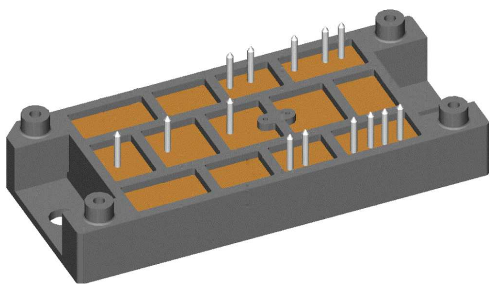
Standard Rectifier Module

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

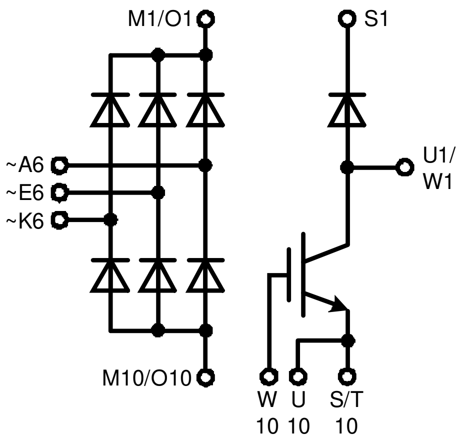
Part number

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

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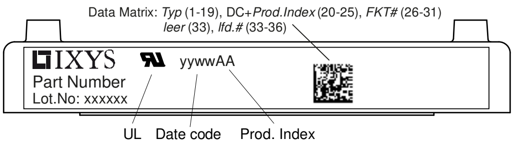
Rectifier						Ratings		
Symbol	Definition	Conditions			min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage			T_{VJ} = 25°C			1700	V
V_{RRM}	max. repetitive reverse blocking voltage			T_{VJ} = 25°C			1600	V
I_R	reverse current	V_R = 1600 V		T_{VJ} = 25°C			100	µA
		V_R = 1600 V		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		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

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*				220		ns
t_r	*current rise time*				100		ns
$t_{d(off)}$	*turn-off delay time*	inductive load	T_{VJ} = 125°C		400		ns
t_f	*current fall time*	V_{CE} = 600 V; I_C = 150 A			220		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 1.2 Ω			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			6		µC
I_{RM}	*max. reverse recovery current*	$-di_F/dt$ = 900 A/µs	T_{VJ} = 125°C		50		A
t_{rr}	*reverse recovery time*	I_F = 30 A; V_{GE} = 0 V			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

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

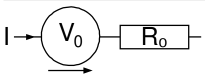


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB160-16NOX	VUB160-16NOX	Box	6	521713

