



flow PACK 2 + R	1200 V / 75 A
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Features</p> <ul style="list-style-type: none"> Inverter, blocking diodes Built-in thermistor IGBT4 technology for low saturation losses </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Target Applications</p> <ul style="list-style-type: none"> Industrial Drives </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Types</p> <ul style="list-style-type: none"> 30-F212R6A075SC-M448E (with thermistor) 30-F212R6A075SC01-M448E10 (without thermistor) </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">flow 2 17 mm housing</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Schematic</p> </div>

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
DC Blocking Diode				
Repetitive peak reverse voltage	V_{RRM}		1600	V
DC forward current	I_{FAV}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	154	A
Surge forward current	I_{FSM}	$t_p = 10\text{ ms}$	1270	A
Power dissipation per Diode	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	189	W
Maximum Junction Temperature	T_{jmax}		150	°C
Inverter Switch				
Collector-emitter break down voltage	V_{CE}		1200	V
DC collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	85	A
Pulsed collector current	I_{CRM}	t_p limited by T_{jmax}	210	A
Turn off safe operating area		$V_{CE} \leq 1200\text{ V}$, $T_j \leq T_{op\ max}$	140	A
Power dissipation per IGBT	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	239	W
Gate-emitter peak voltage	V_{GE}		20	V
Short circuit ratings	t_{SC}	$T_j \leq 150\text{ °C}$	10	µs
	V_{CC}	$V_{GE} = 15\text{ V}$	800	V
Maximum Junction Temperature	T_{jmax}		175	°C

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

Parameter	Symbol	Condition	Value	Unit
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Inverter Diode

Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
DC forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	64	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Power dissipation per Diode	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	127	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_{op}		-40...+($T_{jmax} - 25$)	°C

Insulation Properties

Insulation voltage	V_{is}	DC Test Voltage* $t_p = 2\text{ s}$	4000	V
		Ac Voltage $t_p = 1\text{ min.}$	2500	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative tracking index	CTI		>200	

* 100 % Tested in production



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]	Min	Typ	Max		

DC Blocking Diode

Forward voltage	V_F				100	25 125		1,12 1,07	1,4	V
Threshold voltage (for power loss calc. only)	V_{to}				100	25 125		0,89 0,76		V
Slope resistance (for power loss calc. only)	r_t				100	25 125		2 3		mΩ
Reverse current	I_r				1500	25			0,1	mA
Thermal resistance chip to heatsink per chip	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,37		K/W

Inverter Switch

Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0024	25		5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 150		1,6	2 2,41	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25				0,02	μA
Gate-emitter leakage current	I_{GES}		20	0		25				240	nA
Integrated Gate resistor	R_{gint}							none			Ω
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 8 \Omega$ $R_{gon} = 8 \Omega$	±15	600	75	25			92,8	ns	
Rise time	t_r					150			23		
Turn-off delay time	$t_{d(off)}$					150			27		
Fall time	t_f					25			202		
						150			275		
Turn-on energy loss per pulse	E_{on}					25			4,49	mWs	
Turn-off energy loss per pulse	E_{off}					150			6,5		
						25			3,91		
Input capacitance	C_{ies}					150			6,91		
Output capacitance	C_{oss}	$f = 1 \text{ MHz}$	0	25		25			3900	pF	
Reverse transfer capacitance	C_{rss}								310		
Gate charge	Q_G		±15	960	75	25			230	nC	
Thermal resistance chip to heatsink per chip	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)							0,4		K/W

Inverter Diode

Diode forward voltage	V_F				50	25 150		1,1	1,74 1,77	2,3	V
Peak reverse recovery current	I_{RRM}	$R_{gon} = 8 \Omega$	±15	600	75	25			71,53	ns	
Reverse recovery time	t_{rr}					150			85,7		
Reverse recovered charge	Q_{rr}					25			271,4		
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					150			308,2		
Reverse recovered energy	E_{rec}					25			6,03		
		150			11,73						
		25			2648						
		150			602						
		25			2,28						
		150			4,71						
Thermal resistance chip to heatsink per chip	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)							0,75		K/W

Thermistor

Rated resistance	R					25			22000		Ω
Deviation of R_{100}	$\Delta R/R$	$R_{100} = 1486 \Omega$				100		-12		14	%
Power dissipation	P					25			200		mW
Power dissipation constant						25			2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25			3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25			3998		K
Vincotech NTC Reference						25				B	

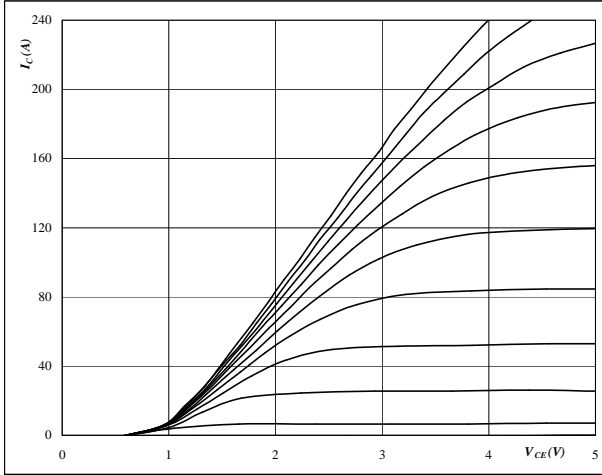


Inverter Switch/Inverter Diode

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



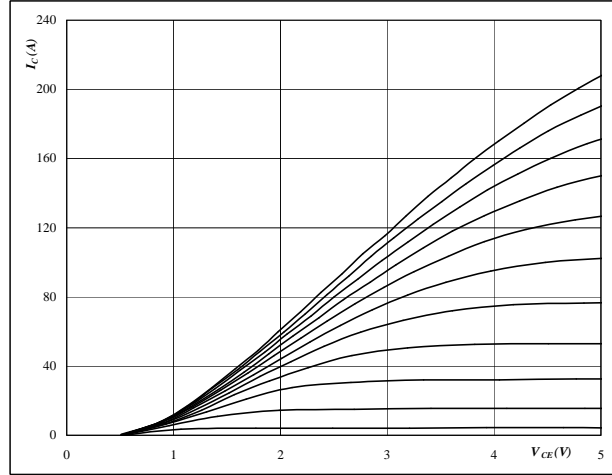
At

$t_p = 250 \mu s$
 $T_j = 25 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



