



Vincotech

80-M312PMA150M01-K420A82

datasheet

MiniSKiiP® PIM 3

1200 V / 150 A

Features

- IGBT M7 with low VCEsat and improved EMC behavior
- Kelvin Emitter for improved switching performance
- Solder-free spring contact technology
- Built-in PTC

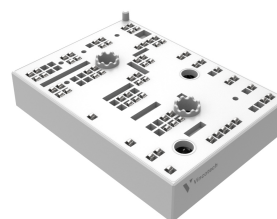
Target applications

- Industrial Drives

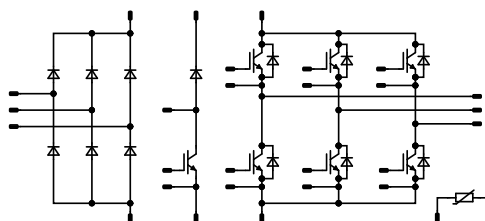
Types

- 80-M312PMA150M01-K420A82

MiniSKiiP® 3 16 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	186	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	411	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Inverter Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	123	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	211	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Brake Switch

Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	186	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	411	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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Brake Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	90	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	168	W
Maximum junction temperature	T_{jmax}		175	°C

Rectifier Diode

Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward average current	I_{FAV}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	85	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	890	A
Surge current capability	I^2t		3960	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	141	W
Maximum junction temperature	T_{jmax}		150	°C



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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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* $t_p = 2\text{ s}$	5500	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		With std lid For more informations see handling instructions	6,3	mm
Clearance		With std lid For more informations see handling instructions	6,3	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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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	

Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,02	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,57 1,8 1,86	1,85	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							3		Ω
Input capacitance	C_{ies}	0	10		25			30000		pF
Output capacitance	C_{oes}							880		pF
Reverse transfer capacitance	C_{res}							320		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		150	25		1000		nC

Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,23		K/W
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*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	±15	600	150	25 125 150		415,6 431,4 433		ns
Rise time	t_r					25 125 150		95,4 109,8 113,8		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		300,2 339,6 345,8		ns
Fall time	t_f					25 125 150		78,49 89,66 96,1		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		21,13 27,11 28,88		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		9,81 13,01 14,02		mWs



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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	

Inverter Diode

Static

Forward voltage	V_F				150	25 125 150		1,8 1,9 1,89	2,1	V
Reverse leakage current	I_R	$V_i = 1200$ V				25			40	μA

Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,45		K/W
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*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

Peak recovery current	I_{RRM}	$di/dt=1573$ A/μs $di/dt=980$ A/μs $di/dt=1114$ A/μs	± 15	600	150	25 125 150		63,36 71,74 74,12		A
Reverse recovery time	t_{rr}					25 125 150		408,81 552,96 623,41		ns
Recovered charge	Q_r					25 125 150		14,68 22,62 25,6		μC
Reverse recovered energy	E_{rec}					25 125 150		4,97 8,08 9,18		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		335,06 235,2 218,31		A/μs



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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	

Brake Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,02	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,57 1,8 1,86	1,85	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							3		Ω
Input capacitance	C_{ies}	0	10		25			30000		pF
Output capacitance	C_{oes}							880		pF
Reverse transfer capacitance	C_{res}							320		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		150	25		1000		nC

Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,23		K/W
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*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 1 \Omega$ $R_{goff} = 1 \Omega$	0/15	700	147	25 125 150		142 144 145		ns
Rise time	t_r					25 125 150		68 81 81		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		426 472 490		ns
Fall time	t_f					25 125 150		68,92 91,64 97,54		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		20,67 25,61 26,7		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		10,6 14,07 14,91		mWs



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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	

Brake Diode

Static

Forward voltage	V_F				100	25 125 150		1,82 1,96 1,96	2,1	V
Reverse leakage current	I_R	$V_i = 1200$ V				25			40	μA

Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,57		K/W
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*Only valid with pre-applied Vincotech thermal interface material.

Dynamic

Peak recovery current	I_{RRM}	$di/dt=949$ A/μs $di/dt=863$ A/μs $di/dt=1320$ A/μs	0/15	700	147	25 125 150		55,27 64 67,14		A
Reverse recovery time	t_{rr}					25 125 150		359,46 463,66 516,02		ns
Recovered charge	Q_r					25 125 150		12,09 18,33 20,6		μC
Reverse recovered energy	E_{rec}					25 125 150		4,45 7,22 8,27		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		350,37 227,05 211,77		A/μs



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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	

Rectifier Diode

Static

Forward voltage	V_F				60	25 125 150		1,04 0,972 0,956	1,1		V
Reverse leakage current	I_R	$V_i = 1600$ V				25 150			100 2		μA

Thermal

Thermal resistance junction to sink*	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,5			K/W
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*Only valid with pre-applied Vincotech thermal interface material.

Thermistor

Static

Rated resistance	R					25		1			kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1670$ Ω				100	-2		2		%
Maximum Current	I_{max}							3			mA
Power dissipation constant	d					25		0,76			mW/K
A-value	A							$7,635 \times 10^{-3}$			1/K
B-value	B							$1,73 \times 10^{-5}$			1/K ²
Vincotech Thermistor Reference									E		



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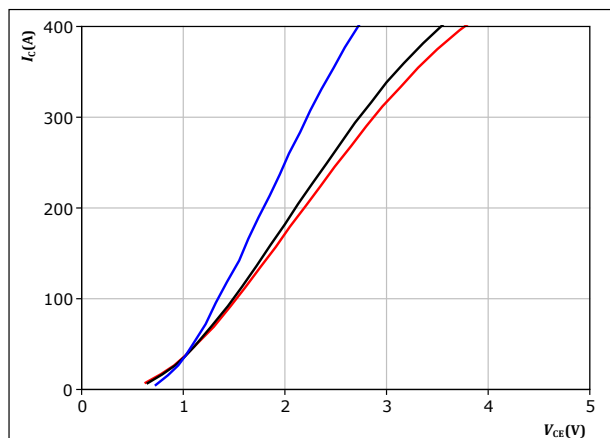
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Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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



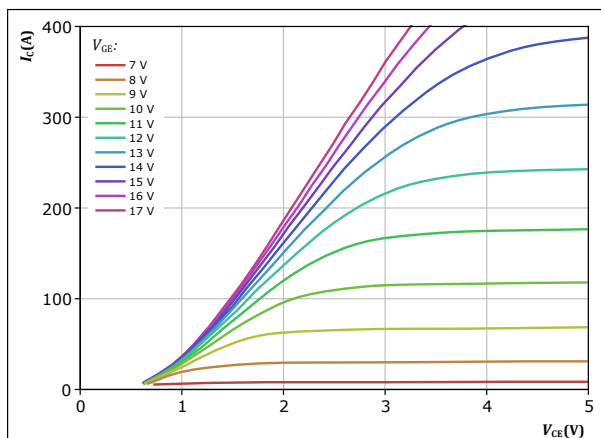
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 2. IGBT

Typical output characteristics

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

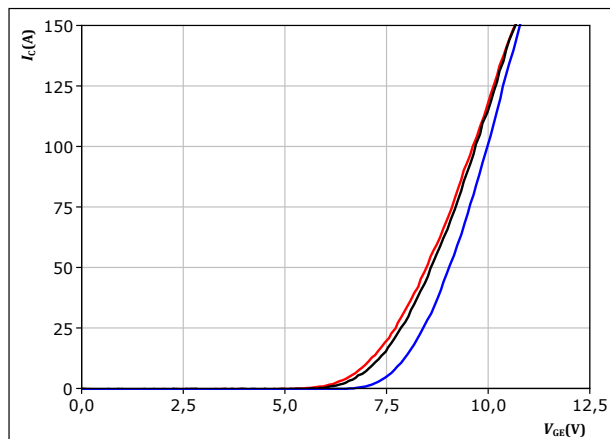


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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



