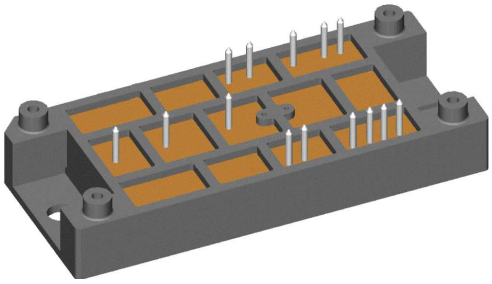
Standard Rectifier Module

3~ Rectifier			Brake Chopper		
V_{RRM}	=	1600 V	V_{CES}	=	1200 V
I_{DAV}	=	180 A	I_{C25}	=	250 A
I_{FSM}	=	1100 A	$V_{CE(sat)}$	=	1.7 V

3~ Rectifier Bridge + Brake Unit

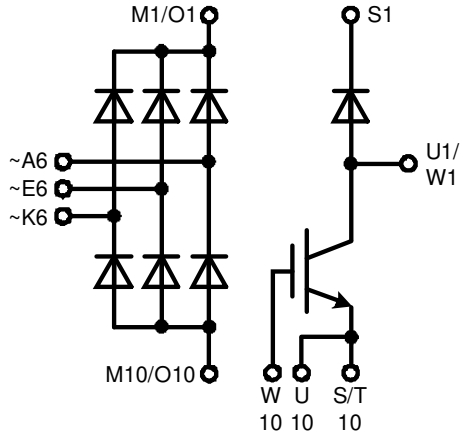
Part number

VUB160-16NOX



Backside: isolated

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

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

© 2019 IXYS all rights reserved

Rectifier

Symbol	Definition	Conditions		Ratings 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	T_{VJ} = 150°C			180	A
		rectangular d = ⅓					
V_{F0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 150°C			0.81	V
r_F	*slope resistance* }					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

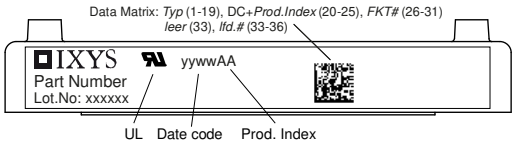
© 2019 IXYS all rights reserved

Brake IGBT + Diode				Ratings			
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			250	A
I_{C80}			T_C = 80°C			175	A
P_{tot}	*total power dissipation*		T_C = 25°C			695	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 150 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 = 6 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 = 150 A			510		nC
$t_{d(on)}$	*turn-on delay time*	inductive load V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 1.2 Ω	T_{VJ} = 125°C		220		ns
t_r	*current rise time*				100		ns
$t_{d(off)}$	*turn-off delay time*				400		ns
t_f	*current fall time*				220		ns
E_{on}	*turn-on energy per pulse*				21.5		mJ
E_{off}	*turn-off energy per pulse*				17		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 1.2 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEK} = 1200 V				450	A
SCSOA	*short circuit safe operating area*	V_{CEK} = 1200 V					
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15	T_{VJ} = 125°C			10	µs
I_{SC}	*short circuit current*	R_G = 1.2 Ω; non-repetitive			650		A
R_{thJC}	*thermal resistance junction to case*					0.16	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			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 $-di_F/dt$ = 900 A/µs I_F = 30 A; V_{GE} = 0 V	T_{VJ} = 125°C		6		µC
I_{RM}	*max. reverse recovery current*				50		A
t_{rr}	*reverse recovery time*				350		ns
E_{rec}	*reverse recovery energy*				2		mJ
R_{thJC}	*thermal resistance junction to case*					0.9	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.3		K/W

© 2019 IXYS all rights reserved

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	50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3600			V
		t = 1 minute		3000			V

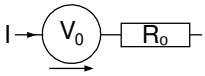


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB160-16NOX	VUB160-16NOX	Box	6	521713

