

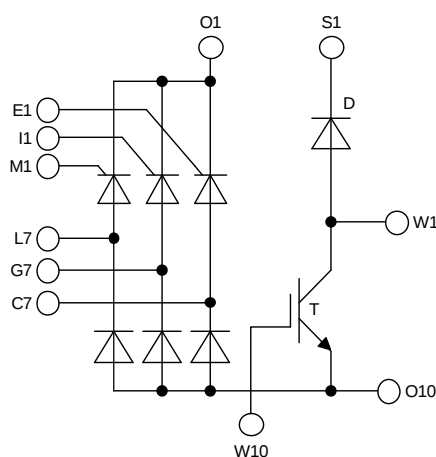
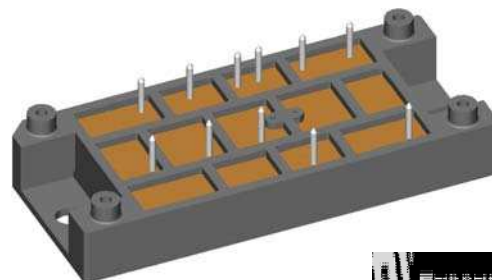
Thyristor Module

3 ~ Rectifier	Brake Chopper
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAVM} = 120 \text{ A}$	$I_{C25} = 155 \text{ A}$
$I_{FSM} = 700 \text{ A}$	$V_{CE(sat)} = 1.9 \text{ V}$

3~ Rectifier Bridge, half-controlled (high-side) + Brake Unit

Part name

VVZB120-16ioX



Features / Advantages:

- Soldering connections for PCB mounting
- Convenient package outline

Applications:

- 3~ Rectifier with brake unit for drive inverters

Package:

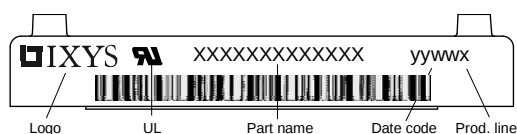
- Housing: V2-Pack
- DCB ceramic base plate
- Isolation voltage 3600 V~
- Easy to mount with two screws
- Space and weight savings
- RoHS compliant

Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			300	μA
		$V_{R/D} = 1600\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			10	mA
V_T	forward voltage drop	$I_T = 40\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.14	V
		$I_T = 80\text{ A}$				1.32	V
		$I_T = 40\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.06	V
		$I_T = 80\text{ A}$				1.29	V
$I_{D(AV)M}$	bridge output current	$T_C = 80^{\circ}\text{C}$ rectangular $d = \frac{1}{3}$	$T_{VJ} = 150^{\circ}\text{C}$			120	A
V_{T0}	threshold voltage	} for power loss calculation only				0.86	V
r_T	slope resistance					5.4	m Ω
R_{thJC}	thermal resistance junction to case					1.00	K/W
R_{thCH}	thermal resistance case to heatsink				0.2		K/W
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				120	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			700	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			755	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			595	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			645	A
I_{2t}	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			2.45	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			2.37	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			1.77	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.73	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		54		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 150^{\circ}\text{C}$			10	W
		$t_p = 300\text{ }\mu\text{s}$				5	W
P_{GAV}	average gate power dissipation					0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 150^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 120\text{ A}$				150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
		$I_G = 0.45\text{ A}; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 40\text{ A}$				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 150^{\circ}\text{C}$			1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			1.5	V
			$T_{VJ} = -40^{\circ}\text{C}$			1.6	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			95	mA
			$T_{VJ} = -40^{\circ}\text{C}$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 30\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			450	mA
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 40\text{ A}; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}; dv/dt = 20\text{ V}/\mu\text{s}; t_p = 200\text{ }\mu\text{s}$	$T_{VJ} = 150^{\circ}\text{C}$		150		μs