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

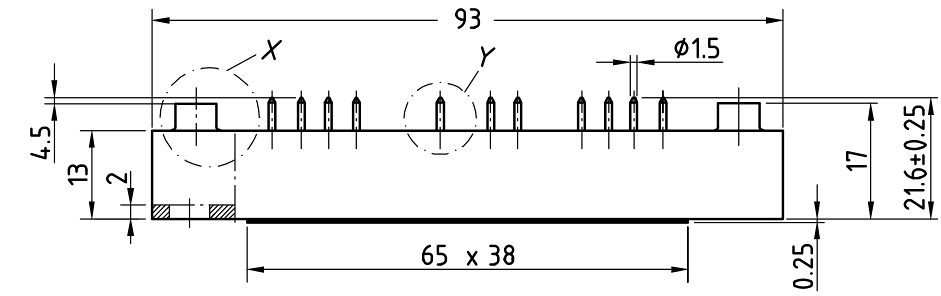
Equivalent Circuits for Simulation

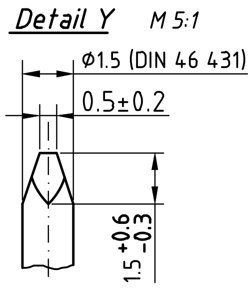
** on die level* $T_{VJ} = 150°C$

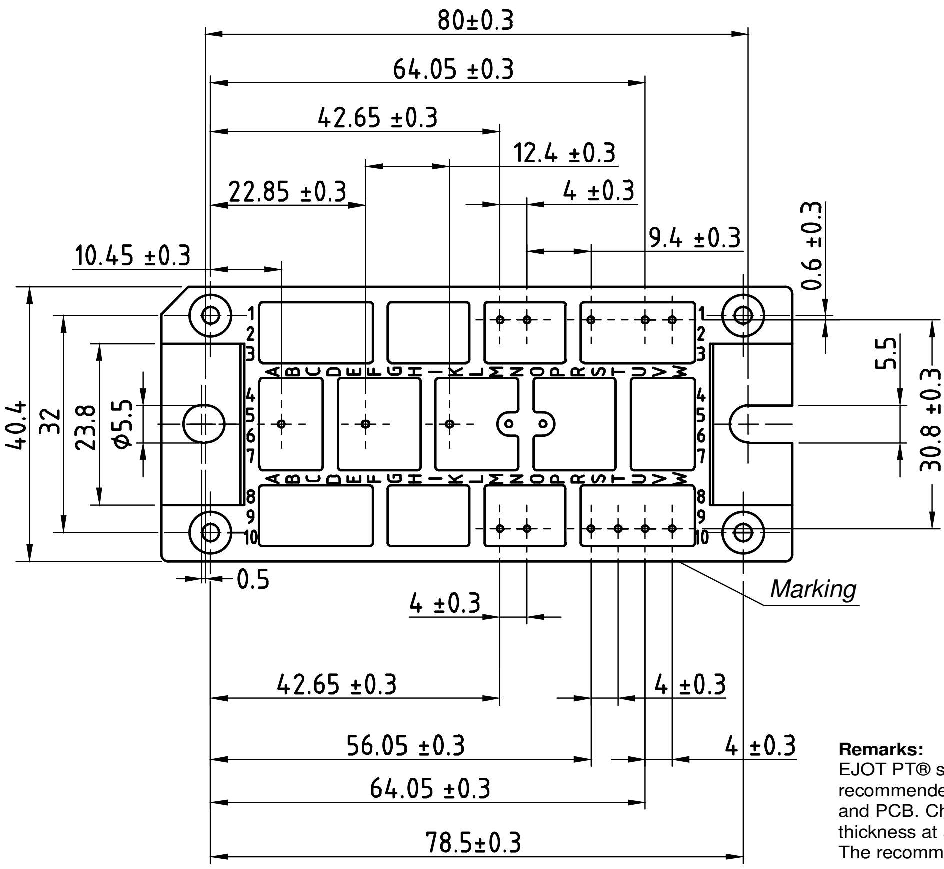


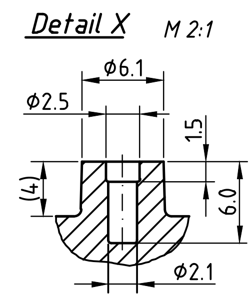
		Rectifier	Brake IGBT +	Brake Diode	
$V_{0\ max}$	*threshold voltage*	0.81	1.1	1.31	V
$R_{0\ max}$	*slope resistance **	3.2	13.8	8	mΩ

Outlines V2-Pack

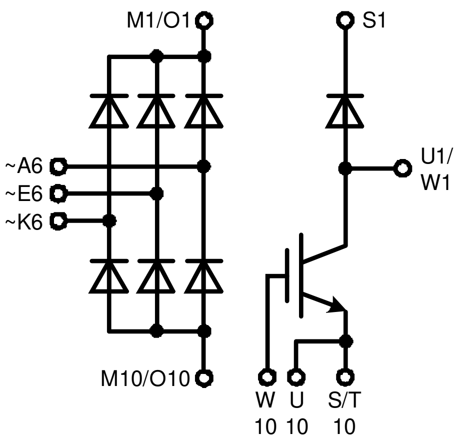








Remarks:
EJOT PT® self-tapping screws of the dimension K25 are recommended for the mechanical connection between module and PCB. Choose the right length according to your board thickness at a maximum depth of 6 mm of the module holes. The recommended mounting torque is 1.5 Nm.