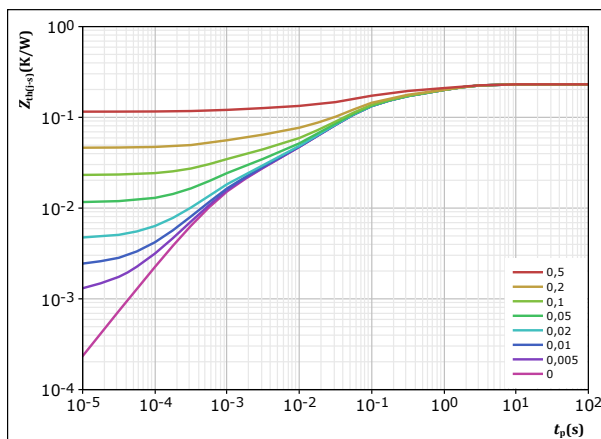
$t_p = 250 \mu s$
 $V_{CE} = 10 V$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,231 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
6,43E-02	1,35E+00
4,70E-02	1,88E-01
9,03E-02	4,69E-02
1,43E-02	5,67E-03
1,51E-02	8,02E-04



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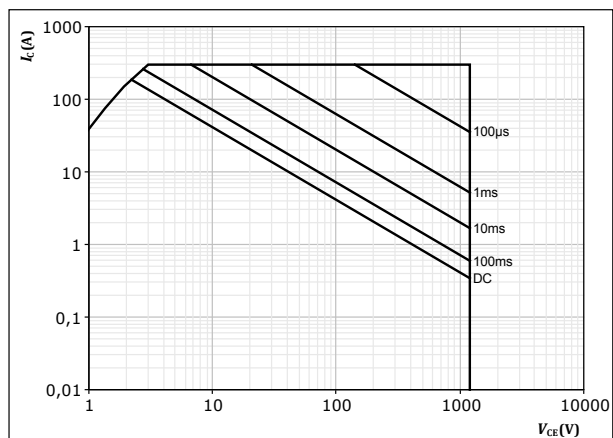
Inverter Switch Characteristics

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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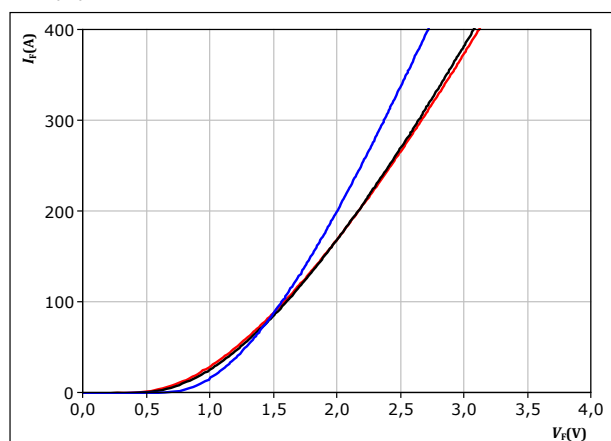
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Inverter Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



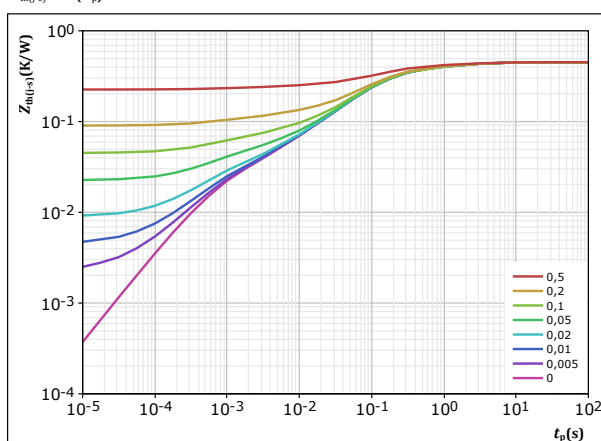
$t_p = 250 \mu s$

T_j : 25 °C, 125 °C, 150 °C

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 0,451 \text{ K/W}$

IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
4,15E-02	3,34E+00
6,77E-02	7,23E-01
1,95E-01	1,44E-01
1,06E-01	5,27E-02
2,17E-02	5,11E-03
1,90E-02	6,41E-04



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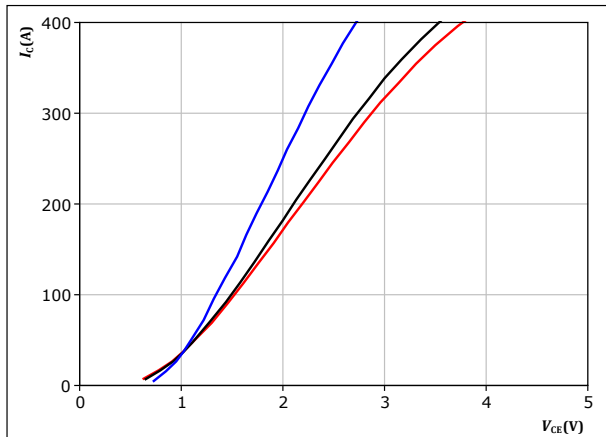
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Brake Switch Characteristics

figure 8. IGBT

Typical output characteristics

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

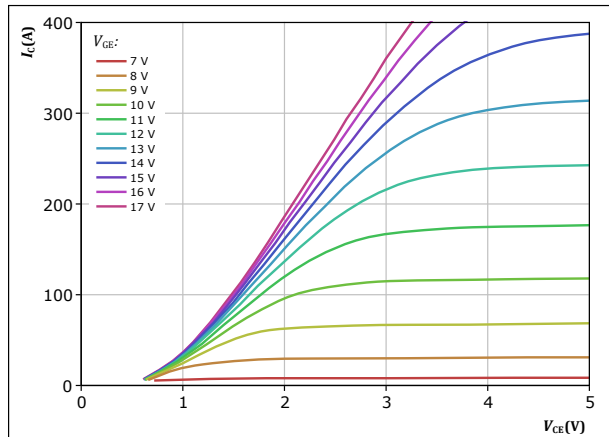


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 9. IGBT

Typical output characteristics

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

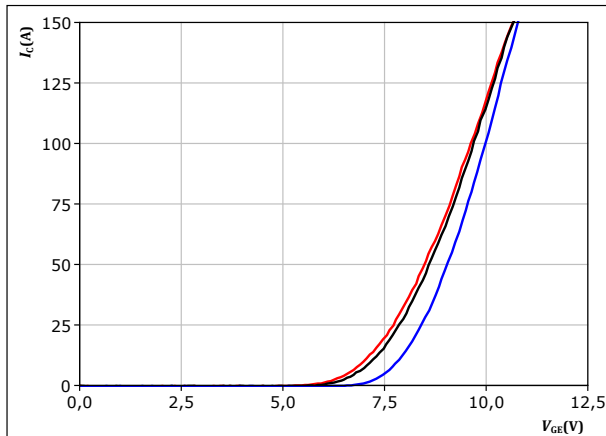


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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

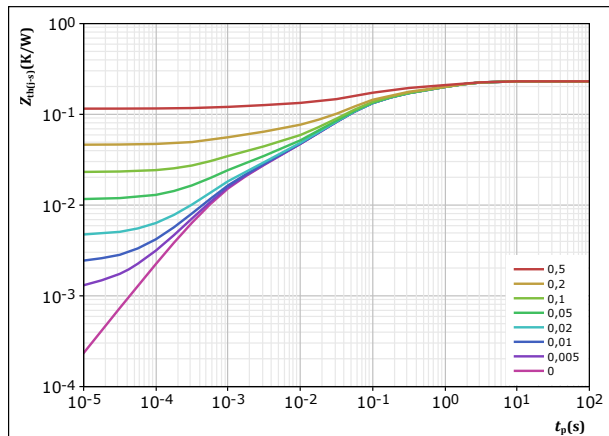


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,231 \text{ K/W}$
IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
6,43E-02	1,35E+00
4,70E-02	1,88E-01
9,03E-02	4,69E-02
1,43E-02	5,67E-03
1,51E-02	8,02E-04



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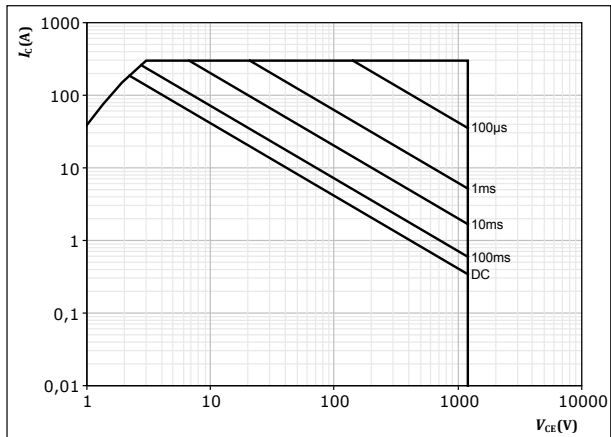
Brake Switch Characteristics

figure 12.