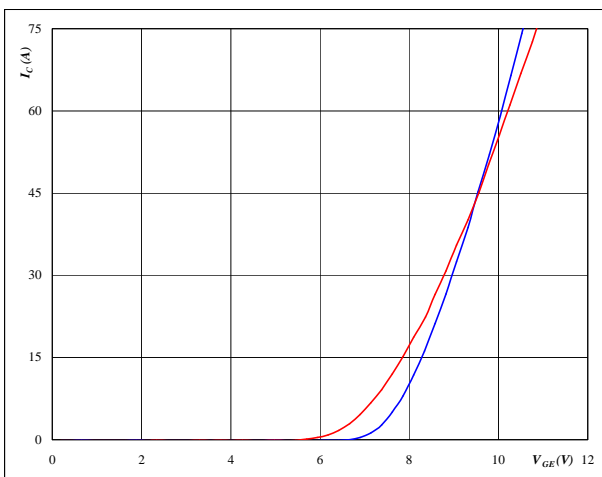
At

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

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



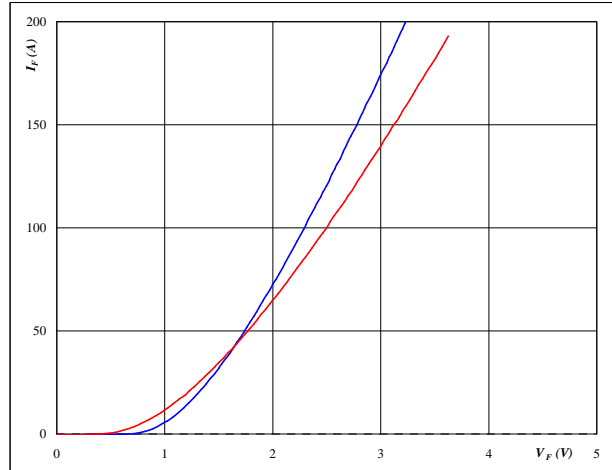
At

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

figure 4. FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

$T_j = 25/150 \text{ } ^\circ C$
 $t_p = 250 \mu s$

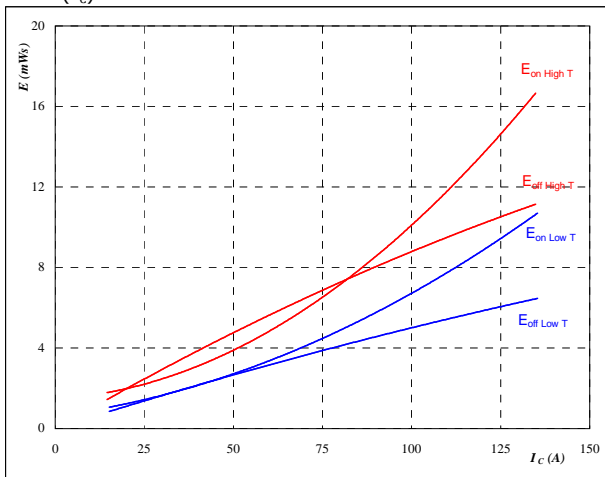


Inverter Switch/Inverter Diode

figure 5. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



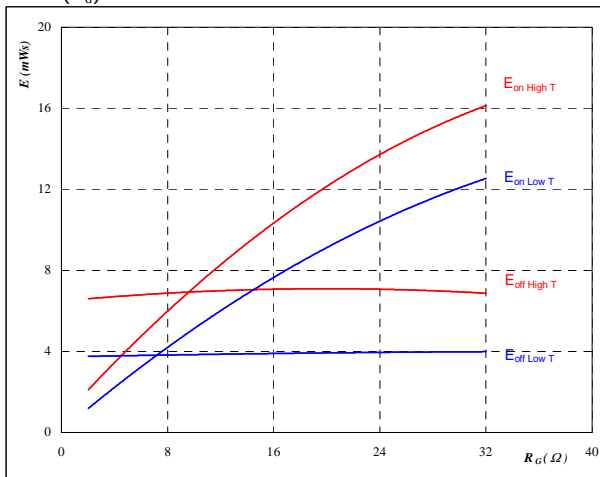
With an inductive load at

- $T_j = 25/150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $R_{gon} = 8$ Ω
- $R_{goff} = 8$ Ω

figure 6. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



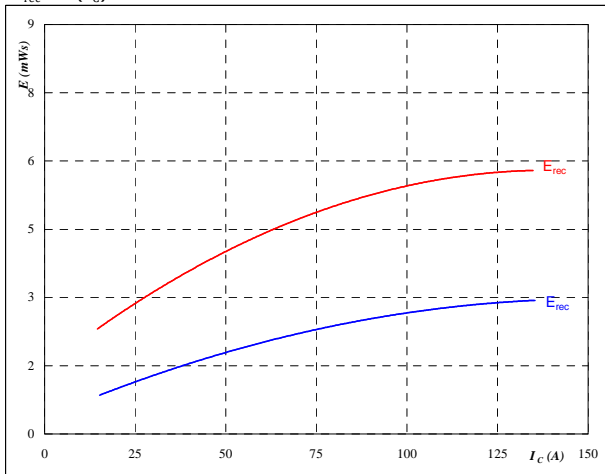
With an inductive load at

- $T_j = 25/150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $I_C = 75$ A

figure 7. FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



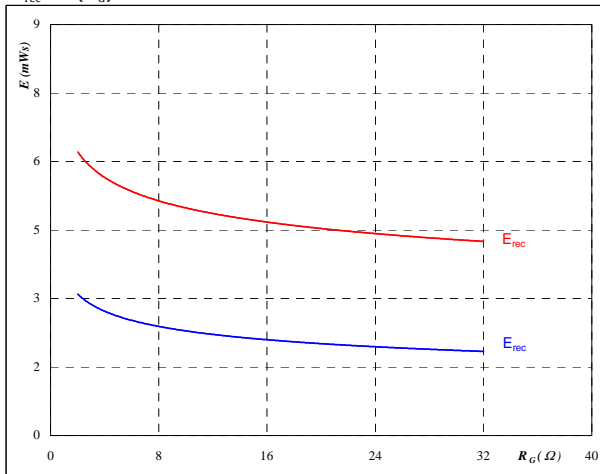
With an inductive load at

- $T_j = 25/150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $R_{gon} = 8$ Ω

figure 8. FWD

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
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $I_C = 75$ A

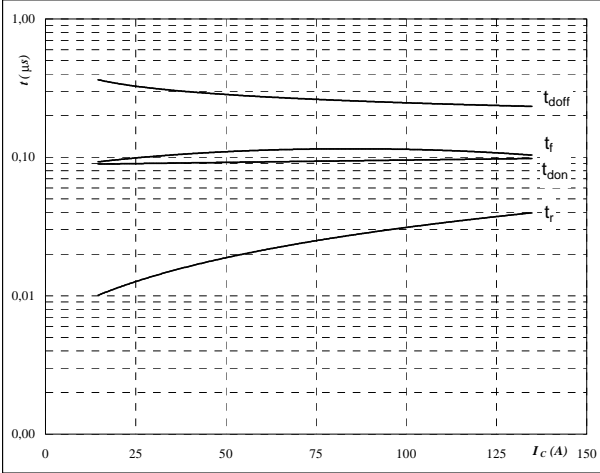


Inverter Switch/Inverter Diode

figure 9. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



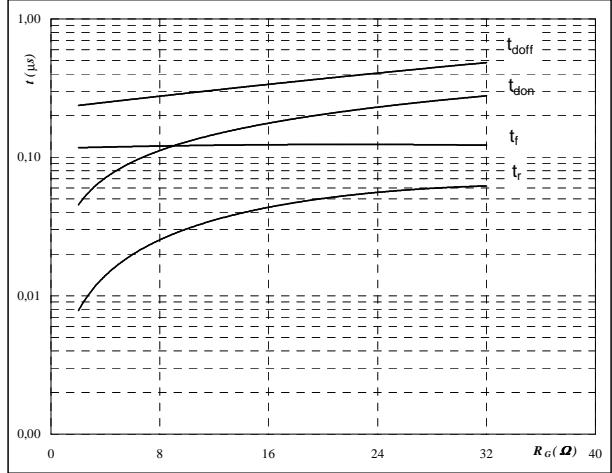
With an inductive load at

- $T_j = 150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $R_{gon} = 8$ Ω
- $R_{goff} = 8$ Ω

