High Voltage Standard Rectifier Module

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

3~ Rectifier Bridge + Brake Unit + NTC
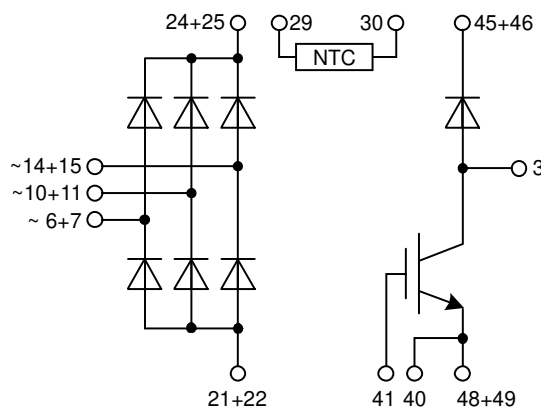
Part number

VUB135-22NO1
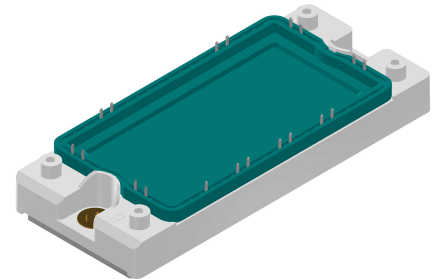
Backside: isolated

UL 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

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage		$T_{VJ} = 25°C$			2300	V
V_{RRM}	max. repetitive reverse blocking voltage		$T_{VJ} = 25°C$			2200	V
I_R	reverse current	$V_R = 2200$ V	$T_{VJ} = 25°C$			100	µA
		$V_R = 2200$ V	$T_{VJ} = 150°C$			2	mA
V_F	forward voltage drop	$I_F = 50$ A	$T_{VJ} = 25°C$			1.20	V
		$I_F = 150$ A				1.68	V
		$I_F = 50$ A	$T_{VJ} = 125°C$			1.13	V
		$I_F = 150$ A				1.74	V
I_{DAV}	bridge output current	$T_C = 105°C$	$T_{VJ} = 150°C$			150	A
		rectangular d = ⅓					
V_{F0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150°C$			0.79	V
r_F	slope resistance					6.4	mΩ
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		$T_C = 25°C$			250	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

Ratings

Brake IGBT + Diode

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage		$T_{VJ} = 25°C$			1700	V
V_{GES}	max. DC gate voltage					±20	V
V_{GEM}	max. transient gate emitter voltage					±30	V
I_{C25}	collector current		$T_C = 25°C$			113	A
I_{C80}			$T_C = 80°C$			80	A
P_{tot}	total power dissipation		$T_C = 25°C$			445	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 75$ A; $V_{GE} = 15$ V	$T_{VJ} = 25°C$		1.9	2.13	V
			$T_{VJ} = 125°C$		2.8		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 3$ mA; $V_{GE} = V_{CE}$	$T_{VJ} = 25°C$	5.2	5.8	6.4	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}$; $V_{GE} = 0$ V	$T_{VJ} = 25°C$			0.6	mA
			$T_{VJ} = 125°C$		0.6		mA
I_{GES}	gate emitter leakage current	$V_{GE} = ±20$ V				400	nA
$Q_{G(on)}$	total gate charge	$V_{CE} = 900$ V; $V_{GE} = 15$ V; $I_C = 75$ A			850		nC
$t_{d(on)}$	turn-on delay time				250		ns
t_r	current rise time				70		ns
$t_{d(off)}$	turn-off delay time	inductive load	$T_{VJ} = 125°C$		670		ns
t_f	current fall time	$V_{CE} = 900$ V; $I_C = 75$ A			420		ns
E_{on}	turn-on energy per pulse	$V_{GE} = ±15$ V; $R_G = 18$ Ω			29		mJ
E_{off}	turn-off energy per pulse				17		mJ
RBSOA	reverse bias safe operating area	$V_{GE} = ±15$ V; $R_G = 18$ Ω	$T_{VJ} = 125°C$				
I_{CM}		$V_{CEK} = 1700$ V				150	A
SCSOA	short circuit safe operating area	$V_{CEK} = 1700$ V					
t_{SC}	short circuit duration	$V_{CE} = 900$ V; $V_{GE} = ±15$	$T_{VJ} = 125°C$			10	µs
I_{SC}	short circuit current	$R_G = 18$ Ω; 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