IGBT

Safe operating area

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



$D =$ single pulse

$T_s = 80$ °C

$V_{GE} = 15$ V

$T_j = T_{jmax}$



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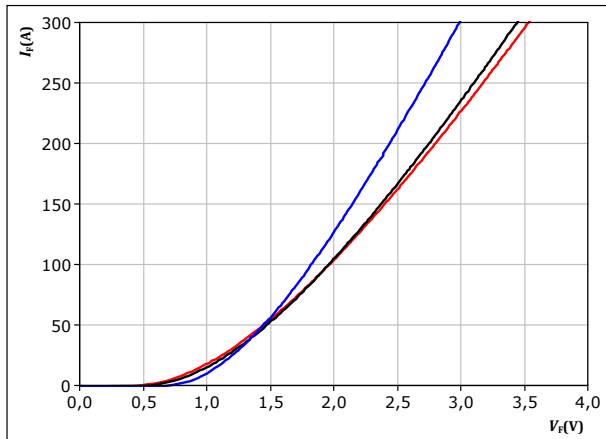
Brake Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

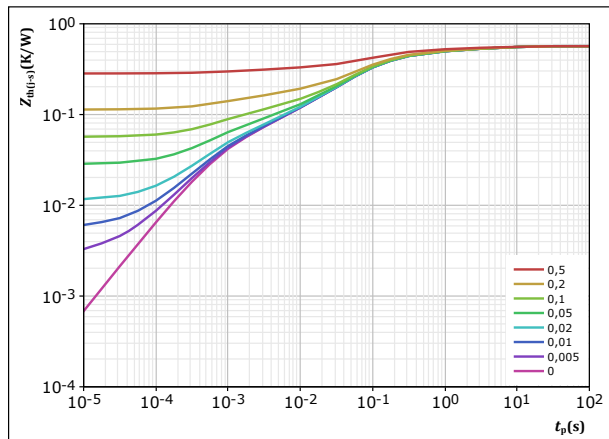
T_j : 25 °C, 125 °C, 150 °C

figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 0,567 \text{ K/W}$

IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
5,57E-02	6,41E+00
7,78E-02	7,56E-01
1,72E-01	1,48E-01
1,82E-01	5,10E-02
4,06E-02	4,40E-03
3,79E-02	6,96E-04



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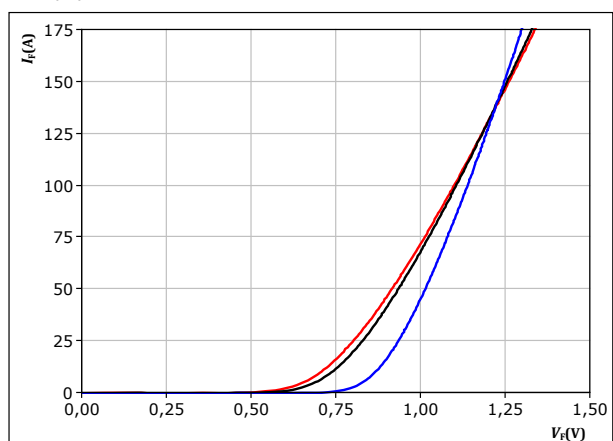
Rectifier Diode Characteristics

figure 15.

Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

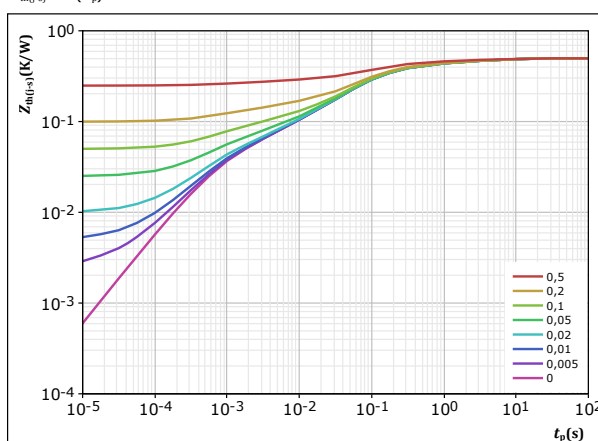
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 16.

Rectifier

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T
$R_{th(j-s)} =$	0,498 K/W
IGBT thermal model values	
R (K/W)	τ (s)
4,89E-02	6,41E+00
6,83E-02	7,56E-01
1,51E-01	1,48E-01
1,60E-01	5,10E-02
3,57E-02	4,40E-03
3,33E-02	6,96E-04



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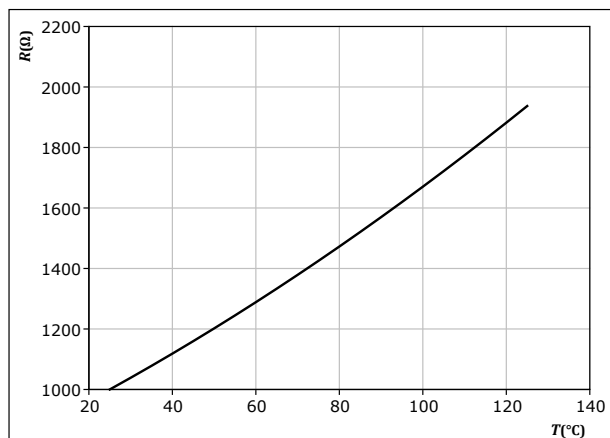
Thermistor Characteristics

figure 17.

Thermistor

Typical PTC characteristic as function of temperature

$$R_T = f(T)$$





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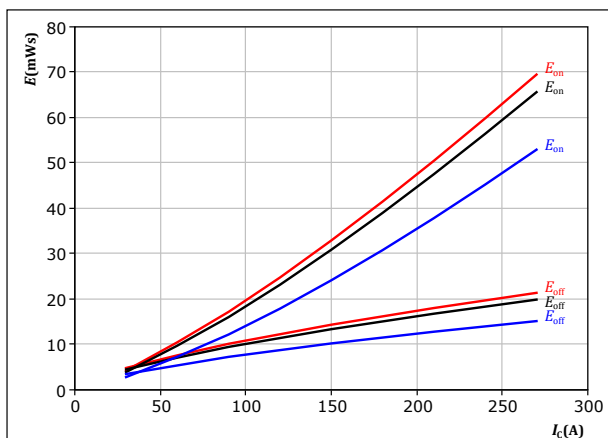
Inverter Switching Characteristics

figure 18.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

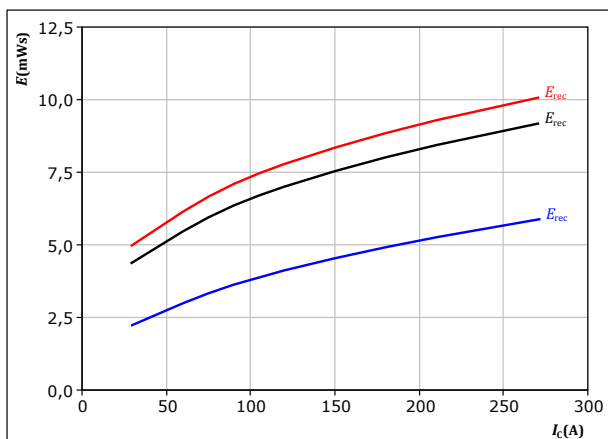
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 20.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