figure 10. IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



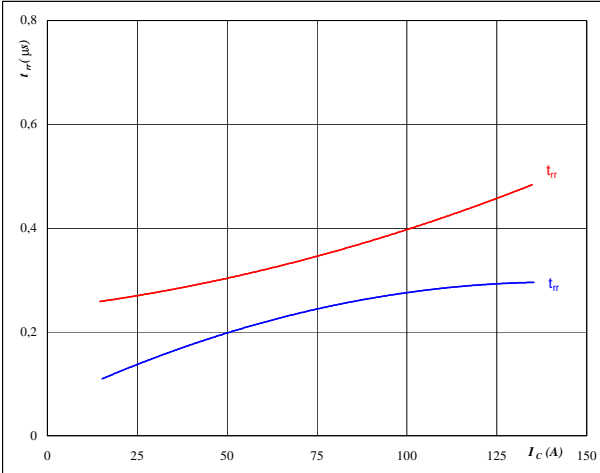
With an inductive load at

- $T_j = 150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $I_C = 75$ A

figure 11. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



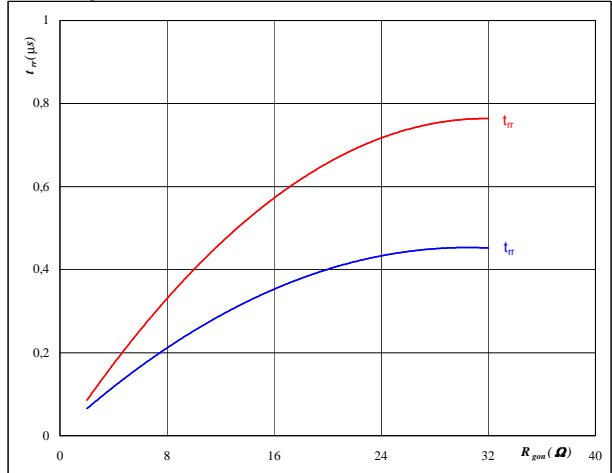
At

- $T_j = 25/150$ °C
- $V_{CE} = 600$ V
- $V_{GE} = \pm 15$ V
- $R_{gon} = 8$ Ω

figure 12. FWD

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

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



At

- $T_j = 25/150$ °C
- $V_R = 600$ V
- $I_F = 75$ A
- $V_{GE} = \pm 15$ V

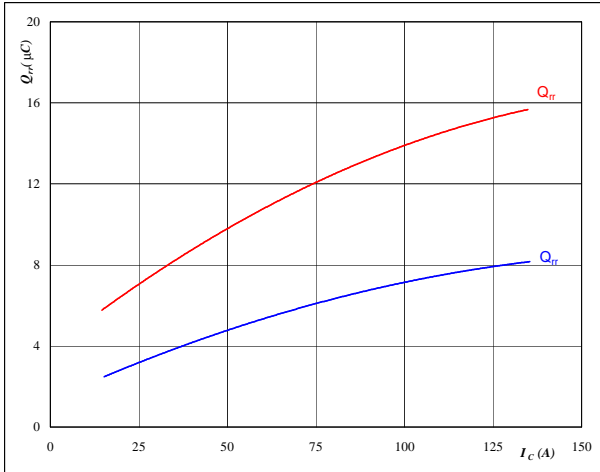


Inverter Switch/Inverter Diode

figure 13. FWD

Typical reverse recovery charge as a function of collector current

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



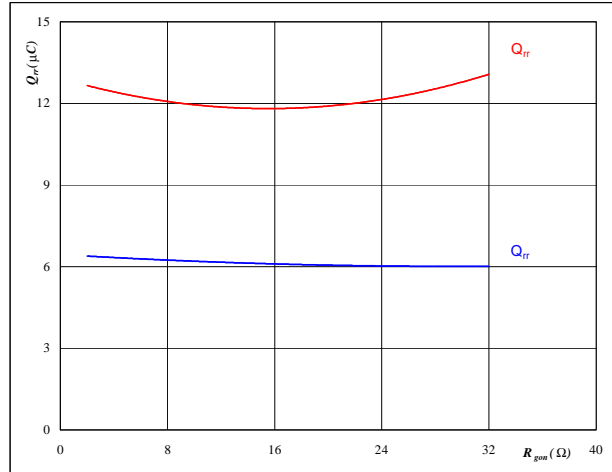
At

$T_j = 25/150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

figure 14. FWD

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

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



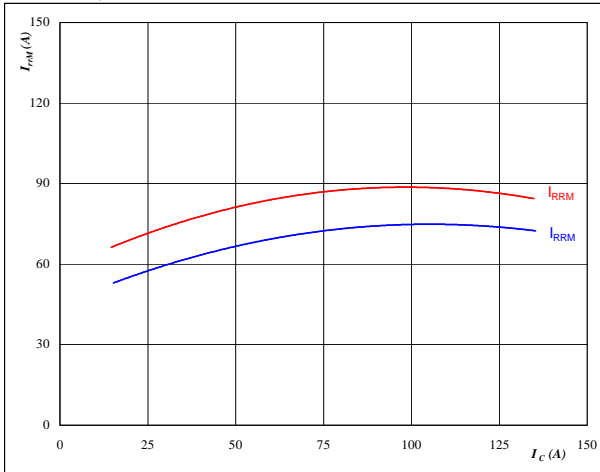
At

$T_j = 25/150$ °C
 $V_R = 600$ V
 $I_F = 75$ A
 $V_{GE} = \pm 15$ V

figure 15. FWD

Typical reverse recovery current as a function of collector current

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