Similar Part	Package	Voltage class
VUB160-16NOXT	V2-Pack	1600

Equivalent Circuits for Simulation

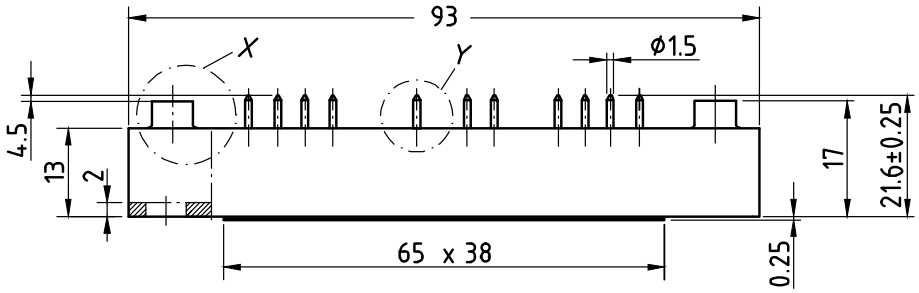
** on die level* T_{VJ} = 150°C

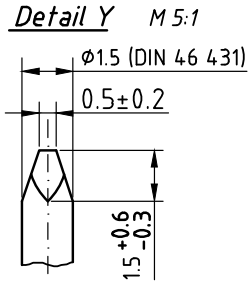


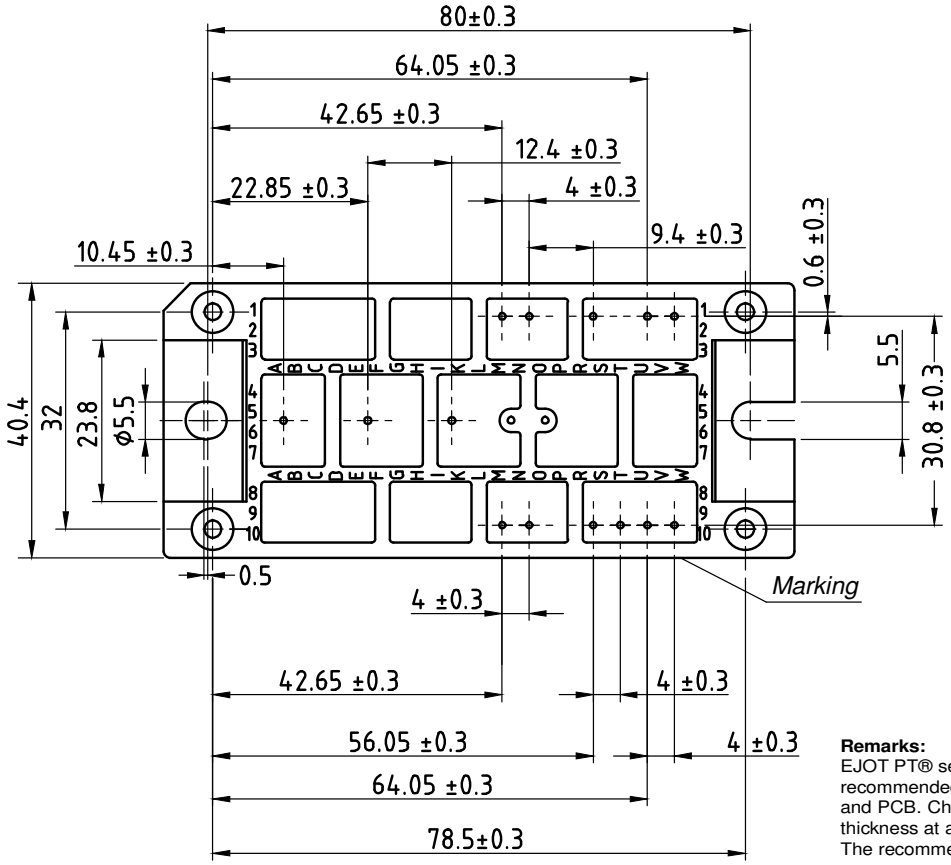
		Rectifier	Brake IGBT +	Brake Diode	
$V_{0\,max}$	*threshold voltage*	0.81	1.1	1.31	V
$R_{0\,max}$	*slope resistance **	3.2	13.8	8	mΩ

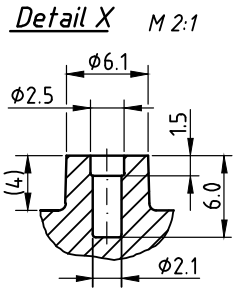
© 2019 IXYS all rights reserved

Outlines V2-Pack

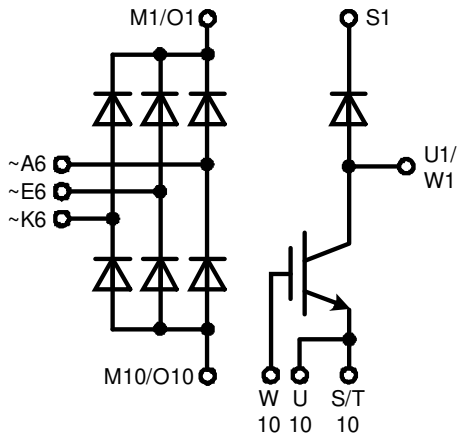








Remarks:
EJOT PT® self-tapping screws of the dimension K25 are recommended for the mechanical connection between module and PCB. Choose the right length according to your board thickness at a maximum depth of 6 mm of the module holes. The recommended mounting torque is 1.5 Nm.



