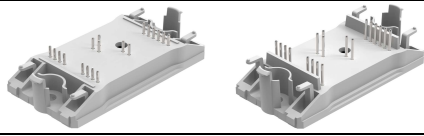
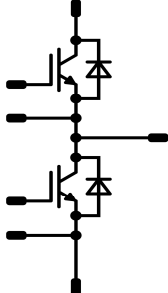




| <i>flow</i> PHASE0 | 600 V / 75 A |
|---|--|
| <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;">Features</p> <ul style="list-style-type: none"> Trench Fieldstop IGBT³ technology 2-clip housing in 12mm and 17mm height Compact and low inductance design </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;">Target Applications</p> <ul style="list-style-type: none"> Motor Drive UPS </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Types</p> <ul style="list-style-type: none"> 10-FZ062PA075SA-P993F08 10-F0062PA075SA-P993F09 </div> | <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;"><i>flow</i>0 housing</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Schematic</p>  </div> |

Maximum Ratings

T_j = 25°C, unless otherwise specified

| Parameter | Symbol | Condition | Value | Unit |
|---|----------------------|--|---------------------------|---------|
| Half-Bridge Switch | | | | |
| Collector-emitter break down voltage | V_{CE} | | 600 | V |
| DC collector current | I_C | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 60 | A |
| Repetitive peak collector current | I_{CRM} | t_p limited by T_{jmax} | 225 | A |
| Power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 104 | W |
| Gate-emitter peak voltage | V_{GE} | | ±20 | V |
| Short circuit ratings | t_{SC} V_{CC} | $T_j \leq 150\text{ °C}$ $V_{GE} = 15\text{ V}$ | 6 360 | μs V |
| Maximum Junction Temperature | T_{jmax} | | 175 | °C |
| Half-Bridge Diode | | | | |
| Peak Repetitive Reverse Voltage | V_{RRM} | | 600 | V |
| DC forward current | I_F | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 51 | A |
| Repetitive peak forward current | I_{FRM} | t_p limited by T_{jmax} | 150 | A |
| Power dissipation | P_{tot} | $T_j = T_{jmax}$ $T_s = 80\text{ °C}$ | 69 | W |
| Maximum Junction Temperature | T_{jmax} | | 175 | °C |
| Thermal Properties | | | | |
| Storage temperature | T_{stg} | | -40...+125 | °C |
| Operation temperature under switching condition | T_{op} | | -40...+(T_{jmax} - 25) | °C |
| Isolation Properties | | | | |
| Isolation voltage | V_{is} | $t = 2\text{ s}$ DC voltage | 4000 | V |
| Creepage distance | | | min 12,7 | mm |
| Clearance | | 17 mm housing | min 12,7 | mm |
| | | 12 mm housing | 9,88 | mm |
| Comparative Tracking Index | CTI | | >200 | |



Characteristic Values

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

Half-Bridge Switch

| | | | | | | | | | | | | |
|---|---------------|---|----------|-----|----|--------|-----------|--|---|--------------|------|----------|
| Gate emitter threshold voltage | $V_{GE(th)}$ | $V_{CE} = V_{GE}$ | | | | 0,0012 | 25 | | 5 | 5,8 | 6,5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 15 | | | 75 | 25 150 | | 1 | 1,63 1,87 | 2,1 | V |
| Collector-emitter cut-off current incl. Diode | I_{CES} | | 0 | 600 | | | 25 | | | | 0,03 | mA |
| Gate-emitter leakage current | I_{GES} | | 20 | 0 | | | 25 | | | | 700 | nA |
| Integrated Gate resistor | R_{gint} | | | | | | | | | 4 | | Ω |
| Turn-on delay time | $t_{d(on)}$ | | | | | | 25 150 | | | 123 132 | | ns |
| Rise time | t_r | | | | | | 25 150 | | | 15 21 | | |
| Turn-off delay time | $t_{d(off)}$ | $R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$ | ± 15 | 300 | 75 | | 25 150 | | | 169 199 | | |
| Fall time | t_f | | | | | | 25 150 | | | 87 105 | | |
| Turn-on energy loss | E_{on} | | | | | | 25 150 | | | 0,52 0,89 | | mWs |
| Turn-off energy loss | E_{off} | | | | | | 25 150 | | | 1,68 2,26 | | |
| Input capacitance | C_{ies} | | | | | | | | | 4700 | | pF |
| Output capacitance | C_{oss} | $f = 1 \text{ MHz}$ | 0 | 25 | | 25 | | | | 300 | | |
| Reverse transfer capacitance | C_{rss} | | | | | | | | | 145 | | |
| Gate charge | Q_G | | 15 | 480 | 75 | 25 | | | | 465 | | nC |
| Thermal resistance junction to sink | $R_{th(j-s)}$ | phase-change material $\lambda = 3,4 \text{ W/mK}$ | | | | | | | | 0,83 | | K/W |

Half-Bridge Diode

| | | | | | | | | | | | | |
|---------------------------------------|----------------------|---|----------|-----|----|----|-----------|--|---|--------------|-----|------------------|
| Diode forward voltage | V_F | | | | | 50 | 25 150 | | 1 | 1,64 1,59 | 2,1 | V |
| Peak reverse recovery current | I_{RRM} | | | | | | 25 150 | | | 94 111 | | A |
| Reverse recovery time | t_{rr} | | | | | | 25 150 | | | 101 128 | | ns |
| Reverse recovered charge | Q_{rr} | $R_{gon} = 2 \Omega$ | ± 15 | 300 | 75 | | 25 150 | | | 3,24 6,50 | | μC |
| Peak rate of fall of recovery current | $(di_{rr}/dt)_{max}$ | | | | | | 25 150 | | | 6615 4122 | | A/ μs |
| Reverse recovered energy | E_{rec} | | | | | | 25 150 | | | 0,75 1,57 | | mWs |
| Thermal resistance junction to sink | $R_{th(j-s)}$ | phase-change material $\lambda = 3,4 \text{ W/mK}$ | | | | | | | | 1,18 | | K/W |

