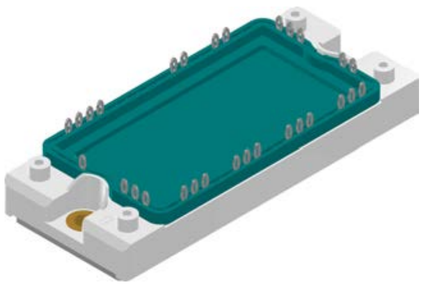
Standard Rectifier Module

3~ Rectifier			Brake Chopper		
V_{RRM}	=	1600 V	V_{CES}	=	1200 V
I_{DAV}	=	280 A	I_{C25}	=	180 A
I_{FSM}	=	1500 A	$V_{CE(sat)}$	=	1,7 V

3~ Rectifier Bridge + Brake Unit + NTC

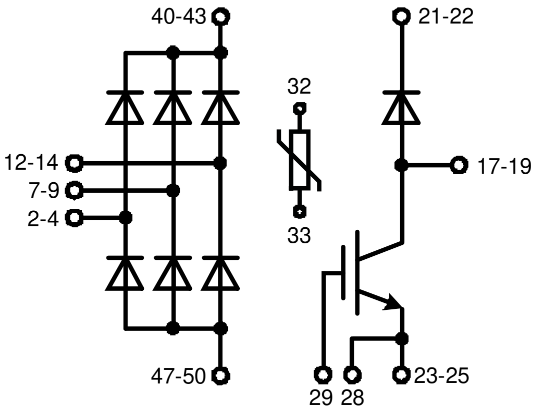
Part number

MDMA280UB1600PTED



Backside: isolated

E72873



Features / Advantages:

- Package with DCB ceramic
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current
- NTC
- X2PT - 2nd generation Xtreme light Punch Through
- Rugged X2PT design results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 2x Ic
- Thin wafer technology combined with X2PT design results in a competitive low VCE(sat) and low thermal resistance

Applications:

- 3~ Rectifier with brake unit for drive inverters

Package: E2-Pack

- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

Disclaimer Notice

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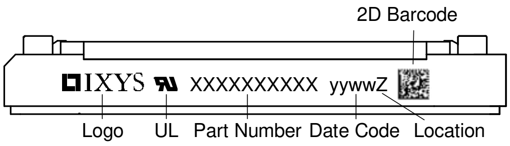
Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	*max. non-repetitive reverse blocking voltage*		T_{VJ} = 25°C			1700	V
V_{RRM}	*max. repetitive reverse blocking voltage*		T_{VJ} = 25°C			1600	V
I_R	*reverse current*	V_R = 1600 V	T_{VJ} = 25°C			100	µA
		V_R = 1600 V	T_{VJ} = 150°C			2	mA
V_F	*forward voltage drop*	I_F = 90 A	T_{VJ} = 25°C			1,23	V
		I_F = 270 A				1,75	V
		I_F = 90 A	T_{VJ} = 125°C			1,18	V
		I_F = 270 A				1,87	V
I_{DAV}	*bridge output current*	T_C = 85°C	T_{VJ} = 150°C			280	A
		rectangular d = ⅓					
V_{F0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 150°C			0,80	V
r_F	*slope resistance*					4,1	mΩ
R_{thJC}	*thermal resistance junction to case*					0,35	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,1		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			355	W
I_{FSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1,50	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1,62	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			1,28	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1,38	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			11,3	kA^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			10,9	kA^2s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			8,13	kA^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			7,87	kA^2s
C_J	*junction capacitance*	V_R = 400 V; f = 1 MHz	T_{VJ} = 25°C		53		pF

