

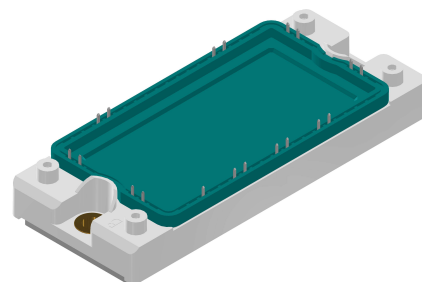
High Voltage Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 2200 \text{ V}$	$V_{CES} = 1700 \text{ V}$
$I_{DAV} = 150 \text{ A}$	$I_{C25} = 113 \text{ A}$
$I_{FSM} = 1100 \text{ A}$	$V_{CE(sat)} = 1.9 \text{ V}$

3~ Rectifier Bridge + Brake Unit + NTC

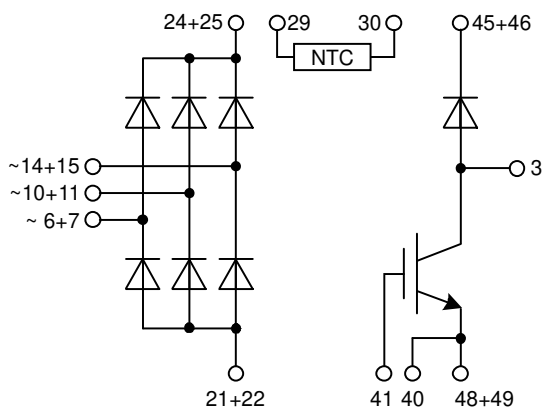
Part number

VUB135-22NO1



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

Applications:

- 3~ Rectifier with brake unit for drive inverters

Package: E2-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

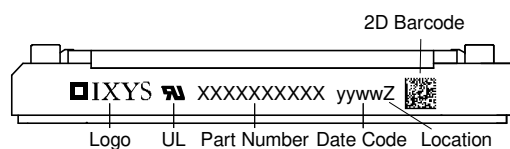
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2300	V
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				2200	V
I_R	reverse current	$V_R = 2200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			100	μA
		$V_R = 2200\text{ V}$	$T_{VJ} = 150^{\circ}\text{C}$			2	mA
V_F	forward voltage drop	$I_F = 50\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.20	V
		$I_F = 150\text{ A}$				1.68	V
		$I_F = 50\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.13	V
		$I_F = 150\text{ A}$				1.74	V
I_{DAV}	bridge output current	$T_C = 105^{\circ}\text{C}$ rectangular	$T_{VJ} = 150^{\circ}\text{C}$ $d = \frac{1}{3}$			150	A
V_{F0}	threshold voltage	} for power loss calculation only		$T_{VJ} = 150^{\circ}\text{C}$		0.79	V
r_F	slope resistance					6.4	m Ω
R_{thJC}	thermal resistance junction to case					0.5	K/W
R_{thCH}	thermal resistance case to heatsink				0.1		K/W
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				250	W
I_{FSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.10	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.19	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			935	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.01	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			6.05	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			5.89	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			4.37	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			4.25	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}; f = 1\text{ MHz}$			37		pF