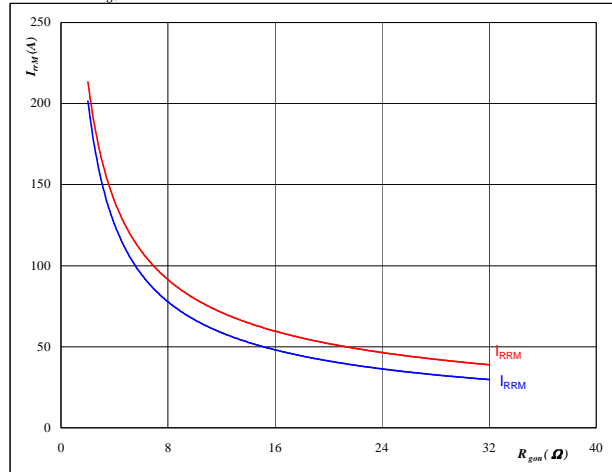
At

$T_j = 25/150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

figure 16. FWD

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

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



At

$T_j = 25/150$ °C
 $V_R = 600$ V
 $I_F = 75$ A
 $V_{GE} = \pm 15$ V

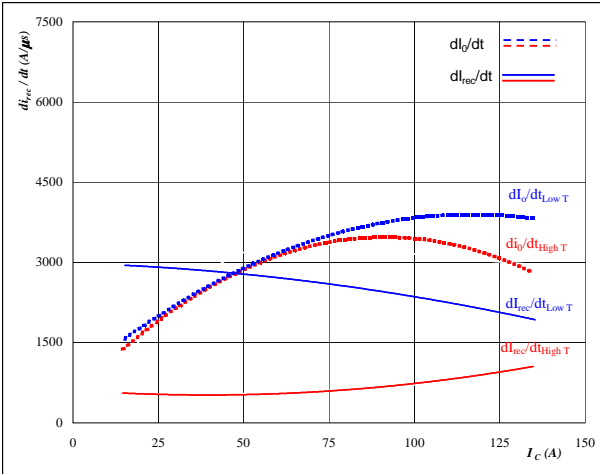


Inverter Switch/Inverter Diode

figure 17. FWD

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

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

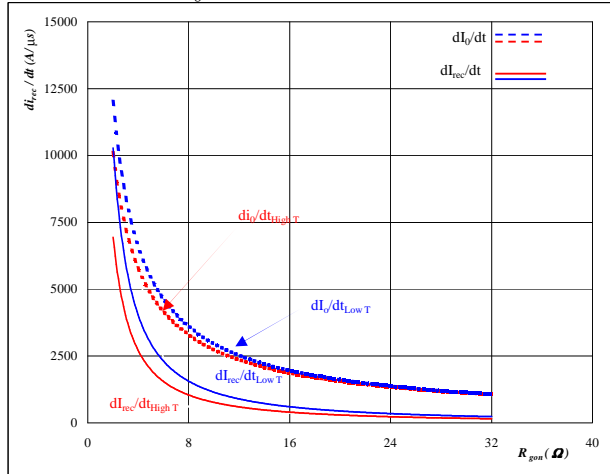


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

figure 18. FWD

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

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

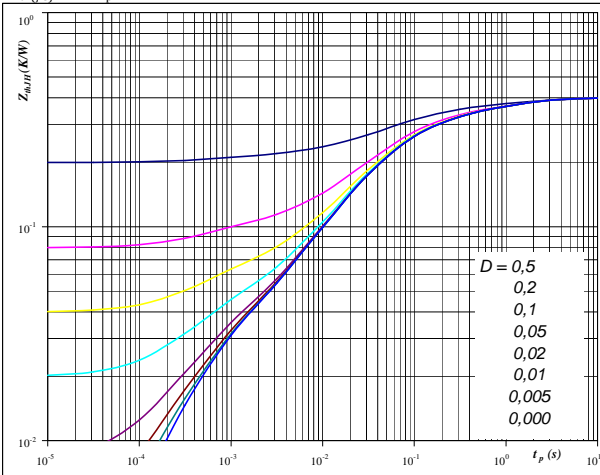


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_R = 600 \text{ V}$
 $I_F = 75 \text{ A}$
 $V_{GE} = \pm 15 \text{ V}$

figure 19. IGBT

IGBT transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{th(j-s)} = 0,40 \text{ K/W}$

IGBT thermal model values

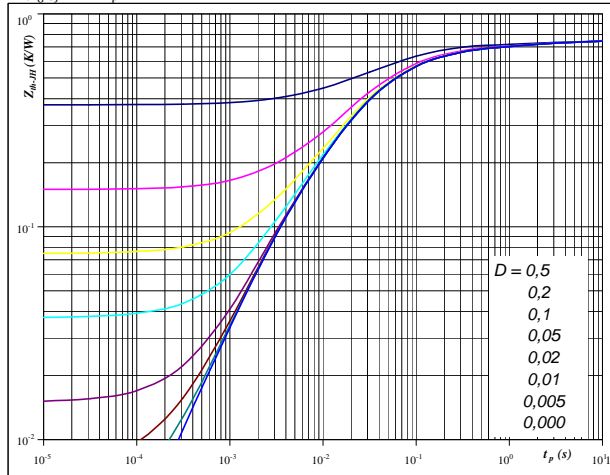
Phase-Change Material

R (K/W)	Tau (s)
6,24E-02	1,56E+00
9,03E-02	2,15E-01
1,40E-01	5,06E-02
6,78E-02	1,56E-02
1,66E-02	3,11E-03
2,14E-02	4,58E-04

figure 20. FWD

FWD transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{th(j-s)} = 0,75 \text{ K/W}$