Symbol	Definition	Conditions		min.	typ.	max.	Unit
Brake IGBT + Diode				Ratings			
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C			1200	V
V_{GES}	*max. DC gate voltage*					±20	V
V_{GEM}	*max. transient gate emitter voltage*					±30	V
I_{C25}	*collector current*		T_C = 25°C			180	A
I_{C100}			T_C = 100°C			140	A
P_{tot}	*total power dissipation*		T_C = 25°C			500	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 100 A; V_{GE} = 15 V	T_{VJ} = 25°C		1,7	2,1	V
			T_{VJ} = 125°C		1,9		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 4 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	6	6,8	7,5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			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 = 100 A			340		nC
$t_{d(on)}$	*turn-on delay time*				230		ns
t_r	*current rise time*	inductive load	T_{VJ} = 125°C		70		ns
$t_{d(off)}$	*turn-off delay time*				380		ns
t_f	*current fall time*	V_{CE} = 600 V; I_C = 100 A			230		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 6,8 Ω			12,5		mJ
E_{off}	*turn-off energy per pulse*				11,5		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 6,8 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEK} = 1200 V; note [1]				300	A
SCSOA	*short circuit safe operating area*	V_{CEK} = 1200 V					
t_{SC}	*short circuit duration*	V_{CE} = 720 V; V_{GE} = ±15	T_{VJ} = 125°C			10	µs
I_{SC}	*short circuit current*	R_G = 6,8 Ω; non-repetitive			450		A
R_{thJC}	*thermal resistance junction to case*					0,25	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,10		K/W
Brake Diode							
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1200	V
I_{F25}	*forward current*		T_C = 25°C			88	A
I_{F100}			T_C = 100°C			59	A
V_F	*forward voltage*	I_F = 60 A	T_{VJ} = 25°C			2,20	V
			T_{VJ} = 125°C		1,95		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0,1	mA
			T_{VJ} = 125°C			1,2	mA
Q_{rr}	*reverse recovery charge*	V_R = 600 V			8		µC
I_{RM}	*max. reverse recovery current*	$-di_F/dt$ = 1200 A/µs	T_{VJ} = 125°C		60		A
t_{rr}	*reverse recovery time*	I_F = 60 A; V_{GE} = 0 V			350		ns
E_{rec}	*reverse recovery energy*				2,5		mJ
R_{thJC}	*thermal resistance junction to case*					0,6	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,1		K/W

[1] RBSOA line test conditions for dynamic testing prior to static testing:
470A @ 820V and T_C = 150°C with gate drive +16.5V / -15V, $R_{G(on)}$ = 6.8Ω and $R_{G(off)}$ = 43Ω.

Package E2-Pack

Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	*RMS current*	per terminal				30	A
T_{VJ}	*virtual junction temperature*			-40		150	°C
T_{op}	*operation temperature*			-40		125	°C
T_{stg}	*storage temperature*			-40		125	°C
Weight					176		g
M_D	*mounting torque*			3		6	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*		*terminal to terminal*	6,0			mm
$d_{Spb/Apb}$			*terminal to backside*	12,0			mm
V_{ISOL}	*isolation voltage*	t = 1 second	50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	4300			V
		t = 1 minute		3600			V



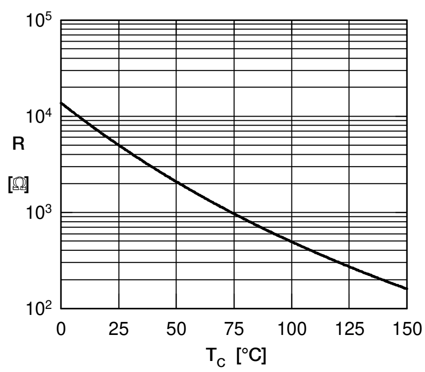
Part description

M = Module
D = Diode
M = Standard Rectifier
A = (up to 1800V)
280 = Current Rating [A]
UB = 3~ Rectifier Bridge + Brake Unit
1600 = Reverse Voltage [V]
PT = PressFit-Pin, Thermistor
ED = E2-Pack
\- = Hyphen
PC = Phase Change Material

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDMA280UB1600PTED	MDMA280UB1600PTED	Blister	28	516613
Alternative	MDMA280UB1600PTED-PC	MDMA280UB1600PTED	Blister	28	515416