Brake IGBT + Diode				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$				1700	V
V_{GES}	max. DC gate voltage					± 20	V
V_{GEM}	max. transient gate emitter voltage					± 30	V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$				113	A
I_{C80}		$T_C = 80^{\circ}\text{C}$				80	A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				445	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 75 \text{ A}; V_{GE} = 15 \text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.9	2.13	V
			$T_{VJ} = 125^{\circ}\text{C}$		2.8		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 3 \text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.2	5.8	6.4	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			0.6	mA
			$T_{VJ} = 125^{\circ}\text{C}$		0.6		mA
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20 \text{ V}$				400	nA
$Q_{G(on)}$	total gate charge	$V_{CE} = 900 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 75 \text{ A}$			850		nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 900 \text{ V}; I_C = 75 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 18 \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		250		ns
t_r	current rise time				70		ns
$t_{d(off)}$	turn-off delay time				670		ns
t_f	current fall time				420		ns
E_{on}	turn-on energy per pulse				29		mJ
E_{off}	turn-off energy per pulse				17		mJ
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15 \text{ V}; R_G = 18 \Omega$	$T_{VJ} = 125^{\circ}\text{C}$				
I_{CM}		$V_{CEK} = 1700 \text{ V}$				150	A
SCSOA	short circuit safe operating area	$V_{CEK} = 1700 \text{ V}$					
t_{SC}	short circuit duration	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15$	$T_{VJ} = 125^{\circ}\text{C}$			10	μs
I_{SC}	short circuit current	$R_G = 18 \Omega$; non-repetitive			340		A
R_{thJC}	thermal resistance junction to case					0.28	K/W
R_{thCH}	thermal resistance case to heatsink				0.10		K/W
Brake Diode							
V_{RRM}	max. repetitive reverse voltage		$T_{VJ} = 25^{\circ}\text{C}$			1700	V
I_{F25}	forward current		$T_C = 25^{\circ}\text{C}$			75	A
I_{F80}			$T_C = 80^{\circ}\text{C}$			50	A
V_F	forward voltage	$I_F = 60 \text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			3.05	V
			$T_{VJ} = 125^{\circ}\text{C}$		2.20		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$			0.1	mA
			$T_{VJ} = 125^{\circ}\text{C}$			6	mA
Q_{rr}	reverse recovery charge	$V_R = 900 \text{ V}$ $-di_F/dt = 1000 \text{ A}/\mu\text{s}$ $I_F = 60 \text{ A}; V_{GE} = 0 \text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$		18		μC
I_{RM}	max. reverse recovery current				70		A
t_{rr}	reverse recovery time				900		ns
E_{rec}	reverse recovery energy				8		mJ
R_{thJC}	thermal resistance junction to case					0.65	K/W
R_{thCH}	thermal resistance case to heatsink				0.25		K/W

Package E2-Pack				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I _{RMS}	RMS current	per terminal				40	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	3600			V
		t = 1 minute		3000			V



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB135-22NO1	VUB135-22NO1	Box	6	503948

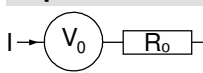
Temperature Sensor NTC

Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	4.75	5	5.25	k Ω
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation

* on die level

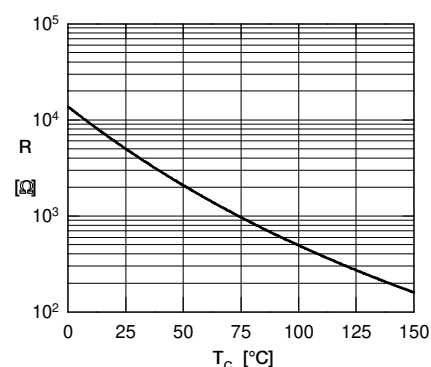
$T_{VJ} = 150^\circ\text{C}$



Rectifier

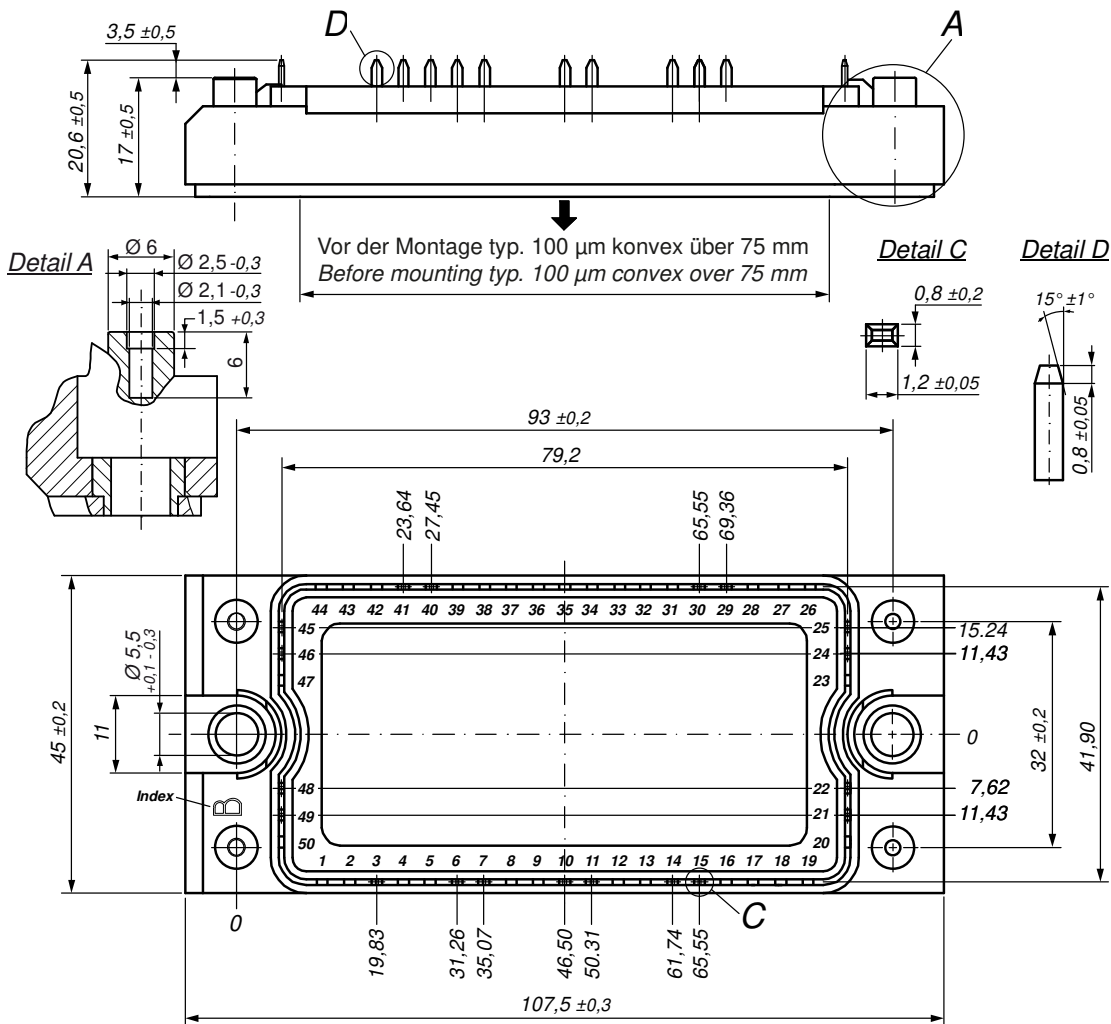
$V_{0\max}$ threshold voltage 0.79 V

$R_{0\max}$ slope resistance * 3.3 m Ω





Outlines E2-Pack



Bemerkung / Note:

- Nichttolerierete 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: $\oplus 0.1$

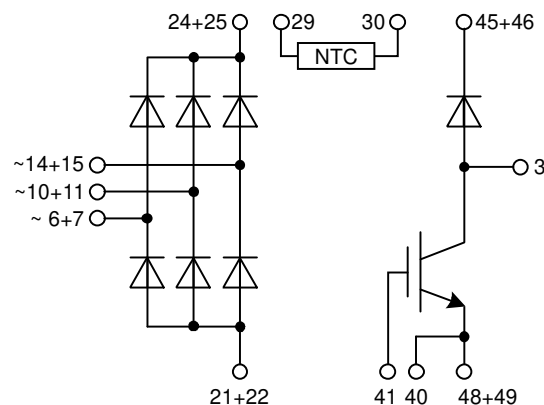
- Montageanleitung / Mounting instruction: www.ixys.com **Application note IXAN0024**

Detail A: PCB-Montage / Mounting on PCB ^L

- Empfohlene, selbstschneidende Schraube / Recommended, self-tapping screw: **EJOT PT®** (Größe / size: **K25**) ^L

- Max. Schraubenlänge / Max. screw length: **PCB-Dicke / thickness + 6 mm** (max. Lochtiefe / hole depth) ^L