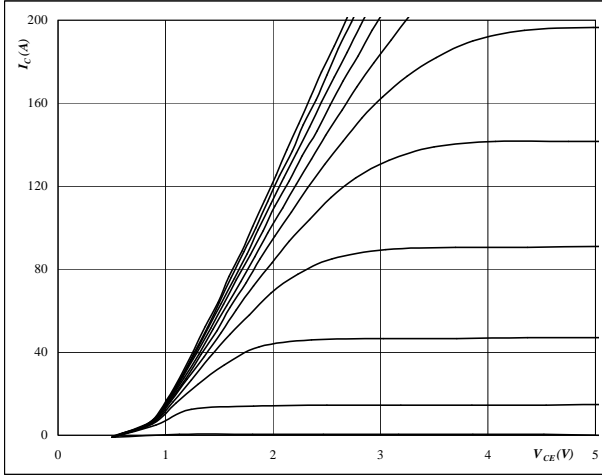


Half-Bridge

figure 1. Half-Bridge Switch

Typical output characteristics

$I_C = f(V_{CE})$



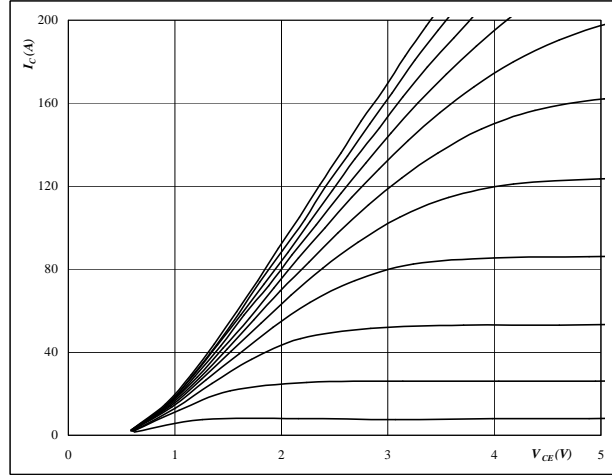
At

$t_p = 350 \mu s$
 $T_j = 25 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 2. Half-Bridge Switch

Typical output characteristics

$I_C = f(V_{CE})$



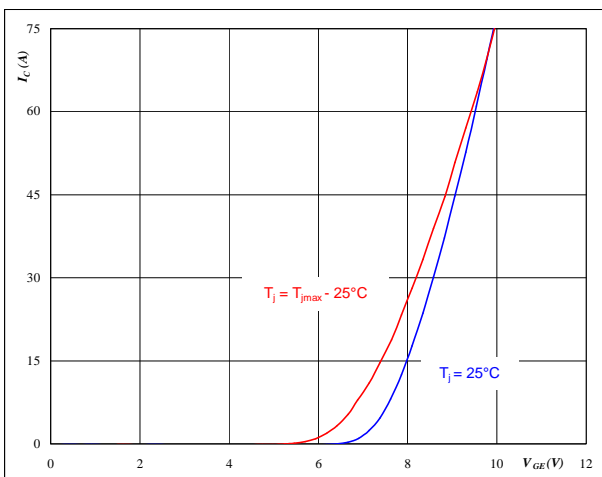
At

$t_p = 350 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. Half-Bridge Switch

Typical transfer characteristics

$I_C = f(V_{GE})$



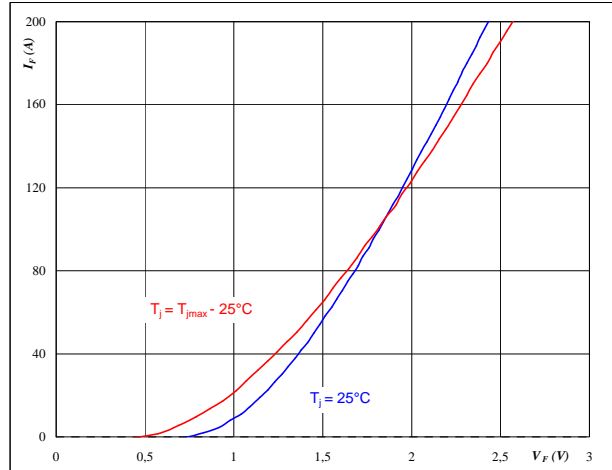
At

$t_p = 350 \mu s$
 $V_{CE} = 10 \text{ V}$

figure 4. Half-Bridge Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

$t_p = 350 \mu s$

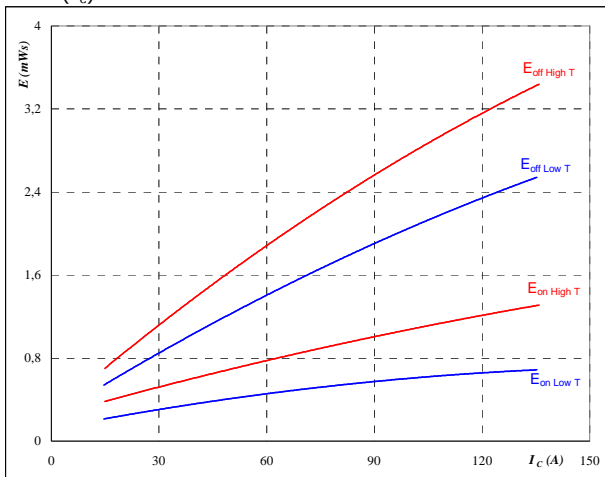


Half-Bridge

figure 5. Half-Bridge Switch

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



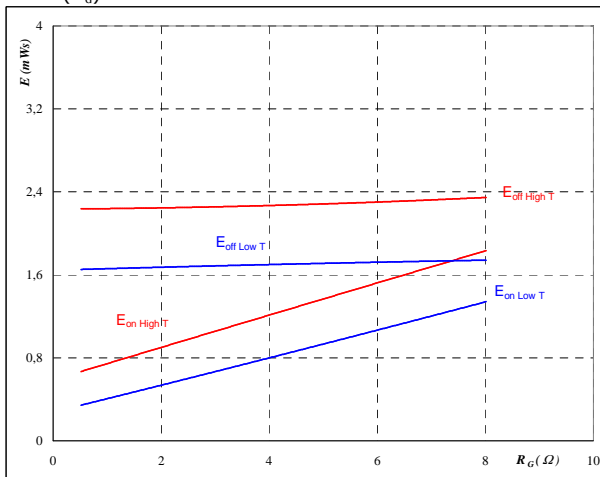
With an inductive load at

| | | |
|--------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |
| $R_{goff} =$ | 2 | Ω |

figure 6. Half-Bridge Switch

Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$



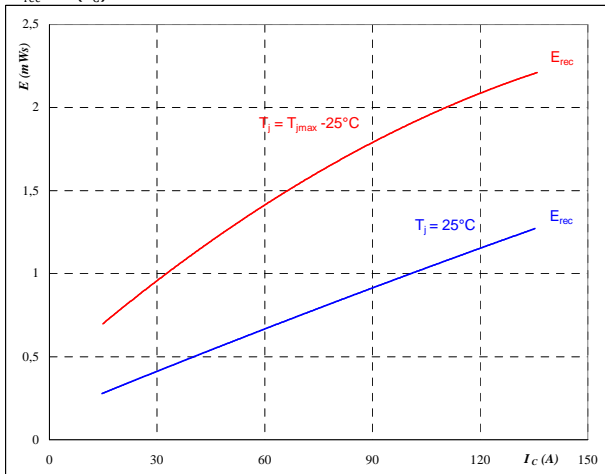
With an inductive load at

| | | |
|------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $I_C =$ | 75 | A |