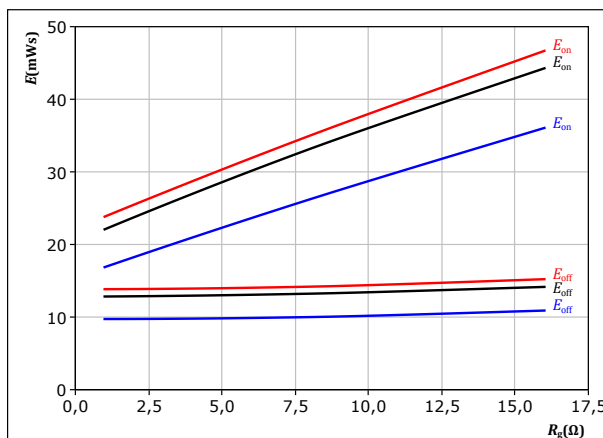
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 19.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

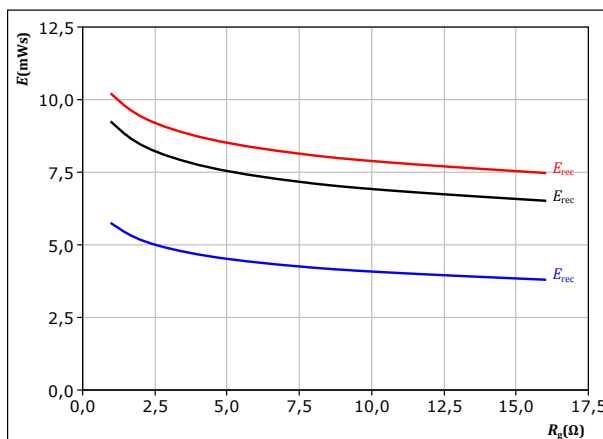
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 21.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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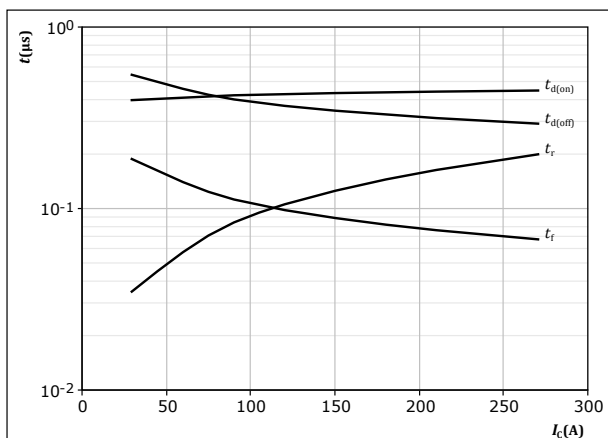
Inverter Switching Characteristics

figure 22.

IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



With an inductive load at

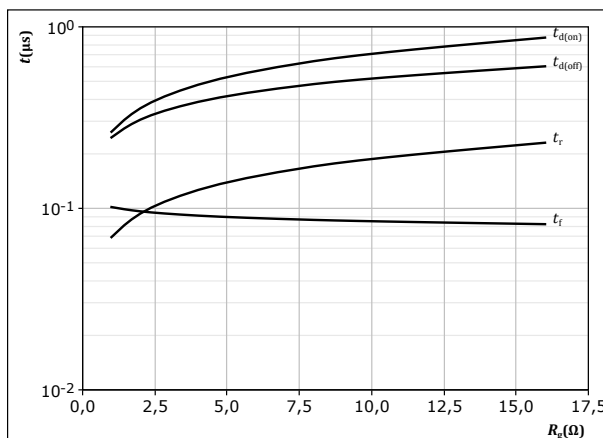
$T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

figure 23.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

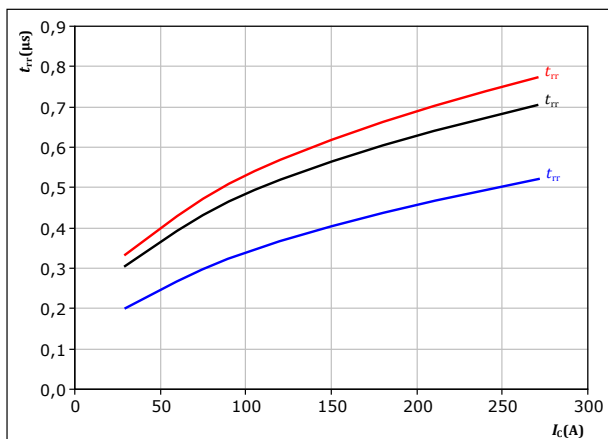
$T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

figure 24.

FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

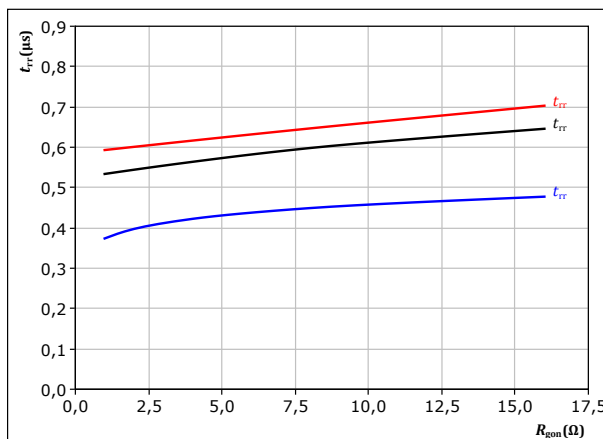
T_j : — 25 °C
— 125 °C
— 150 °C

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

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

T_j : — 25 °C
— 125 °C
— 150 °C



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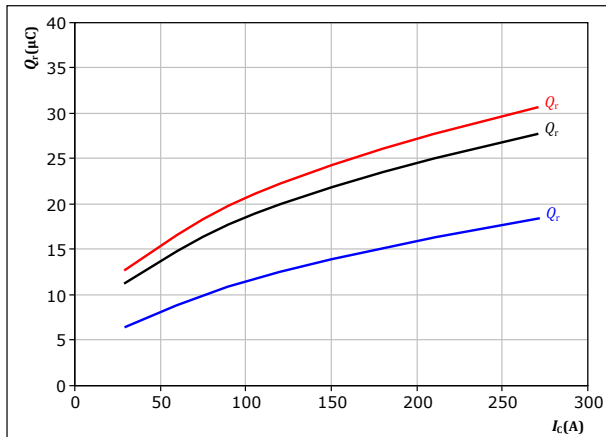
Inverter Switching Characteristics

figure 26.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

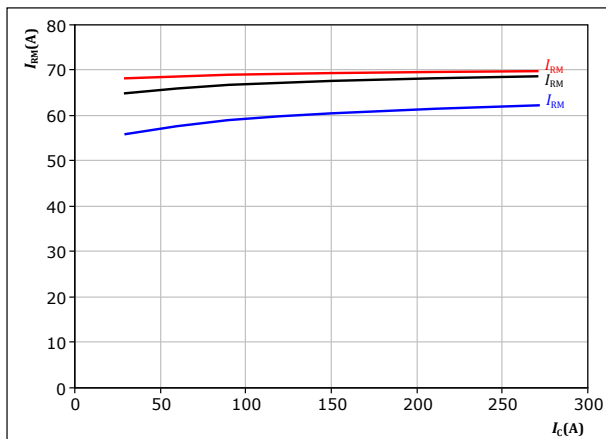
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 28.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

