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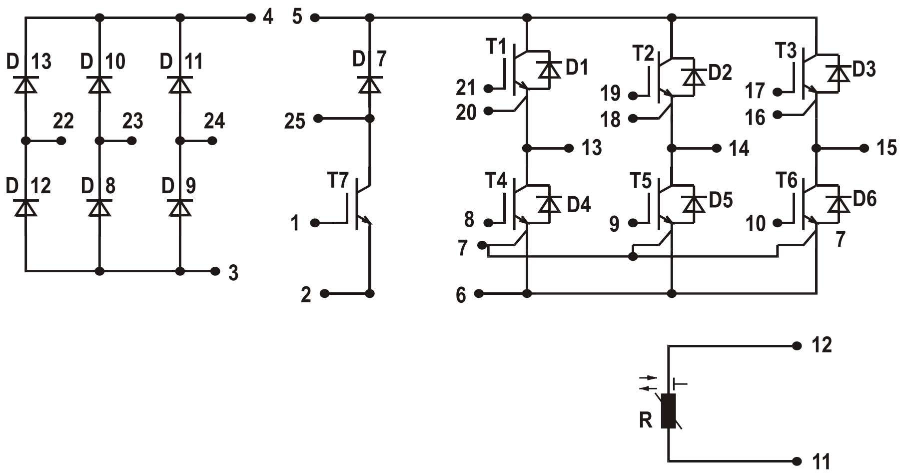
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

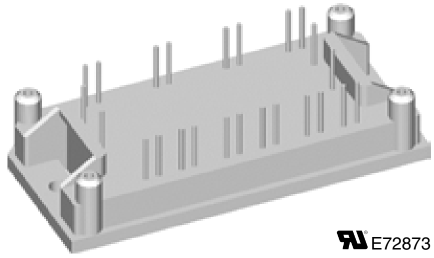
Converter - Brake - Inverter Module
XPT IGBT

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{DAVM25} = 150 A	I_{C25} = 17 A	I_{C25} = 28 A
I_{FSM} = 320 A	$V_{CE(sat)}$ = 1.8 V	$V_{CE(sat)}$ = 1.8 V

Part name (Marking on product)

MIXA20WB1200TML





E72873

Pin configuration see outlines.

Features:

- High level of integration - only one power semiconductor module required for the whole drive
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - square RBSOA @ 3x I_C
  - low EMI
- Thin wafer technology combined with the XPT design results in a competitive low $V_{CE(sat)}$
- Temperature sense included
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

Application:

- AC motor drives
- Pumps, Fans
- Washing machines
- Air-conditioning system
- Inverter and power supplies

Package:

- DCB based "E1-Pack"
- Assembly height is 17 mm
- Insulated base plate
- UL registered E72873

IXYS reserves the right to change limits, test conditions and dimensions.

20101103c

Ouput Inverter T1 - T6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C			1200	V
V_{GES} V_{GEM}	*max. DC gate voltage* *max. transient collector gate voltage*	continuous transient				±20 ±30	V V
I_{C25} I_{C80}	*collector current*		T_C = 25°C T_C = 80°C			28 20	A A
P_{tot}	*total power dissipation*		T_C = 25°C			100	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 16 A; V_{GE} = 15 V	T_{VJ} = 25°C T_{VJ} = 125°C		1.8 2.1	2.1	V V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 0.6 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	5.5	6.0	6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		0.02 0.2	0.2	mA mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 15 A			48		nC
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 15 A V_{GE} = ±15 V; R_G = 56 Ω	T_{VJ} = 125°C		70 40 250 100 1.55 1.7		ns ns ns ns mJ mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 56 Ω; V_{CEK} = 1200 V	T_{VJ} = 125°C			45	A
I_{SC} (SCSOA)	*short circuit safe operating area*	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 56 Ω; t_p = 10 µs; non-repetitive	T_{VJ} = 125°C		60		A
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per IGBT)			 0.42	1.26	K/W K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{RRM}	*max. repetitve reverse voltage*		T_{VJ} = 25°C			1200	V
I_{F25} I_{F80}	*forward current*		T_C = 25°C T_C = 80°C			33 22	A A
V_F	*forward voltage*	I_F = 20 A; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		1.95 1.95	2.2	V V
Q_{rr} I_{RM} t_{rr} E_{rec}	*reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_R = 600 V di_F/dt = -400 A/µs I_F = 20 A; V_{GE} = 0 V	T_{VJ} = 125°C		3 20 350 0.7		µC A ns mJ
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per diode)			 0.5	1.5	K/W K/W

IXYS reserves the right to change limits, test conditions and dimensions.