- Empfohlenes Drehmoment / Recommended mounting torque: **1.5 Nm**



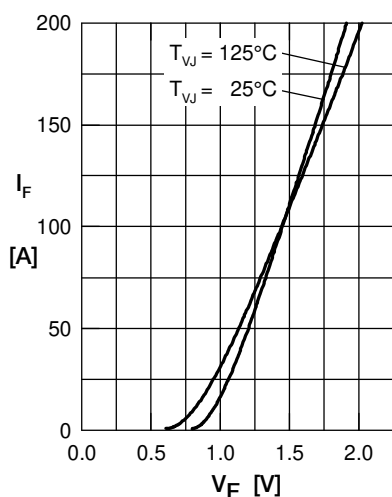
Rectifier


Fig. 1 Forward current vs. voltage drop per diode

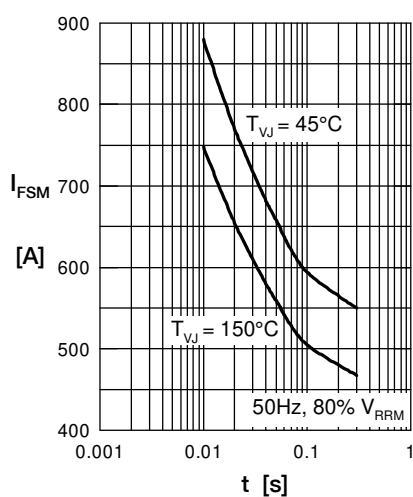


Fig. 2 Surge overload current vs. time per diode

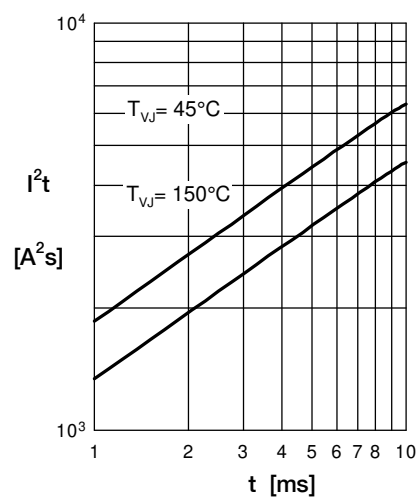


Fig. 3 I^2t vs. time per diode

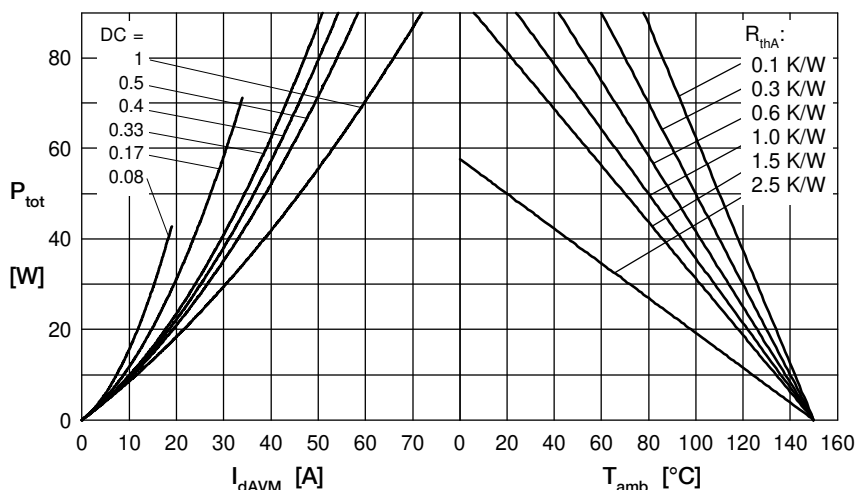


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

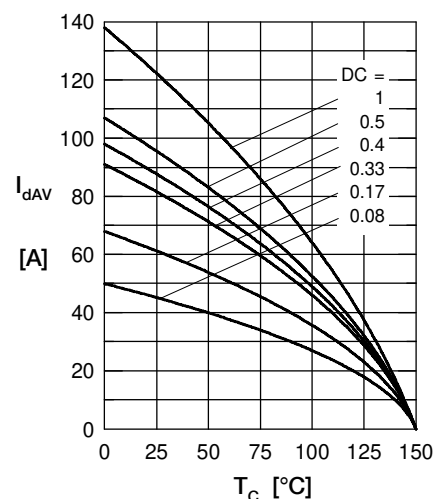


Fig. 5 Max. forward current vs. case temperature per diode

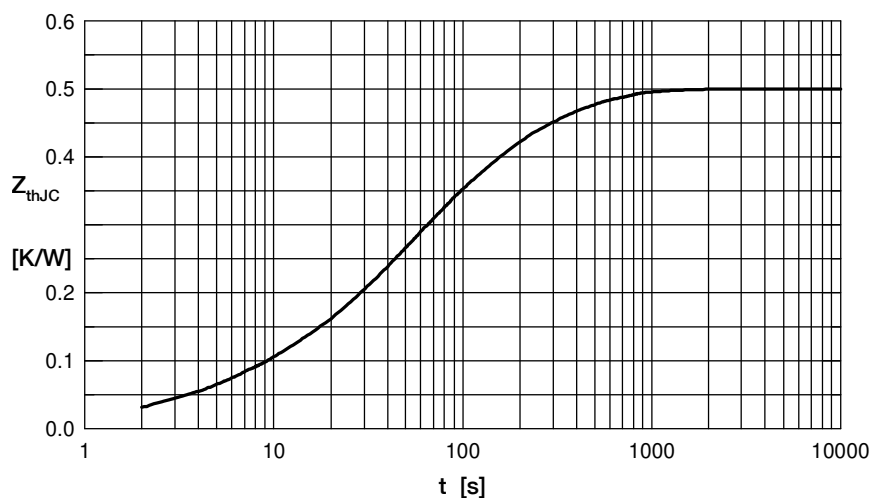


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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

