



Vincotech

10-F112M3A025SH-M746F09

datasheet

flow3xMNPC 1

1200 V / 25 A

Features

- 3 phase mixed voltage component topology
- neutral point clamped inverter
- reactive power capability
- low inductance layout

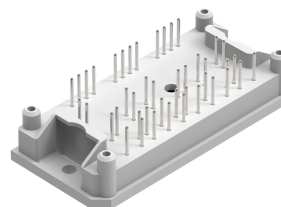
Target applications

- solar inverter
- UPS

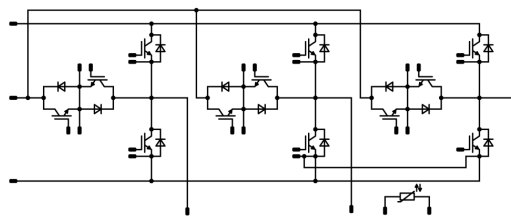
Types

- 10-F112M3A025SH-M746F09

flow 1 17 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}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	31	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	75	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	94	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Buck Diode

Peak repetitive reverse voltage	V_{RRM}		600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	22	A
Surge (non-repetitive) forward current	I_{FSM}	$T_j = 25\text{ °C}$	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	41	W
Maximum junction temperature	T_{jmax}		150	$^{\circ}\text{C}$

Boost Switch

Collector-emitter voltage	V_{CES}		600	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	27	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	56	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	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
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	13	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	36	A
Surge current capability	I^2t		0	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	39	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			>12,7	mm
Clearance			>12,7	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	

Buck Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00085	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125	1,78	2,11 2,42 ⁽¹⁾	2,42 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2,4	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		1430		pF
Output capacitance	C_{oes}							115		pF
Reverse transfer capacitance	C_{res}							75		pF
Gate charge	Q_g	$V_{CC} = 960 \text{ V}$	15		25	25		115		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,01		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \Omega$ $R_{goff} = 16 \Omega$	± 15	350	15	25 125		73 74,2		ns
Rise time	t_r					25 125		15 18		ns
Turn-off delay time	$t_{d(off)}$					25 125		166,4 219,8		ns
Fall time	t_f					25 125		21,09 116,3		ns
Turn-on energy (per pulse)	E_{on}					25 125		0,17 0,3		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,367 0,629		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	

Buck Diode

Static

Forward voltage	V_F				15	25 125	1,88	2,47 1,73	2,73 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 600$ V				25			100	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,71		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=1415$ A/μs $di/dt=1159$ A/μs	± 15	350	15	25 125		16,08 22,27		A
Reverse recovery time	t_{rr}					25 125		23,04 32,92		ns
Recovered charge	Q_r					25 125		0,191 0,442		μC
Reverse recovered energy	E_{rec}					25 125		0,025 0,05		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125		1860 1998		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		

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00029	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		20	25 125	1,1	1,53 1,7	1,9 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	600		25			1,1	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		1100		pF
Output capacitance	C_{oes}							71		pF
Reverse transfer capacitance	C_{res}							32		pF
Gate charge	Q_g	$V_{CC} = 480 \text{ V}$	15		20	25		120		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,7		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \Omega$ $R_{goff} = 16 \Omega$	± 15	350	15	25 125		72,4 74,2		ns
Rise time	t_r					25 125		14 15,6		ns
Turn-off delay time	$t_{d(off)}$					25 125		131,2 157,2		ns
Fall time	t_f					25 125		33,89 68,86		ns
Turn-on energy (per pulse)	E_{on}					25 125		0,313 0,387		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,379 0,529		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	

Boost Diode

Static

Forward voltage	V_F				8	25 125 150		2,18 2,31	2,65 ⁽¹⁾ 2,68 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25 150		0,3	0,06 0,7	mA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						2,44		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=1124$ A/ μ s $di/dt=1109$ A/ μ s	± 15	350	15	25 125		21,09 24,46		A
Reverse recovery time	t_{rr}					25 125		29,92 34,71		ns
Recovered charge	Q_r					25 125		0,693 1,51		μ C
Reverse recovered energy	E_{rec}					25 125		0,137 0,382		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125		1972 2214		A/ μ s



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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	

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				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
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⁽¹⁾ Value at chip level

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



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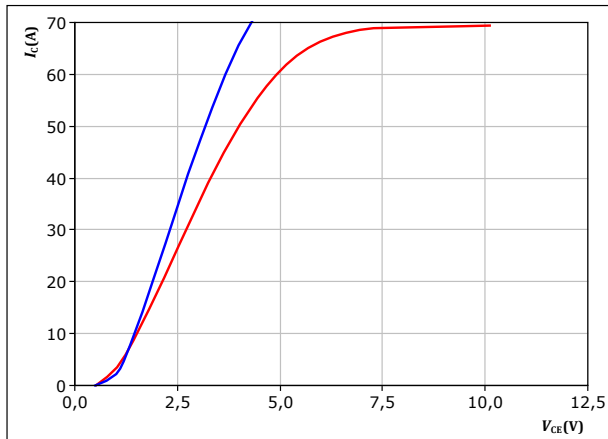
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Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

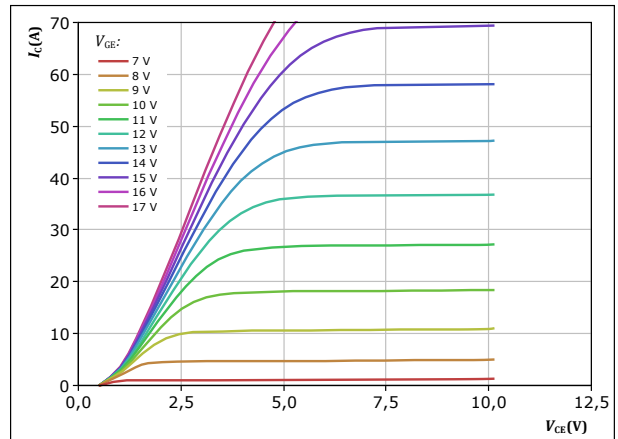


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 ^\circ C$
 $125 ^\circ C$

figure 2. IGBT

Typical output characteristics

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

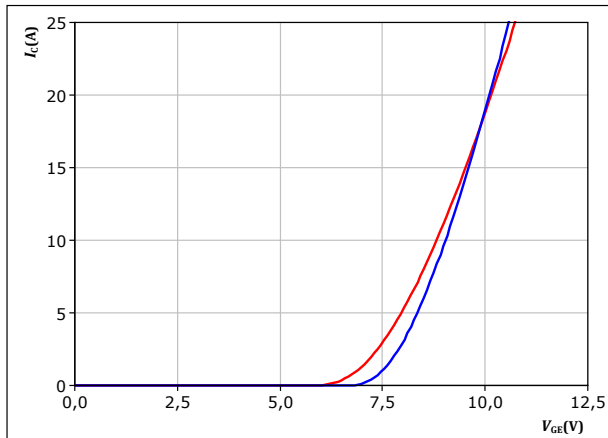


$t_p = 250 \mu s$
 $T_j = 125 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

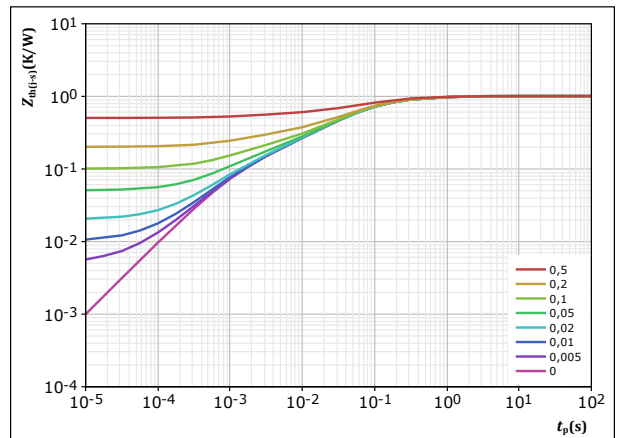


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 ^\circ C$
 $125 ^\circ C$

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,009 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
8,44E-02	1,03E+00
2,46E-01	1,79E-01
4,48E-01	5,38E-02
1,38E-01	1,04E-02
5,48E-02	1,66E-03
3,85E-02	8,73E-04