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Brake T7

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C			1200	V
V_{GES}	*max. DC gate voltage*	continuous				±20	V
V_{GEM}	*max. transient collector gate voltage*	transient				±30	V
I_{C25}	*collector current*		T_C = 25°C			17	A
I_{C80}			T_C = 80°C			12	A
P_{tot}	*total power dissipation*		T_C = 25°C			63	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 9 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.8	2.1	V
			T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 0.3 mA; $V_{GE} = V_{CE}$	T_{VJ} = 25°C	5.5	6.0	6.5	V
I_{CES}	*collector emitter leakage current*	$V_{CE} = V_{CES}$; V_{GE} = 0 V	T_{VJ} = 25°C		0.01	0.1	mA
			T_{VJ} = 125°C		0.1		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 10 A			27		nC
$t_{d(on)}$	*turn-on delay time*	inductive load V_{CE} = 600 V; I_C = 10 A V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 125°C		70		ns
t_r	*current rise time*				40		ns
$t_{d(off)}$	*turn-off delay time*				250		ns
t_f	*current fall time*				100		ns
E_{on}	*turn-on energy per pulse*				1.1		mJ
E_{off}	*turn-off energy per pulse*				1.1		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 100 Ω; V_{CEK} = 1200 V	T_{VJ} = 125°C			30	A
I_{SC} (SCSOA)	*short circuit safe operating area*	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 100 Ω; t_p = 10 µs; non-repetitive	T_{VJ} = 125°C		40		A
R_{thJC}	*thermal resistance junction to case*	(per IGBT)				2.0	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.7		K/W

Brake Chopper D7

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 150°C			1200	V
I_{F25}	*forward current*		T_C = 25°C			33	A
I_{F80}			T_C = 80°C			22	A
V_F	*forward voltage*	I_F = 20 A; V_{GE} = 0 V	T_{VJ} = 25°C		1.95	2.2	V
			T_{VJ} = 125°C		1.95		V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C		0.01	0.1	mA
			T_{VJ} = 125°C		0.1		mA
Q_{rr}	*reverse recovery charge*	V_R = 600 V di_F/dt = 400 A/µs I_F = 20 A; V_{GE} = 0 V	T_{VJ} = 125°C		3		µC
I_{RM}	*max. reverse recovery current*				20		A
t_{rr}	*reverse recovery time*				350		ns
E_{rec}	*reverse recovery energy*				0.7		mJ
R_{thJC}	*thermal resistance junction to case*	(per diode)				1.5	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.5		K/W

IXYS reserves the right to change limits, test conditions and dimensions.

Input Rectifier Bridge D8 - D11

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1600	V
I_{FAV} I_{DAVM}	*average forward current* *max. average DC output current*	sine 180° rect.; d = $^1/_3$	T_C = 80°C T_C = 80°C			37 105	A A
I_{FSM}	*max. forward surge current*	t = 10 ms; sine 50 Hz	T_{VJ} = 25°C T_{VJ} = 125°C			320 280	A A
I^2t	*I^2t value for fusing*	t = 10 ms; sine 50 Hz	T_{VJ} = 25°C T_{VJ} = 125°C			510 390	A^2s A^2s
P_{tot}	*total power dissipation*		T_C = 25°C			110	W
V_F	*forward voltage*	I_F = 50 A	T_{VJ} = 25°C T_{VJ} = 125°C		1.36 1.36	1.7	V V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C T_{VJ} = 125°C		 0.2	0.02	mA mA
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per diode) (per diode)			 0.36	1.1	K/W K/W

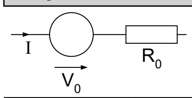
Temperature Sensor NTC

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
R_{25}	*resistance*		T_C = 25°C	4.45	4.7	5.0	kΩ
$B_{25/50}$					3510		K

