Standard Rectifier Module

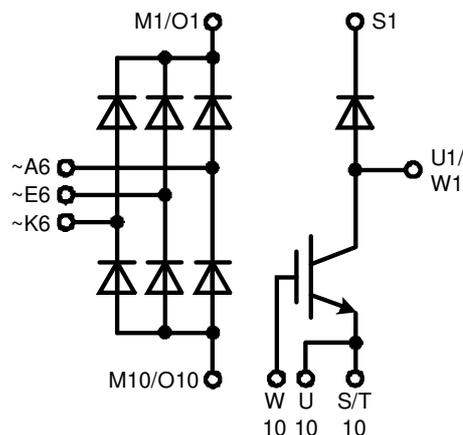|	3~ Rectifier	Brake Chopper	
V_{RRM} =	1600 V	V_{CES} =	1200 V
I_{DAV} =	180 A	I_{C25} =	180 A
I_{FSM} =	1100 A	$V_{CE(sat)}$ =	1.7 V

3~ Rectifier Bridge + Brake Unit

Part number

VUB120-16NOX
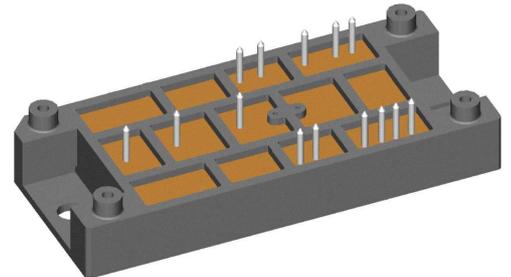
Backside: isolated

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
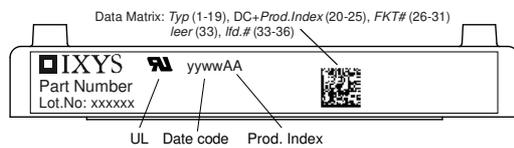● Advanced power cycling

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Rectifier

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			$T_{VJ} = 150°C$			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; $V_{GE} = ±15$	$T_{VJ} = 125°C$			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; $V_{GE} = 0$ V			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

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	3000			V

(V_ISOL conditions: 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA)

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

IXYS
Part Number
Lot.No: xxxxxx

RU yywwAA

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 $T_{VJ} = 150°C$

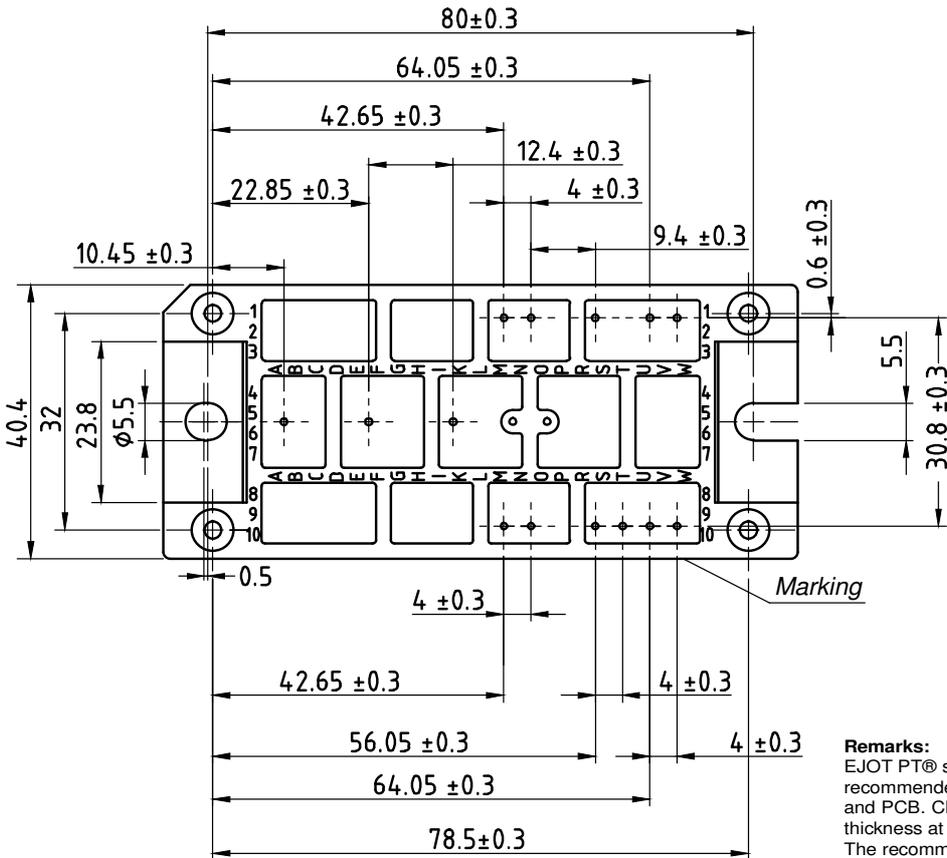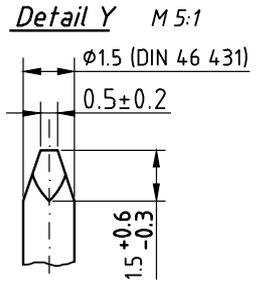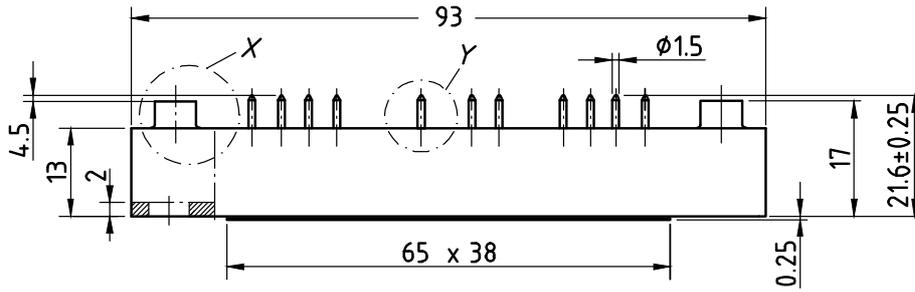I —(V_0)—[R_0]—
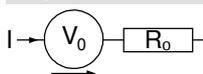
		Rectifier	Brake Diode	
$V_{0\ max}$	threshold voltage	0.81	1.31	V
$R_{0\ max}$	slope resistance *	3.2	8	mΩ

