Standard Rectifier Module

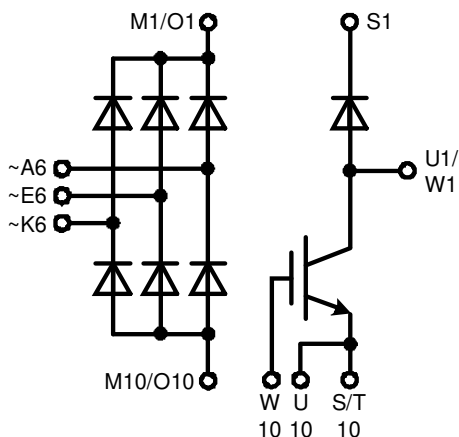|	3~ Rectifier	Brake Chopper
V_{RRM} = 1600 V	V_{CES} = 1200 V
I_{DAV} = 180 A	I_{C25} = 180 A
I_{FSM} = 1100 A	$V_{CE(sat)}$ = 1.7 V

3~ Rectifier Bridge + Brake Unit

Part number

VUB120-16NOX
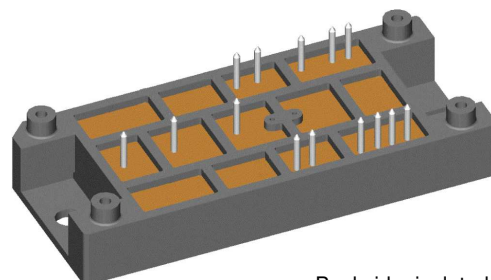
Backside: isolated

U E72873

Features / Advantages:

● Package with DCB ceramic base plate
● Improved temperature and power cycling
● Planar passivated chips
● Very low forward voltage drop
● Very low leakage current
● 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: V2-Pack

● Isolation Voltage: 3600 V~
● Industry standard outline
● RoHS compliant
● Soldering pins for PCB mounting
● Height: 17 mm
● Base plate: DCB ceramic
● Reduced weight
● Advanced power cycling

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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
		$V_R = 1600\ V$	$T_{VJ} = 125°C$			2	mA
V_F	forward voltage drop	$I_F = 60\ A$	$T_{VJ} = 25°C$			1.16	V
		$I_F = 180\ A$				1.55	V
		$I_F = 60\ A$	$T_{VJ} = 125°C$			1.09	V
		$I_F = 180\ A$				1.59	V
I_{DAV}	bridge output current	$T_C = 90°C$ rectangular d = ⅓	$T_{VJ} = 150°C$			180	A
V_{F0}	threshold voltage ⎫		$T_{VJ} = 150°C$			0.81	V
r_F	slope resistance ⎬ for power loss calculation only					4.4	mΩ
R_{thJC}	thermal resistance junction to case					0.6	K/W
R_{thCH}	thermal resistance case to heatsink				0.2		K/W
P_{tot}	total power dissipation		$T_C = 25°C$			205	W
I_{FSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1.10	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			1.19	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			935	A
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			1.01	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			6.05	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			5.89	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			4.37	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			4.25	kA²s
C_J	junction capacitance	$V_R = 400\ V$; f = 1 MHz	$T_{VJ} = 25°C$		37		pF

Brake IGBT + Diode

Symbol	Definition	Conditions		min.	typ.	max.	Unit
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_{C80}			$T_C = 80°C$			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				70		ns
$t_{d(off)}$	turn-off delay time	inductive load	$T_{VJ} = 125°C$		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				300	A
SCSOA	short circuit safe operating area	$V_{CEK} = 1200$ V					
t_{SC}	short circuit duration	$V_{CE} = 720$ V; $V_{GE} = ±15$ V	$T_{VJ} = 125°C$			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