Module

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
T_{VJ} T_{VJM} T_{stg}	*operating temperature* *max. virtual junction temperature* *storage temperature*			-40 -40		125 150 125	°C °C °C
V_{ISOL}	*isolation voltage*	$I_{ISOL} \leq$ 1 mA; 50/60 Hz				2500	V~
CTI	*comparative tracking index*					-	
M_d	*mounting torque*	(M4)		2.0		2.2	Nm
d_S d_A	*creep distance on surface* *strike distance through air*			12.7 7.6			mm mm
Weight					40		g

Equivalent Circuits for Simulation



Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
V_0 R_0	*rectifier diode*	D8 - D13	T_{VJ} = 150°C			0.88 9.0	V mΩ
V_0 R_0	*IGBT*	T1 - T6	T_{VJ} = 150°C			1.1 86.3	V mΩ
V_0 R_0	*free wheeling diode*	D1 - D6	T_{VJ} = 150°C			1.19 40.0	V mΩ
V_0 R_0	*IGBT*	T7	T_{VJ} = 150°C			1.1 153	V mΩ
V_0 R_0	*free wheeling diode*	D7	T_{VJ} = 150°C			1.19 40	V mΩ

IXYS reserves the right to change limits, test conditions and dimensions.

T_C = 25°C unless otherwise stated

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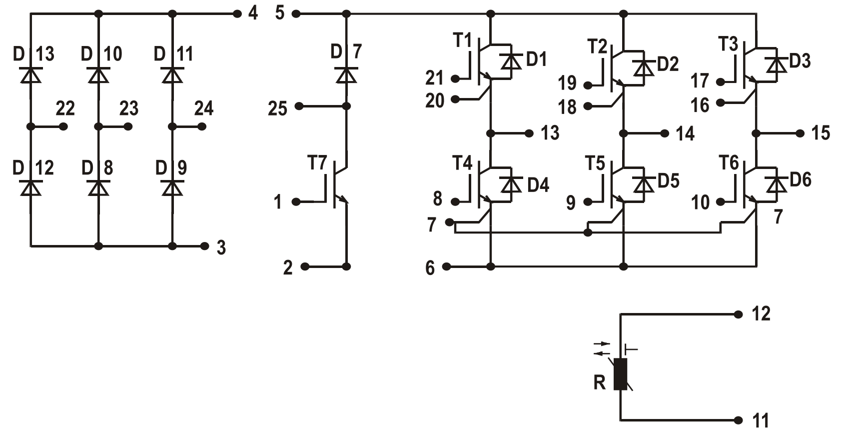
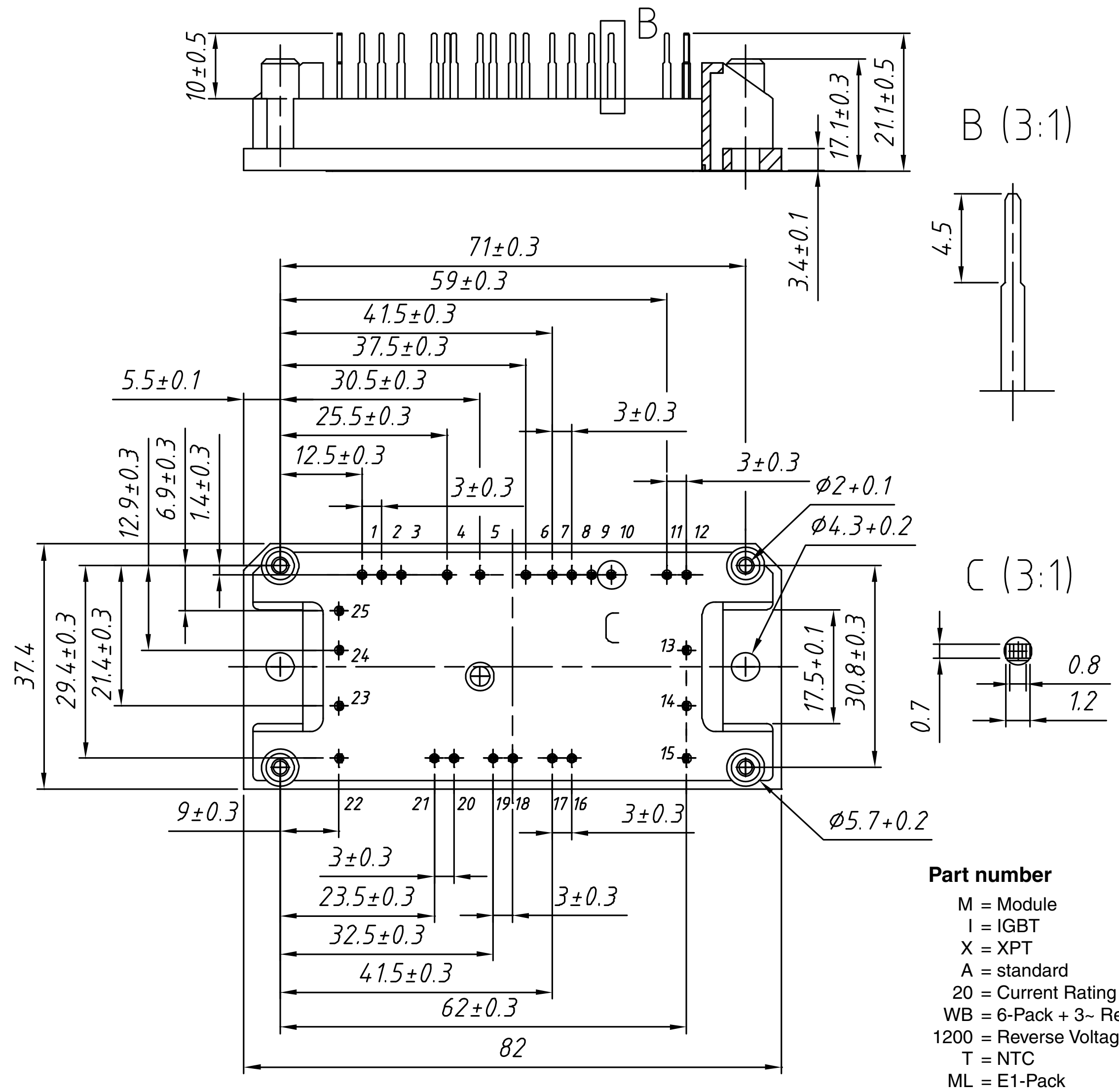
Circuit Diagram