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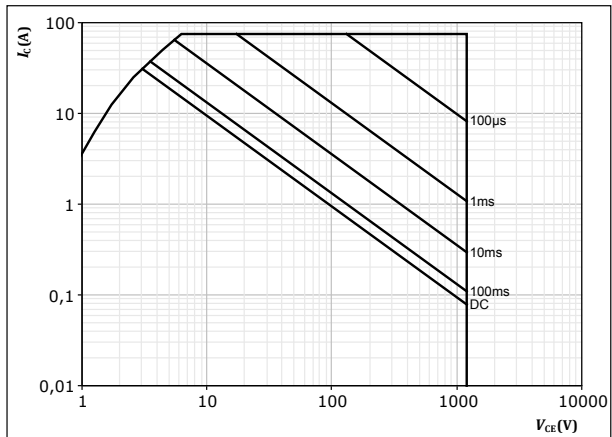
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Buck Switch Characteristics

figure 5. 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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Buck Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

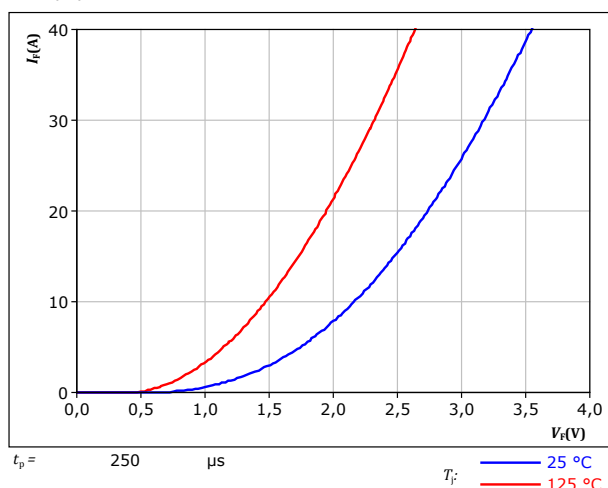
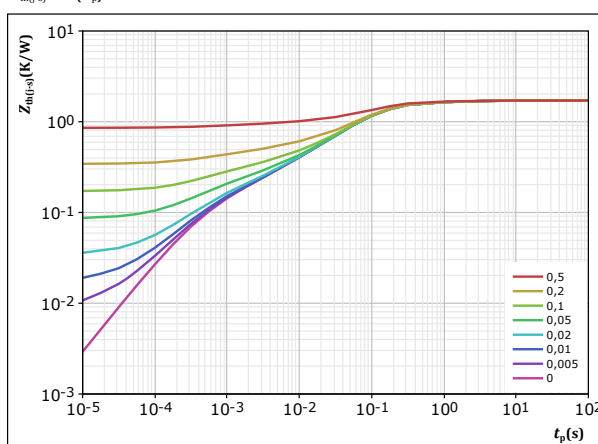


figure 7.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	1,713	K/W
FWD thermal model values		
R (K/W)	τ (s)	
7,49E-02	2,70E+00	
1,69E-01	4,49E-01	
9,61E-01	9,37E-02	
2,39E-01	3,41E-02	
1,24E-01	6,38E-03	
7,56E-02	1,23E-03	
7,06E-02	3,59E-04	



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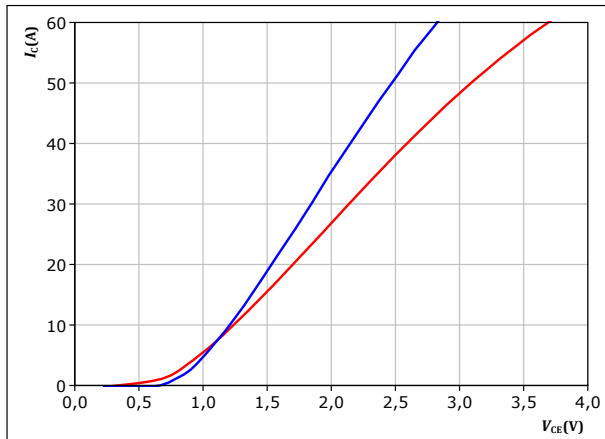
Boost Switch Characteristics

figure 8.

IGBT

Typical output characteristics

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



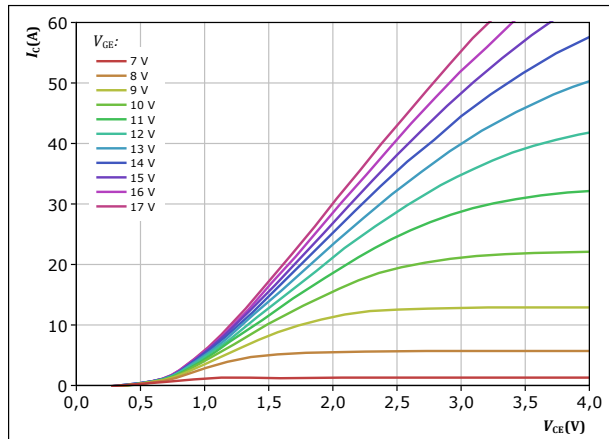
$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 ^\circ C$
 $125 ^\circ C$

figure 9.

IGBT

Typical output characteristics

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



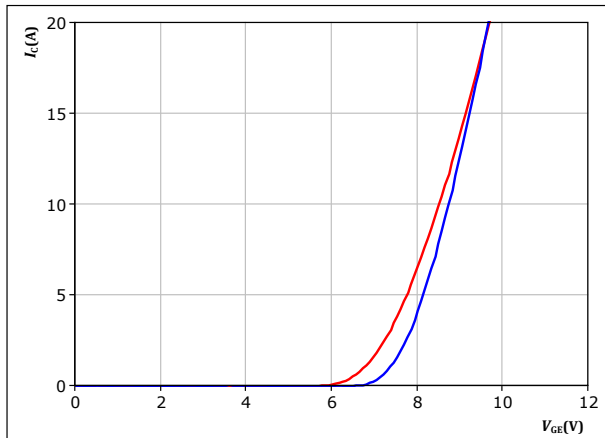
$t_p = 250 \mu s$
 $T_j = 125 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 10.

IGBT

Typical transfer characteristics

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



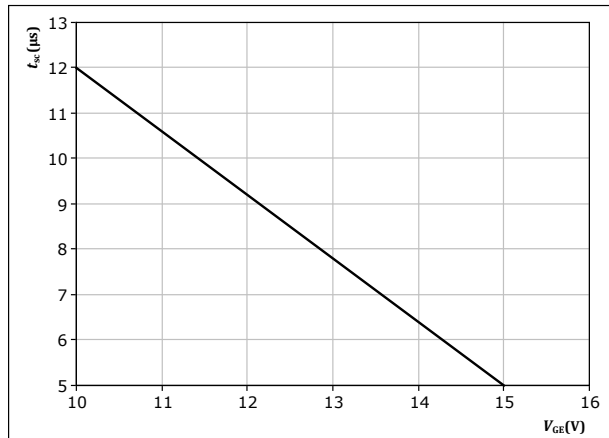
$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 ^\circ C$
 $125 ^\circ C$

figure 11.

IGBT

Short circuit withstand time as a function of V_{GE}

$$t_{sc} = f(V_{GE})$$



At $V_{CE} = 333 V$
 $T_j \leq 333 ^\circ C$



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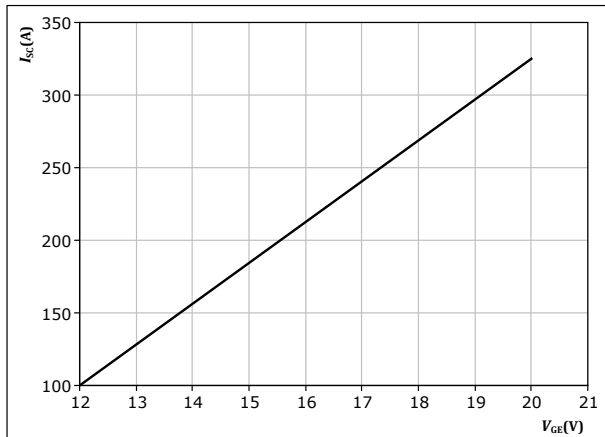
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Boost Switch Characteristics

figure 12.