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RRM}	max. repetitive reverse voltage		$T_{VJ} = 25°C$			1200	V
I_{F25}	forward current		$T_C = 25°C$			48	A
I_{F80}			$T_C = 80°C$			32	A
V_F	forward voltage	$I_F = 30$ A	$T_{VJ} = 25°C$			2.75	V
			$T_{VJ} = 125°C$		1.60		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25°C$			0.25	mA
			$T_{VJ} = 125°C$			1	mA
Q_{rr}	reverse recovery charge	$V_R = 600$ V			5.2		μC
I_{RM}	max. reverse recovery current	$-di_F/dt = 1000$ A/μs	$T_{VJ} = 125°C$		50		A
t_{rr}	reverse recovery time	$I_F = 30$ A			300		ns
E_{rec}	reverse recovery energy				1.9		mJ
R_{thJC}	thermal resistance junction to case					0.9	K/W
R_{thCH}	thermal resistance case to heatsink				0.3		K/W

![IXYS logo]

Package   V2-Pack

			Ratings			
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			100	A
T_{VJ}	*virtual junction temperature*		-40		150	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		125	°C
Weight				76		g
M_D	*mounting torque*		2		2.5	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	3600			V
		t = 1 minute 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA	3000			V

Data Matrix: *Typ* (1-19), *DC+Prod.Index* (20-25), *FKT#* (26-31)
leer (33), *lfd.#* (33-36)

□ IXYS   🆄🅻   yywwAA
Part Number
Lot.No: xxxxxx

UL   Date code   Prod. Index
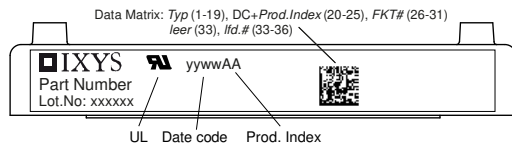
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB120-16NOX	VUB120-16NOX	Box	6	520475

Similar Part	Package	Voltage class
VUB120-16NOXT	V2-Pack	1600

Equivalent Circuits for Simulation   ** on die level* $T_{VJ} = 150\,°C$

I → (V₀) → [R₀]

		Rectifier	**Brake Diode**	
$V_{0\,max}$	*threshold voltage*	0.81	1.31	V
$R_{0\,max}$	*slope resistance **	3.2	8	mΩ