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RRM}	max. repetitive reverse voltage		$T_{VJ} = 25°C$			1700	V
I_{F25}	forward current		$T_C = 25°C$			75	A
I_{F80}			$T_C = 80°C$			50	A
V_F	forward voltage	$I_F = 60$ A	$T_{VJ} = 25°C$			3.05	V
			$T_{VJ} = 125°C$		2.20		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25°C$			0.1	mA
			$T_{VJ} = 125°C$			6	mA
Q_{rr}	reverse recovery charge	$V_R = 900$ V			18		µC
I_{RM}	max. reverse recovery current	$-di_F/dt = 1000$ A/µs	$T_{VJ} = 125°C$		70		A
t_{rr}	reverse recovery time	$I_F = 60$ A; $V_{GE} = 0$ V			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

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

2D Barcode

IXYS [UL] XXXXXXXXXX yywwZ

Logo   UL   Part Number   Date Code   Location

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°	4.75	5	5.25	kΩ
B$_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation   *on die level*   T$_{VJ}$ = 150°C

I → (V$_0$) — [R$_0$] —
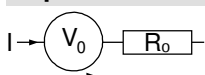
Rectifier

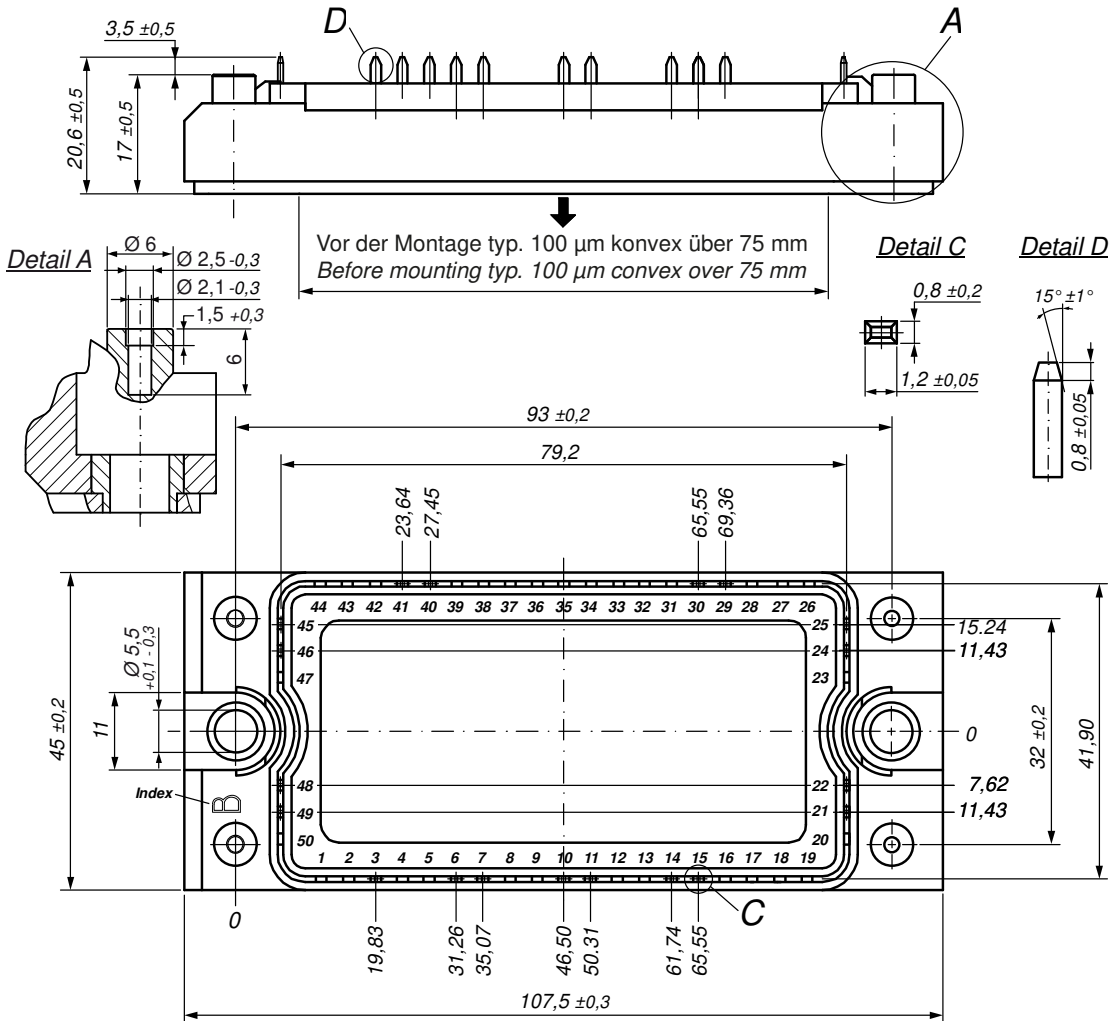|			
V$_{0 max}$	threshold voltage	0.79	V
R$_{0 max}$	slope resistance *	3.3	mΩ
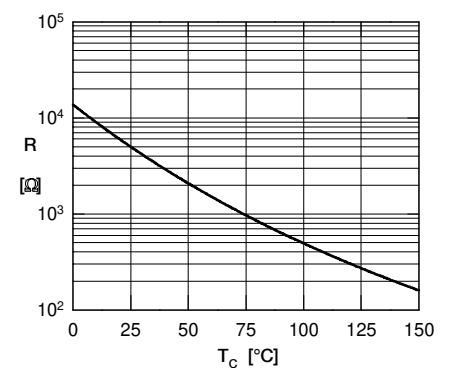
Typ. NTC resistance vs. temperature