Brake IGBT				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
V_{GES}	max. DC gate voltage					± 20	V
V_{GEM}	max. transient collector gate voltage					± 30	V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$				155	A
I_{C80}		$T_C = 80^{\circ}\text{C}$				107	A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				500	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 100\text{A}; V_{GE} = 15\text{V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.9	2.2	V
			$T_{VJ} = 125^{\circ}\text{C}$		2.5		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 4\text{mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.4	5.9	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{V}$	$T_{VJ} = 25^{\circ}\text{C}$			0.1	mA
			$T_{VJ} = 125^{\circ}\text{C}$		0.1		mA
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20\text{V}$				500	nA
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{V}; V_{GE} = 15\text{V}; I_C = 100\text{A}$			295		nC
$t_{d(on)}$	turn-on delay time	} inductive load $V_{CE} = 600\text{V}; I_C = 100\text{A}$ $V_{GE} = \pm 15\text{V}; R_G = 6.8\Omega$	$T_{VJ} = 125^{\circ}\text{C}$		70		ns
t_r	current rise time				40		ns
$t_{d(off)}$	turn-off delay time				250		ns
t_f	current fall time				100		ns
E_{on}	turn-on energy per pulse				8.5		mJ
E_{off}	turn-off energy per pulse				11.5		mJ
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15\text{V}; R_G = 6.8\Omega$	$T_{VJ} = 125^{\circ}\text{C}$				
I_{CM}		$V_{CEK} = 1200\text{V}$				300	A
SCSOA	short circuit safe operating area						
t_{sc}	short circuit duration	$V_{CE} = 720\text{V}; V_{GE} = \pm 15\text{V}$	$T_{VJ} = 125^{\circ}\text{C}$			10	μs
I_{sc}	short circuit current	$R_G = 6.8\Omega$; non-repetitive			400		A
R_{thJC}	thermal resistance junction to case					0.25	K/W
R_{thCH}	thermal resistance case to heatsink				0.1		K/W

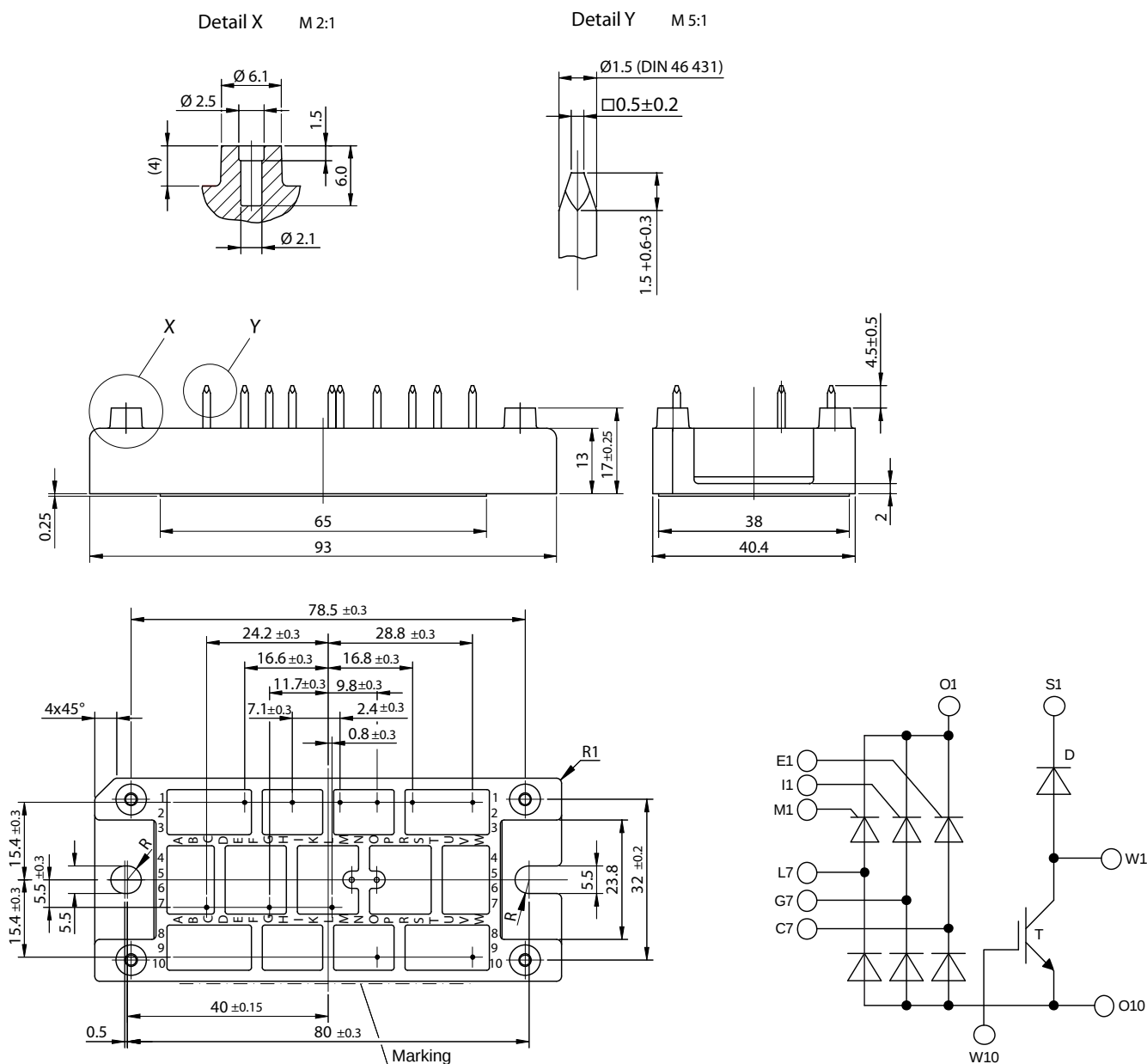
Brake Diode							
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$				48	A
I_{F80}		$T_C = 80^{\circ}\text{C}$				34	A
V_F	forward voltage	$I_F = 30\text{A}$	$T_{VJ} = 25^{\circ}\text{C}$			2.71	V
			$T_{VJ} = 125^{\circ}\text{C}$			1.94	V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$			0.25	mA
			$T_{VJ} = 125^{\circ}\text{C}$			1	mA
Q_{rr}	reverse recovery charge	} $V_R = 600\text{V}$ $-di_F/dt = 400\text{A}/\mu\text{s}$ $I_F = 30\text{A}$	$T_{VJ} = 125^{\circ}\text{C}$		1.8		μC
I_{RM}	max. reverse recovery current				23		A
t_{rr}	reverse recovery time				150		ns
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}	I_{RM} current	per terminal			100	A
T_{stg}	storage temperature		-40		125	°C
T_{vj}	virtual junction temperature		-40		150	°C
Weight				76		g
M_D	mounting torque		2		2.5	Nm
V_{ISOL}	isolation voltage	t = 1 second	3600			V
		t = 1 minute	3000			V
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	6.0			mm
$d_{Spt/Apb}$		terminal to backside	12.0			mm