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Outlines   V2-Pack

Detail Y M 5:1

Detail X M 2:1
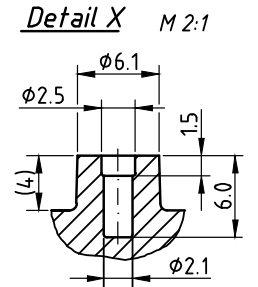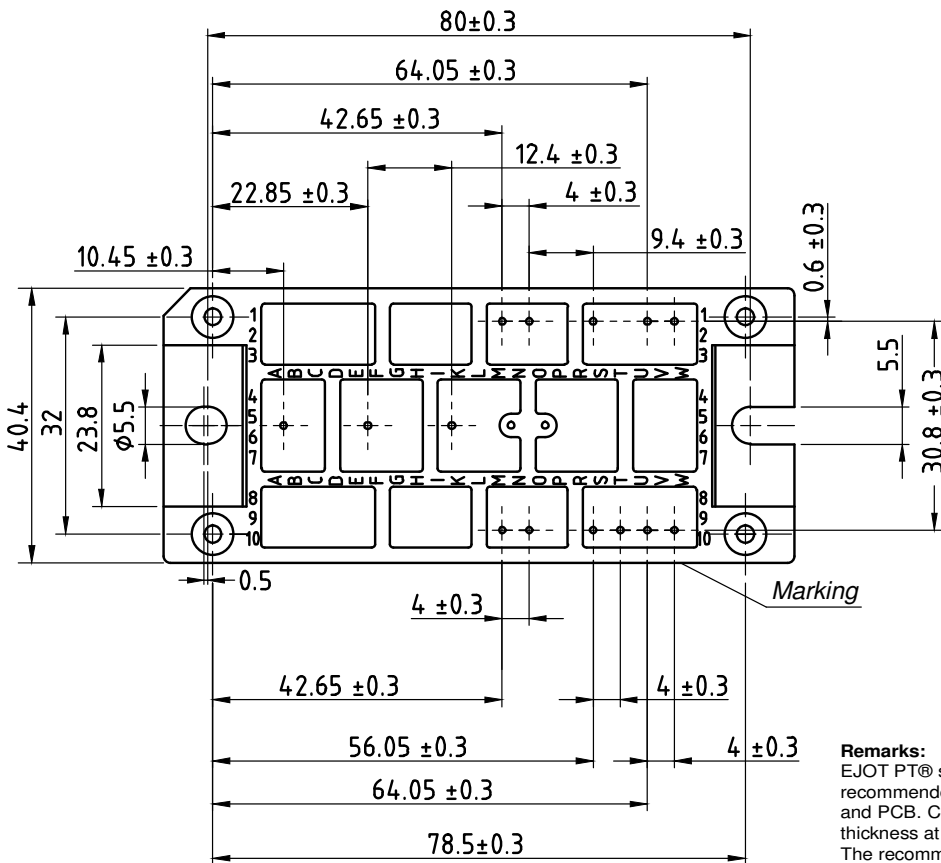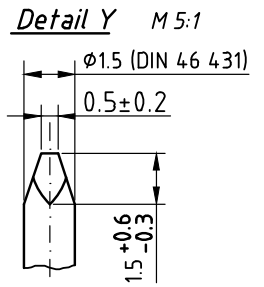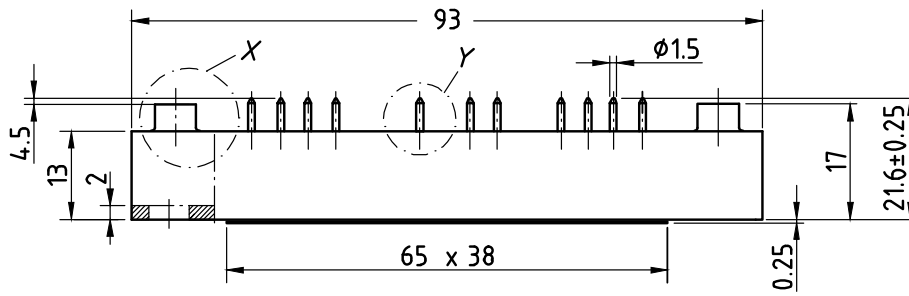
Remarks:
EJOT PT® self-tapping screws of the dimension K25 are recommended for the mechanical connection between module and PCB. Choose the right length according to your board thickness at a maximum depth of 6 mm of the module holes. The recommended mounting torque is 1.5 Nm.
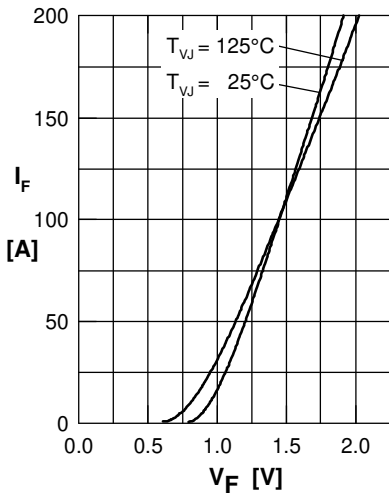

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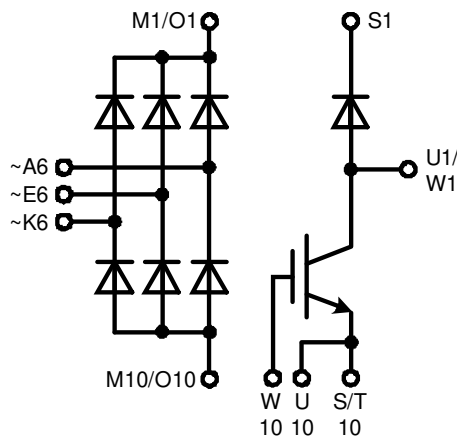
Rectifier