IGBT

Typical short circuit current as a function of V_{GE}
 $I_{SC} = f(V_{GE})$

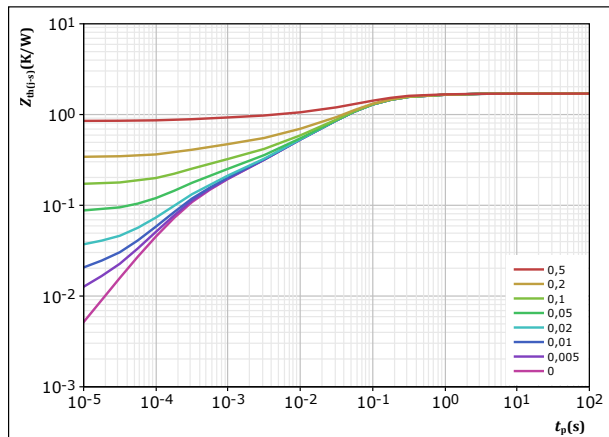


At $V_{CE} = 333$ V
 $T_j \leq 333$ °C

figure 13.

IGBT

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



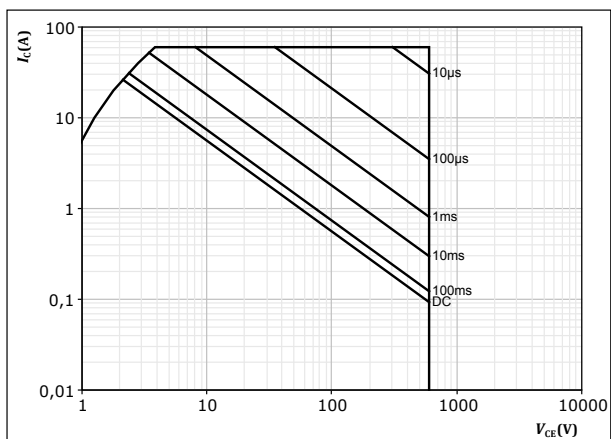
$D = t_p / T$
 $R_{th(j-s)} = 1,701$ K/W
IGBT thermal model values

R (K/W)	τ (s)
9,97E-02	1,34E+00
3,46E-01	1,70E-01
8,15E-01	5,34E-02
2,54E-01	7,74E-03
7,70E-02	1,33E-03
1,09E-01	2,63E-04

figure 14.

IGBT

Safe operating area
 $I_C = f(V_{CE})$

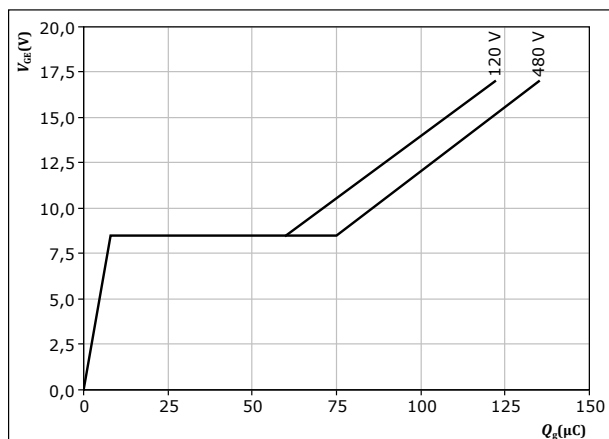


$D = \text{single pulse}$
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 15.

IGBT

Gate voltage vs gate charge
 $V_{GE} = f(Q_g)$



$I_C = 33$ A
 $T_j = 25$ °C



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Boost Diode Characteristics

figure 16.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

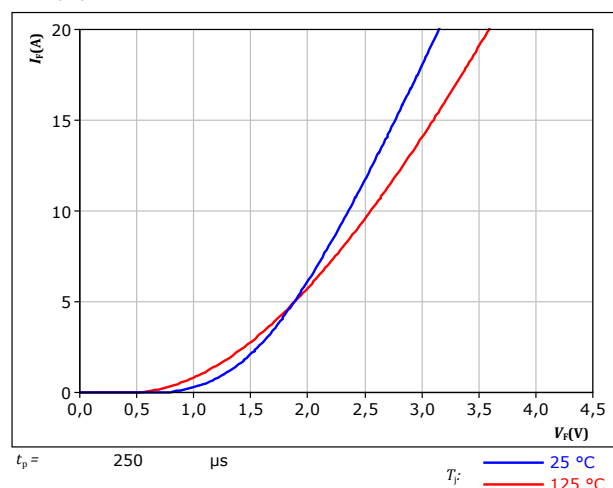
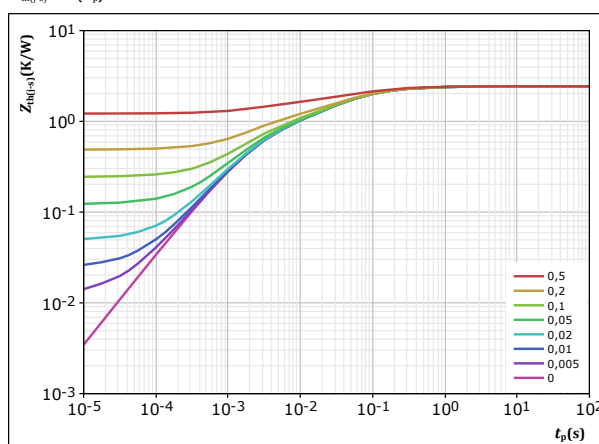


figure 17.

FWD

Transient thermal impedance as a function of pulse width

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





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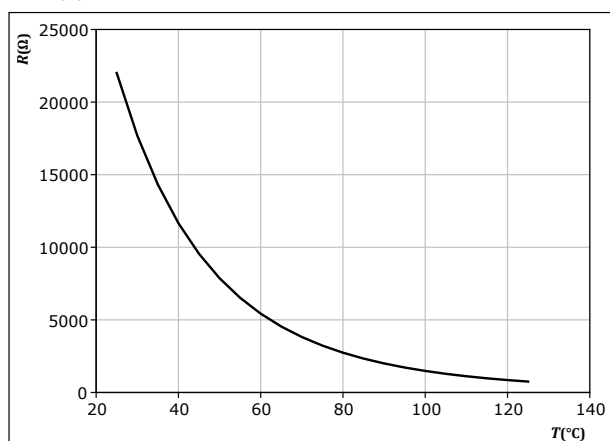
Thermistor Characteristics

figure 18.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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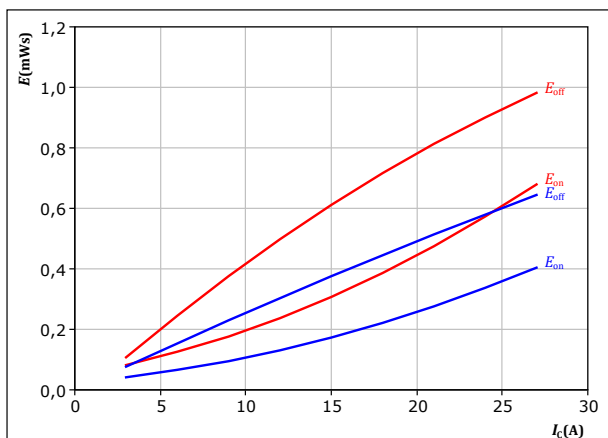
Buck Switching Characteristics