Outlines   E2-Pack

*D*   *A*

3,5 ±0,5

20,6 ±0,5
17 ±0,5

Vor der Montage typ. 100 µm konvex über 75 mm
Before mounting typ. 100 µm convex over 75 mm

Detail A

Ø 6
Ø 2,5 -0,3
Ø 2,1 -0,3
1,5 +0,3
6

Detail C

0,8 ±0,2
1,2 ±0,05

Detail D

15° ±1°
0,8 ±0,05

93 ±0,2
79,2

23,64
27,45
65,55
69,36

44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
45	25	15,24
46	24	11,43
47	23	

45 ±0,2

Ø 5,5 +0,1 -0,3
11

0   32 ±0,2   41,90

Index   B

48	22	7,62
49	21	11,43
50	20	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

0

19,83
31,26
35,07
46,50
50,31
61,74
65,55

C

107,5 ±0,3

Bemerkung / *Note:*

- Nichttolerierte 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
- 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**

24+25   29   30   45+46

NTC

~14+15

~10+11   3

~ 6+7

21+22   41 40 48+49
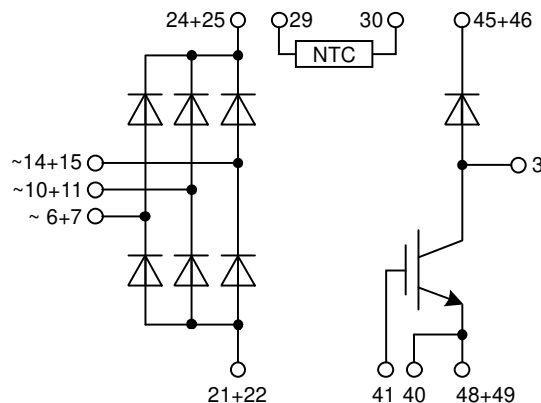
Rectifier
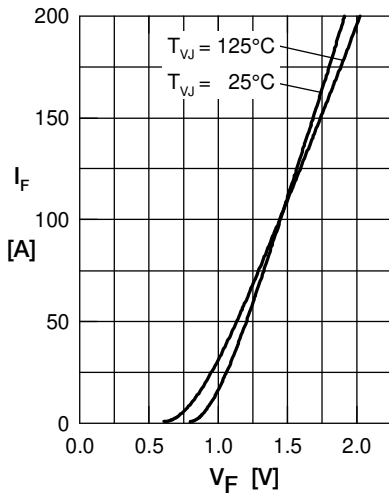
Fig. 1 Forward current vs.
voltage drop per diode
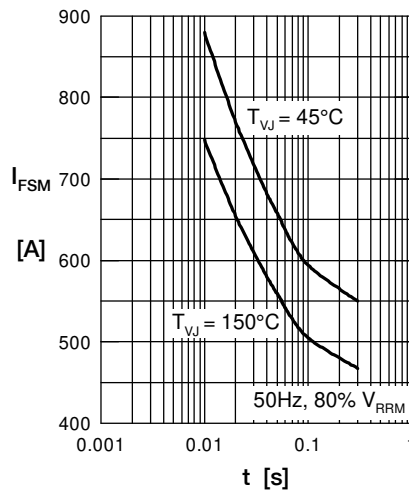
Fig. 2 Surge overload current
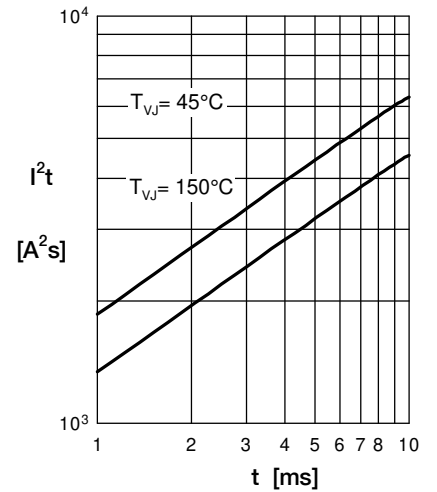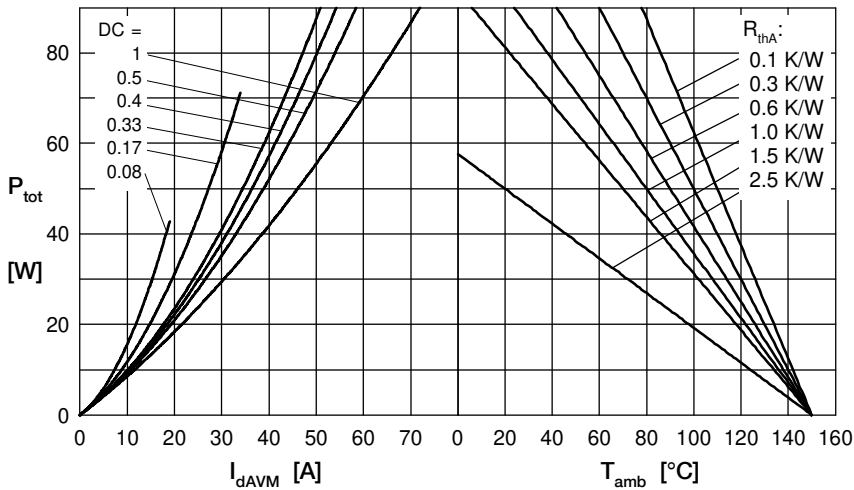vs. time per diode

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

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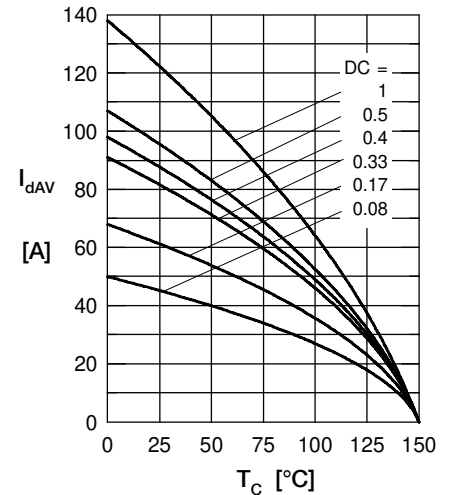and ambient temperature per diode