Fig. 1 Forward current vs.
voltage drop per diode
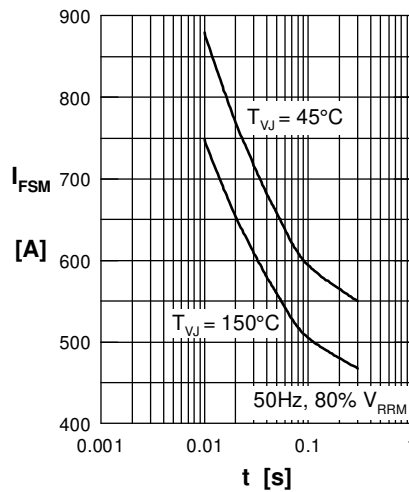
Fig. 2 Surge overload current
vs. time per diode
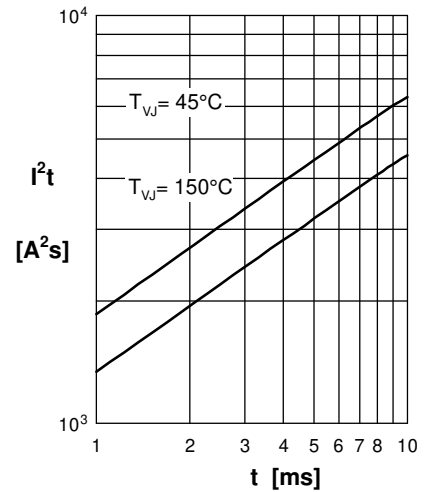
Fig. 3 I^2t vs. time per diode
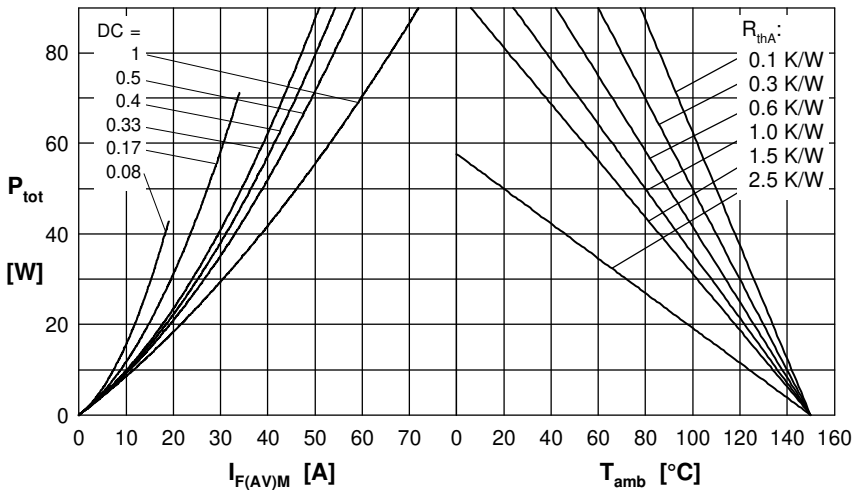
Fig. 4 Power dissipation vs. forward current
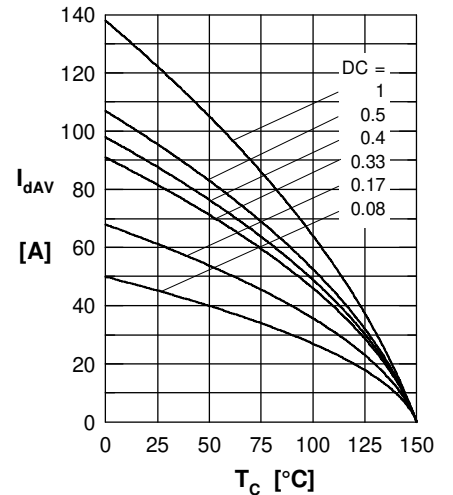and ambient temperature per diode

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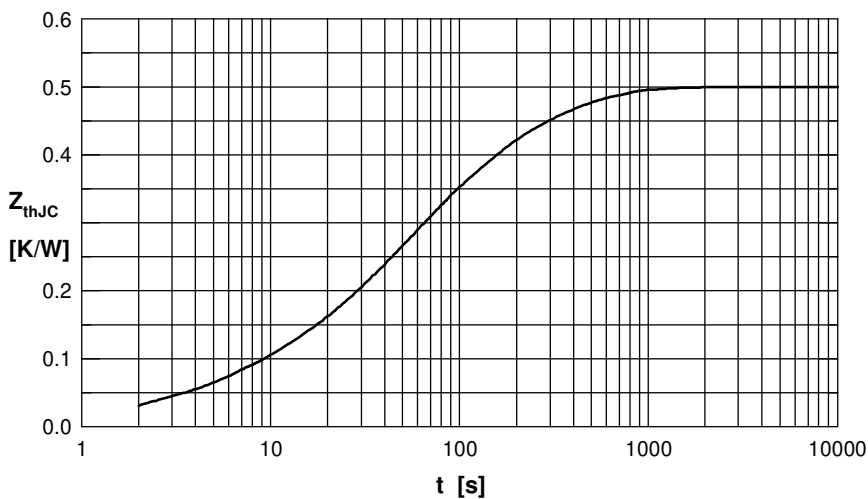case temperature per diode