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747 and per semiconductor unless otherwise specified   20191220h

Outlines   V2-Pack

93

Φ1.5

4.5

13

2

65 x 38

0.25

17

21.6±0.25

Φ1.5 (DIN 46 431)

0.5±0.2

$1.5^{+0.6}_{-0.3}$

80±0.3

64.05 ±0.3

42.65 ±0.3

12.4 ±0.3

4 ±0.3

22.85 ±0.3

9.4 ±0.3

10.45 ±0.3

0.6 ±0.3

40.4

32

23.8

Φ5.5

5.5

30.8 ±0.3

0.5

Marking

4 ±0.3

42.65 ±0.3

4 ±0.3

56.05 ±0.3

4 ±0.3

64.05 ±0.3

78.5±0.3

Φ6.1

Φ2.5

1.5

(4)

6.0

Φ2.1
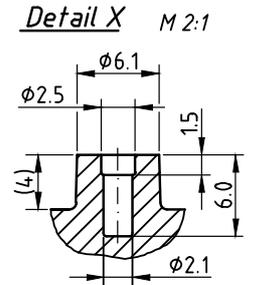
Remarks:
EJOT PT® self-tapping screws of the dimension K25 are recommended for the mechanical connection between module and PCB. Choose the right length according to your board thickness at a maximum depth of 6 mm of the module holes. The recommended mounting torque is 1.5 Nm.