Outline Drawing

Dimensions in mm (1 mm = 0.0394")



Part number

M = Module
I = IGBT
X = XPT
A = standard
20 = Current Rating [A]
WB = 6-Pack + 3~ Rectifier Bridge & Brake Unit
1200 = Reverse Voltage [V]
T = NTC
ML = E1-Pack

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXA 20 WB 1200 TML	MIXA20WB1200TML	Box	10	508630

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IGBT T1 - T6

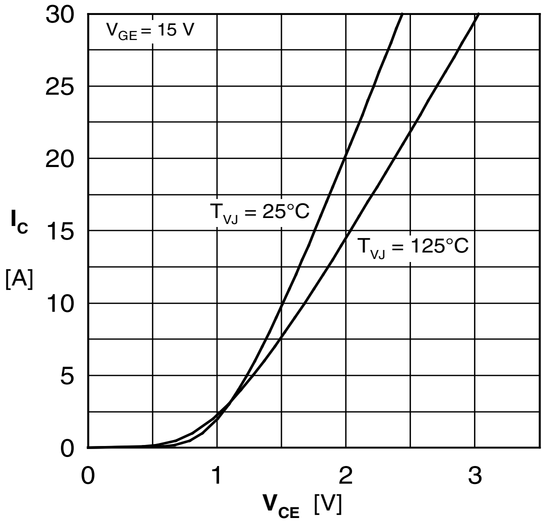