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

Constants for Z_{thJC} calculation:

i	R_{th} (K/W)	t_i (s)
1	0.040	0.004
2	0.003	0.010
3	0.140	0.030
4	0.120	0.300
5	0.197	0.080

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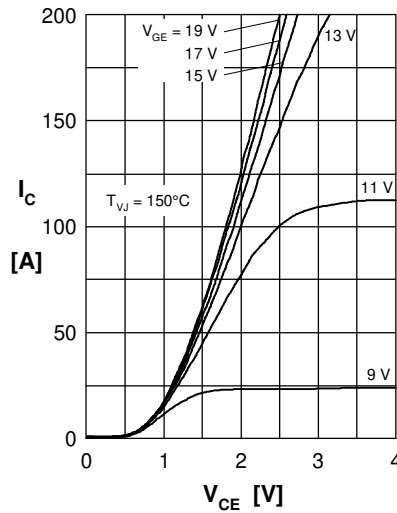**Brake IGBT + Diode**
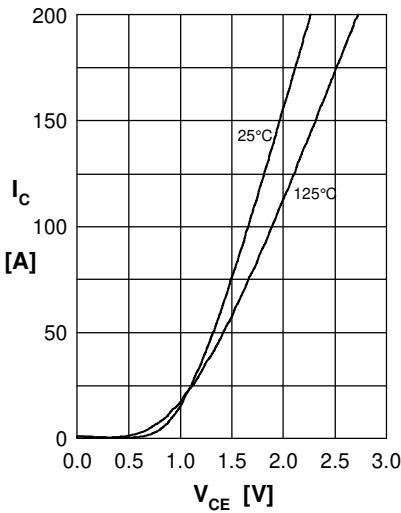
Fig.1 Output characteristics IGBT
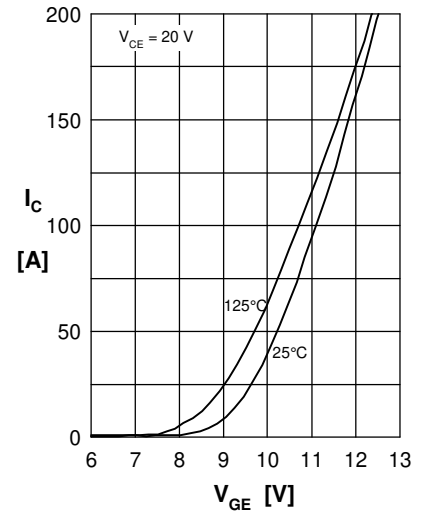

Fig.2 Typ. output characteristics IGBT

Fig. 3 Typ. transfer charact. IGBT

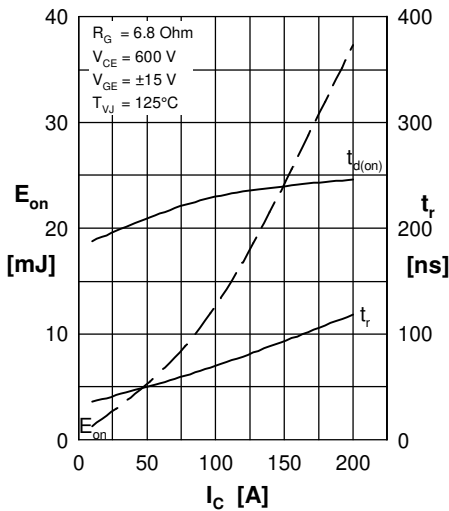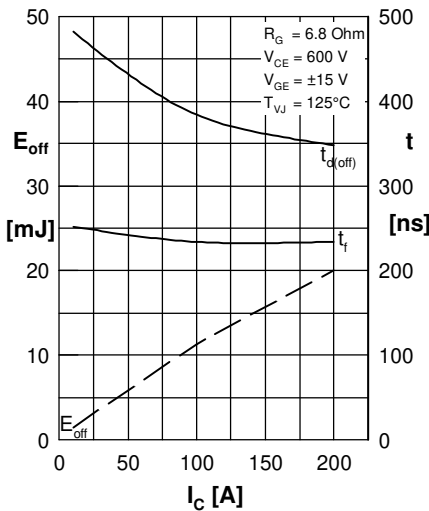Fig. 4 Typ. turn-on energy & switch. times vs. collector current