M1/O1   S1

~A6   U1/ W1

~E6

~K6

M10/O10

W   U   S/T
10 10 10
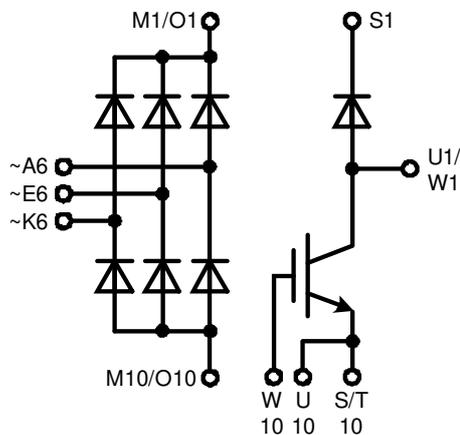
Rectifier
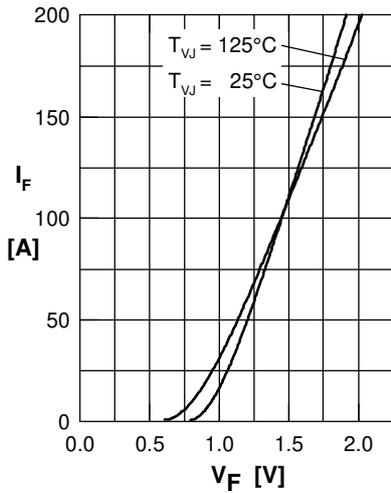
Fig. 1 Forward current vs.
voltage drop per diode
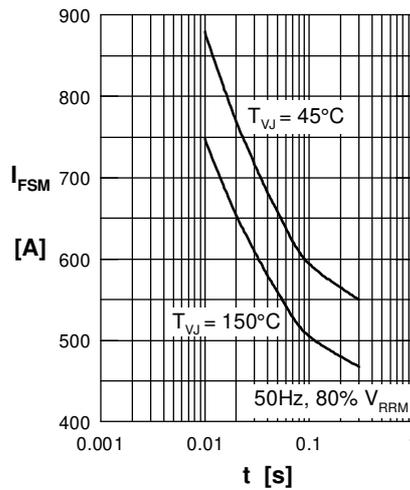
Fig. 2 Surge overload current
vs. time per diode
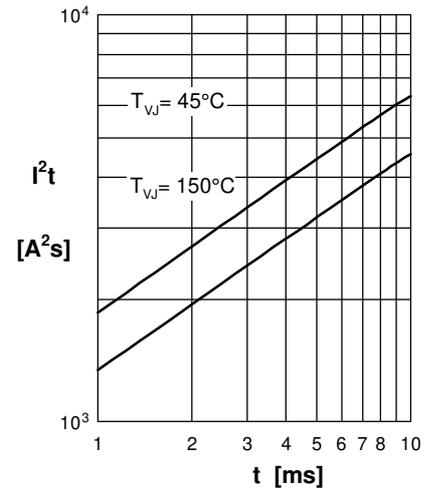
Fig. 3 I^2t vs. time per diode
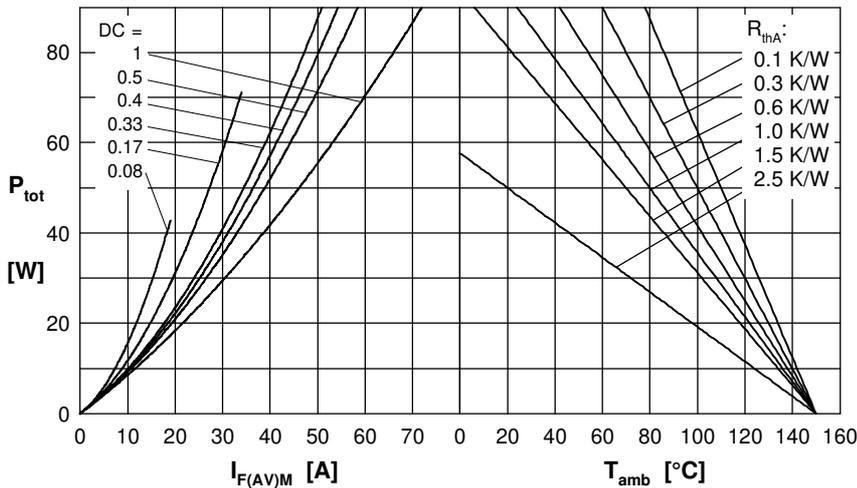
Fig. 4 Power dissipation vs. forward current
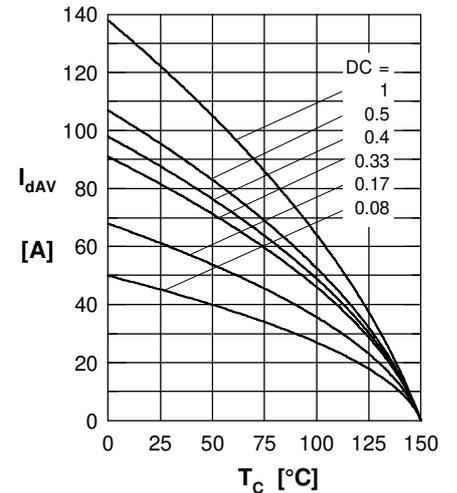and ambient temperature per diode