Rectifier

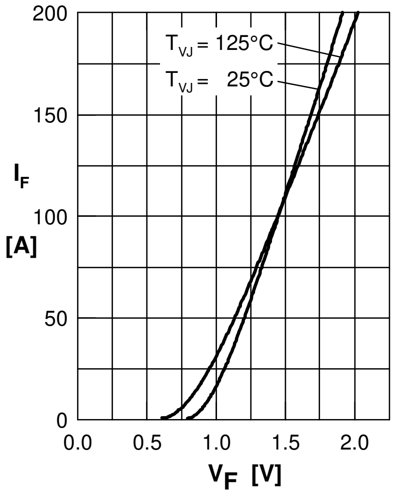


Fig. 1 Forward current vs. voltage drop per diode

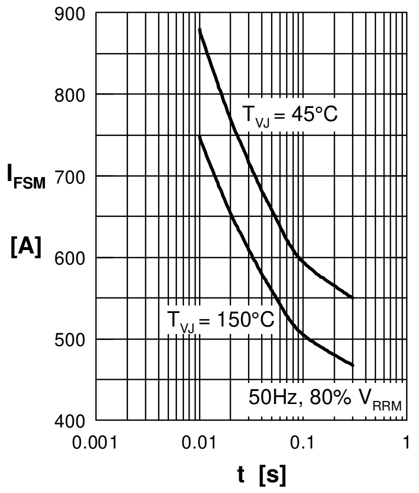


Fig. 2 Surge overload current vs. time per diode

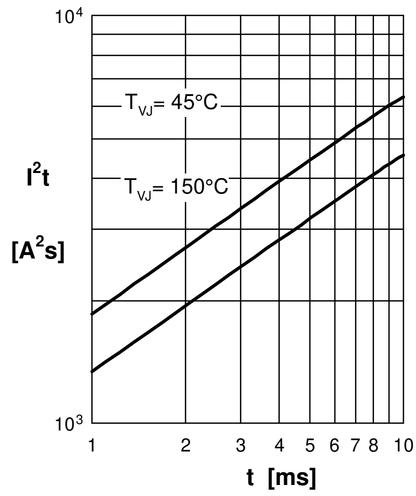


Fig. 3 I^2t vs. time per diode

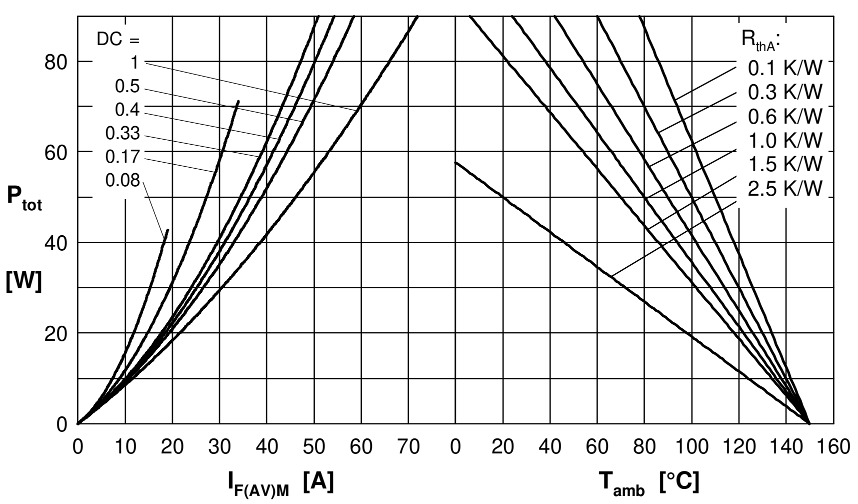


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

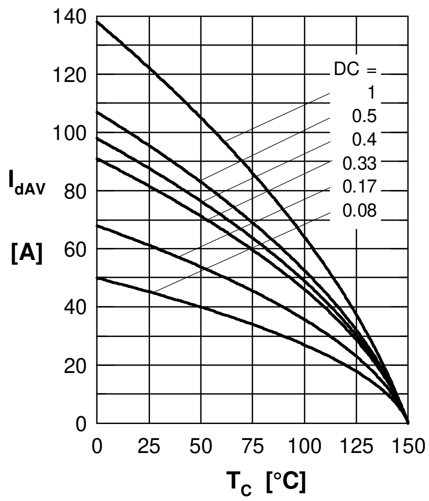


Fig. 5 Max. forward current vs. case temperature per diode

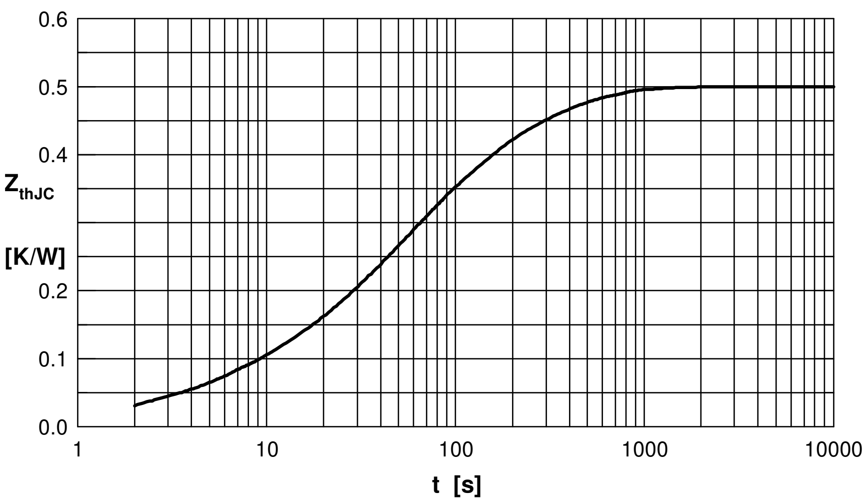


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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