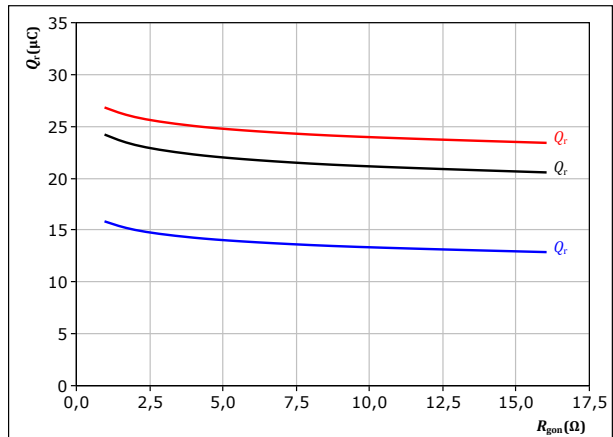
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 27.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

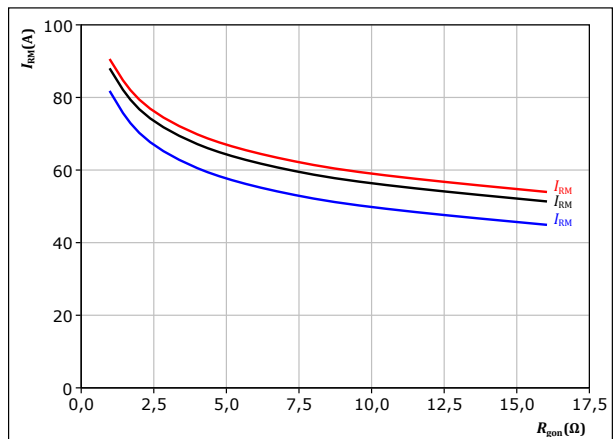
T_j :
— 25 °C
— 125 °C
— 150 °C

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

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 150$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



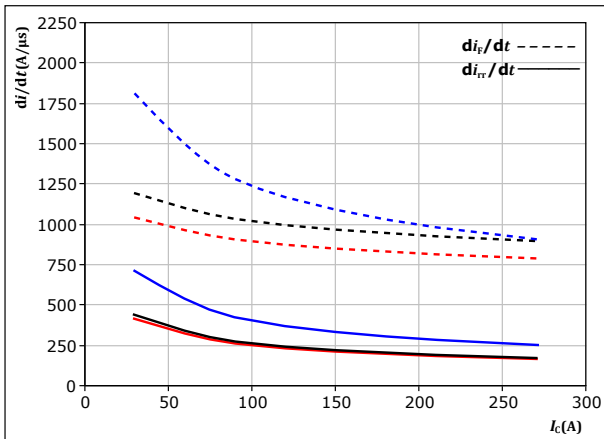
Vincotech

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datasheet

Inverter Switching Characteristics

figure 30. FWD

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



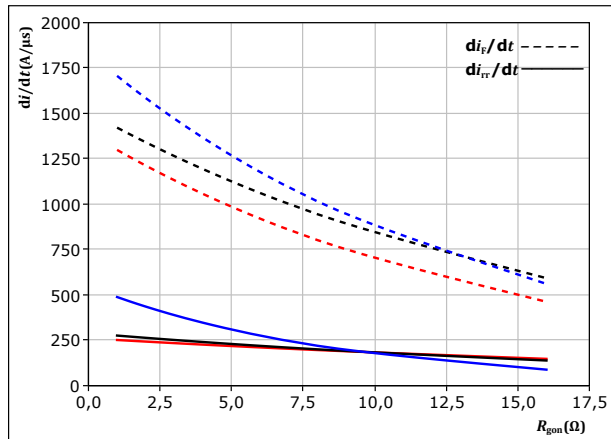
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

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

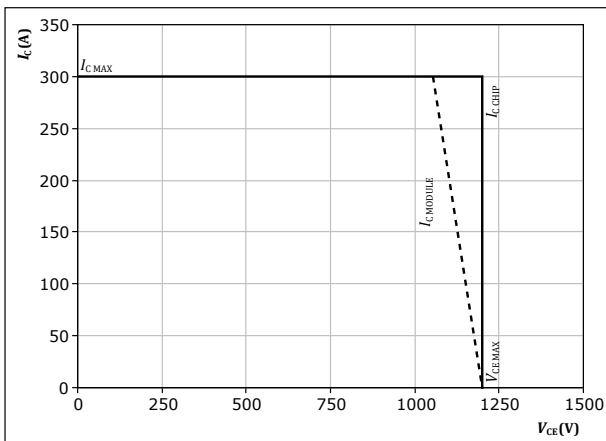
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 150 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 32. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$



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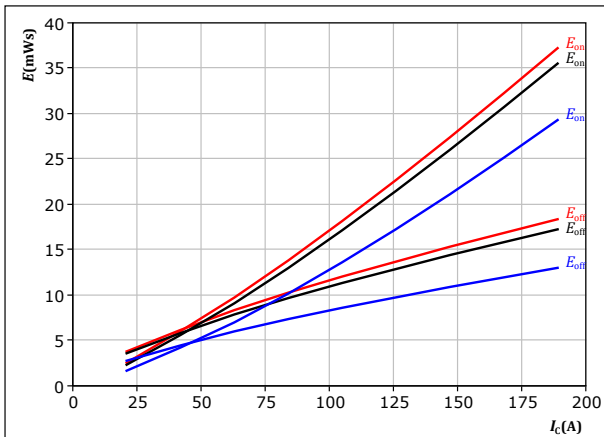
Brake Switching Characteristics

figure 33.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω
 $R_{goff} = 1$ Ω

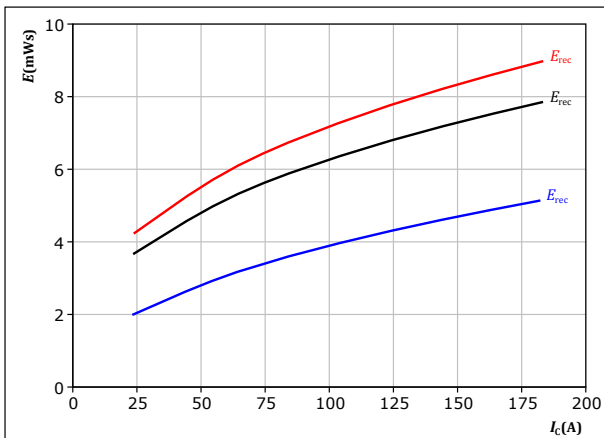
T_j : 25 °C (blue)
125 °C (black)
150 °C (red)

figure 35.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω

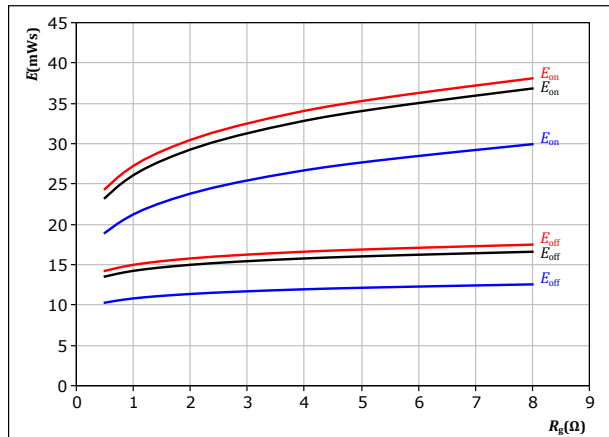
T_j : 25 °C (blue)
125 °C (black)
150 °C (red)