FWD thermal model values

Phase-Change Material

R (K/W)	Tau (s)
4,26E-02	3,64E+00
6,76E-02	6,18E-01
2,53E-01	8,65E-02
3,23E-01	2,11E-02
6,24E-02	3,47E-03

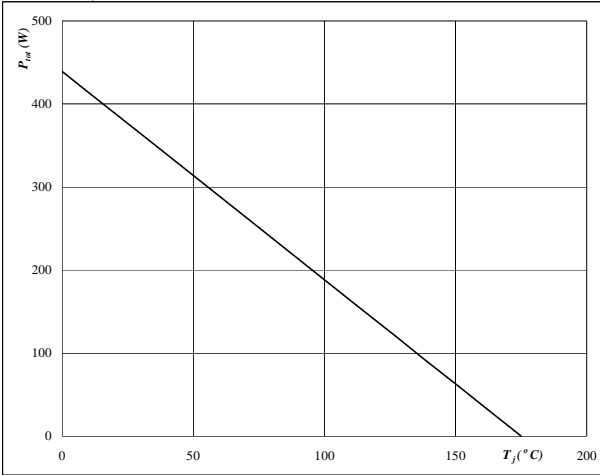


Inverter Switch/Inverter Diode

figure 21. IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$

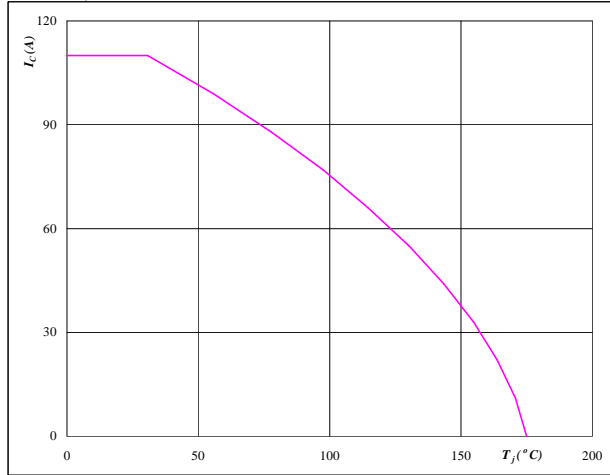


At
T_j = 175 °C

figure 22. IGBT

Collector current as a function of heatsink temperature

$I_c = f(T_j)$

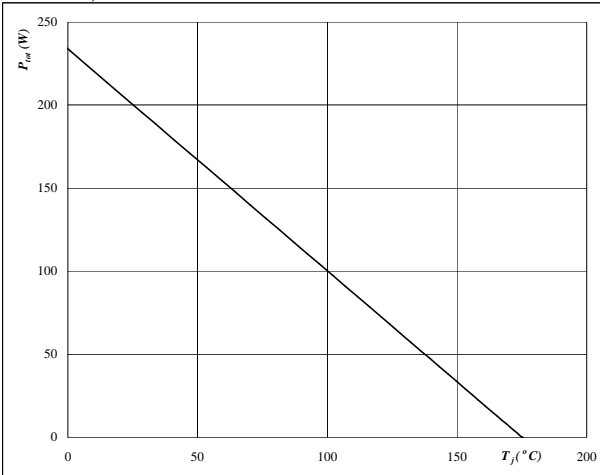


At
T_j = 175 °C
V_{GE} = 15 V

figure 23. FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$

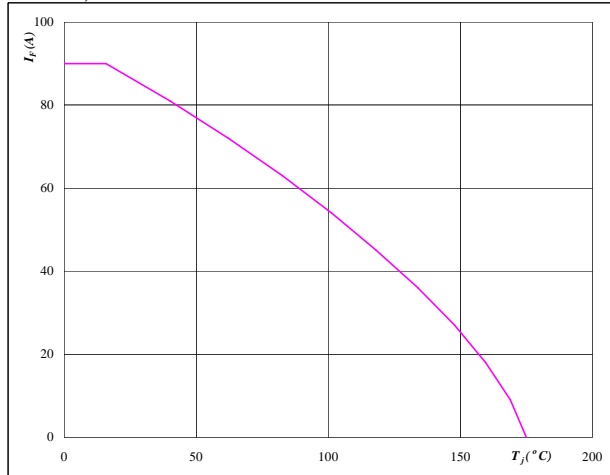


At
T_j = 175 °C

figure 24. FWD

Forward current as a function of heatsink temperature

$I_F = f(T_j)$



At
T_j = 175 °C

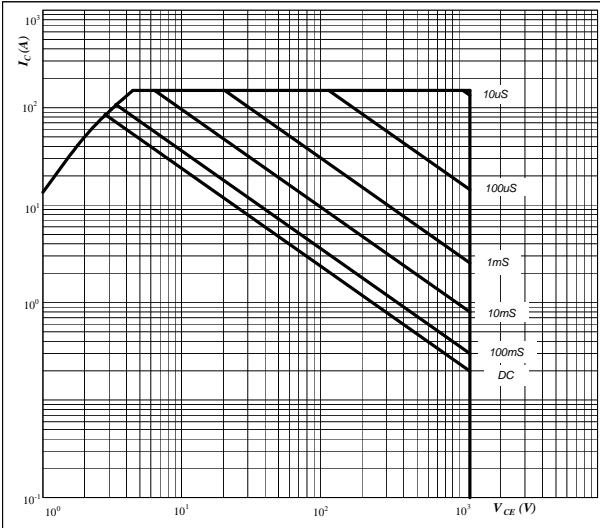


Inverter Switch/Inverter Diode

figure 25. IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$

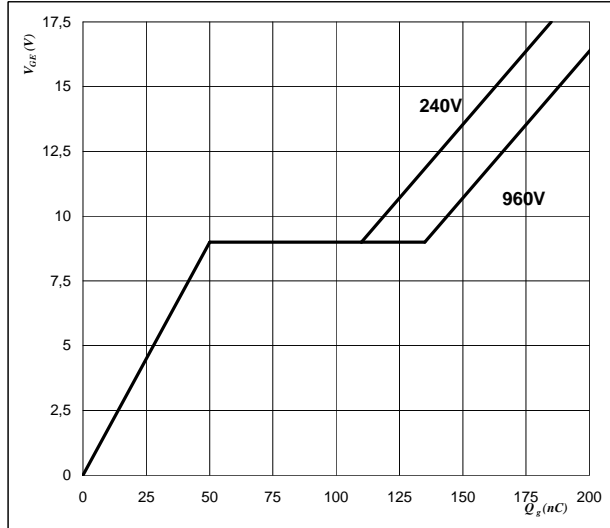


At
 $D =$ single pulse
 $T_s =$ 80 °C
 $V_{GE} =$ ±15 V
 $T_j = T_{jmax}$

figure 26. IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$

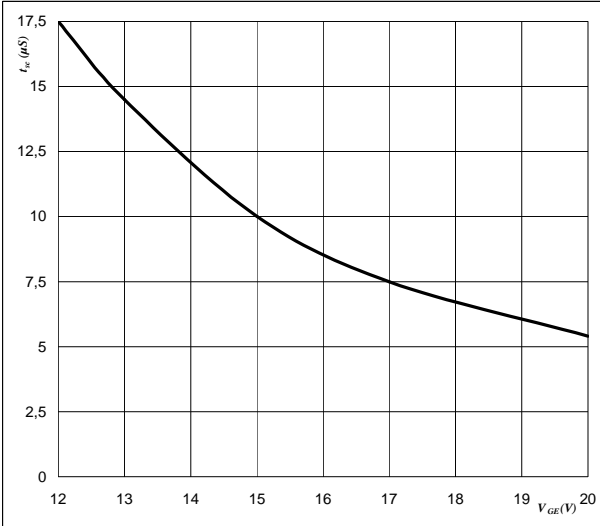


At
 $I_C =$ 75 A

figure 27. IGBT

Short circuit withstand time as a function of gate-emitter voltage

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

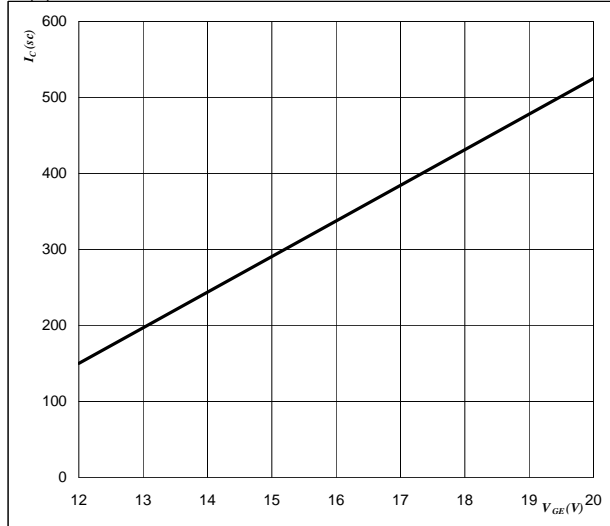


At
 $V_{CE} =$ 1200 V
 $T_j \leq$ 175 °C

figure 28. IGBT

Typical short circuit collector current as a function of gate-emitter voltage

$I_{C(sc)} = f(V_{GE})$

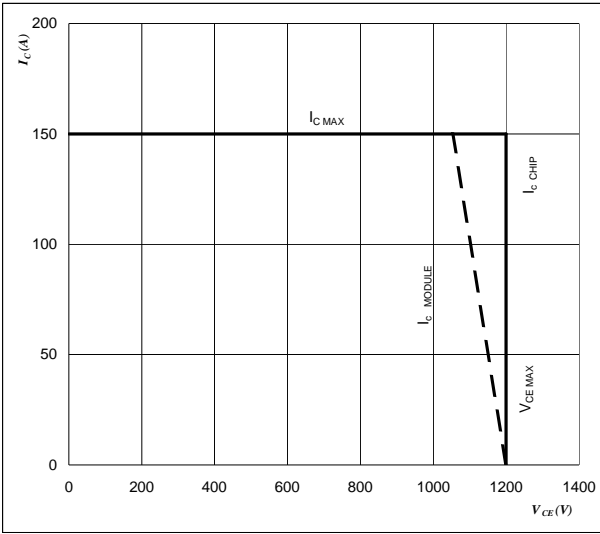


At