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VVZB120-16ioX	VVZB120-16ioX	Box	6	511152

Outlines



Rectifier

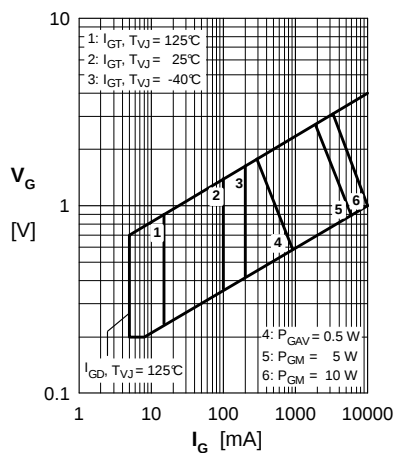


Fig. 1 Gate trigger characteristics

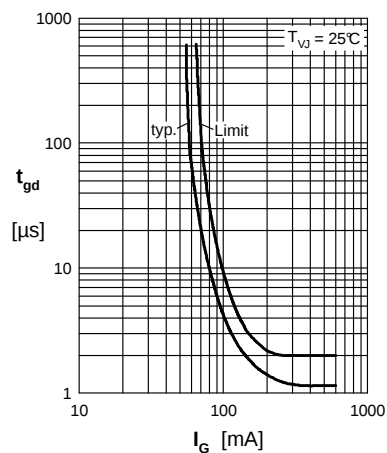


Fig. 2 Gate trigger delay time

Rectifier

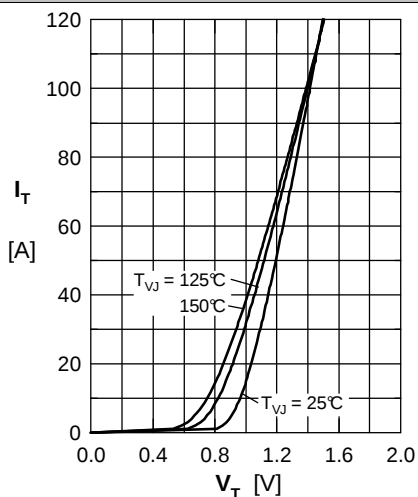


Fig.3 Forward current versus voltage drop per diode

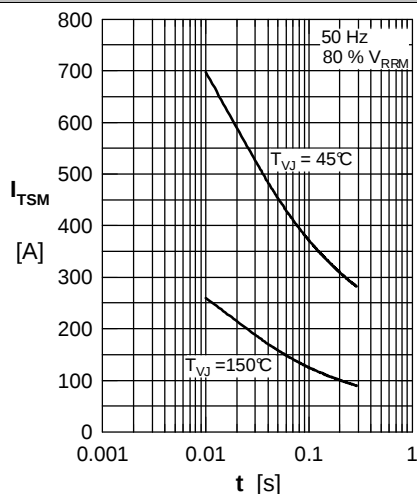