Brake IGBT + Diode

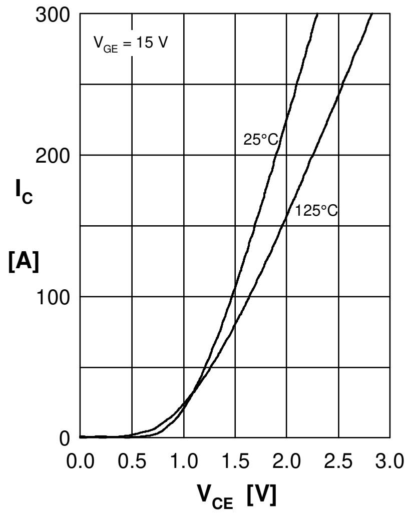


Fig.1 Output characteristics IGBT

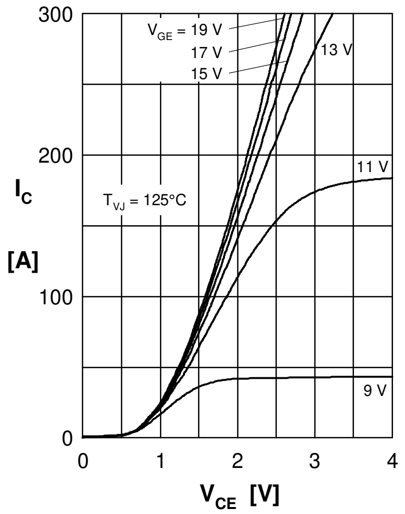


Fig.2 Typ. output characteristics IGBT

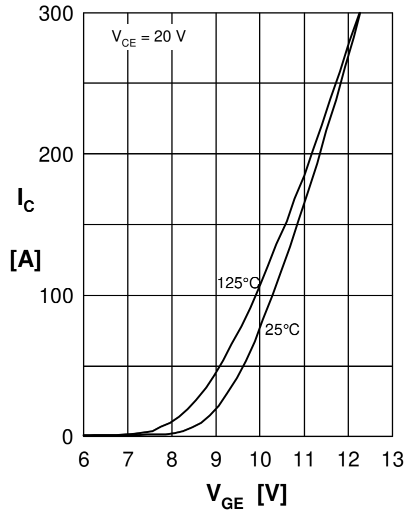


Fig. 3 Typ. transfer charact. IGBT

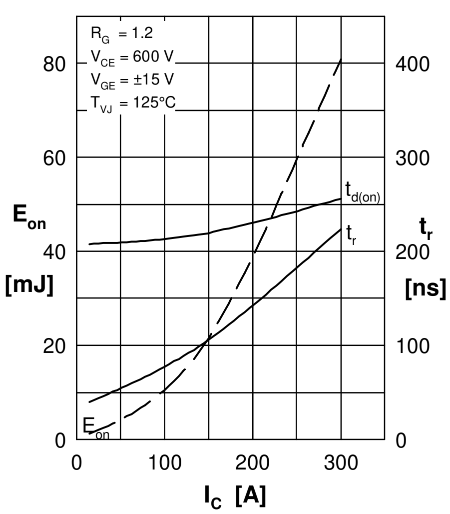


Fig. 4 Typ. turn-on energy & switch. times vs. collector current

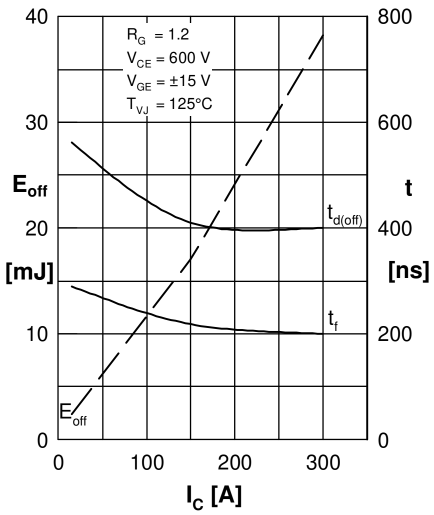