figure 7. Half-Bridge Switch

Typical reverse recovery energy loss as a function of collector current

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



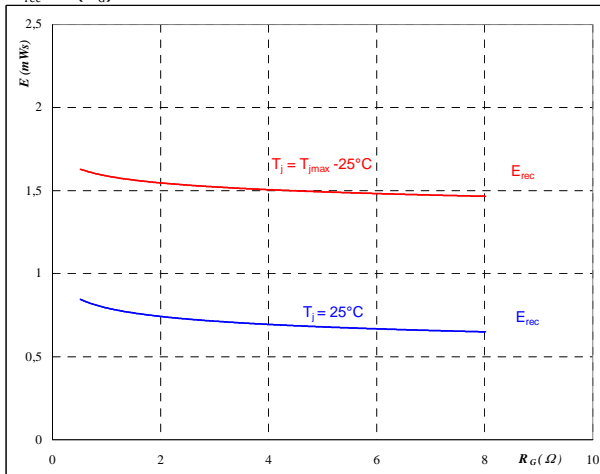
With an inductive load at

| | | |
|-------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |

figure 8. Half-Bridge Switch

Typical reverse recovery energy loss as a function of gate resistor

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



With an inductive load at

| | | |
|------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $I_C =$ | 75 | A |

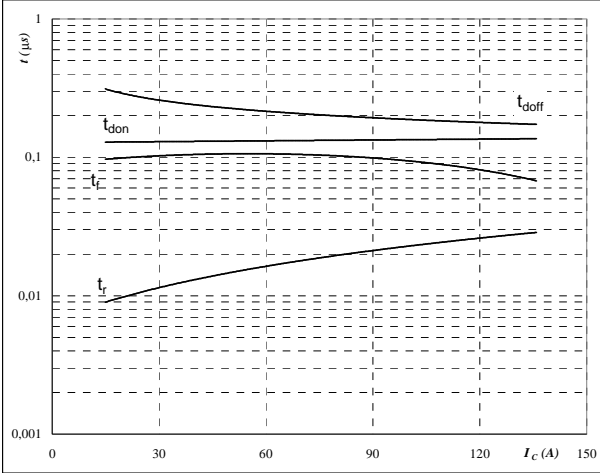


Half-Bridge

figure 9. Half-Bridge Switch

Typical switching times as a function of collector current

$$t = f(I_C)$$



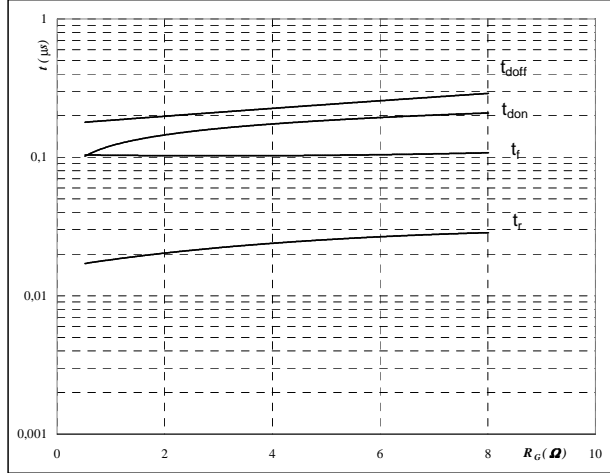
With an inductive load at

| | | |
|--------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |
| $R_{goff} =$ | 2 | Ω |

figure 10. Half-Bridge Switch

Typical switching times as a function of gate resistor

$$t = f(R_G)$$



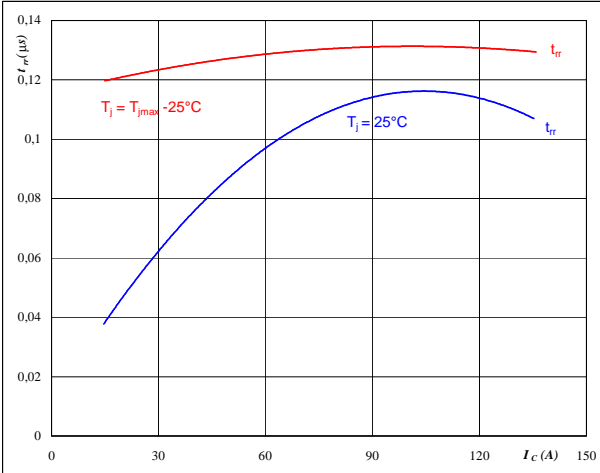
With an inductive load at

| | | |
|------------|-----|----|
| $T_j =$ | 150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $I_C =$ | 75 | A |

figure 11. Half-Bridge Diode

Typical reverse recovery time as a function of collector current

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



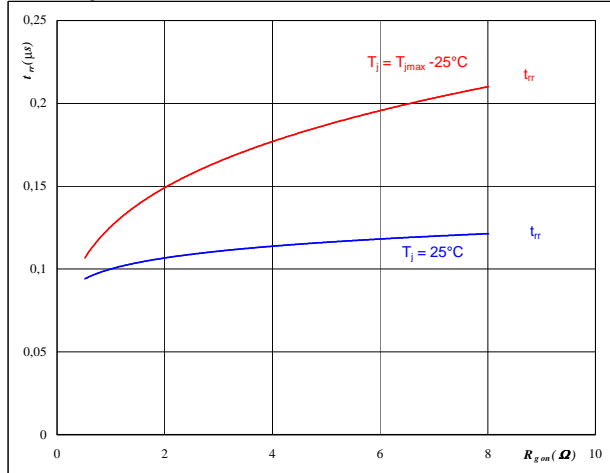
At

| | | |
|-------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |

figure 12. Half-Bridge Diode

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

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



At

| | | |
|------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_R =$ | 300 | V |
| $I_F =$ | 75 | A |
| $V_{GE} =$ | ±15 | V |