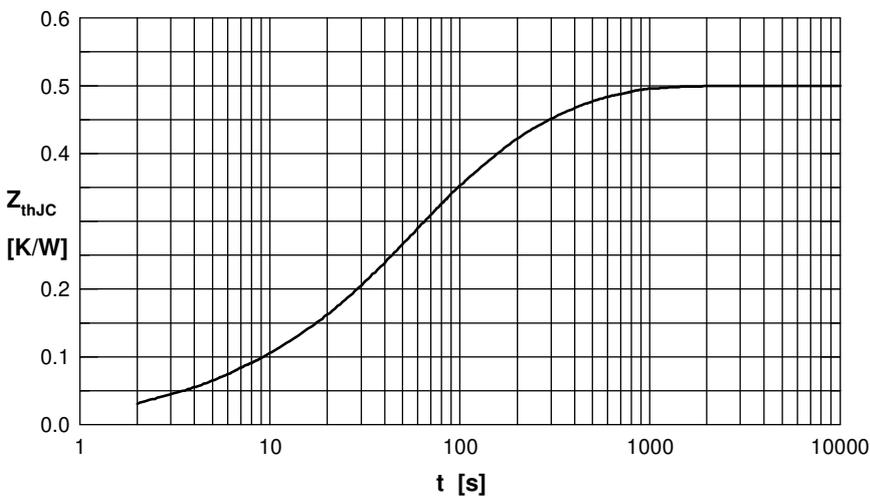Fig. 5 Max. forward current vs.
case temperature per diode

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
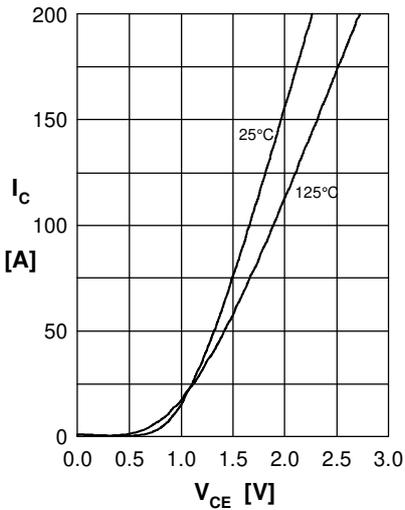
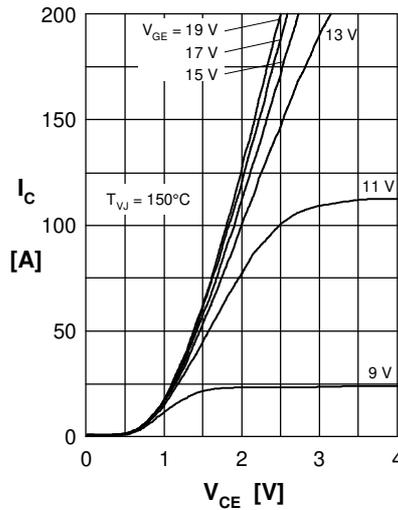Fig.1 Output characteristics IGBT
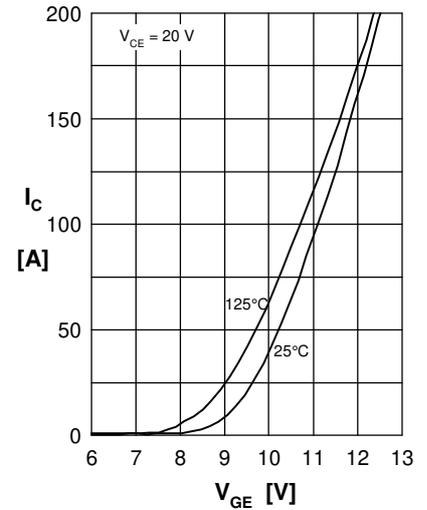