Fig. 5 Typ. turn-off energy & switch. times vs. collector current

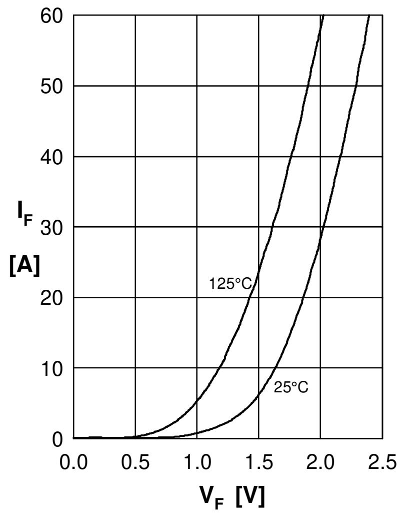


Fig. 6 Typ. forward characteristics Diode

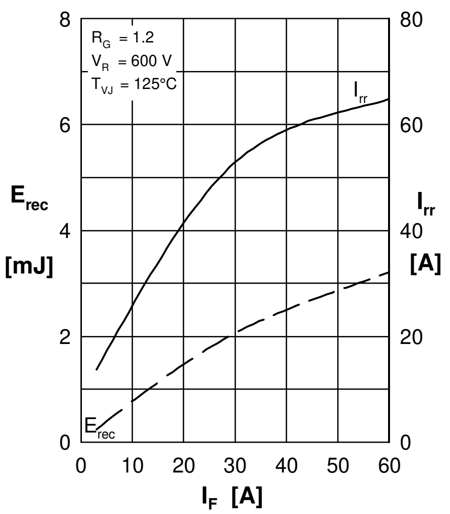


Fig. 7 Typ. reverse recovery characteristics Diode

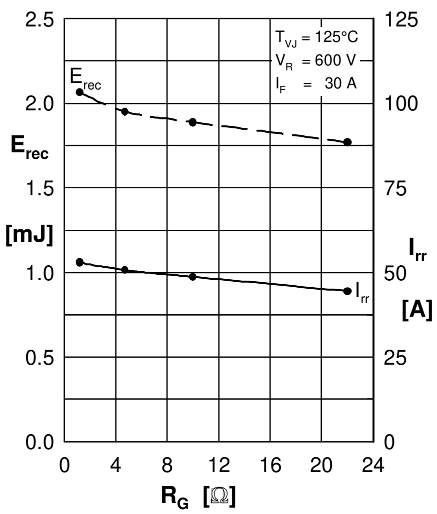


Fig. 8 Typ. reverse recovery characteristics Diode

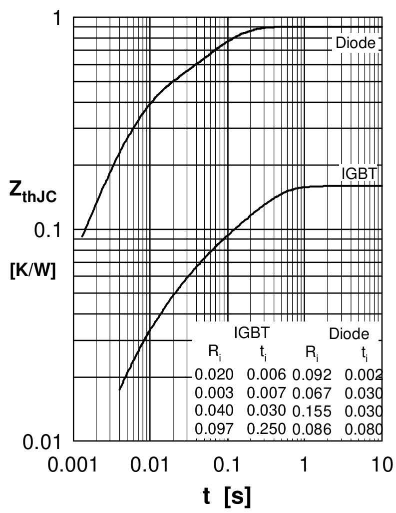


Fig. 9 Transient thermal resistance junction to case