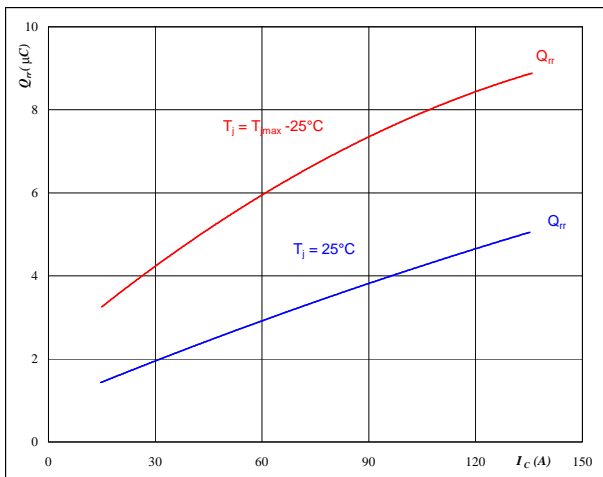


Half-Bridge

figure 13. Half-Bridge Diode

Typical reverse recovery charge as a function of collector current

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



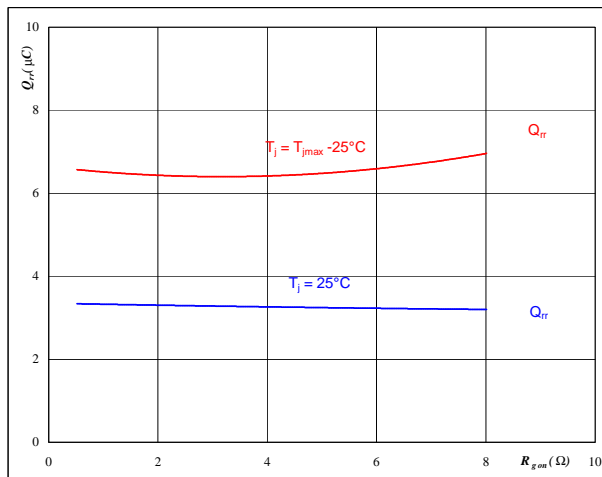
At

| | | |
|-------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |

figure 14. Half-Bridge Diode

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

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



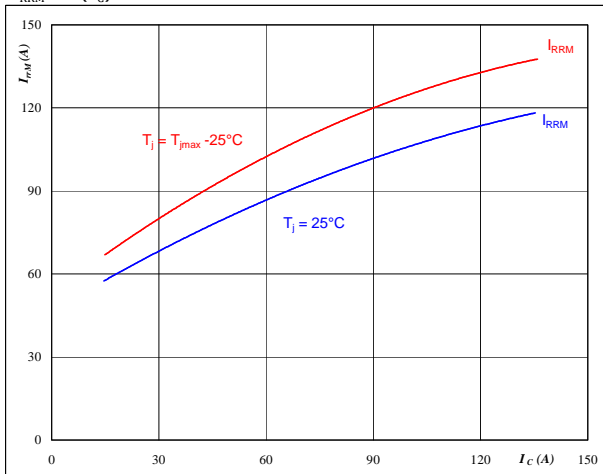
At

| | | |
|------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_R =$ | 300 | V |
| $I_F =$ | 75 | A |
| $V_{GE} =$ | ±15 | V |

figure 15. Half-Bridge Diode

Typical reverse recovery current as a function of collector current

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



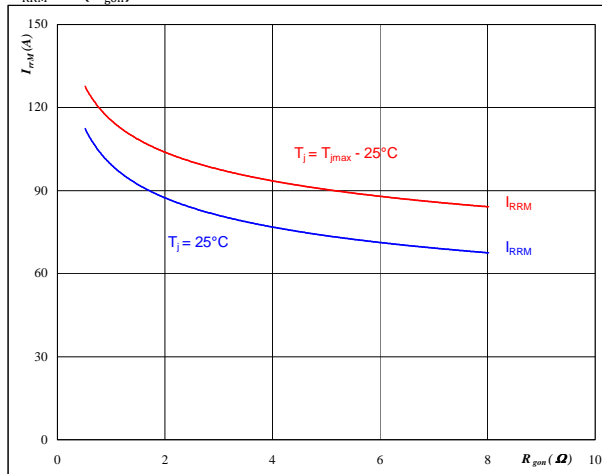
At

| | | |
|-------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_{CE} =$ | 300 | V |
| $V_{GE} =$ | ±15 | V |
| $R_{gon} =$ | 2 | Ω |

figure 16. Half-Bridge Diode

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

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



At

| | | |
|------------|--------|----|
| $T_j =$ | 25/150 | °C |
| $V_R =$ | 300 | V |
| $I_F =$ | 75 | A |
| $V_{GE} =$ | ±15 | V |

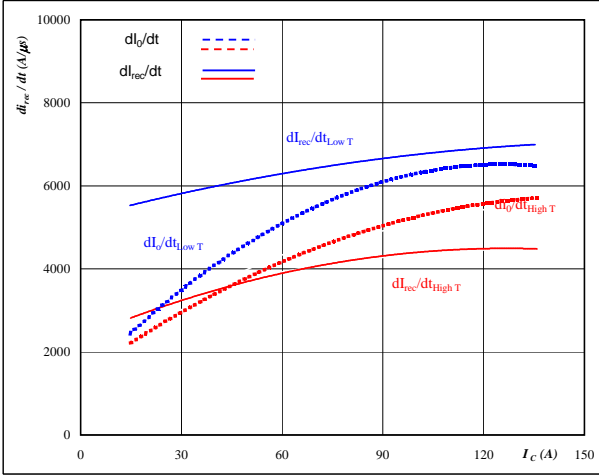


Half-Bridge

figure 17. Half-Bridge Diode

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

$$dI_0/dt, dI_{rec}/dt = f(I_C)$$

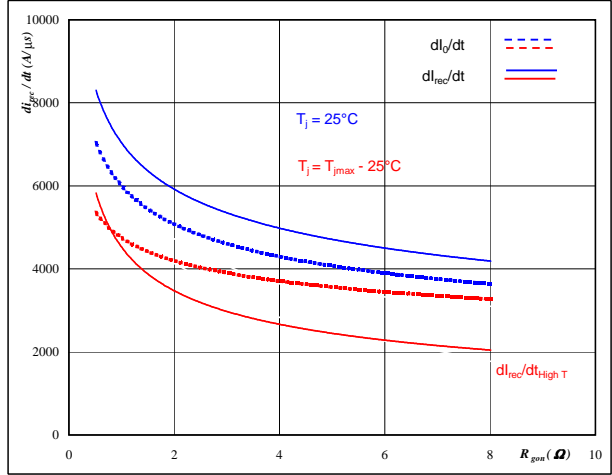


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 300 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

figure 18. Half-Bridge Diode

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$$dI_0/dt, dI_{rec}/dt = f(R_{gon})$$

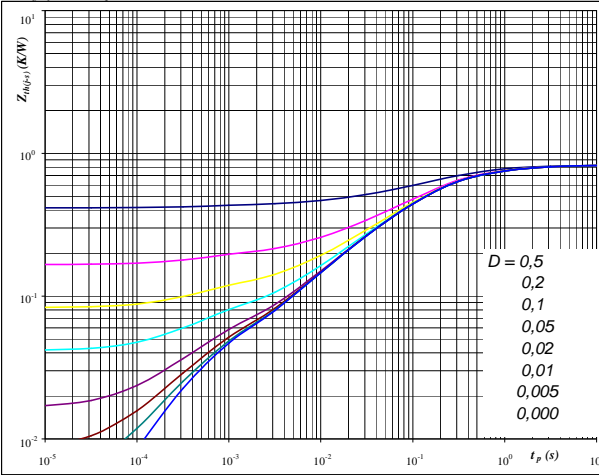


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_R = 300 \text{ V}$
 $I_F = 75 \text{ A}$
 $V_{GE} = \pm 15 \text{ V}$

figure 19. Half-Bridge Switch

IGBT transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{th(j-s)} = 0,83 \text{ K/W}$