 $V_{CE} \leq$ 1200 V
 $T_j =$ 175 °C



figure 29. IGBT
Reverse bias safe operating area

$I_C = f(V_{CE})$



At

- $T_j = 150\ ^\circ\text{C}$
- $R_{gon} = 8\ \Omega$
- $R_{goff} = 8\ \Omega$

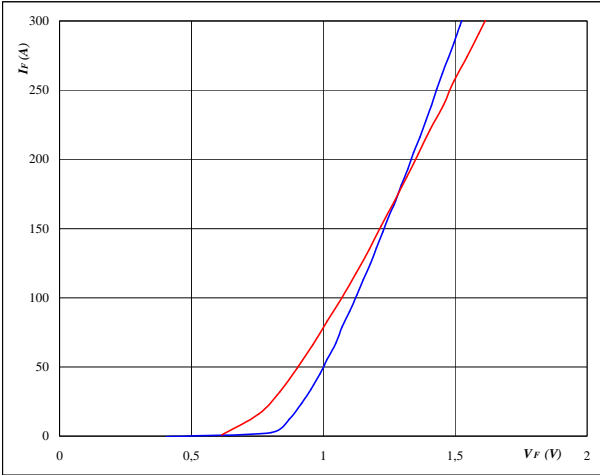


DC Blocking Diode

figure 1. DC Blocking diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$

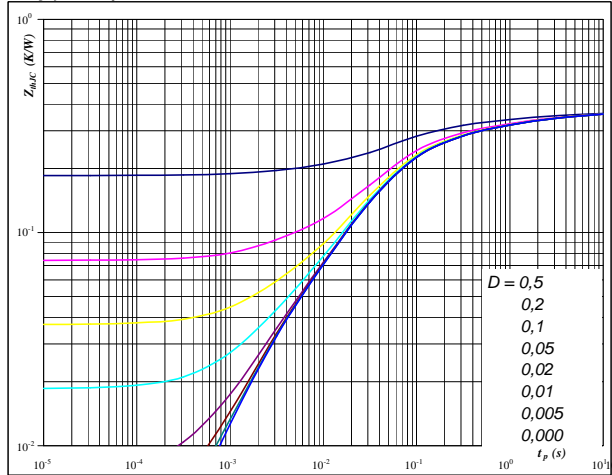


At
 $T_j = 25/125 \text{ } ^\circ\text{C}$
 $t_p = 250 \text{ } \mu\text{s}$

figure 2. DC Blocking diode

Diode transient thermal impedance as a function of pulse width

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

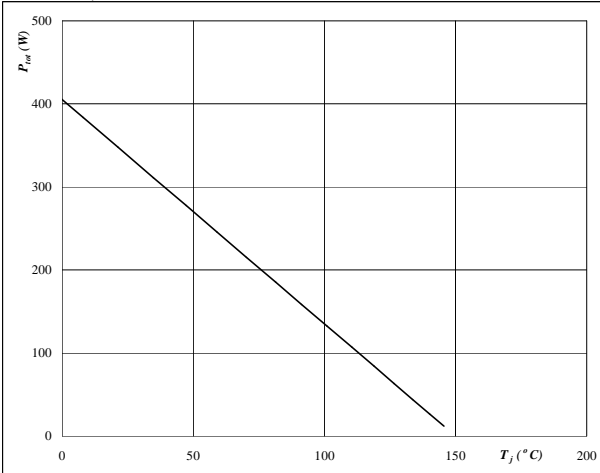


At
 $D = t_p / T$
 $R_{th(j-s)} = 0,37 \text{ K/W}$

figure 3. DC Blocking diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$

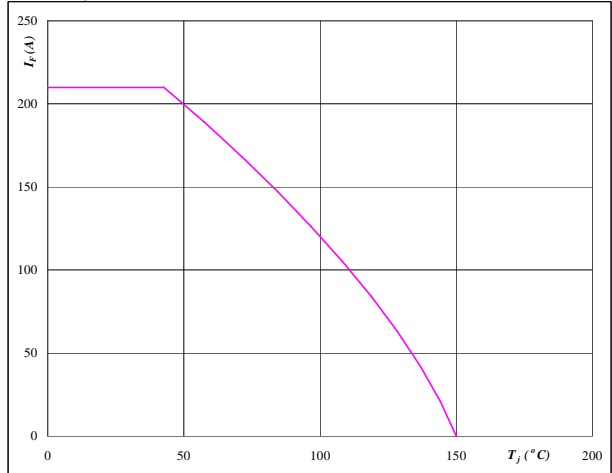


At
 $T_j = 150 \text{ } ^\circ\text{C}$

figure 4. DC Blocking diode

Forward current as a function of heatsink temperature

$I_F = f(T_j)$



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

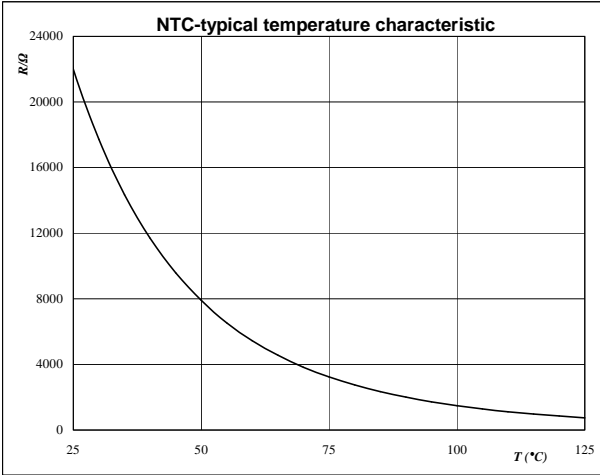


Thermistor

figure 1. Thermistor

**Typical NTC characteristic
as a function of temperature**

$$R_T = f(T)$$





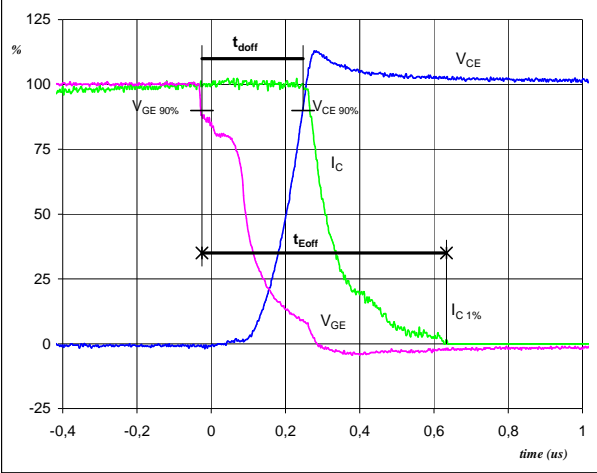
Switching Definitions Inverter

General conditions

T_j	=	150 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

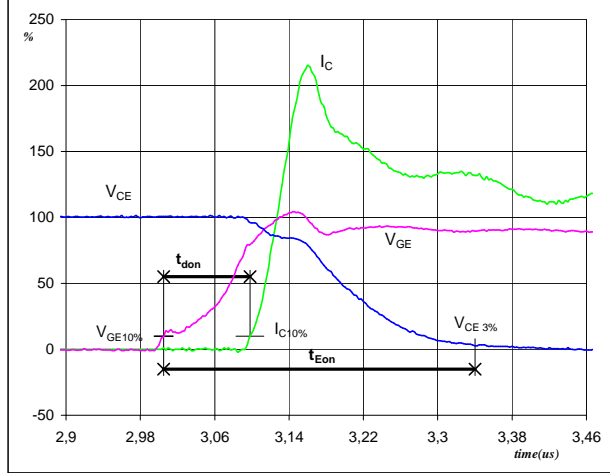
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff}
 (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	75	A
t_{doff} =	0,28	μs
t_{Eoff} =	0,66	μs