figure 19.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

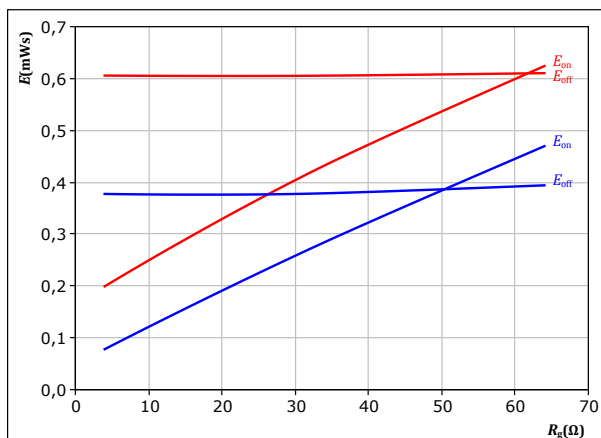
T_j : — 25 °C
— 125 °C

figure 20.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

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

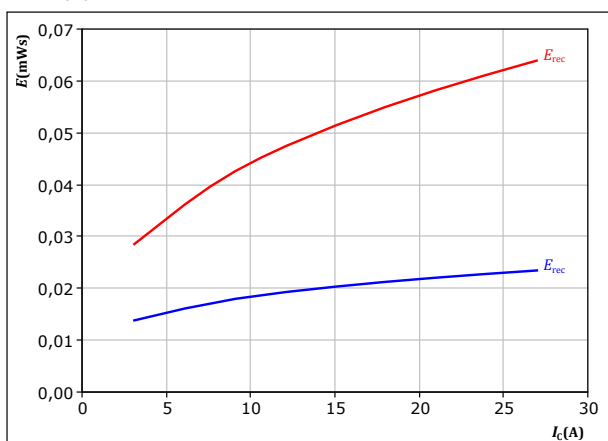
T_j : — 25 °C
— 125 °C

figure 21.

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

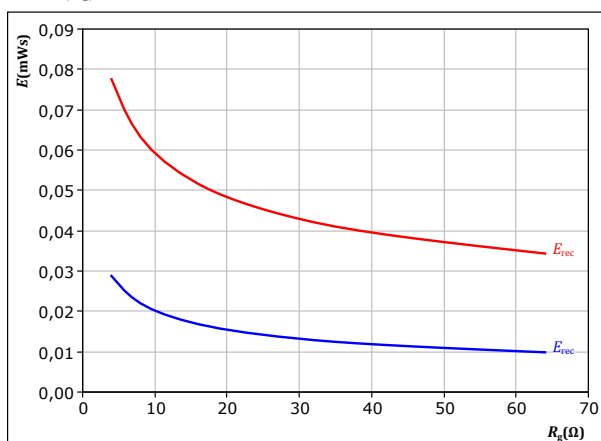
T_j : — 25 °C
— 125 °C

figure 22.

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
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A

T_j : — 25 °C
— 125 °C



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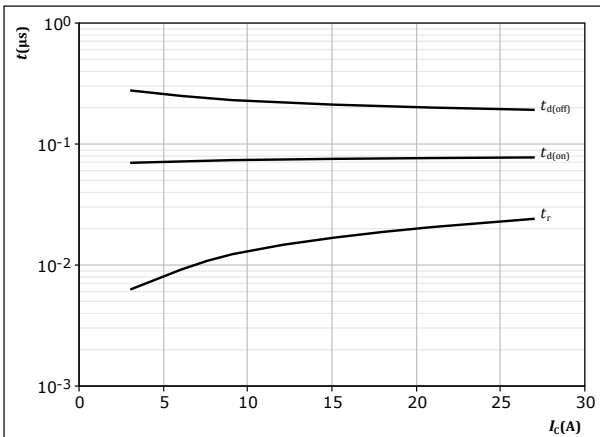
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Buck Switching Characteristics

figure 23.

IGBT

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



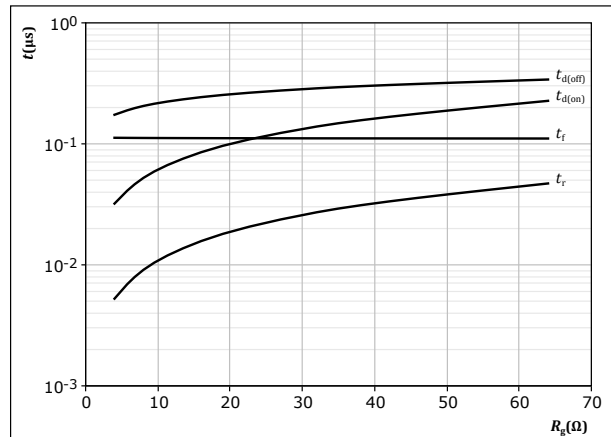
With an inductive load at

$T_j = 125$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

figure 24.

IGBT

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



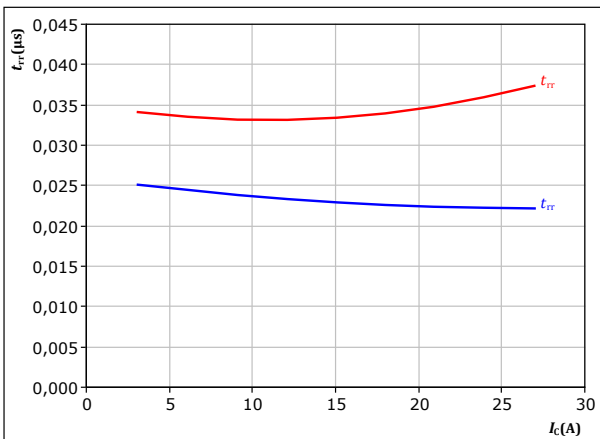
With an inductive load at

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

figure 25.

FWD

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



With an inductive load at

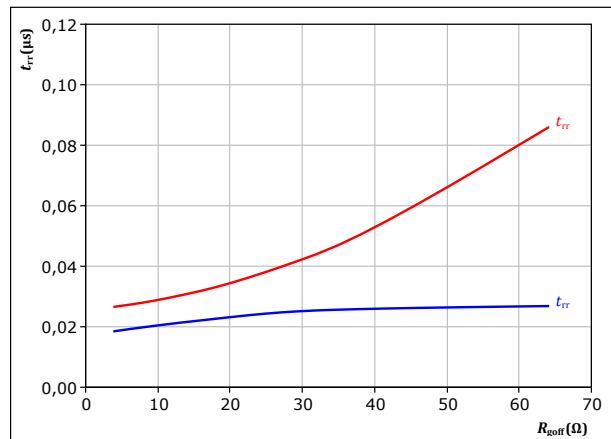
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

T_j : — 25 °C
— 125 °C

figure 26.

FWD

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



With an inductive load at

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

T_j : — 25 °C
— 125 °C



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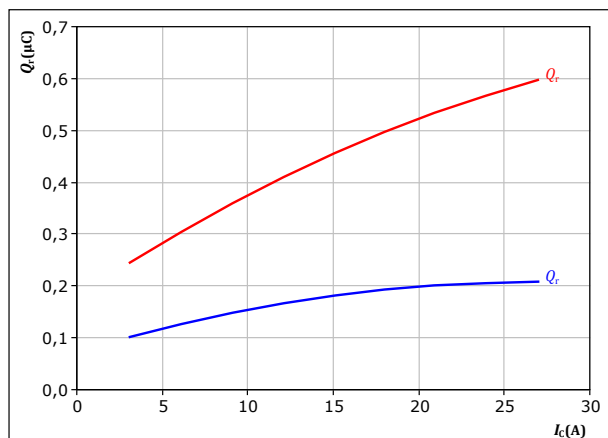
Buck Switching Characteristics

figure 27.

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
 $R_{gon} = 16$ Ω

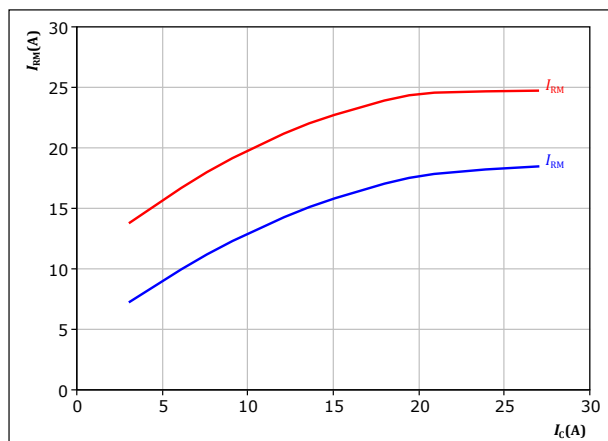
T_j : — 25 °C
— 125 °C

figure 29.