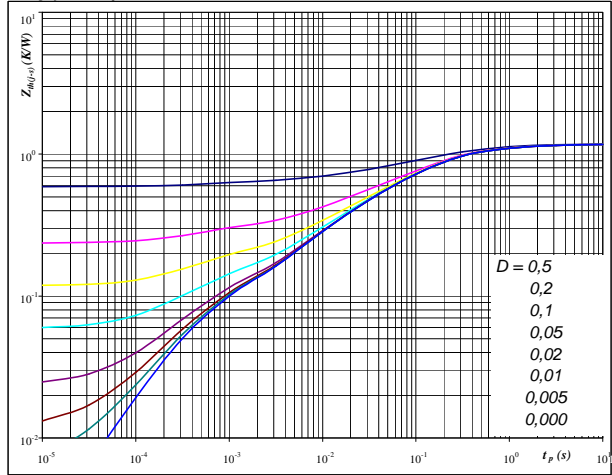
IGBT thermal model values

| R (K/W) | Tau (s) |
|----------|----------|
| 2,50E-02 | 9,78E+00 |
| 1,27E-01 | 1,12E+00 |
| 3,97E-01 | 1,86E-01 |
| 1,75E-01 | 4,04E-02 |
| 6,97E-02 | 8,14E-03 |
| 3,66E-02 | 4,72E-04 |

figure 20. Half-Bridge Diode

FWD transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{th(j-s)} = 1,18 \text{ K/W}$

FWD thermal model values

| R (K/W) | Tau (s) |
|----------|----------|
| 3,13E-02 | 9,08E+00 |
| 1,33E-01 | 1,00E+00 |
| 5,21E-01 | 1,71E-01 |
| 2,81E-01 | 3,39E-02 |
| 1,36E-01 | 6,90E-03 |
| 7,81E-02 | 4,32E-04 |

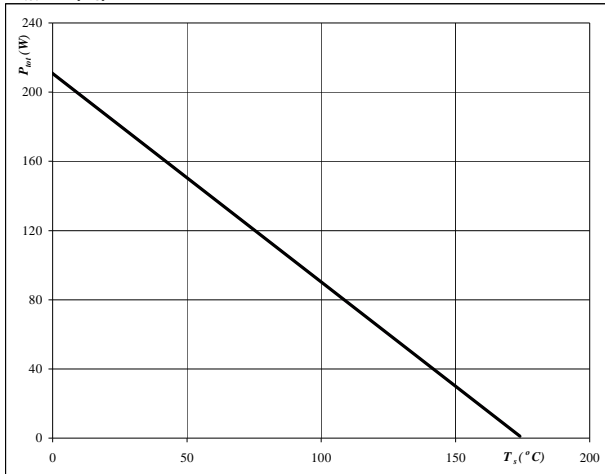


Half-Bridge

figure 21. Half-Bridge Switch

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$

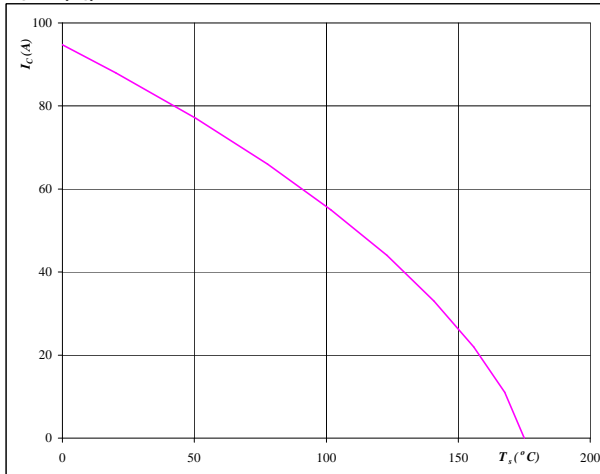


At
 $T_j = 175 \text{ } ^\circ\text{C}$

figure 22. Half-Bridge Switch

Collector current as a function of heatsink temperature

$I_C = f(T_s)$

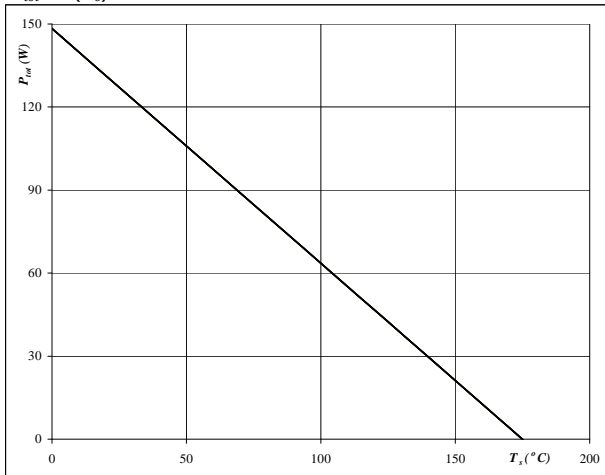


At
 $T_j = 175 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$

figure 23. Half-Bridge Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$

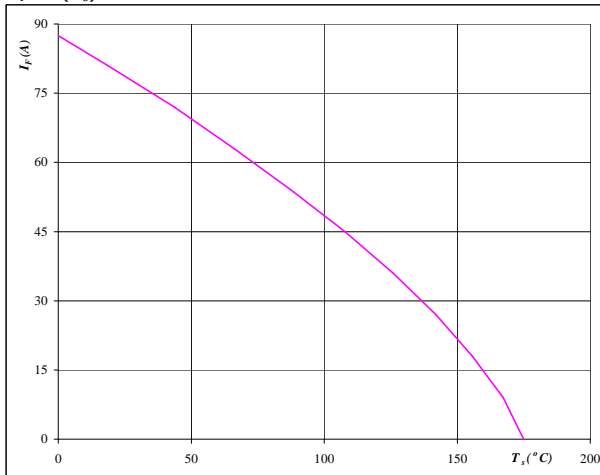


At
 $T_j = 175 \text{ } ^\circ\text{C}$

figure 24. Half-Bridge Diode

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At
 $T_j = 175 \text{ } ^\circ\text{C}$