© 2019 IXYS all rights reserved

Rectifier

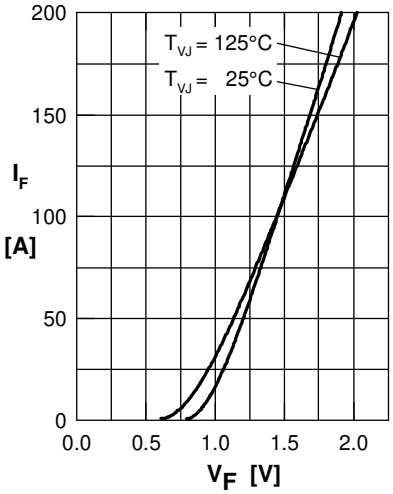


Fig. 1 Forward current vs. voltage drop per diode

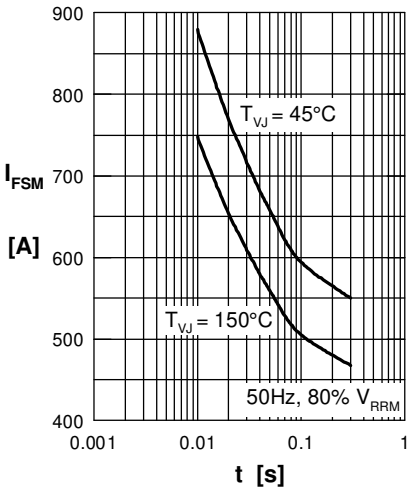


Fig. 2 Surge overload current vs. time per diode

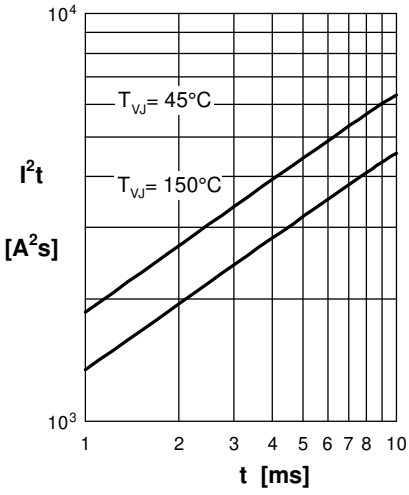


Fig. 3 I^2t vs. time per diode

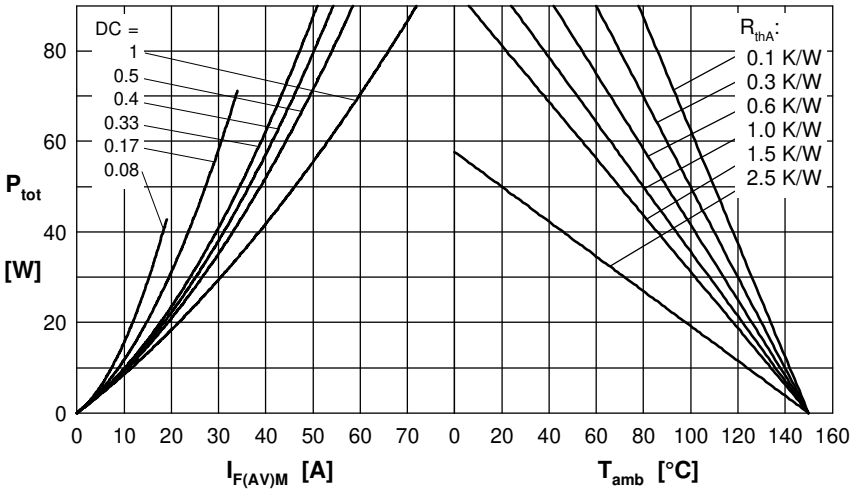


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

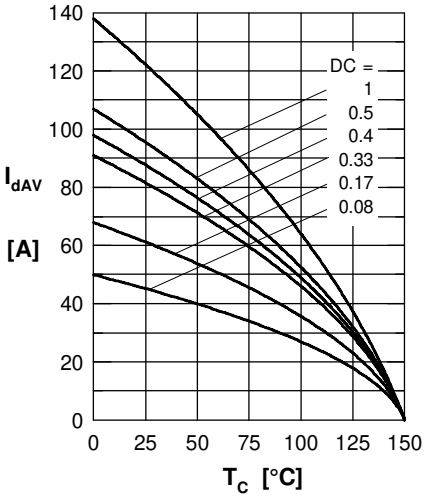


Fig. 5 Max. forward current vs. case temperature per diode

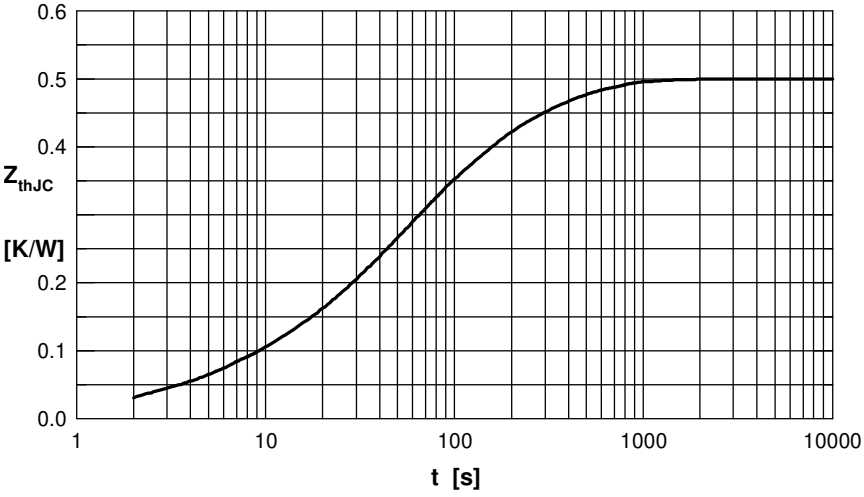


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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