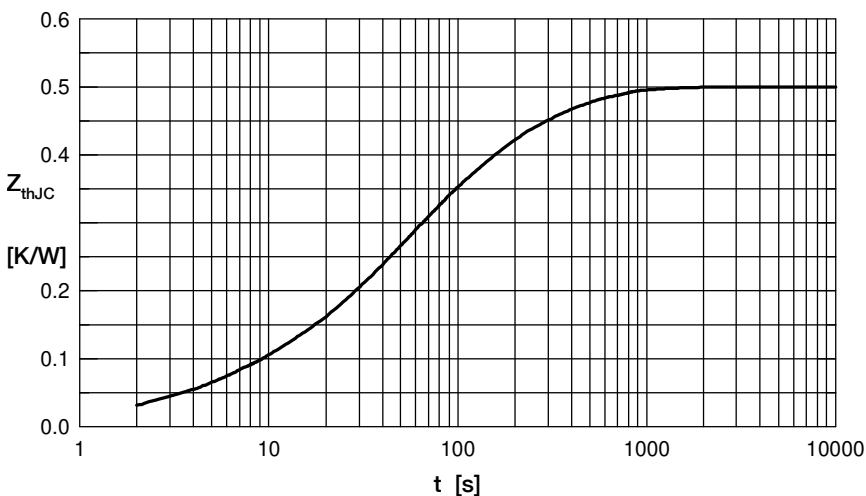Fig. 5 Max. forward current vs.
case temperature per diode

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
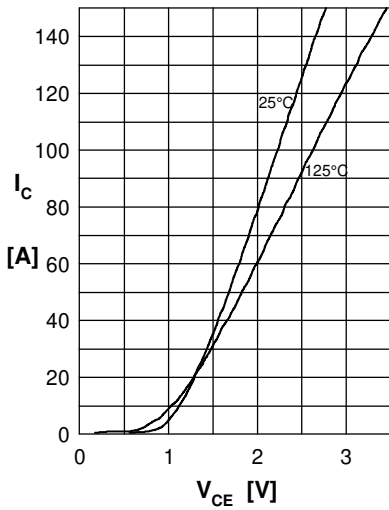
Fig.1 Output characteristics IGBT

Fig.2 Typ. output characteristics IGBT
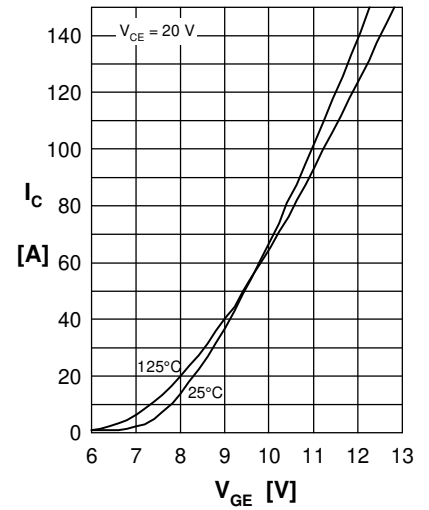
Fig. 3 Typ. transfer charact. IGBT
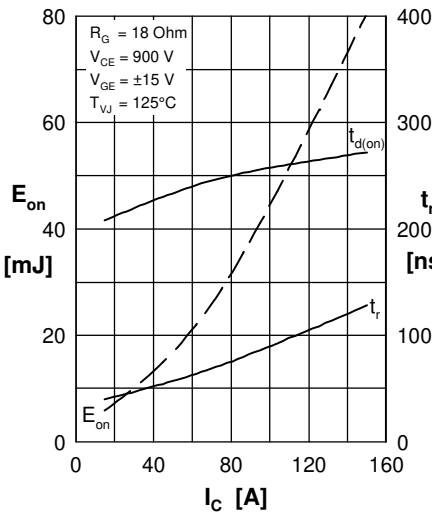
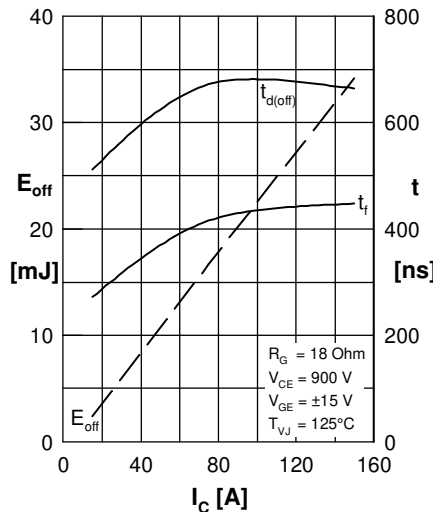Fig. 4 Typ. turn-on energy & switch. times vs. collector current