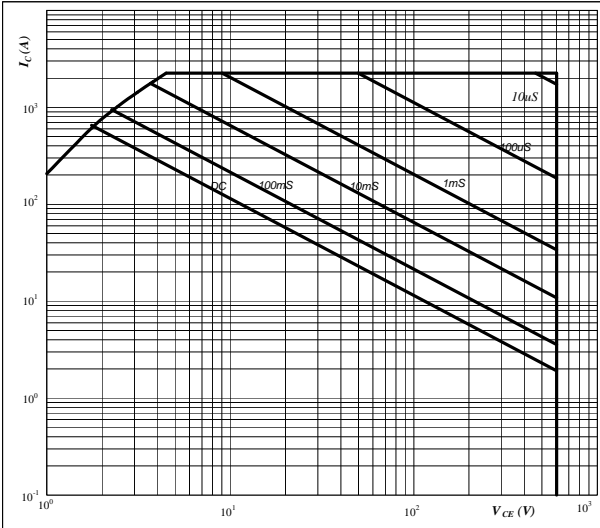


Half-Bridge

figure 25. Half-Bridge Switch

Safe operating area as a function of collector-emitter voltage

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



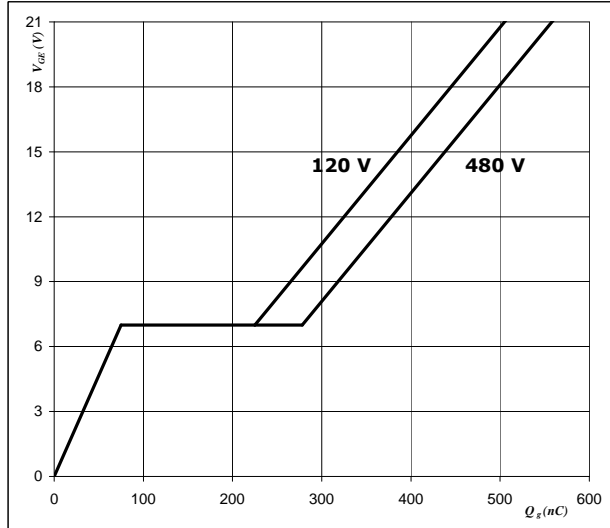
At

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

figure 26. Half-Bridge Switch

Gate voltage vs Gate charge

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



At

- $I_C =$ 75 A



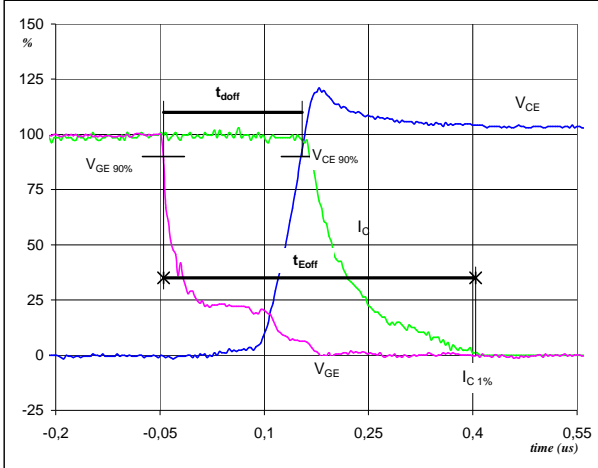
Switching Definitions

General conditions

| | | |
|------------|---|--------|
| T_j | = | 150 °C |
| R_{gon} | = | 2 Ω |
| R_{goff} | = | 2 Ω |

figure 1. Half-Bridge Switch

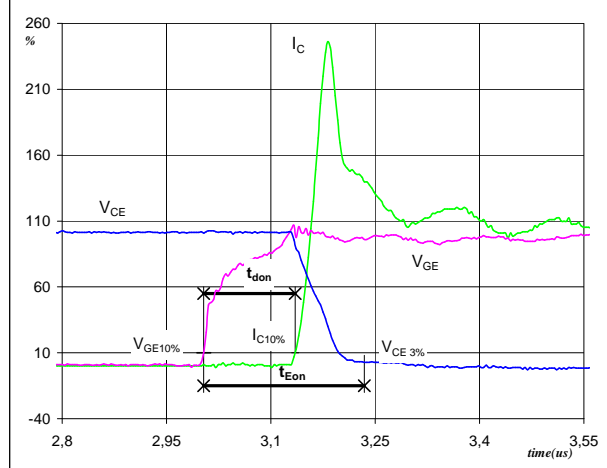
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



| | | |
|-------------------|------|----|
| V_{GE} (0%) = | -15 | V |
| V_{GE} (100%) = | 15 | V |
| V_C (100%) = | 300 | V |
| I_C (100%) = | 75 | A |
| t_{doff} = | 0,20 | μs |
| t_{Eoff} = | 0,45 | μs |

figure 2. Half-Bridge Switch

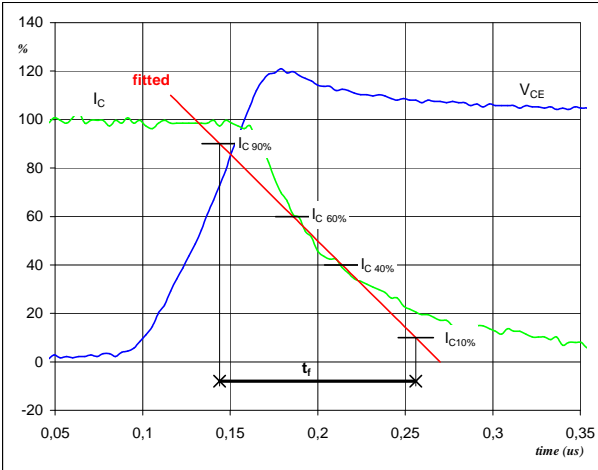
Turn-on Switching Waveforms & definition of t_{donr} , t_{Eon}
(t_{Eon} = integrating time for E_{on})



| | | |
|-------------------|------|----|
| V_{GE} (0%) = | -15 | V |
| V_{GE} (100%) = | 15 | V |
| V_C (100%) = | 300 | V |
| I_C (100%) = | 75 | A |
| t_{don} = | 0,13 | μs |
| t_{Eon} = | 0,23 | μs |

figure 3. Half-Bridge Switch

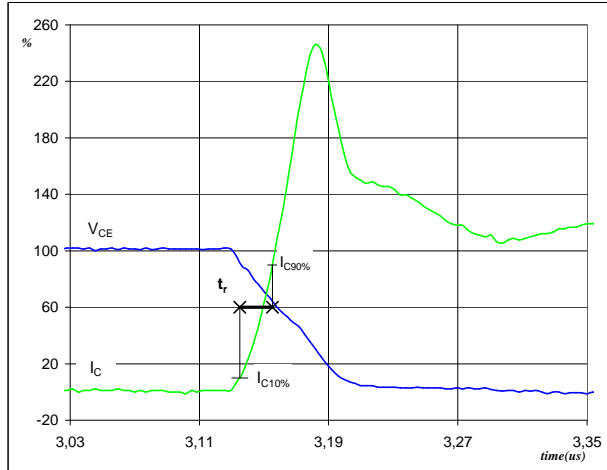
Turn-off Switching Waveforms & definition of t_f