© 2019 IXYS all rights reserved

Brake IGBT + Diode

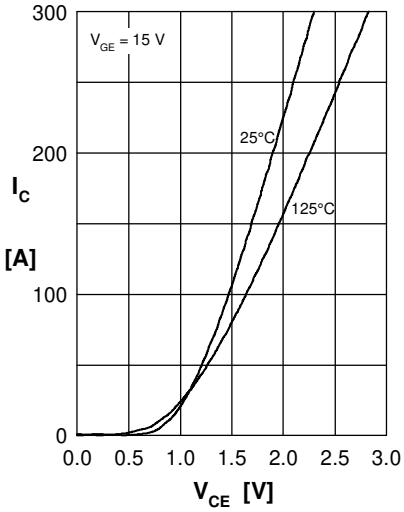


Fig.1 Output characteristics IGBT

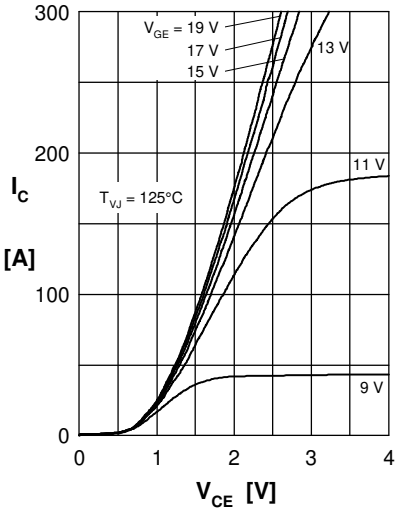


Fig.2 Typ. output characteristics IGBT

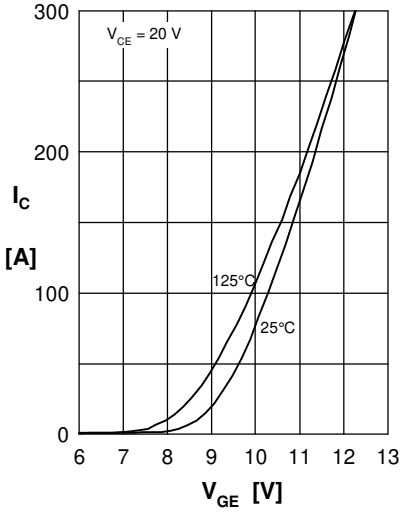


Fig. 3 Typ. transfer charact. IGBT

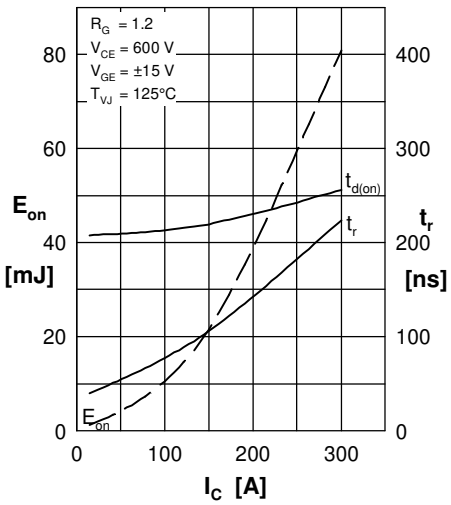


Fig. 4 Typ. turn-on energy & switch. times vs. collector current

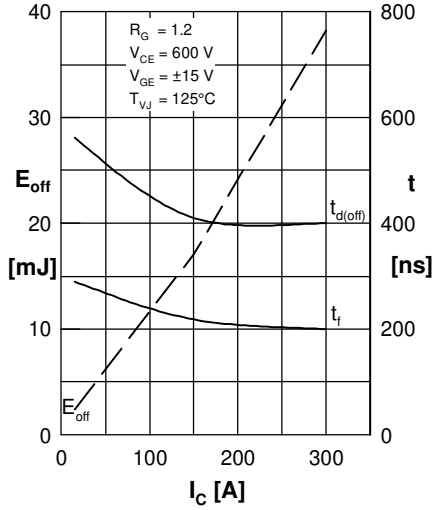