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
 $R_{gon} = 16$ Ω

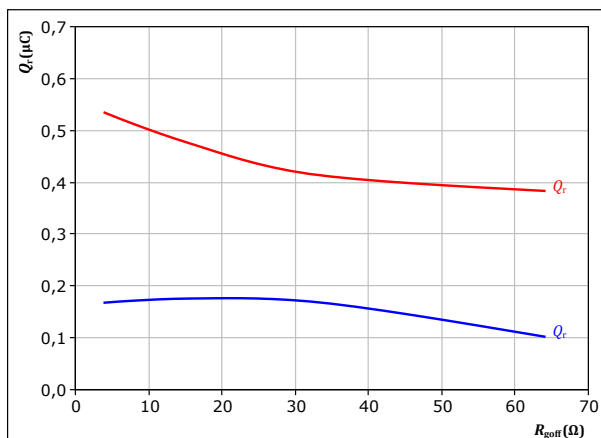
T_j : — 25 °C
— 125 °C

figure 28.

FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

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

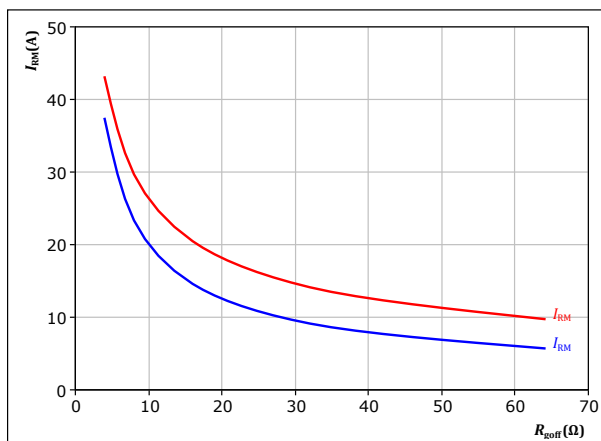
T_j : — 25 °C
— 125 °C

figure 30.

FWD

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

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



With an inductive load at

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

T_j : — 25 °C
— 125 °C



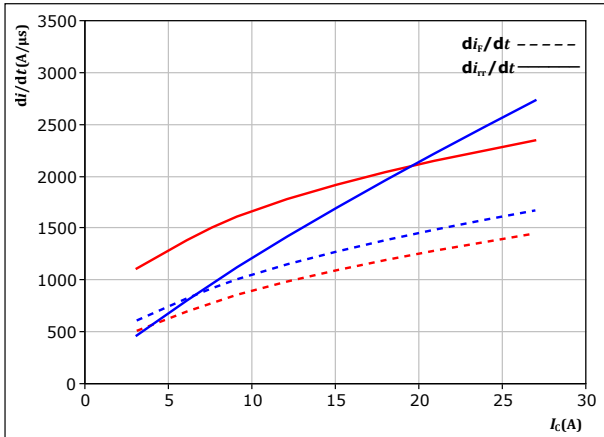
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datasheet

Buck Switching Characteristics

figure 31. FWD

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



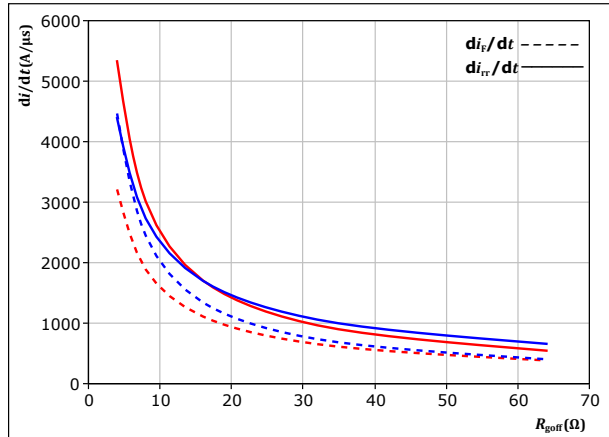
With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{goff} = 16 \text{ } \Omega$

T_j : — 25 °C
— 125 °C

figure 32. FWD

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



With an inductive load at

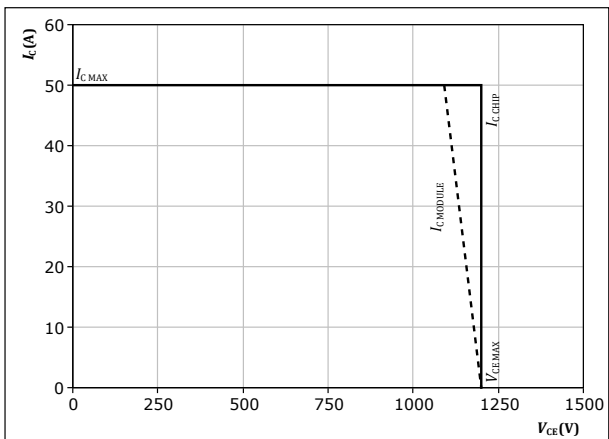
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 15 \text{ A}$

T_j : — 25 °C
— 125 °C

figure 33. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 125 \text{ } ^\circ\text{C}$
 $R_{goff} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$



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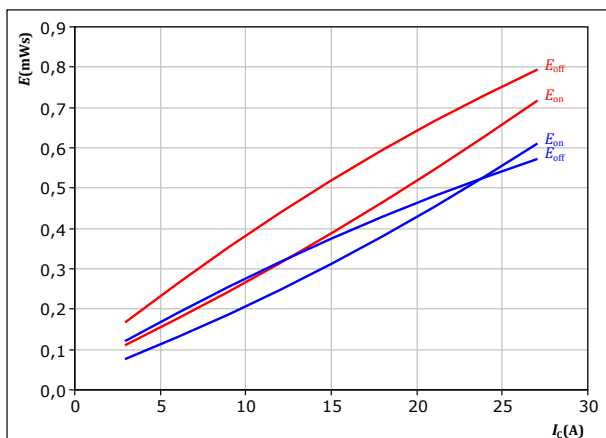
Boost Switching Characteristics

figure 34.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

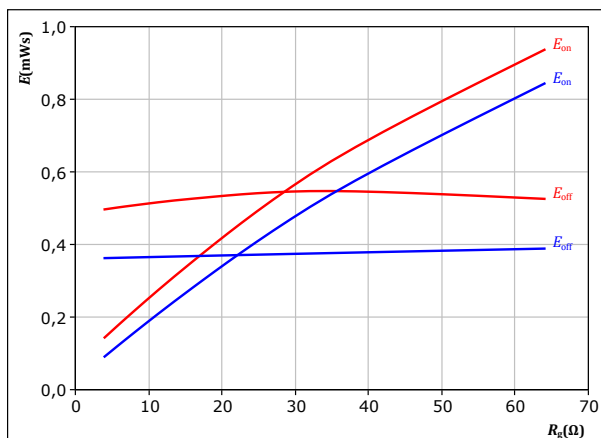
T_j : — 25 °C
— 125 °C

figure 35.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

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

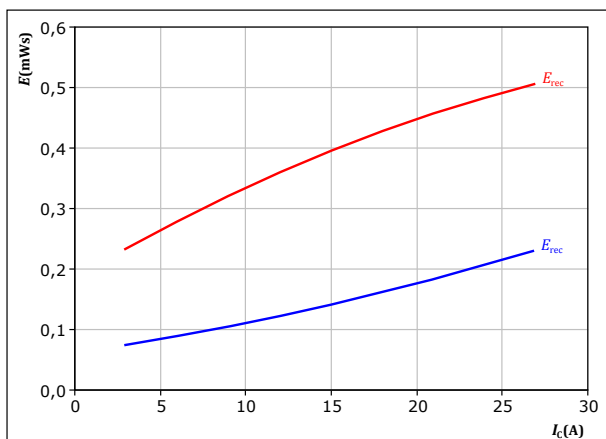
T_j : — 25 °C
— 125 °C

figure 36.