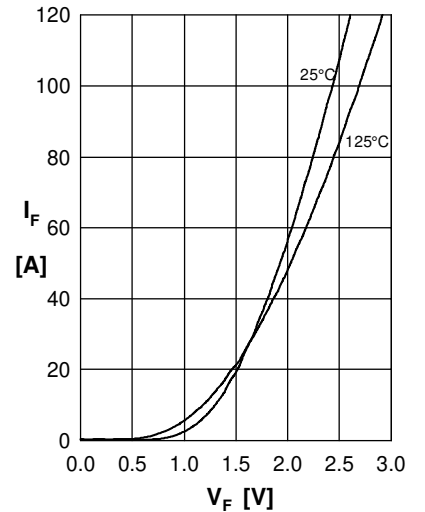Fig. 5 Typ. turn-off energy & switch. times vs. collector current
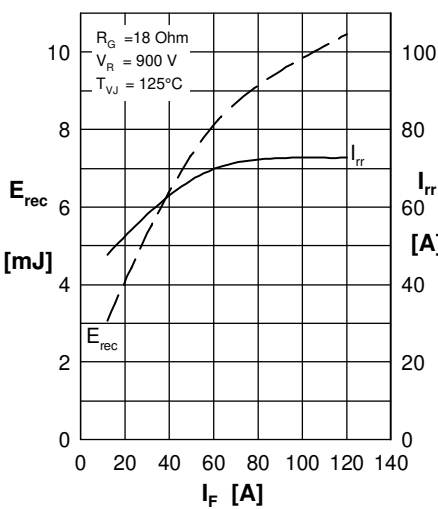

Fig. 6 Typ. forward characteristics Diode
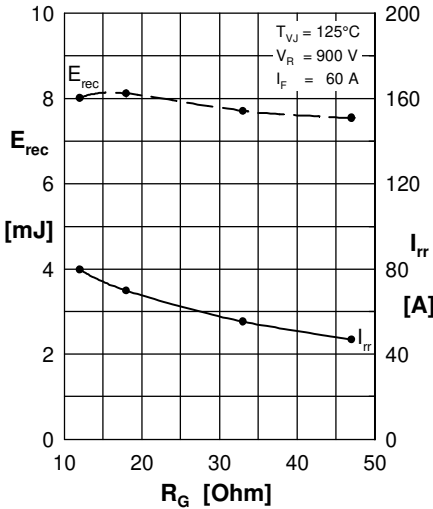

Fig. 7 Typ. reverse recovery characteristics Diode
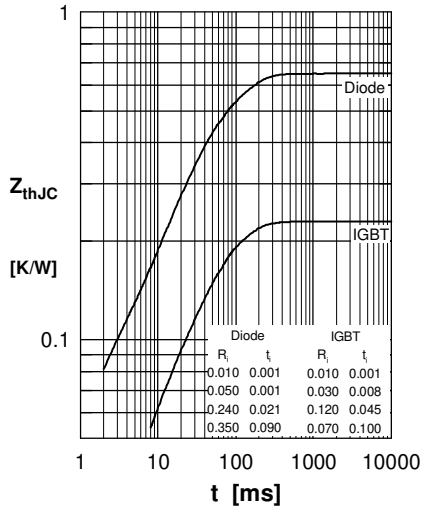

Fig. 8 Typ. reverse recovery characteristics Diode

Fig. 9 Transient thermal resistance junction to case

IXYS reserves the right to change limits, conditions and dimensions.

Data according to IEC 60747and per semiconductor unless otherwise specified

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