Fig. 5 Typ. turn-off energy & switch. times vs. collector current

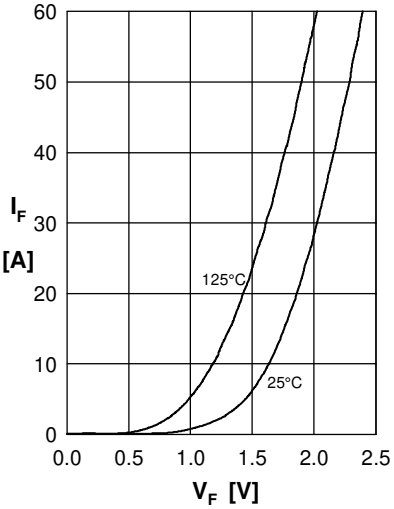


Fig. 6 Typ. forward characteristics Diode

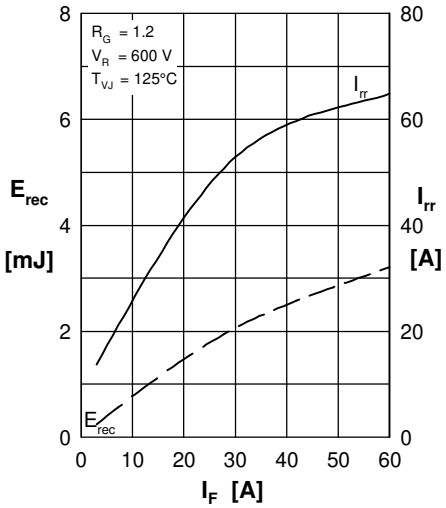


Fig. 7 Typ. reverse recovery characteristics Diode

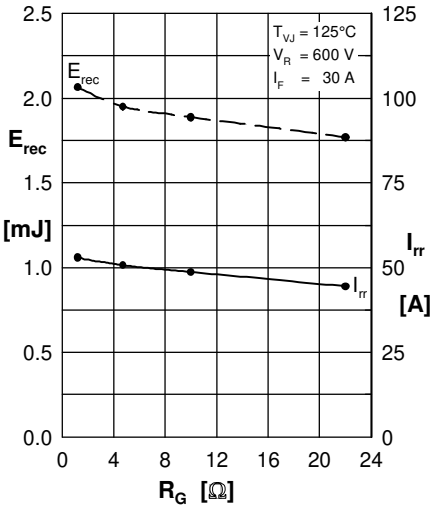


Fig. 8 Typ. reverse recovery characteristics Diode

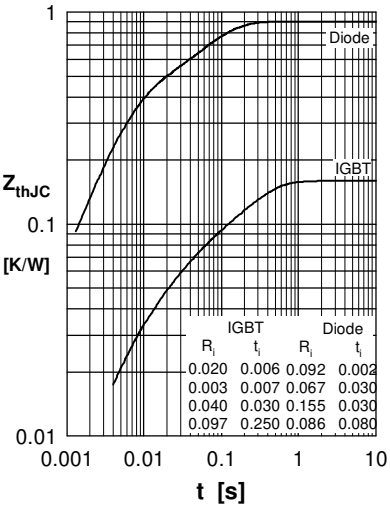


Fig. 9 Transient thermal resistance junction to case

© 2019 IXYS all rights reserved