Fig.2 Typ. output characteristics IGBT

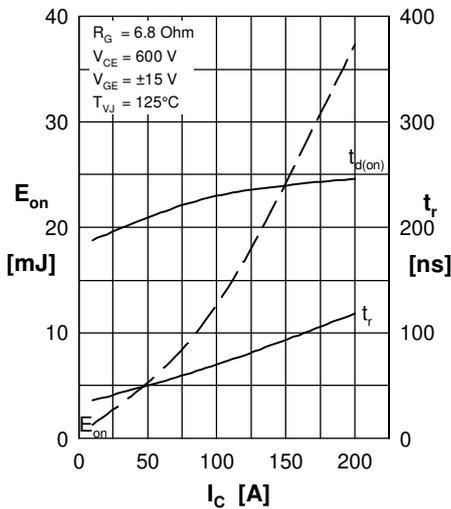Fig. 3 Typ. transfer charact. IGBT

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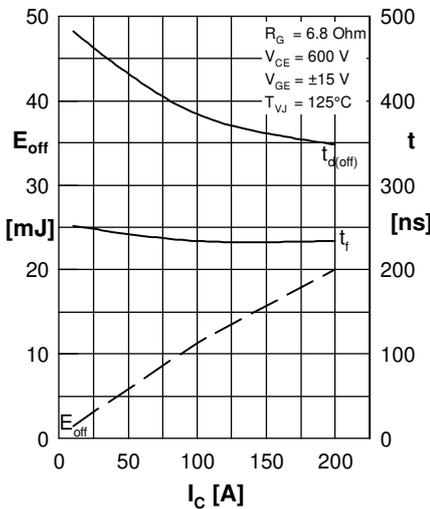

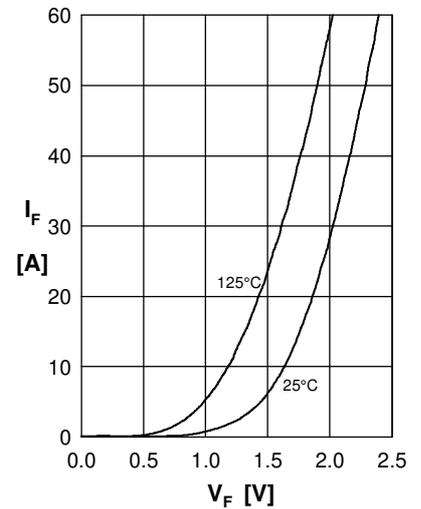Fig. 5 Typ. turn-off energy & switch. times vs. collector current
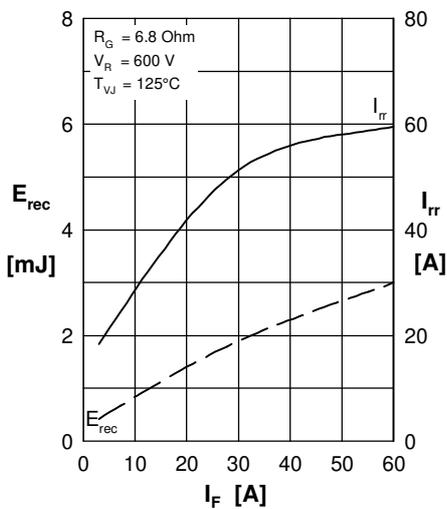

Fig. 6 Typ. forward characteristics Diode
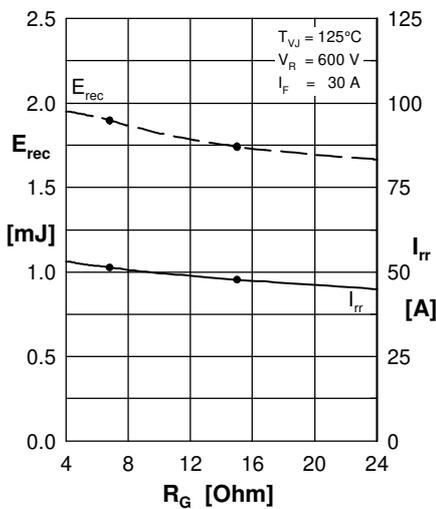

Fig. 7 Typ. reverse recovery characteristics Diode
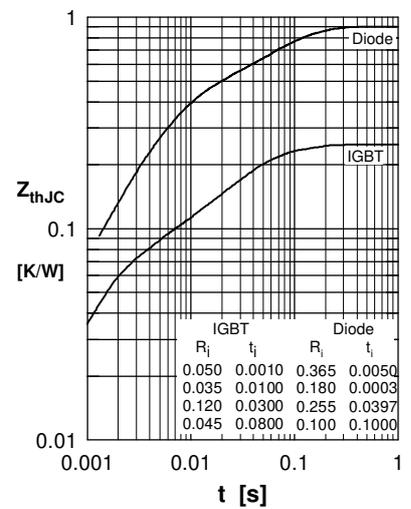

Fig. 8 Typ. reverse recovery characteristics Diode

Fig. 9 Transient thermal resistance junction to case

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