Fig. 1 Typ. output characteristics

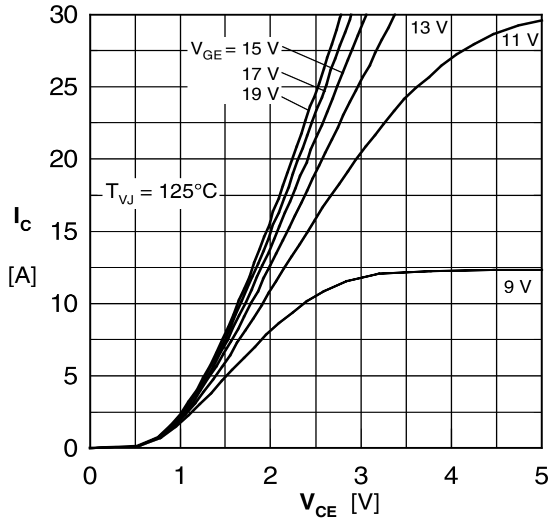

Fig. 2 Typ. output characteristics

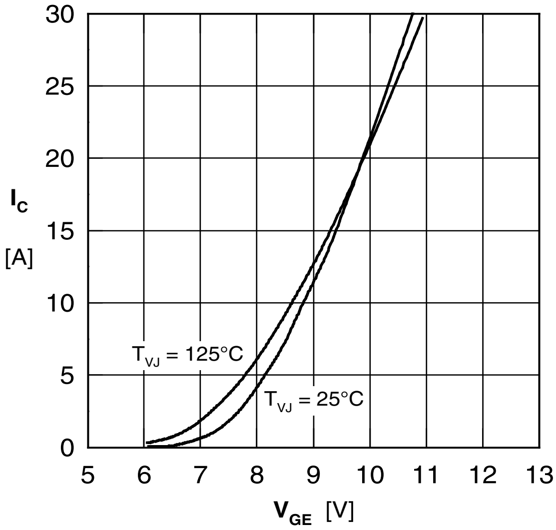

Fig. 3 Typ. tranfer characteristics

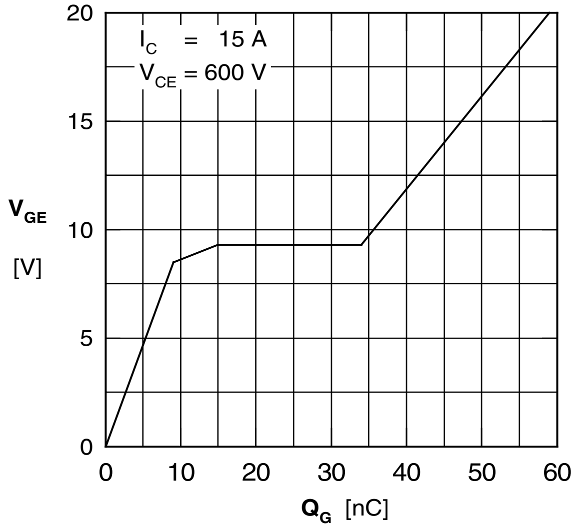

Fig. 4 Typ. turn-on gate charge

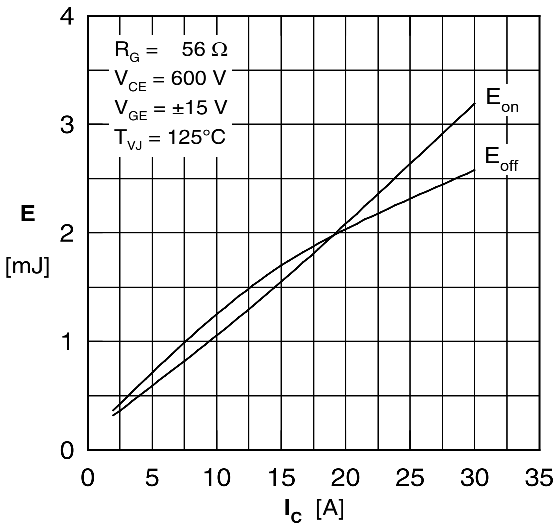

Fig. 5 Typ. switching energy vs. collector current

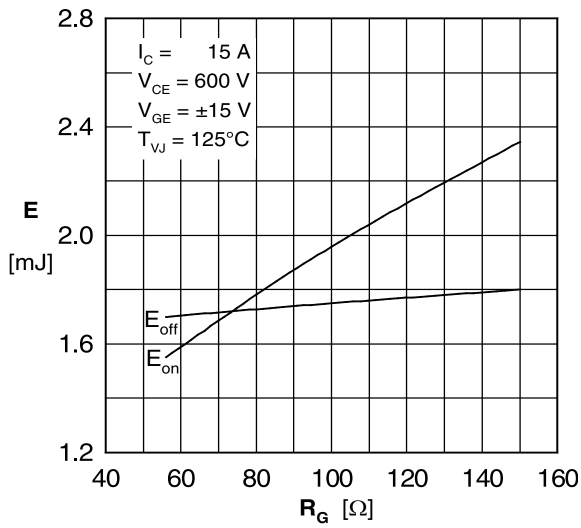