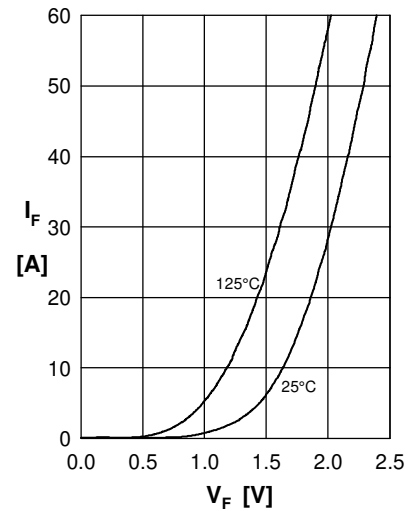Fig. 5 Typ. turn-off energy & switch. times vs. collector current

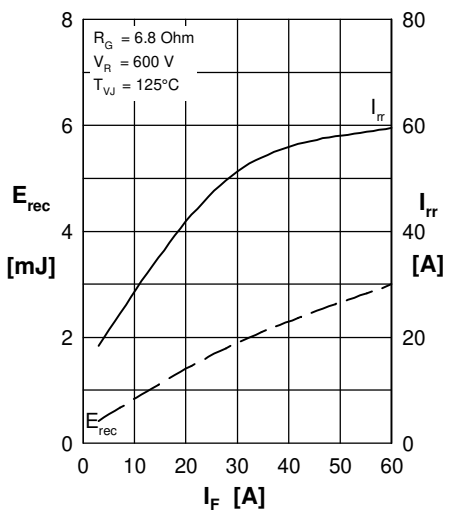Fig. 6 Typ. forward characteristics Diode

Fig. 7 Typ. reverse recovery characteristics Diode
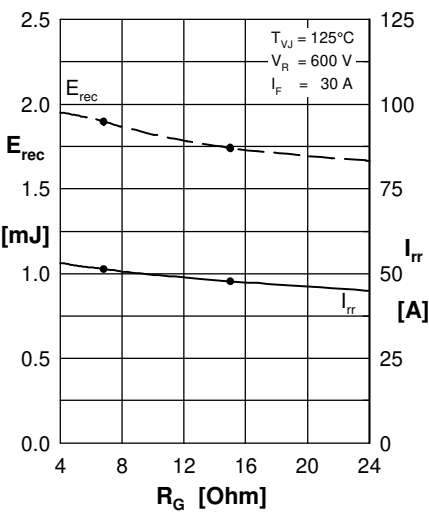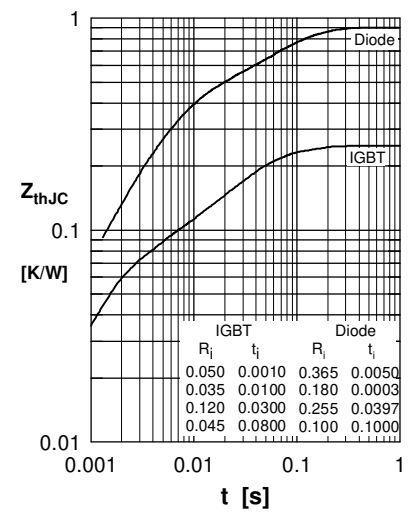

Fig. 8 Typ. reverse recovery characteristics Diode

Fig. 9 Transient thermal resistance junction to case

IGBT		Diode	
R_i	t_i	R_i	t_i
0.050	0.0010	0.365	0.0050
0.035	0.0100	0.180	0.0003
0.120	0.0300	0.255	0.0397
0.045	0.0800	0.100	0.1000

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