Temperature Sensor NTC

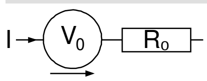
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°	4,85	5	5,15	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

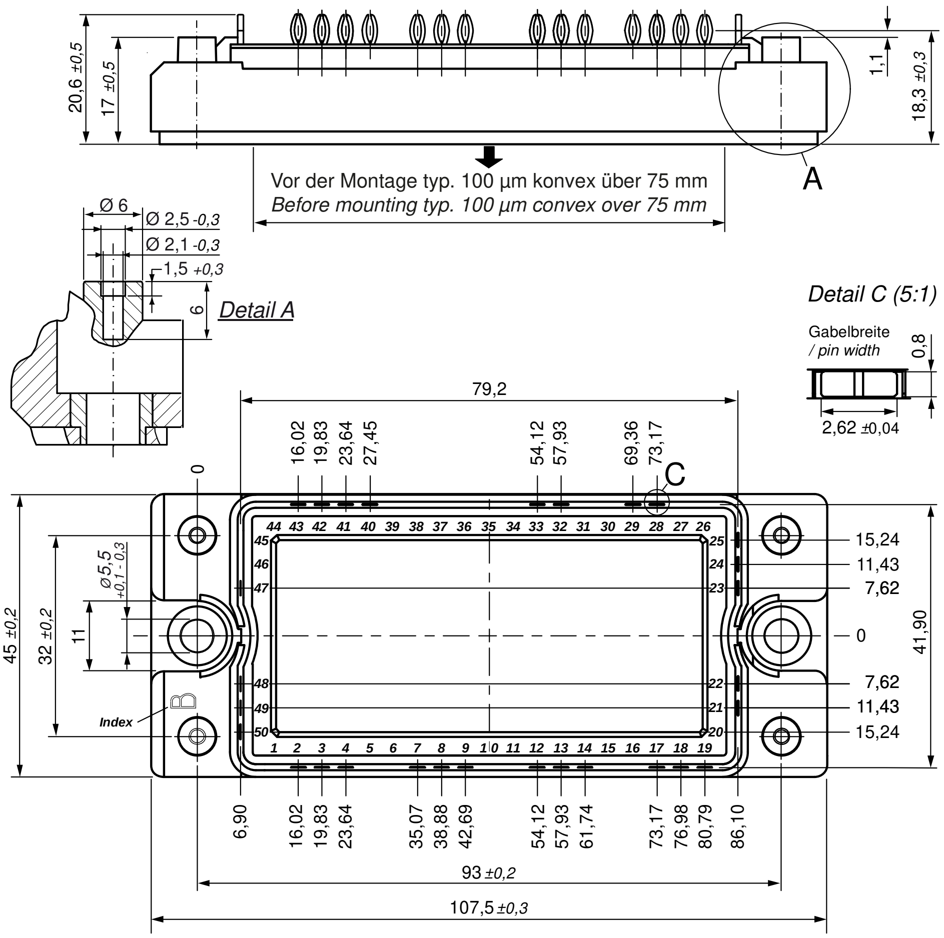
Equivalent Circuits for Simulation

** on die level* T_{VJ} = 150°C



		Rectifier	Brake Diode	
$V_{0\,max}$	*threshold voltage*	0,8	1,22	V
$R_{0\,max}$	*slope resistance **	2	13	mΩ