figure 2. IGBT

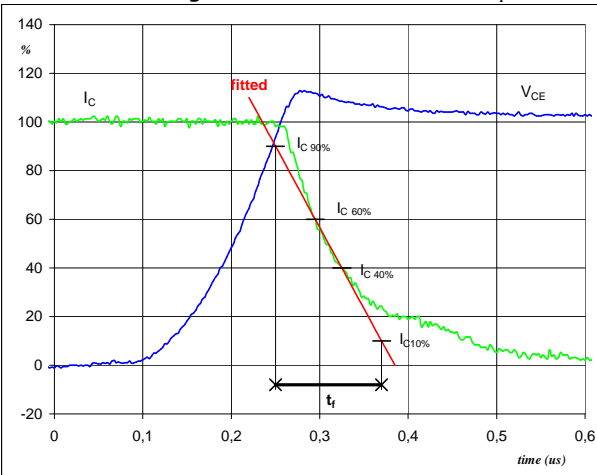
Turn-on Switching Waveforms & definition of t_{donr} , t_{Eon}
 (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	75	A
t_{don} =	0,09	μs
t_{Eon} =	0,33	μs

figure 3. IGBT

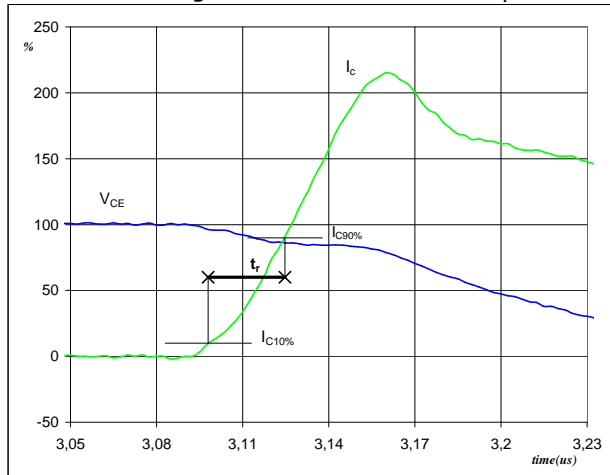
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	75	A
t_f =	0,12	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

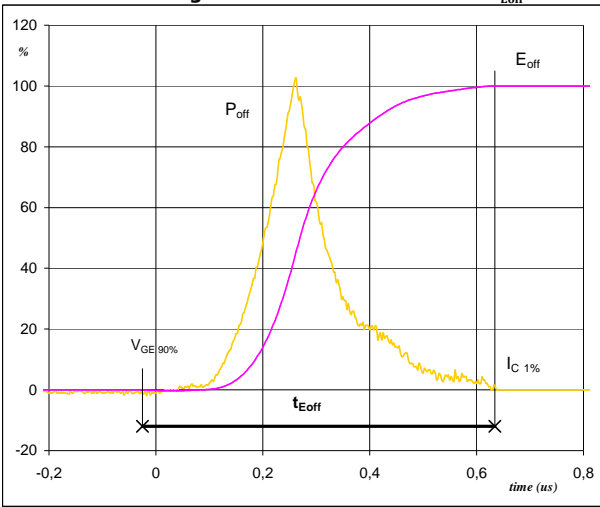


V_C (100%) =	600	V
I_C (100%) =	75	A
t_r =	0,03	μs



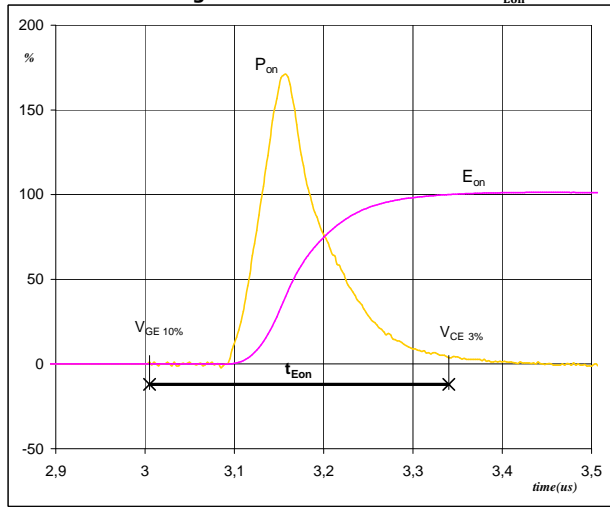
Switching Definitions Output Inverter

figure 5. IGBT
Turn-off Switching Waveforms & definition of t_{Eoff}



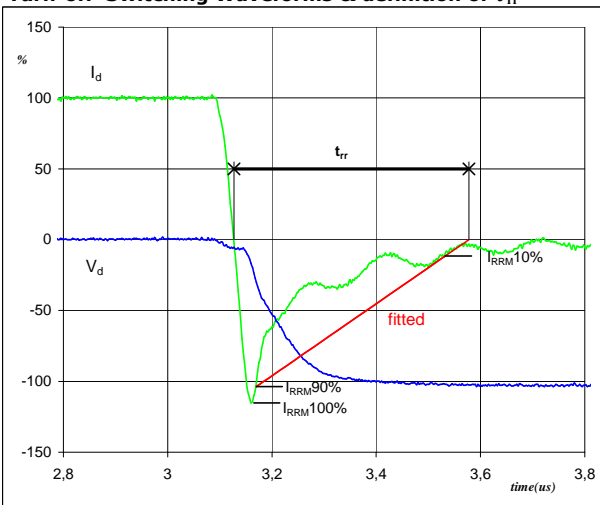
$P_{off} (100\%) = 44,82 \text{ kW}$
 $E_{off} (100\%) = 6,91 \text{ mJ}$
 $t_{Eoff} = 0,66 \text{ }\mu\text{s}$

figure 6. IGBT
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on} (100\%) = 44,82 \text{ kW}$
 $E_{on} (100\%) = 6,50 \text{ mJ}$
 $t_{Eon} = 0,33 \text{ }\mu\text{s}$

figure 7. FWD
Turn-off Switching Waveforms & definition of t_{rr}



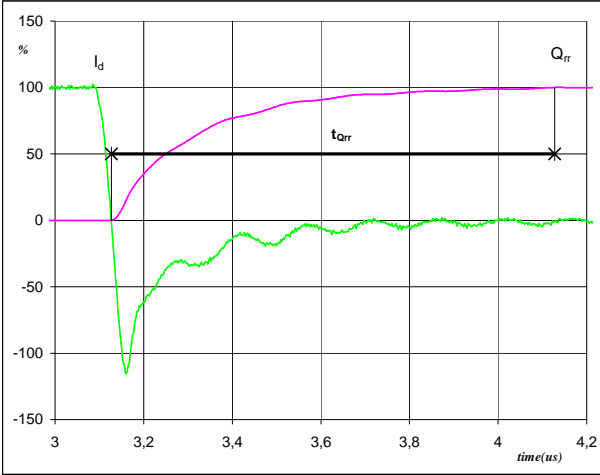
$V_d (100\%) = 600 \text{ V}$
 $I_d (100\%) = 75 \text{ A}$
 $I_{RRM} (100\%) = -86 \text{ A}$
 $t_{rr} = 0,31 \text{ }\mu\text{s}$