| | | |
|----------------|-------|----|
| V_C (100%) = | 300 | V |
| I_C (100%) = | 75 | A |
| t_f = | 0,105 | μs |

figure 4. Half-Bridge Switch

Turn-on Switching Waveforms & definition of t_r

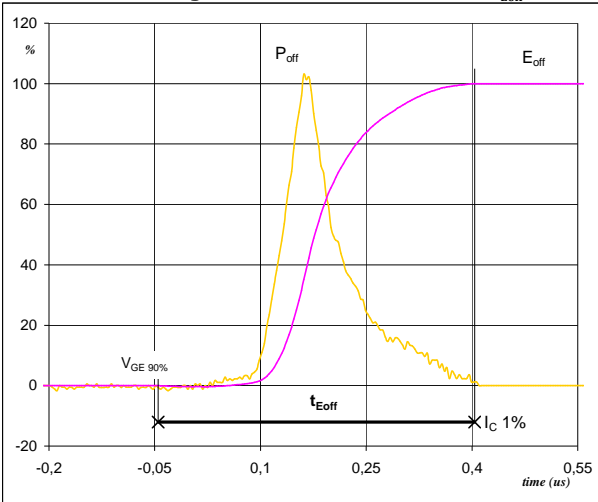


| | | |
|----------------|------|----|
| V_C (100%) = | 300 | V |
| I_C (100%) = | 75 | A |
| t_r = | 0,02 | μs |



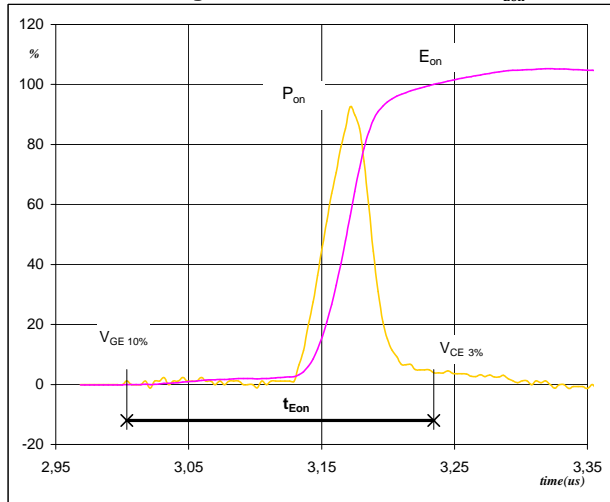
Switching Definitions

figure 5. Half-Bridge Switch
Turn-off Switching Waveforms & definition of t_{Eoff}



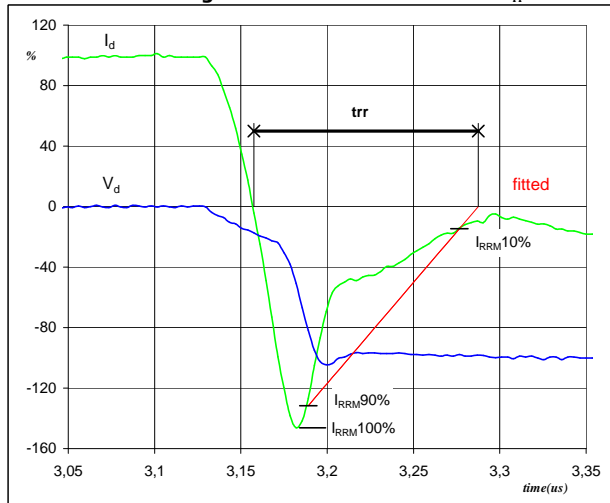
$P_{off} (100\%) = 22,63 \text{ kW}$
 $E_{off} (100\%) = 2,26 \text{ mJ}$
 $t_{Eoff} = 0,45 \text{ }\mu\text{s}$

figure 6. Half-Bridge Switch
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on} (100\%) = 22,63 \text{ kW}$
 $E_{on} (100\%) = 0,89 \text{ mJ}$
 $t_{Eon} = 0,23 \text{ }\mu\text{s}$

figure 7. Half-Bridge Switch
Turn-off Switching Waveforms & definition of t_{trr}



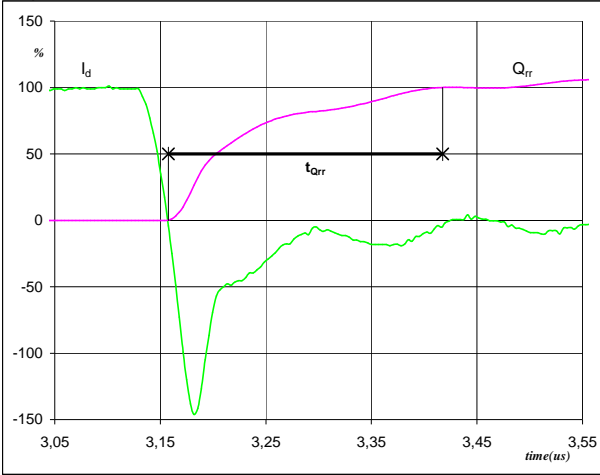
$V_d (100\%) = 300 \text{ V}$
 $I_d (100\%) = 75 \text{ A}$
 $I_{RRM} (100\%) = 111 \text{ A}$
 $t_{rr} = 0,13 \text{ }\mu\text{s}$



Switching Definitions

figure 8. Half-Bridge Diode

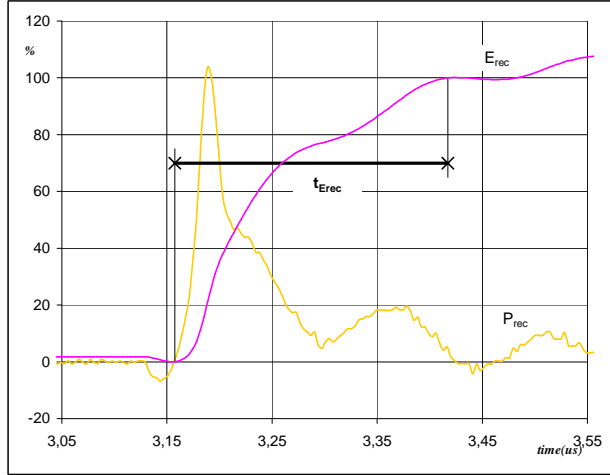
Turn-on Switching Waveforms & definition of t_{Qrr}
 (t_{Qrr} = integrating time for Q_{rr})



| | | |
|-------------------|------|---------------|
| I_d (100%) = | 75 | A |
| Q_{rr} (100%) = | 6,50 | μC |
| t_{Qrr} = | 0,26 | μs |

figure 9. Half-Bridge Diode

Turn-on Switching Waveforms & definition of t_{Erec}
 (t_{Erec} = integrating time for E_{rec})



| | | |
|--------------------|-------|---------------|
| P_{rec} (100%) = | 22,63 | kW |
| E_{rec} (100%) = | 1,57 | mJ |
| t_{Erec} = | 0,26 | μs |