Outlines E2-Pack

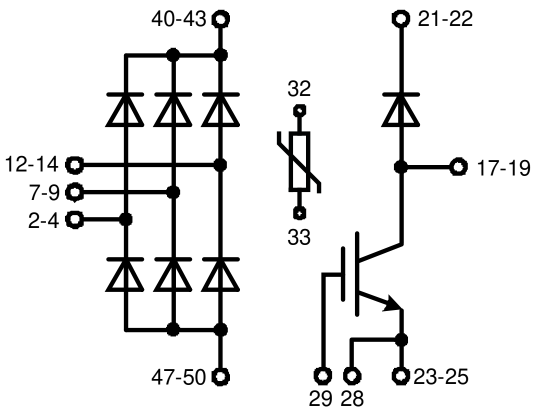


Bemerkung / ***Note:***

- Nicht tolerierte Maße nach / *Measure without tolerances according DIN ISO 2768-T1-m*
- PCB-Lochmuster / *PCB hole pattern:* **see pin position**
- Toleranz Pin-Position und PCB-Lochmuster / *Tolerance of pin position and PCB hole pattern:* ⊕ **0.1**
- Bohrlochdurchmesser / *Diameter of drill:* **Ø 2.35 mm**
- Endlochdurchmesser / *Diameter of plated holes:* **Ø 2.14 - 2.29 mm** (Cu thickness in via typ. 50 µm)
- Beschichtung / *Plating:* **chem. Sn max. 15 µm**
- Einpresskraft / *Insert Force:* per terminal with a typ. insert speed of 7 mm/s: **typ. 90 N**
- Weitere Angaben / *Further information:* www.ixys.com **Application note IXAN0077**
- Montageanleitung / *Mounting instruction:* www.ixys.com **Application note IXAN0024**

Detail A: PCB-Montage / *Mounting on PCB*

- Empfohlene, selbstschneidende Schraube / *Recommended, self-tapping screw:* **EJOT PT**® (Größe / *size:* **K25**)
- Max. Schraubenlänge / *Max. screw length:* **PCB-Dicke** / **thickness + 6 mm** (max. Lochtiefe / *hole depth)*
- Empfohlenes Drehmoment / *Recommended mounting torque:* **1.5 Nm**