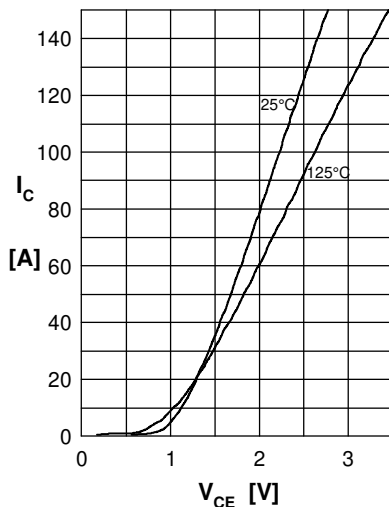
Brake IGBT + Diode


Fig.1 Output characteristics IGBT

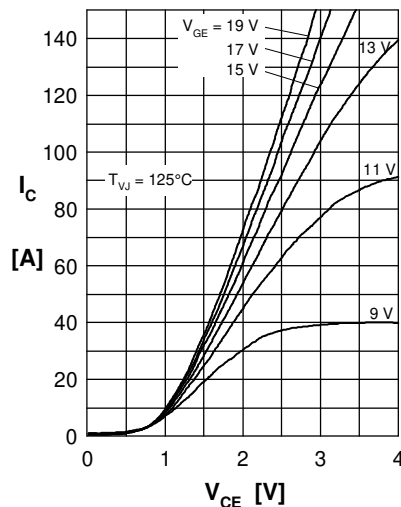


Fig.2 Typ. output characteristics IGBT

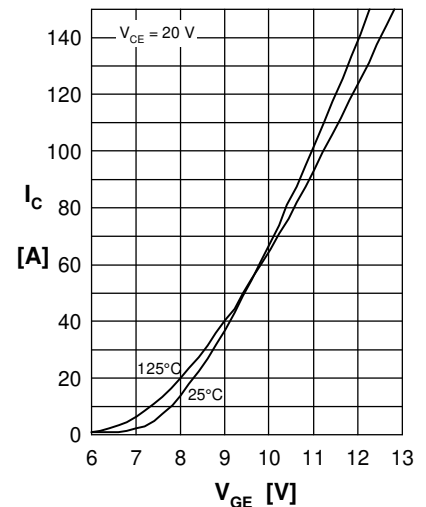


Fig.3 Typ. transfer charact. IGBT

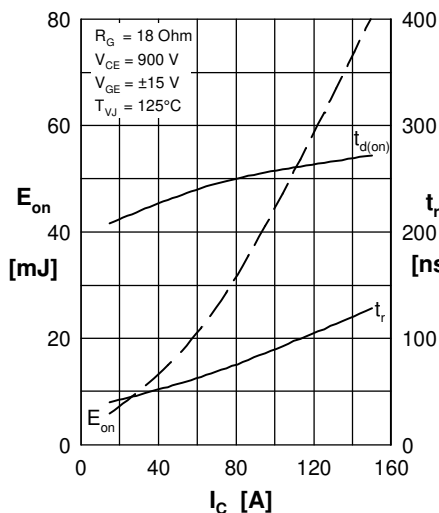


Fig.4 Typ. turn-on energy & switch. times vs. collector current

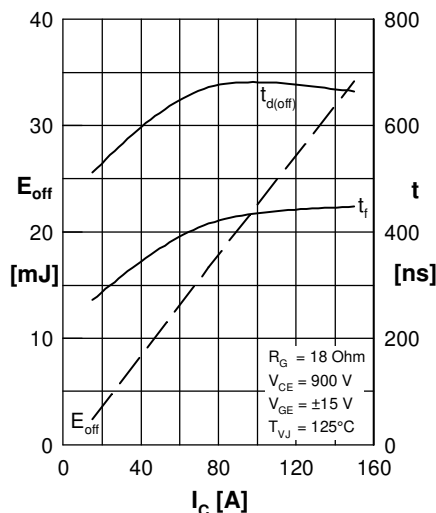