figure 34.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_C = 147$ A

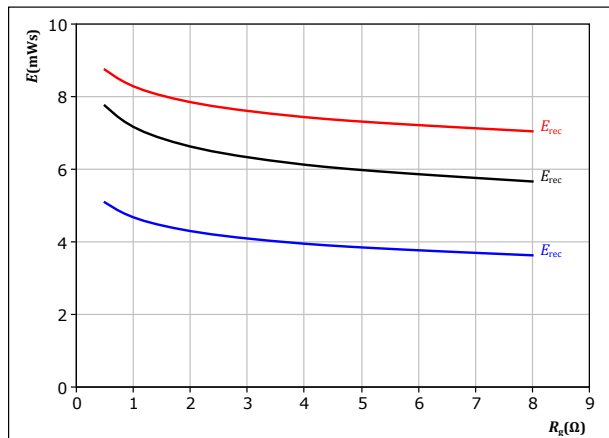
T_j : 25 °C (blue)
125 °C (black)
150 °C (red)

figure 36.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_C = 147$ A

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



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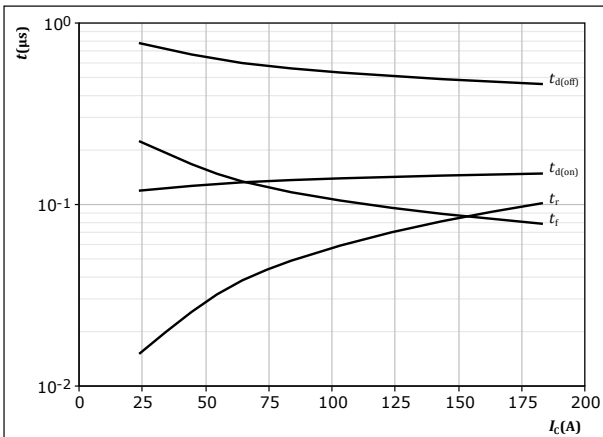
Brake Switching Characteristics

figure 37.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



With an inductive load at

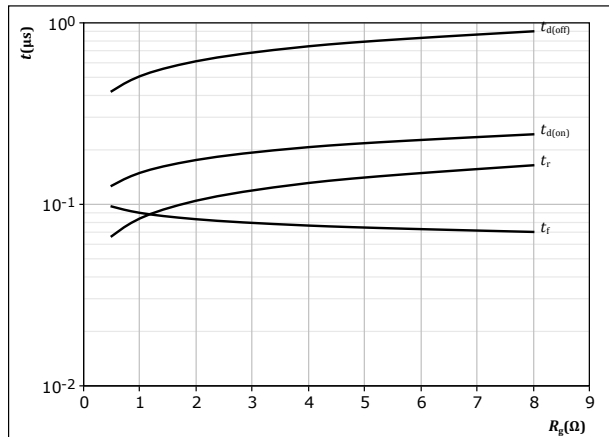
$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω
 $R_{goff} = 1$ Ω

figure 38.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

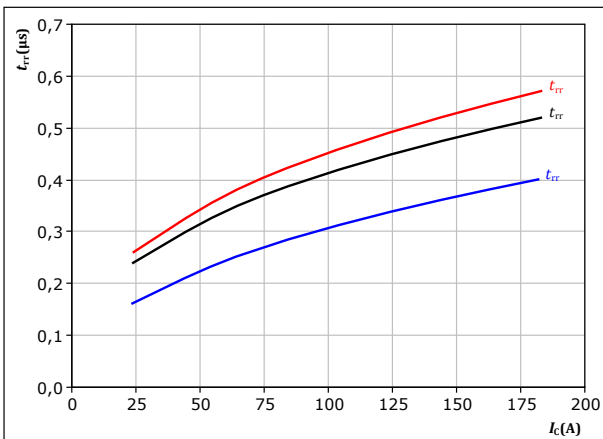
$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_C = 147$ A

figure 39.

FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω

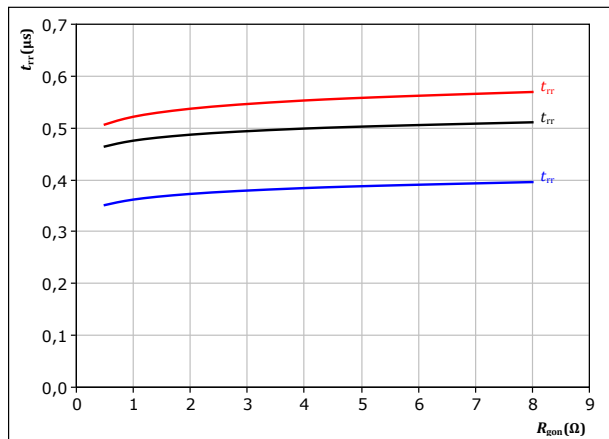
T_j : 25 °C (blue)
125 °C (black)
150 °C (red)

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

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_C = 147$ A

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



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datasheet

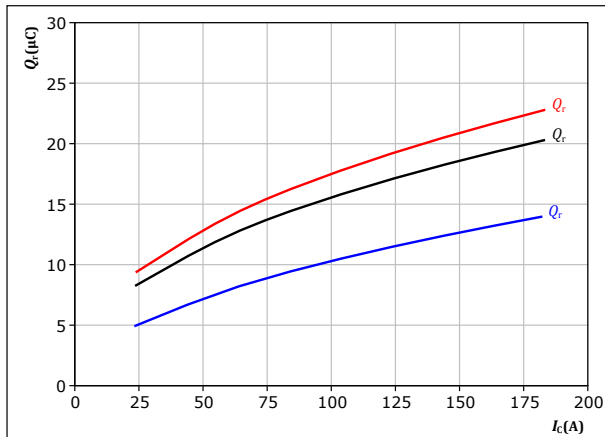
Brake Switching Characteristics

figure 41.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω

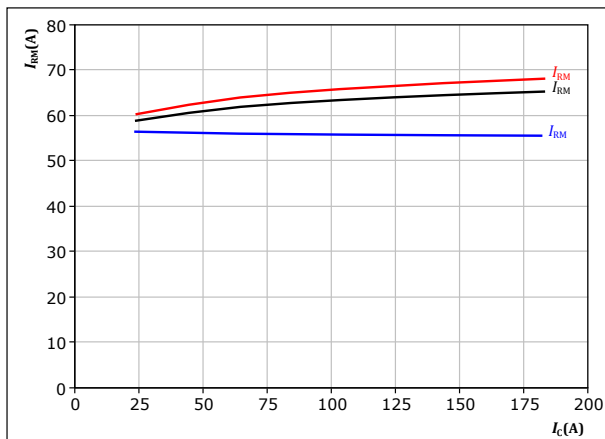
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 43.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω

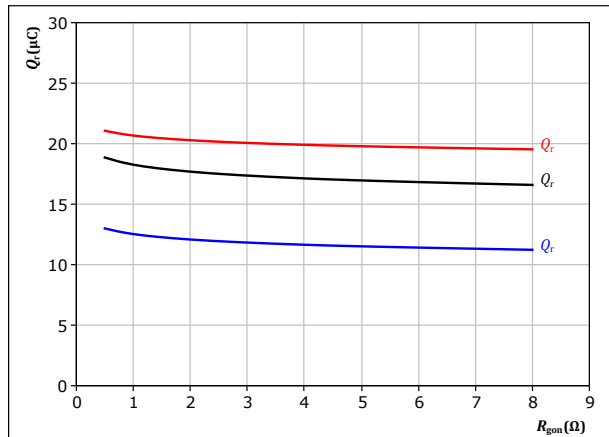
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 42.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_c = 147$ A

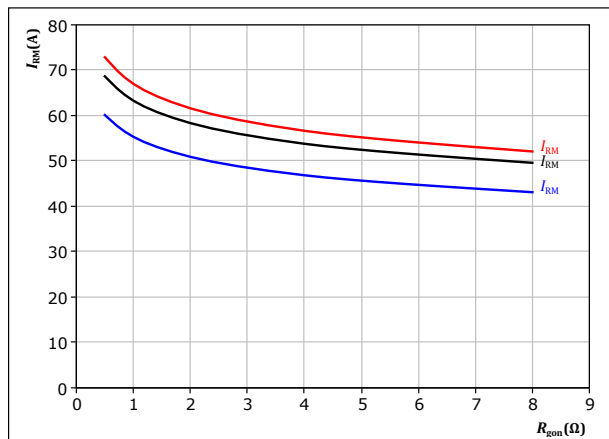
T_j :
— 25 °C
— 125 °C
— 150 °C

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

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_c = 147$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