Fig. 6 Typ. switching energy vs. gate resistance

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Diode D1 - D6

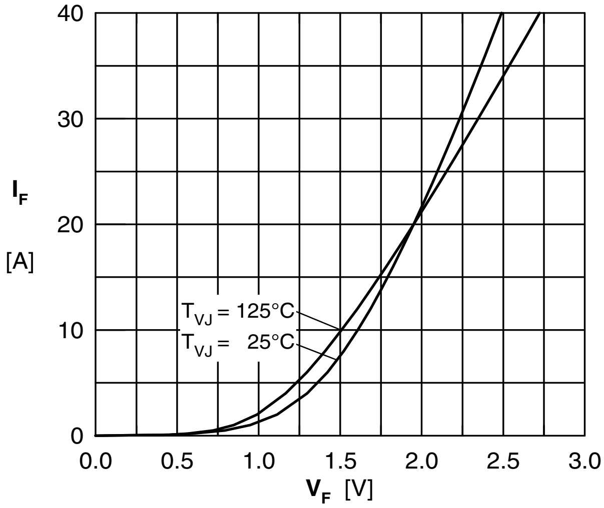


Fig. 7 Typ. Forward current versus V_F

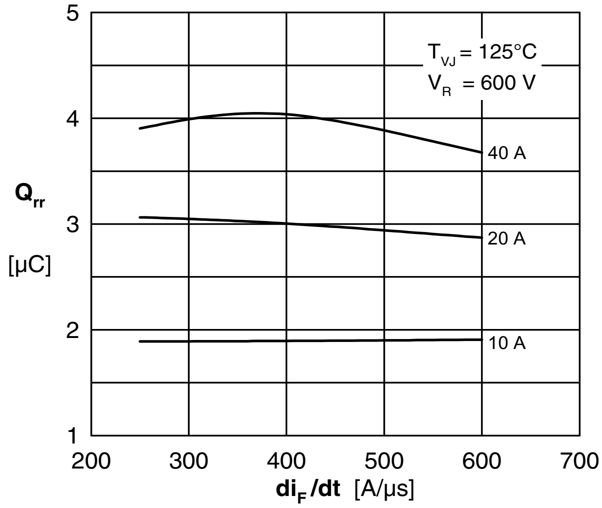


Fig. 8 Typ. reverse recov.charge Q_{rr} vs. di/dt

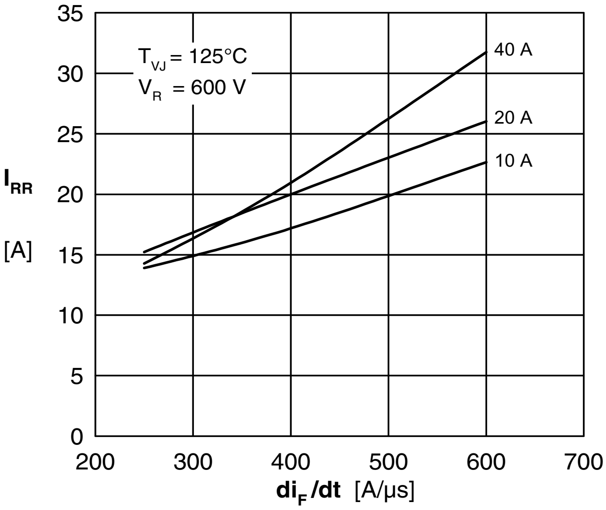


Fig. 9 Typ. peak reverse current I_{RM} vs. di/dt

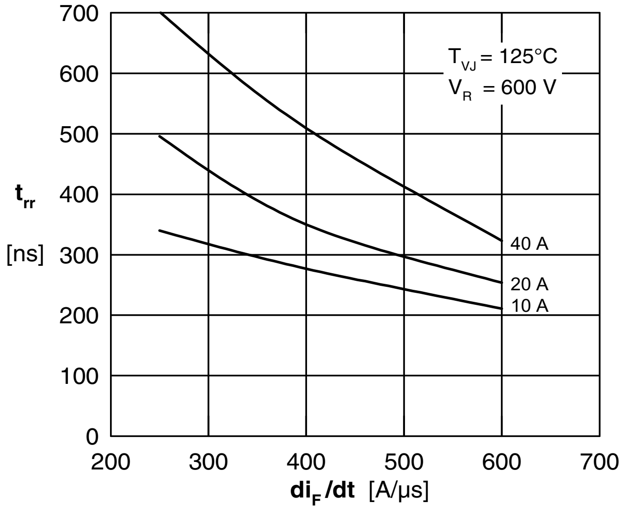