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

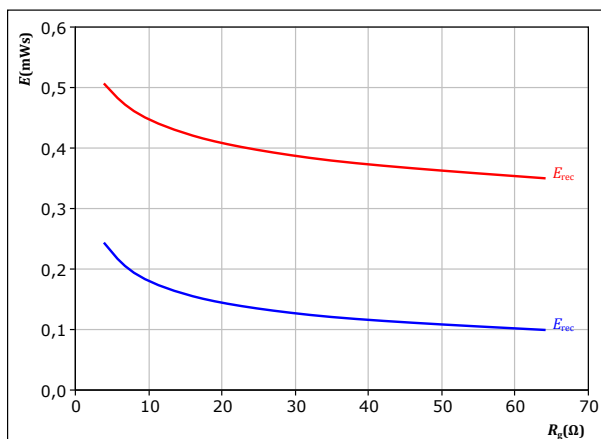
T_j : — 25 °C
— 125 °C

figure 37.

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
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A

T_j : — 25 °C
— 125 °C



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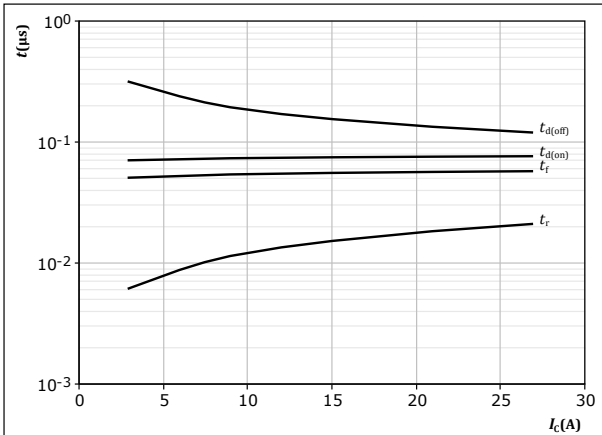
10-F112M3A025SH-M746F09
datasheet

Boost Switching Characteristics

figure 38.

IGBT

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



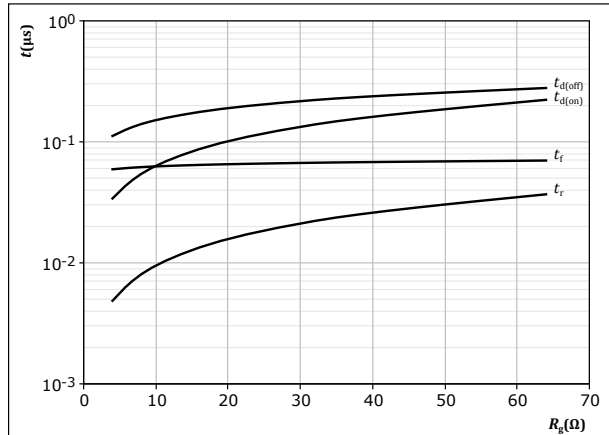
With an inductive load at

$T_j = 125$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

figure 39.

IGBT

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



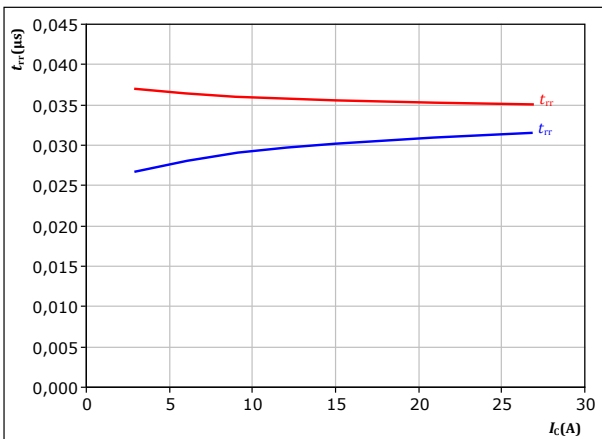
With an inductive load at

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

figure 40.

FWD

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



With an inductive load at

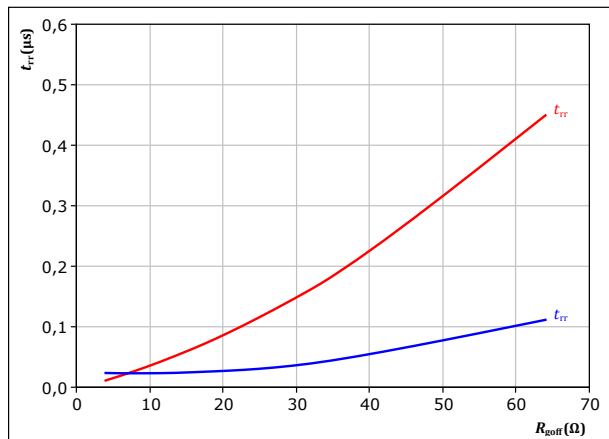
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

T_j : — 25 °C
— 125 °C

figure 41.

FWD

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



With an inductive load at

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

T_j : — 25 °C
— 125 °C



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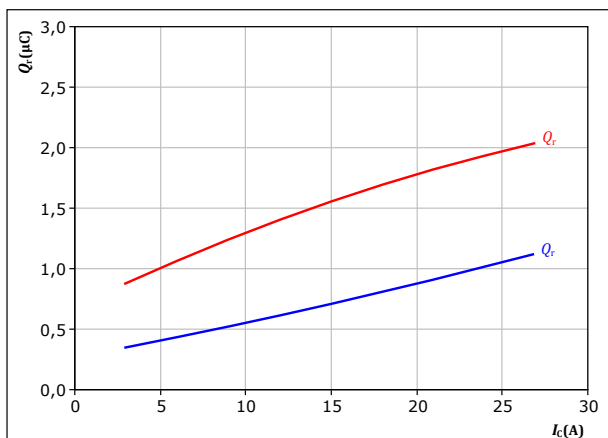
Boost Switching Characteristics

figure 42.

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
 $R_{gon} = 16$ Ω

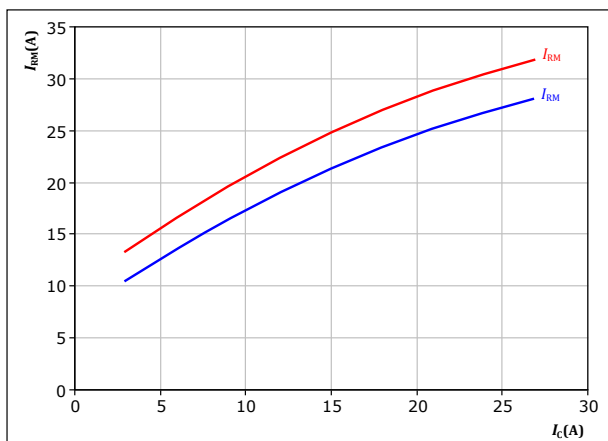
T_j : — 25 °C
— 125 °C

figure 44.

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
 $R_{gon} = 16$ Ω

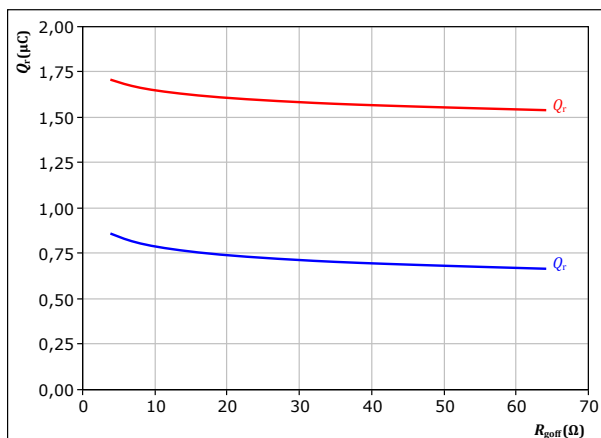
T_j : — 25 °C
— 125 °C

figure 43.

FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

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

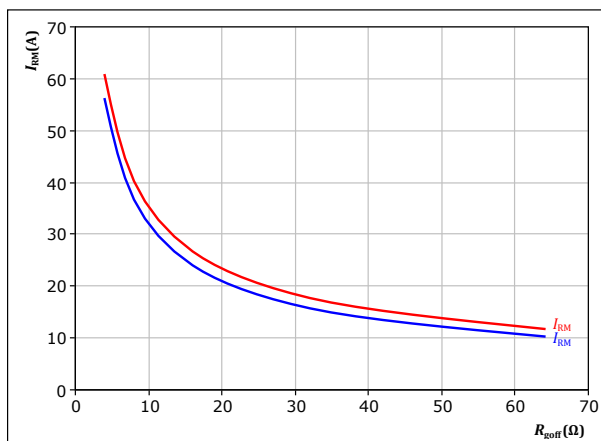
T_j : — 25 °C
— 125 °C

figure 45.

FWD

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

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



With an inductive load at

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

T_j : — 25 °C
— 125 °C



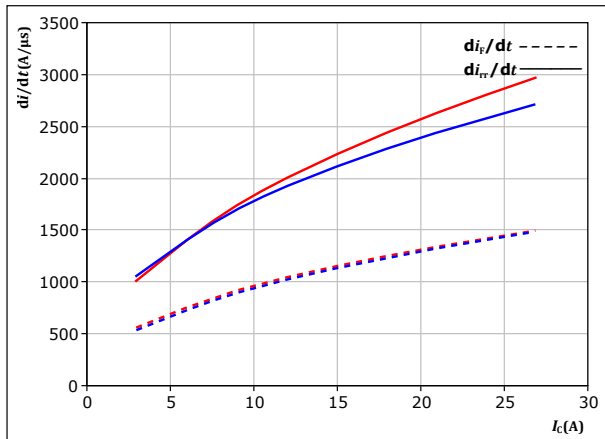
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datasheet

Boost Switching Characteristics

figure 46. FWD

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



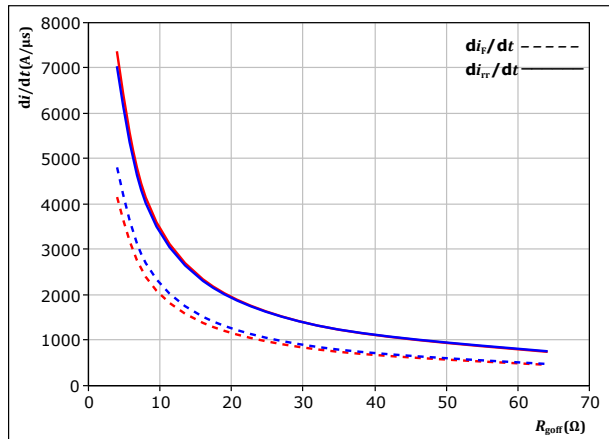
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{goff} = 16$ Ω

T_j : 25 °C
 125 °C

figure 47. FWD

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



With an inductive load at

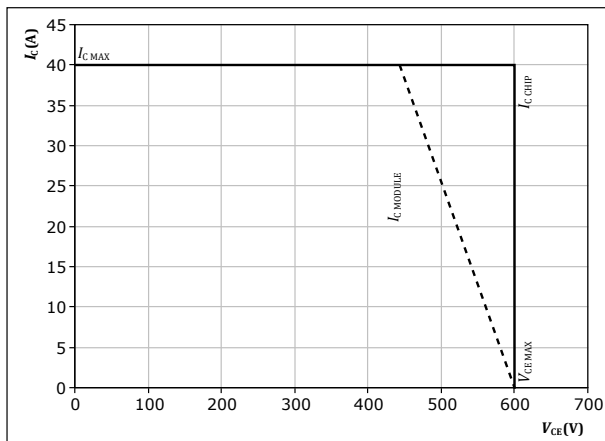
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A

T_j : 25 °C
 125 °C

figure 48. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 125$ °C
 $R_{goff} = 16$ Ω
 $R_{goff} = 16$ Ω



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Switching Definitions

figure 49. IGBT

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

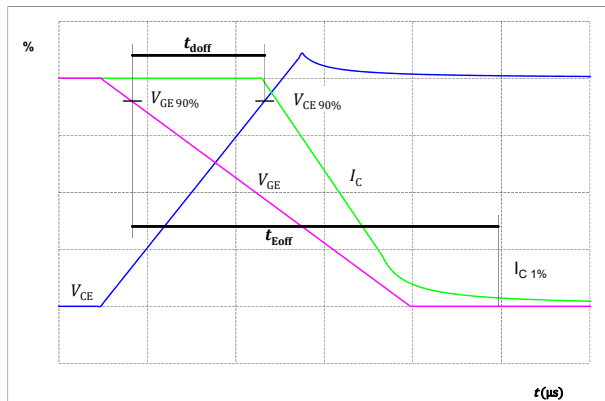


figure 50. IGBT

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

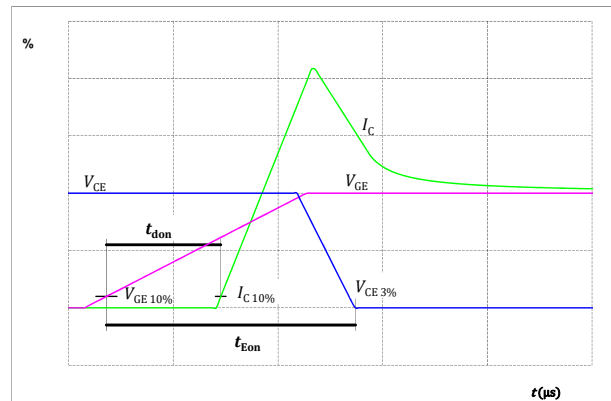


figure 51. IGBT

Turn-off Switching Waveforms & definition of t_f

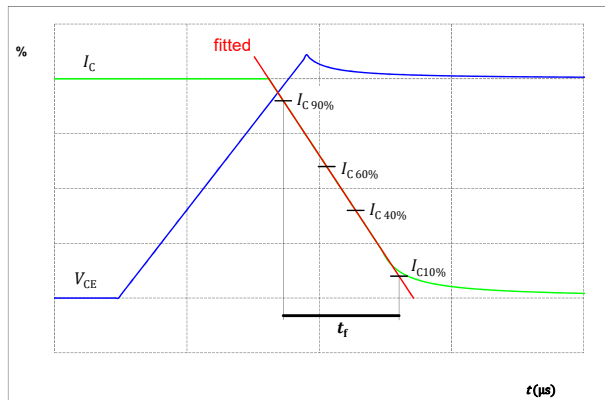
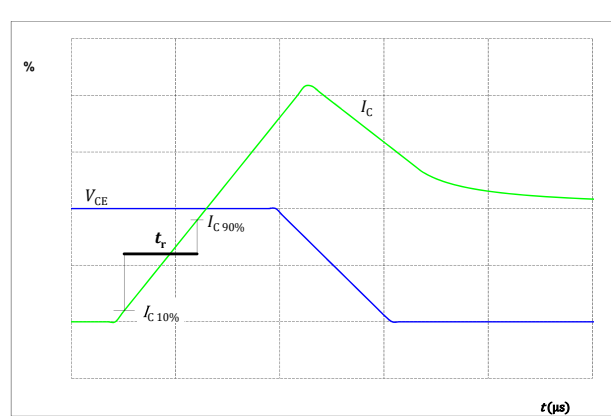


figure 52. IGBT

Turn-on Switching Waveforms & definition of t_r





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Switching Definitions

figure 53.