Fig.5 Typ. turn-off energy & switch. times vs. collector current

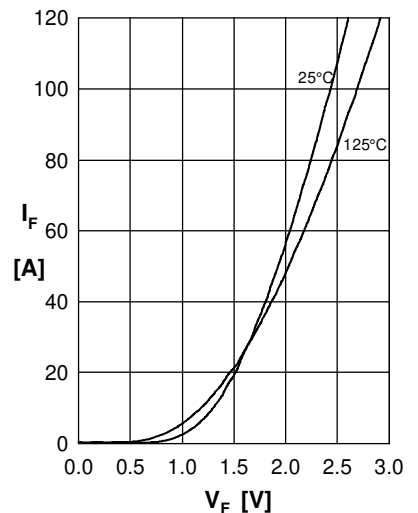


Fig.6 Typ. forward characteristics Diode

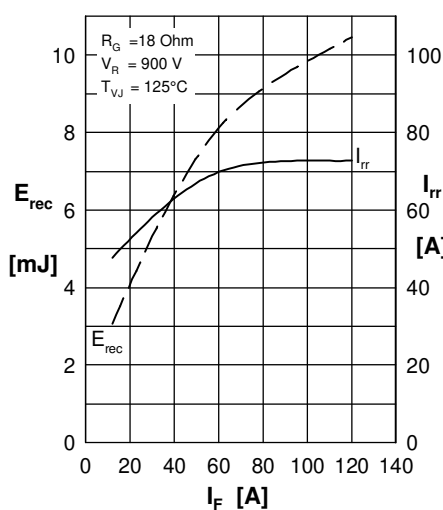


Fig.7 Typ. reverse recovery characteristics Diode

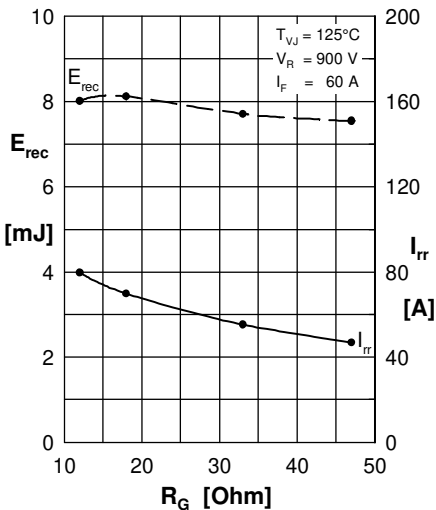


Fig.8 Typ. reverse recovery characteristics Diode

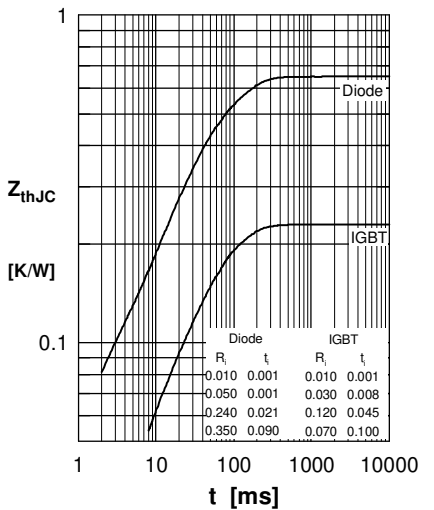


Fig.9 Transient thermal resistance junction to case