Fig. 10 Typ. recovery time t_{rr} versus di/dt

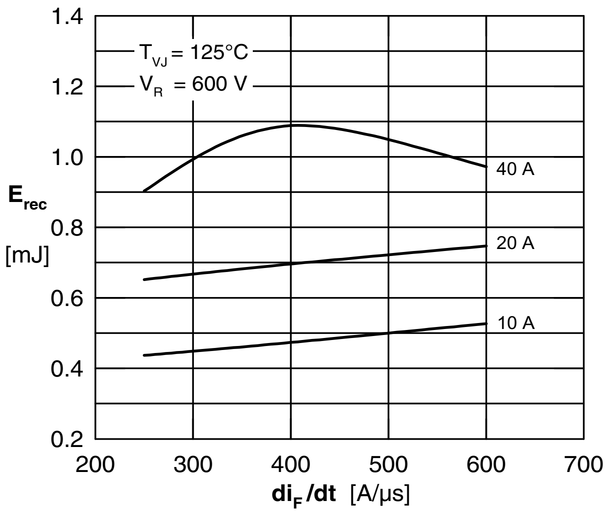
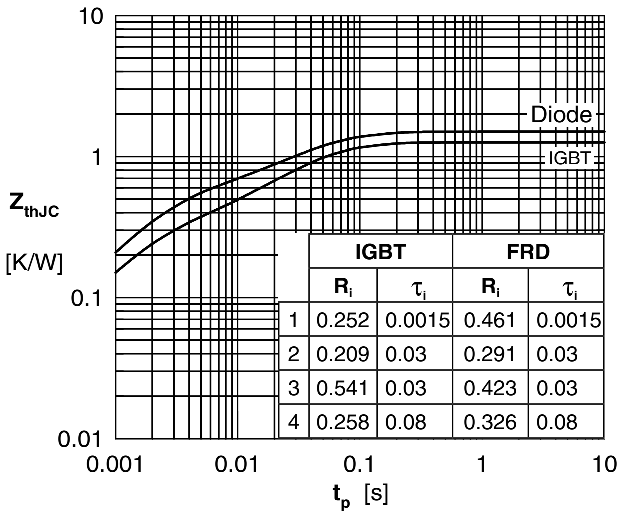


Fig. 11 Typ. recovery energy E_{rec} versus di/dt



	IGBT		FRD	
	R_i	τ_i	R_i	τ_i
1	0.252	0.0015	0.461	0.0015
2	0.209	0.03	0.291	0.03
3	0.541	0.03	0.423	0.03
4	0.258	0.08	0.326	0.08

Fig. 12 Typ. transient thermal impedance

NTC

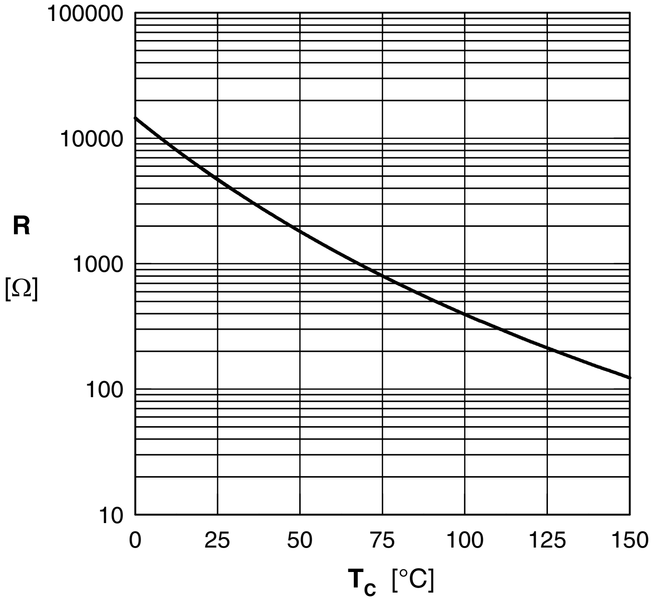


Fig. 13 Typ. thermistor resistance vs. temperature