Rectifier

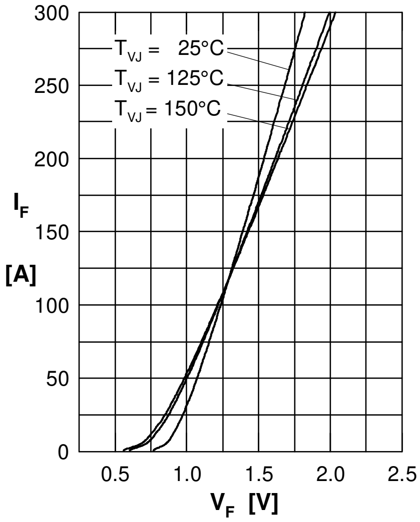


Fig. 1 Forward current versus voltage drop per diode

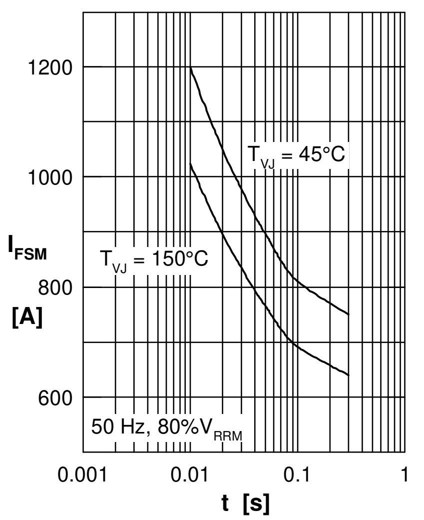


Fig. 2 Surge overload current vs. time per diode

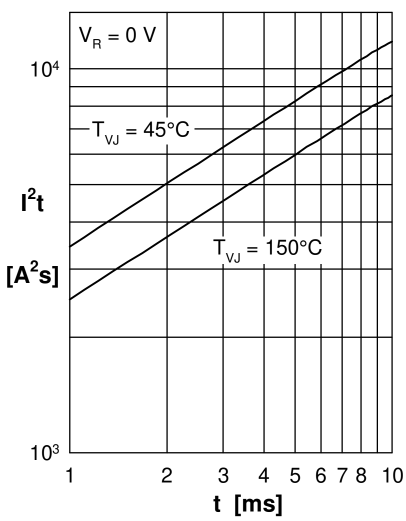


Fig. 3 I^2t versus time per diode

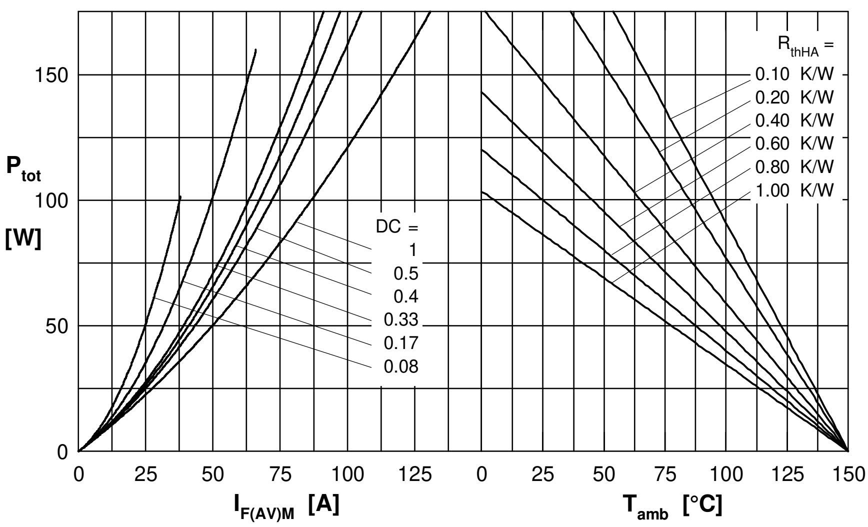


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

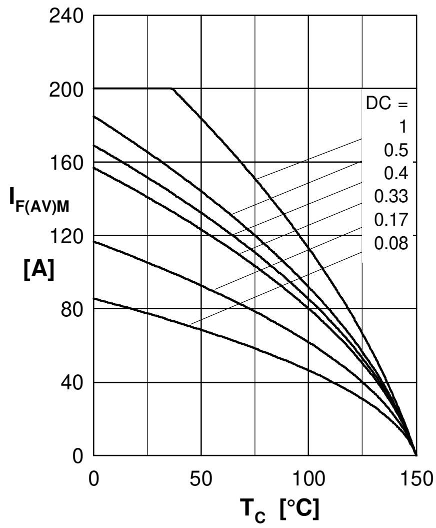


Fig. 5 Max. forward current vs. case temperature per diode

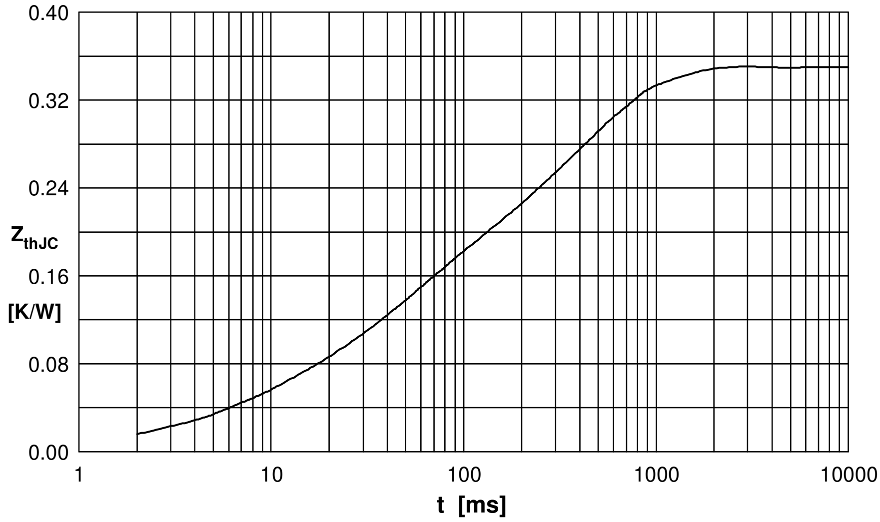


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.030	0.006
2	0.003	0.007
3	0.114	0.040
4	0.203	0.400