Ordering Code and Marking - Outline - Pinout

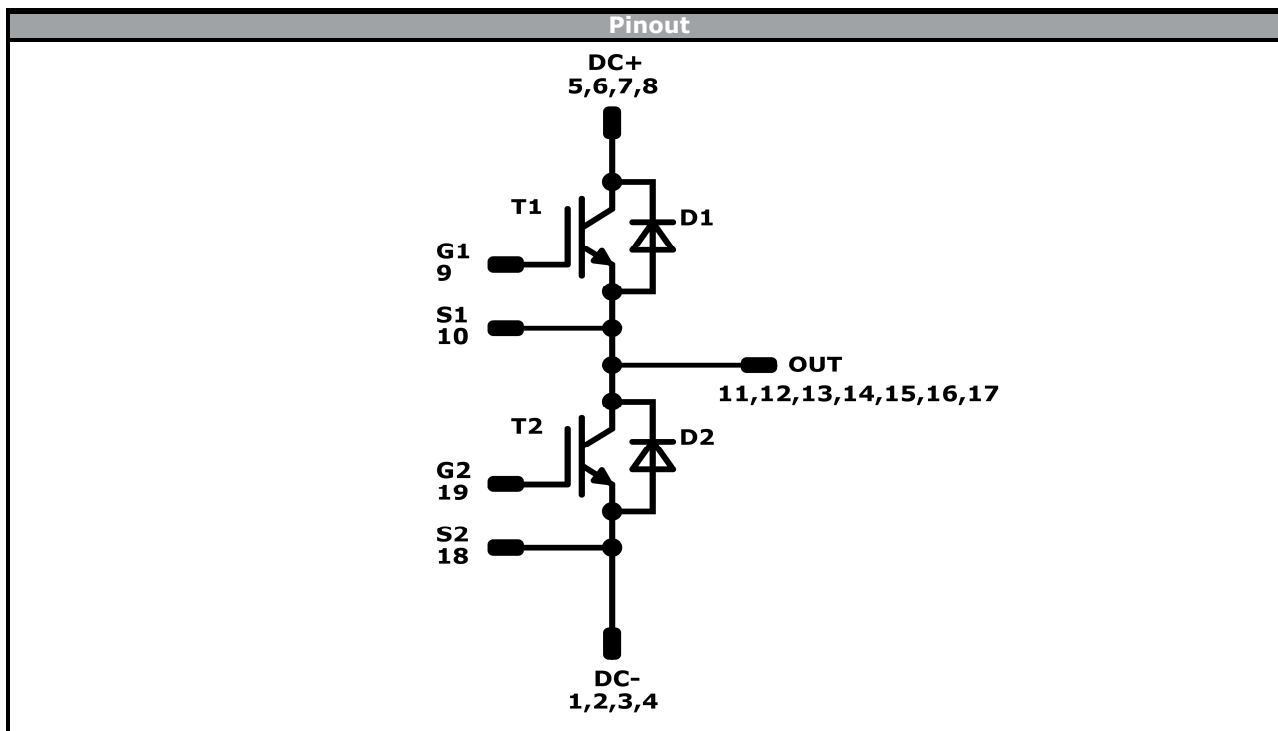
| Ordering Code & Marking | | | | | | | | |
|---|--|------------|------|--|-----------|------------|--------|-----------|
| Version | | | | Ordering Code | | | | |
| without thermal paste with solder pins 12mm housing | | | | 10-FZ062PA075SA-P993F08 | | | | |
| with thermal paste with solder pins 12mm housing | | | | 10-FZ062PA075SA-P993F08-/3/ | | | | |
| without thermal paste with solder pins 17mm housing | | | | 10-F0062PA075SA-P993F09 | | | | |
| with thermal paste with solder pins 17mm housing | | | | 10-F0062PA075SA-P993F09-/3/ | | | | |
| | | | Text | Name | Date code | UL & VIN | Lot | Serial |
| | | | | NN-NNNNNNNNNNNNNN-TTTTTIV WWYY UL VIN LLLLL SSSS | Type&Ver | Lot number | Serial | Date code |
| | | Datamatrix | | TTTTTIV | LLLLL | SSSS | WWYY | |

| Pin table | | | | Outline | |
|-----------|-------|-------|----------|---------|--|
| Pin | X | Y | Function | | |
| 1 | 0 | 0 | DC- | | |
| 2 | 0 | 2,3 | DC- | | |
| 3 | 0 | 4,6 | DC- | | |
| 4 | 0 | 6,9 | DC- | | |
| 5 | 0 | 15,6 | DC+ | | |
| 6 | 0 | 17,9 | DC+ | | |
| 7 | 0 | 20,2 | DC+ | | |
| 8 | 0 | 22,5 | DC+ | | |
| 9 | 13,85 | 16,45 | G1 | | |
| 10 | 16,75 | 16,45 | S1 | | |
| 11 | 33,5 | 11,5 | OUT | | |
| 12 | 33,5 | 9,2 | OUT | | |
| 13 | 33,5 | 6,9 | OUT | | |
| 14 | 33,5 | 4,6 | OUT | | |
| 15 | 33,5 | 2,3 | OUT | | |
| 16 | 33,5 | 0 | OUT | | |
| 17 | 13,85 | 13,55 | OUT | | |
| 18 | 19,55 | 4,95 | S2 | | |
| 19 | 19,55 | 7,85 | G2 | | |

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



Ordering Code and Marking - Outline - Pinout




| Identification | | | | | |
|----------------|-----------|---------|---------|--------------------|---------|
| ID | Component | Voltage | Current | Function | Comment |
| T1, T2 | IGBT | 600 V | 75 A | Half-Bridge Switch | |
| D1, D2 | FWD | 600 V | 75 A | Half-Bridge Diode | |



| Packaging instruction | | | |
|-----------------------------------|------------|------------------|----------------|
| Standard packaging quantity (SPQ) | 135 | >SPQ Standard | <SPQ Sample |

| Handling instruction |
|---|
| Handling instructions for <i>flow</i> 0 packages see vincotech.com website. |

| Package data |
|--|
| Package data for <i>flow</i> 0 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-Fx062PA075SA-P993F0x-D2-14 | 04. Jun. 2016 | | |

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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.