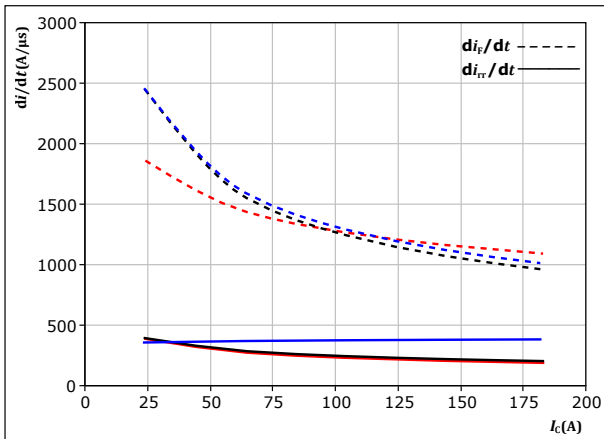
Vincotech

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datasheet

Brake Switching Characteristics

figure 45. FWD

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



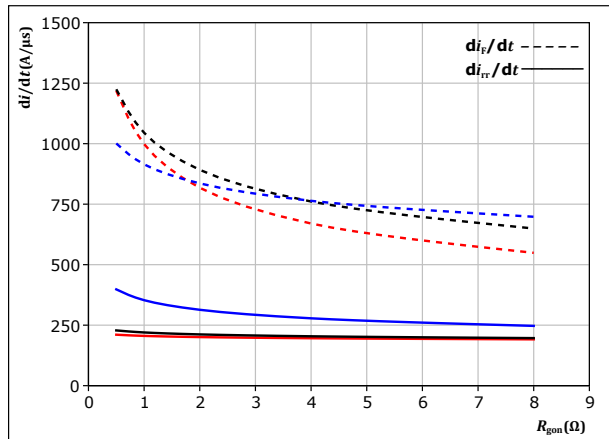
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $R_{gon} = 1$ Ω

T_j : 25 °C
125 °C
150 °C

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

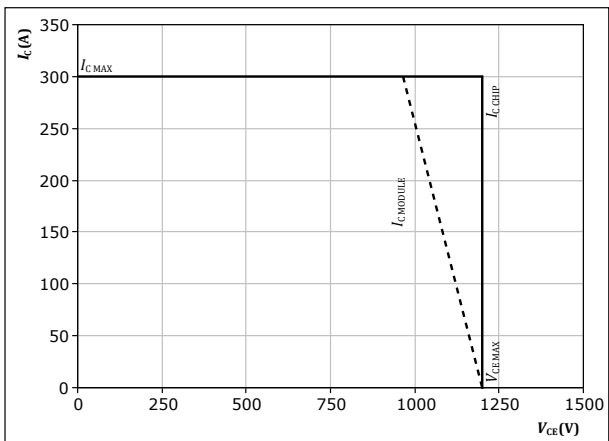
$V_{CE} = 700$ V
 $V_{GE} = 0/15$ V
 $I_C = 147$ A

T_j : 25 °C
125 °C
150 °C

figure 47. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 1$ Ω
 $R_{goff} = 1$ Ω



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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})

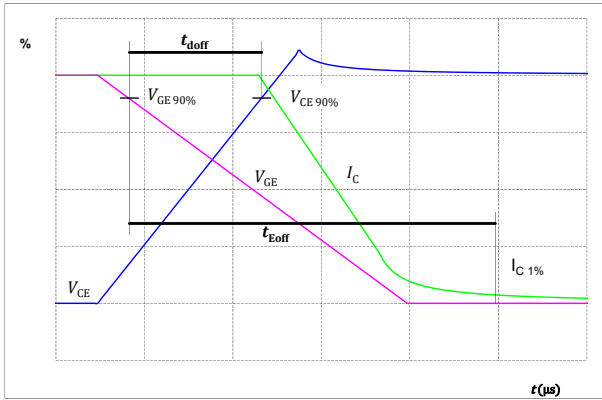


figure 49. IGBT

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

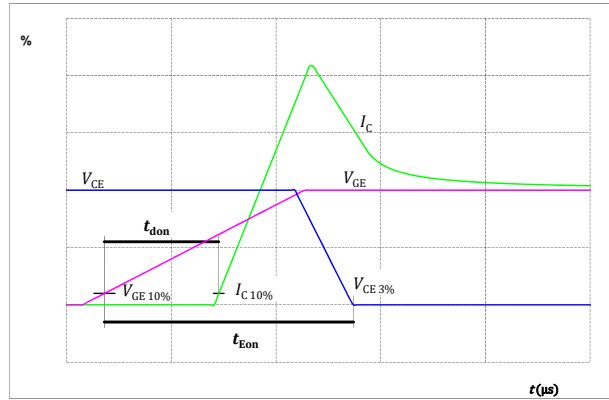


figure 50. IGBT

Turn-off Switching Waveforms & definition of t_f

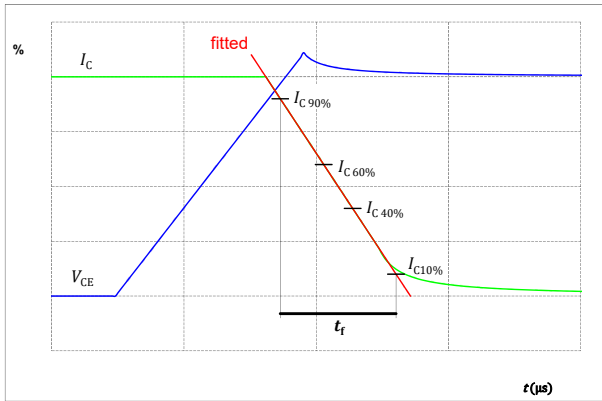
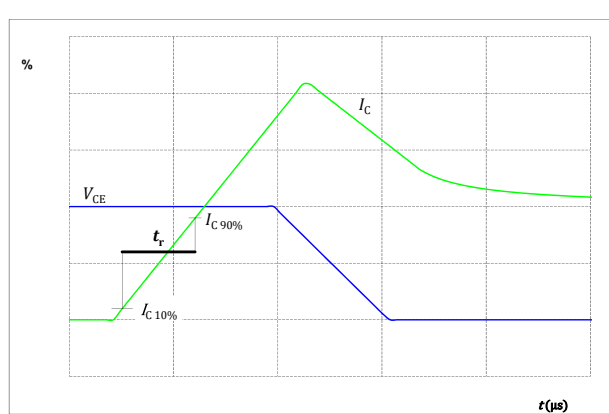


figure 51. IGBT

Turn-on Switching Waveforms & definition of t_r





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80-M312PMA150M01-K420A82 datasheet

Switching Definitions

figure 52.

FWD

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

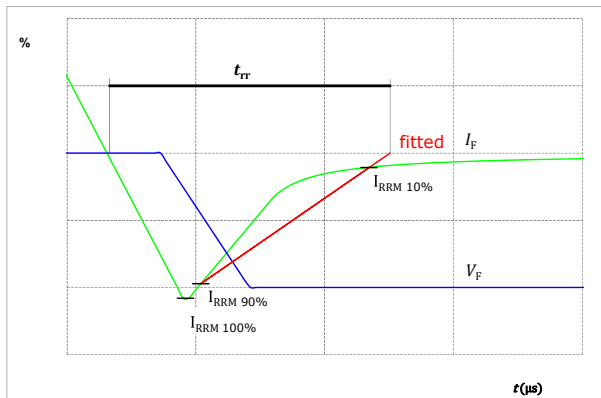
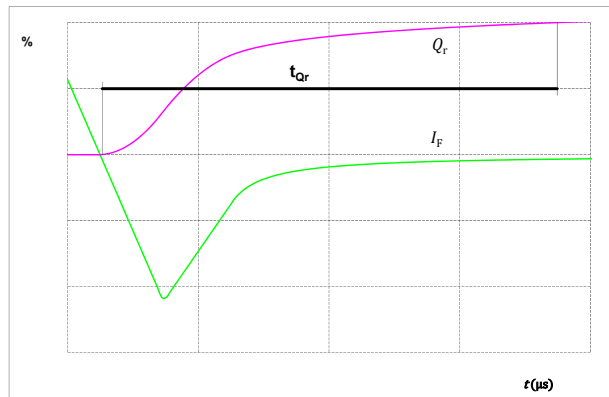


figure 53.