Brake IGBT + Diode

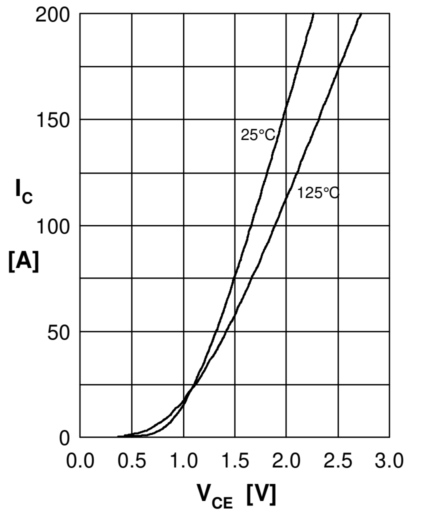


Fig.1 Output characteristics IGBT

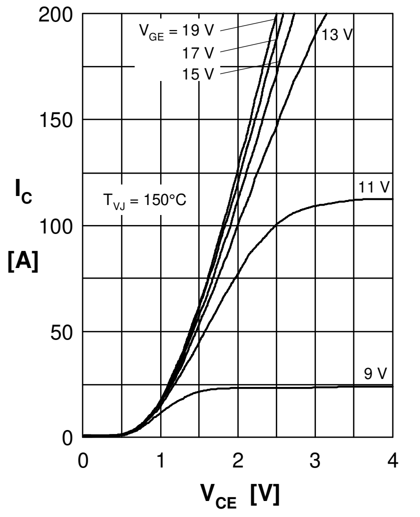


Fig.2 Typ. output characteristics IGBT

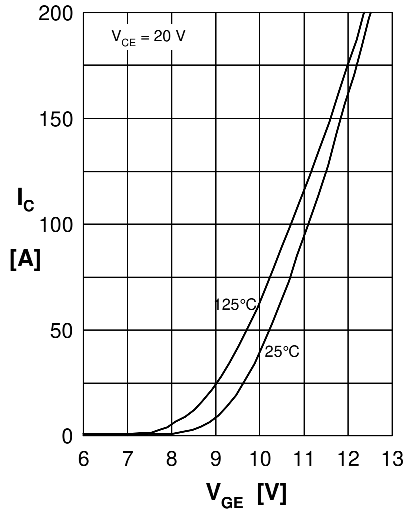


Fig. 3 Typ. transfer charact. IGBT

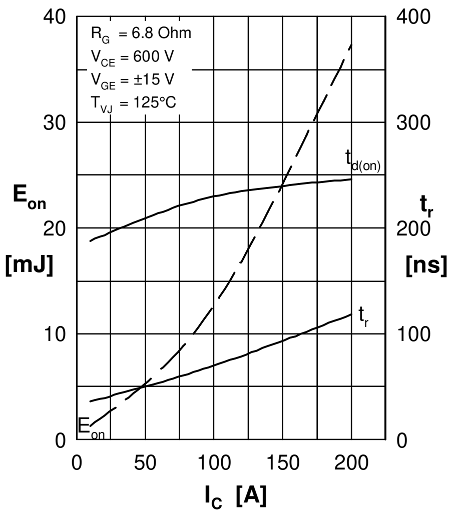


Fig. 4 Typ. turn-on energy & switch. times vs. collector current

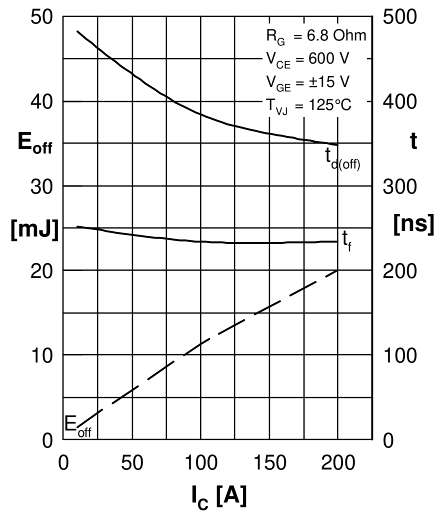


Fig. 5 Typ. turn-off energy & switch. times vs. collector current