FWD

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

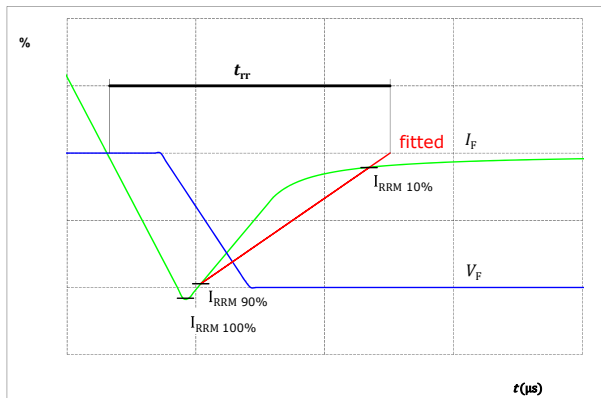
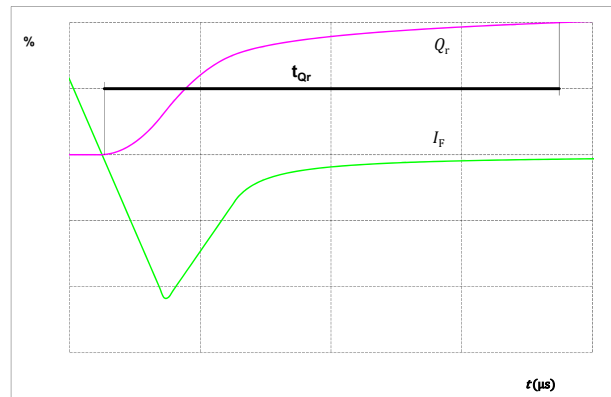


figure 54.

FWD

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





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datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-F112M3A025SH-M746F09
With thermal paste (5,2 W/mK, PTM6000HV)	10-F112M3A025SH-M746F09-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-F112M3A025SH-M746F09-/3/

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

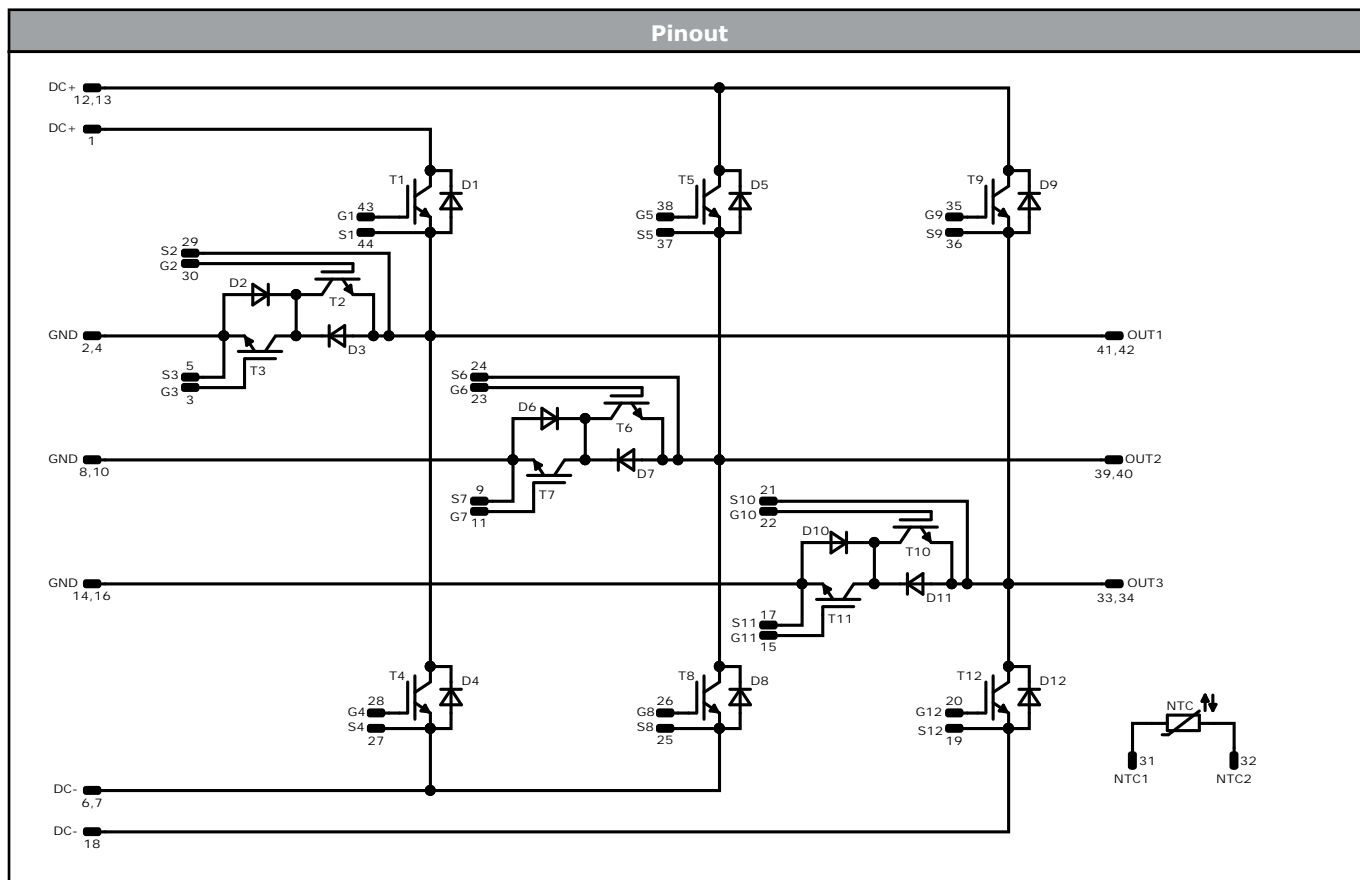
Outline				
Pin table [mm]				
Pin	X	Y	Function	
1	52,2	0	+DC	
2	46,2	0	GND	
3	47	3	G3	
4	40,9	0	GND	
5	44	3	S3	
6	34,9	0	-DC	
7	34,9	3	-DC	
8	28,9	0	GND	
9	25,9	2	S7	
10	22,9	0	GND	
11	22,9	3	G7	
12	16,9	0	+DC	
13	16,9	3	+DC	
14	10,9	0	GND	
15	10,9	3	G11	
16	6	0	GND	
17	7,9	3	S11	
18	0	0	-DC	
19	4,75	8,9	S12	
20	1,75	7,9	G12	
21	13,25	13,7	S10	
22	13,25	10,7	G10	
23	21,25	10,7	G6	
24	21,25	13,7	S6	
25	30,4	9,7	S8	
26	33,4	9,7	G8	
27	40,15	11,2	S4	
28	40,15	8,2	G4	
29	50,45	10,7	S2	
30	50,45	13,7	G2	
31	0	16,35	NTC	
32	0	19,35	NTC	
33	5,45	28,2	OUT3	
34	8,25	28,2	OUT3	
35	11,25	28,2	G9	
36	14,25	28,2	S9	
37	23	28,2	S5	
38	26	28,2	G5	
39	29	28,2	OUT2	
40	31,8	28,2	OUT2	
41	40,4	28,2	OUT1	
42	43,2	28,2	OUT1	
43	46,2	28,2	G1	
44	49,2	28,2	S1	

Tolerance of pinpositions: $\pm 0,5\text{mm}$ at the end of pins
Dimension of coordinate axis is only offset without tolerance



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datasheet



Identification					
ID	Component	Voltage	Current	Function	Comment
T1, T4, T5, T8, T9, T12	IGBT	1200 V	25 A	Buck Switch	
D2, D3, D6, D7, D10, D11	FWD	600 V	15 A	Buck Diode	
T3, T2, T7, T6, T11, T10	IGBT	600 V	20 A	Boost Switch	
D1, D4, D5, D8, D9, D12	FWD	1200 V	8 A	Boost Diode	
NTC	Thermistor			Thermistor	



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datasheet

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

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

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

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

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



Document No.:	Date:	Modification:	Pages
10-F112M3A025SH-M746F09-D6-14	19 Sep. 2021	New Datasheet format, module is unchanged Introduce Rth values with PSX-P7 TIM Separate datasheet for pressfit pin version	

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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.