | 9,9  | Ph       |
| 10  | 0             | 12,7 | Ph       |
| 11  | 0             | 15,5 | Ph       |
| 12  | 0             | 22,6 | G13      |
| 13  | 2,8           | 22,6 | S13      |
| 14  | 10,1          | 22,6 | GND      |
| 15  | 19,2          | 22,6 | DC+      |
| 16  | 22            | 22,6 | DC+      |
| 17  | 30,8          | 22,6 | S11      |
| 18  | 33,6          | 22,6 | G11      |
| 19  | 33,6          | 14,8 | Therm1   |
| 20  | 33,6          | 8,2  | Therm2   |
| 21  | not assembled |      |          |
| 22  | not assembled |      |          |

Technical drawing of a component showing top and bottom views with dimensions.

Top view dimensions:

- Width: 16.8 mm
- Height: 16.3 mm
- Pin diameter:  $\phi 1 \pm 0.05$

Bottom view dimensions:

- Width: 16.8 mm
- Height: 16.3 mm

Pin locations are numbered 1 through 22, corresponding to the Pin table.

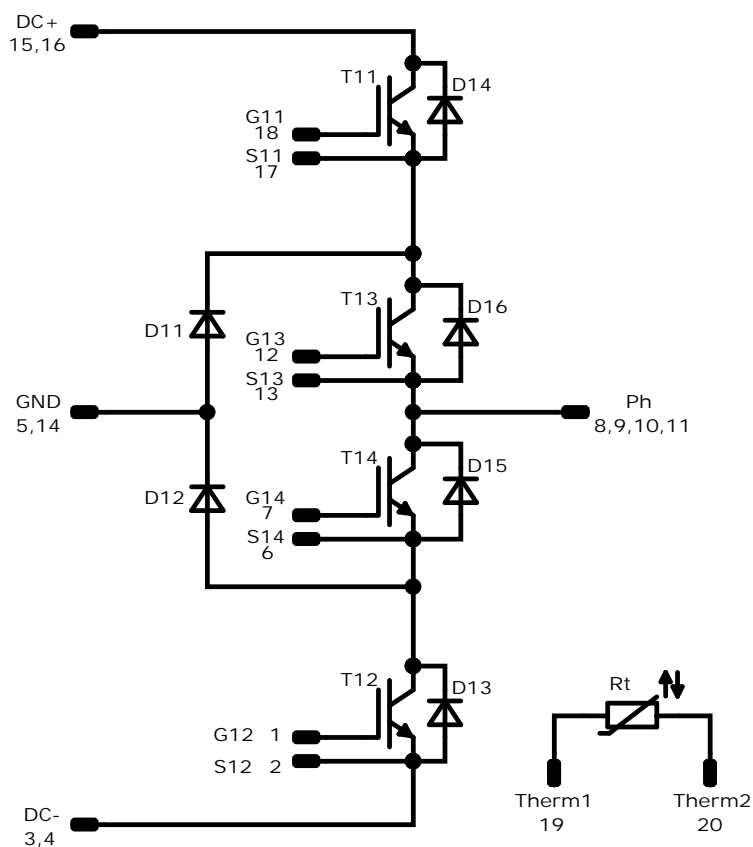
Tolerance of pinpositions:  $\pm 0.5$  mm at the end of pins  
Dimension of coordinate axis is only offset without tolerance



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datasheet

Pinout



Identification


| ID       | Component | Voltage | Current | Function             | Comment |
|----------|-----------|---------|---------|----------------------|---------|
| T11, T12 | IGBT      | 650 V   | 100 A   | Buck Switch          |         |
| D11, D12 | FWD       | 650 V   | 100 A   | Buck Diode           |         |
| T13, T14 | IGBT      | 650 V   | 100 A   | Boost Switch         |         |
| D13, D14 | FWD       | 650 V   | 100 A   | Boost Diode          |         |
| D15, D16 | FWD       | 650 V   | 100 A   | Boost Sw. Inv. Diode |         |
| Rt       | NTC       |         |         | Thermistor           |         |





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datasheet

| Packaging instruction   |      |          |      |   |
|---|------|----------|------|---|
| Standard packaging quantity (SPQ) 135   | >SPQ | Standard | <SPQ | Sample  |
| Handling instruction  |      |          |      |   |
| Handling instructions for <i>flow 0</i> packages see vincotech.com website.   |      |          |      |   |
| Package data  |      |          |      |   |
| Package data for <i>flow 0</i> 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-FZ07NIA100S502-P927F58-D1-14 | 23 Apr. 2020 |               |       |

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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.