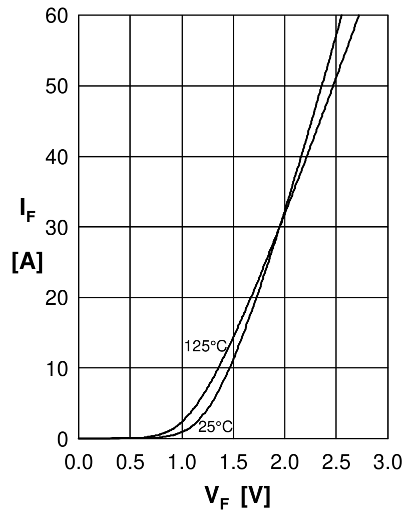


Fig. 6 Typ. forward current versus V_F

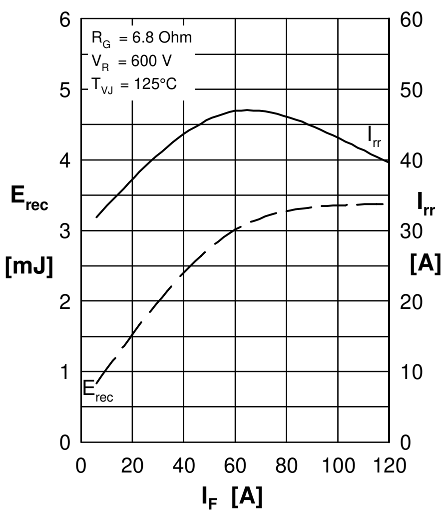


Fig. 7 Typ. reverse recovery characteristics Diode

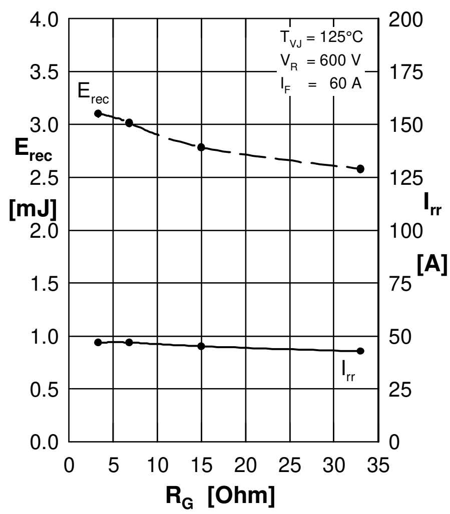
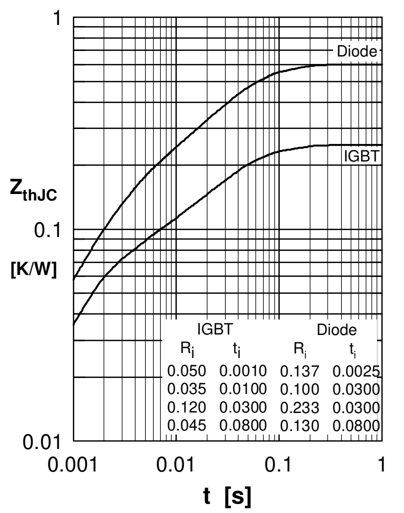


Fig. 8 Typ. reverse recovery characteristics Diode



IGBT		Diode	
R_i	t_i	R_i	t_i
0.050	0.0010	0.137	0.0025
0.035	0.0100	0.100	0.0300
0.120	0.0300	0.233	0.0300
0.045	0.0800	0.130	0.0800

Fig. 9 Transient thermal resistance junction to case