Switching Definitions Output Inverter

figure 8. FWD

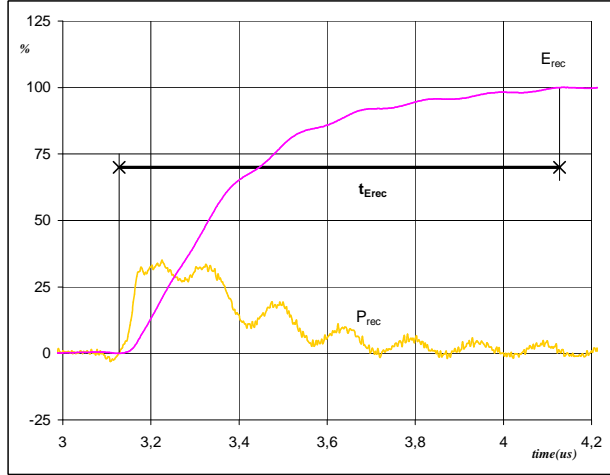
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	11,73	μC
t_{Qrr} =	1,00	μs

figure 9. FWD

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



P_{rec} (100%) =	44,82	kW
E_{rec} (100%) =	4,71	mJ
t_{Erec} =	1,00	μs

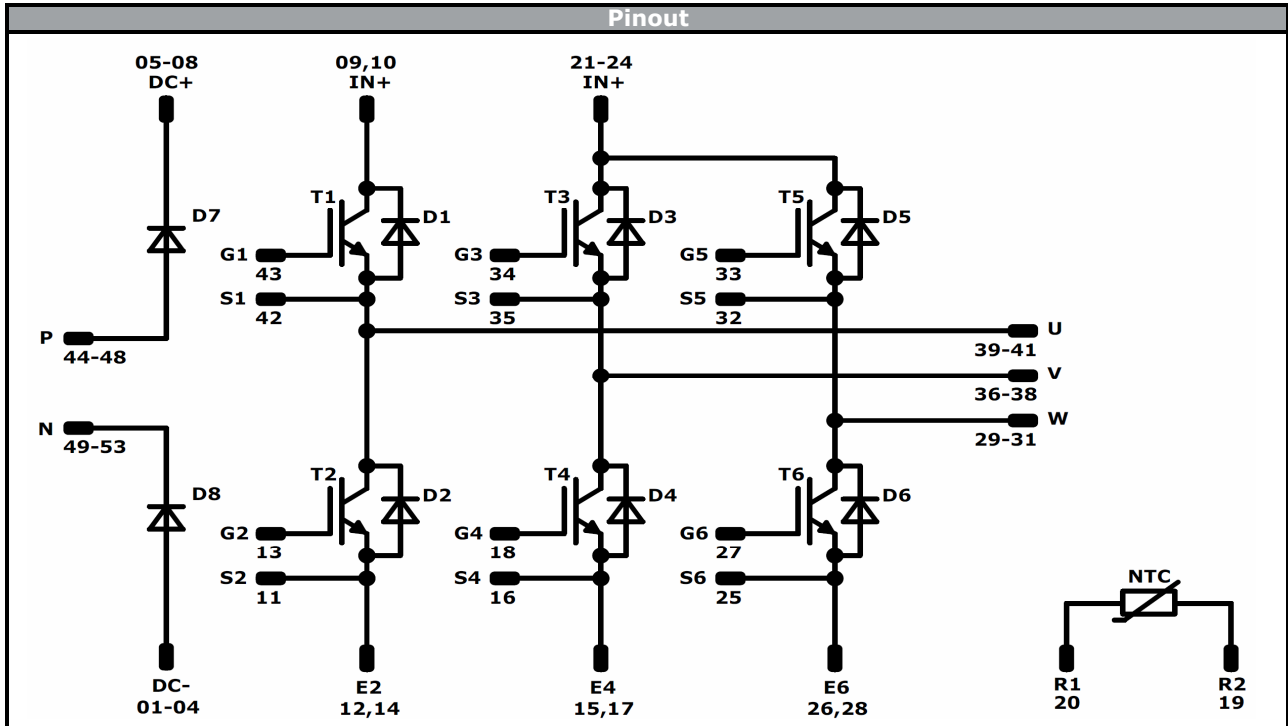


Ordering Code & Marking						
Version			Ordering Code			
without thermal paste 17 mm housing with solder pins with thermistor			30-F212R6A075SC-M448E			
with thermal paste 17 mm housing with solder pins with thermistor			30-F212R6A075SC-M448E-/3/			
without thermal paste 17 mm housing with solder pins without thermistor			30-F212R6A075SC01-M448E10			
with thermal paste 17 mm housing with solder pins without thermistor			30-F212R6A075SC01-M448E10-/3/			
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTVV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline							
Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	71,2	0	DC-	32	7,8	37,2	S5
2	68,7	0	DC-	33	10,6	37,2	G5
3	66,2	0	DC-	34	18,45	37,2	G3
4	63,7	0	DC-	35	21,25	37,2	G3
5	55,95	0	DC+	36	24,05	37,2	V
6	53,45	0	DC+	37	26,55	37,2	V
7	55,95	2,8	DC+	38	29,05	37,2	V
8	53,45	2,8	DC+	39	36,1	37,2	U
9	48,4	0	IN+	40	38,6	37,2	U
10	45,9	0	IN+	41	41,1	37,2	U
11	38,9	0	S2	42	43,9	37,2	S1
12	36,1	0	E2	43	46,7	37,2	G1
13	38,9	2,8	G2	44	53,7	37,2	P
14	36,1	2,8	E2	45	56,2	37,2	P
15	31,3	0	E4	46	58,7	37,2	P
16	28,5	0	S4	47	71,2	37,2	P
17	31,3	2,8	E4	48	71,2	34,7	P
18	28,5	2,8	G4	49	71,2	25,2	N
19*	19,3	0	R2	50	71,2	22,7	N
20*	19,3	2,8	R1	51	71,2	20,2	N
21	12,3	0	IN+	52	68,7	12,8	N
22	9,8	0	IN+	53	71,2	12,8	N
23	12,3	2,8	IN+	54	Not assembled		
24	9,8	2,8	IN+	55			
25	2,8	0	S6	56			
26	0	0	E6				
27	2,8	2,8	G6				
28	0	2,8	E6				
29	0	37,2	W				
30	2,5	37,2	W				
31	5	37,2	W				

Tolerance of positions: ±0.05mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

* Not assembled in 30-F212R6A075SC01-M448E10




Identification					
ID	Component	Voltage	Current	Function	Comment
D7 , D8	FWD	1600 V	100 A	DC Blocking Diode	
T1 - T6	IGBT	1200 V	70 A	Inverter Switch	
D1 - D6	FWD	1200 V	50 A	Inverter Diode	
NTC	Thermistor			Thermistor	Not assembled in 30-F212R6A075SC01-M448E10



Packaging instruction			
Standard packaging quantity (SPQ)	36	>SPQ Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 2</i> packages see vincotech.com website.

Package data
Package data for <i>flow 2</i> packages see vincotech.com website.

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

Document No.:	Date:	Modification:	Pages
30-F212R6A075SCx-M448Ex-D4-14	17 oct. 2017	logo, SPQ corrected	All

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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.