FWD

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





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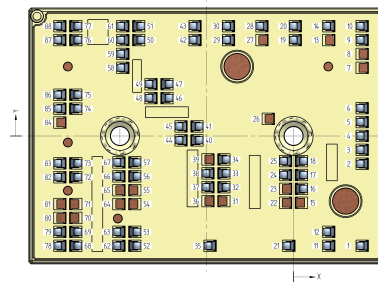
80-M312PMA150M01-K420A82

datasheet

Ordering Code	
Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M312PMA150M01-K420A82-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M312PMA150M01-K420A82-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M312PMA150M01-K420A82-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M312PMA150M01-K420A82-/1B/
With std lid (6.5mm height) + thermal grease (3,4 W/mK, PSX-P7, silicone-free)	80-M312PMA150M01-K420A82-/3A/
With thin lid (2.8mm height) + thermal grease (3,4 W/mK, PSX-P7, silicone-free)	80-M312PMA150M01-K420A82-/3B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M312PMA150M01-K420A82-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M312PMA150M01-K420A82-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M312PMA150M01-K420A82-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M312PMA150M01-K420A82-/5B/

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

Outline							
Pin table [mm]							
Pin	X	Y	Function	45	-25,9	2,2	+B
1	15,83	-25,3	G5	46	10,82	8,74	B
2	15,83	-6,4	E5	47	10,82	11,94	B
3	15,83	-3,2	W	48	-32,82	8,74	B
4	15,83	0	W	49	-32,82	11,94	B
5	15,83	3,2	W	50	4,32	22,1	-B
6	15,83	6,4	W	51	4,32	25,3	-B
7	not assembled			52	3,42	-25,3	+rect
8	not assembled			53	3,42	-22,1	+rect
9	15,83	22,1	G6	54	not assembled		
10	15,83	25,3	E6	55	not assembled		
11	8,13	-25,3	-T	56	3,42	-9,3	+DC
12	8,13	-22,1	+T	57	3,42	-6,1	+DC
13	not assembled			58	-39,32	15,7	GB
14	8,13	25,3	-DC	59	-39,32	18,9	EB
15	not assembled			60	-39,32	22,1	-B
16	41,82	-12,18	E3	61	-39,32	25,3	-B
17	41,82	-8,98	V	62	-40,22	-25,3	+rect
18	41,82	-5,79	V	63	-40,22	-22,1	+rect
19	0,43	22,1	G4	64	not assembled		
20	0,43	25,3	E4	65	not assembled		
21	-1,07	-25,3	G3	66	-40,22	-9,3	+DC
22	not assembled			67	-40,22	-6,09	+DC
23	not assembled			68	-10,18	-25,3	L1
24	-1,82	-8,98	V	69	-10,18	-22,1	L1
25	-1,82	-5,79	V	70	not assembled		
26	not assembled			71	not assembled		
27	not assembled			72	-10,18	-9,5	L2
28	-7,27	25,3	-DC	73	-10,18	-6,3	L2
29	-14,97	22,1	G2	74	-10,18	6,3	-rect
30	-14,97	25,3	E2	75	-10,18	9,5	-rect
31	not assembled			76	-10,18	22,1	L3
32	23,95	-11,82	U	77	-10,18	25,3	L3
33	23,95	-8,63	U	78	-53,82	-25,3	L1
34	23,95	-5,42	E1	79	-53,82	-22,1	L1
35	-19,22	-25,3	G1	80	not assembled		
36	not assembled			81	not assembled		
37	-19,7	-11,82	U	82	-53,82	-9,5	L2
38	-19,7	-8,62	U	83	-53,82	-6,3	L2
39	not assembled			84	not assembled		
40	17,74	-1	+B	85	-53,82	6,3	-rect
41	17,74	2,2	+B	86	-53,82	9,5	-rect
42	-22,67	22,1	-DC	87	-53,82	22,1	L3
43	-22,67	25,3	-DC	88	-53,82	25,3	L3
44	-25,9	-1	+B				

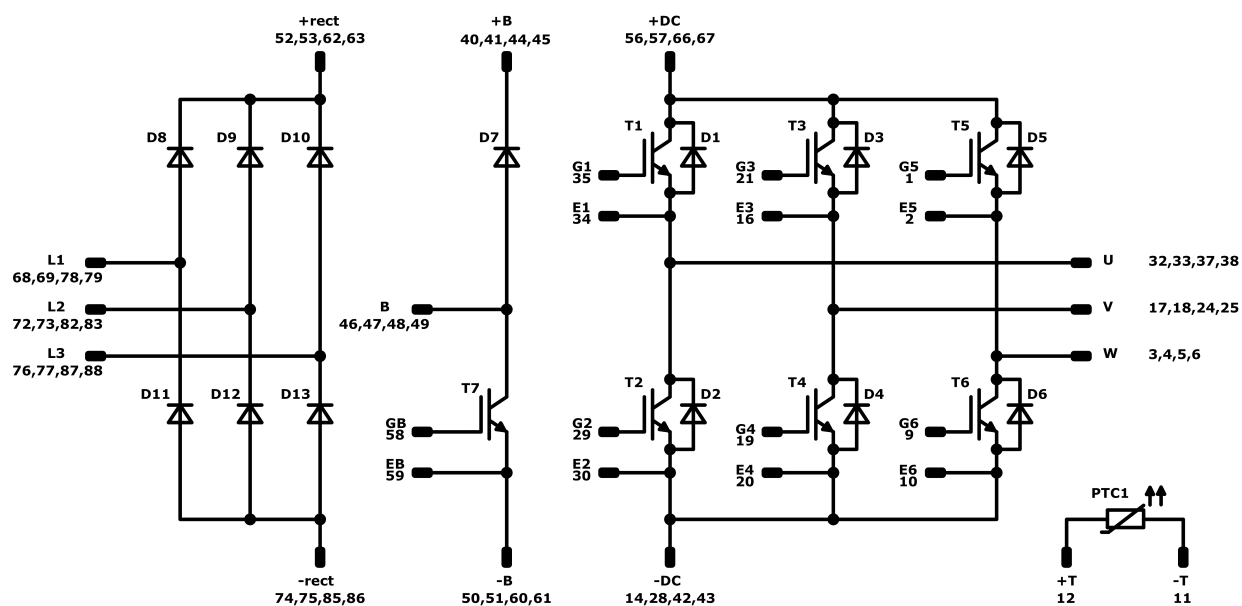


Pad positions refers to center point. For more informations on pad design please see package data



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T2, T1, T4, T3, T6, T5	IGBT	1200 V	150 A	Inverter Switch	
D1, D2, D3, D4, D5, D6	FWD	1200 V	150 A	Inverter Diode	
T7	IGBT	1200 V	150 A	Brake Switch	
D7	FWD	1200 V	100 A	Brake Diode	
D11, D8, D12, D9, D13, D10	Rectifier	1600 V	60 A	Rectifier Diode	
PTC1	Thermistor			Thermistor	



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80-M312PMA150M01-K420A82
datasheet

Packaging instruction				
Standard packaging quantity (SPQ) 48	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for MiniSKiiP® 3 packages see vincotech.com website.				
Package data				
Package data for MiniSKiiP® 3 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.				

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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.