Fig.4 Surge overload current

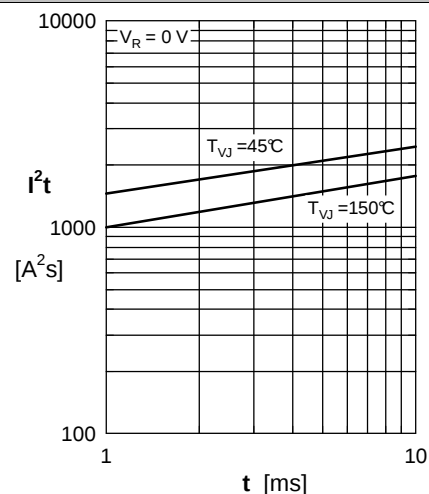


Fig.5 I^2t versus time per diode

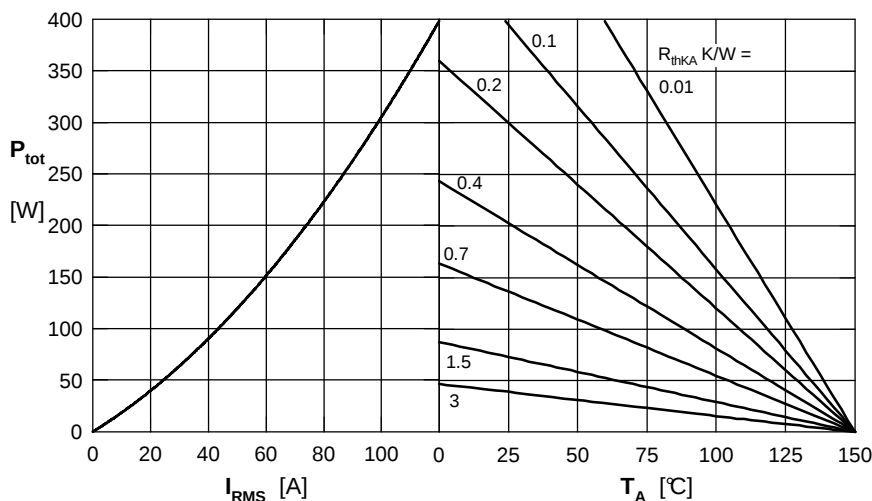


Fig.6 Power dissipation versus direct output current and ambient temperature, sine 180°

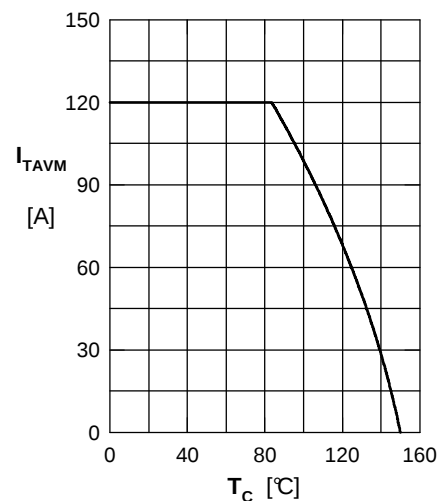


Fig.7 Max. forward current vs. case temperature

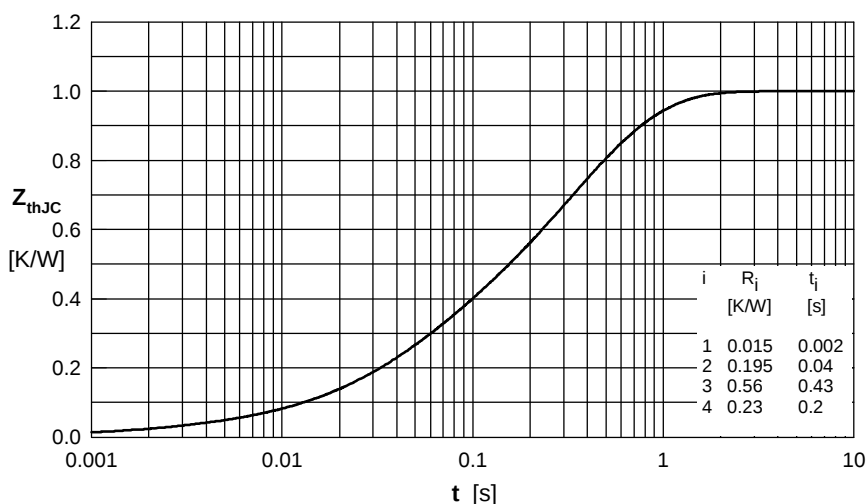


Fig.8 Transient thermal impedance junction to case

Brake IGBT

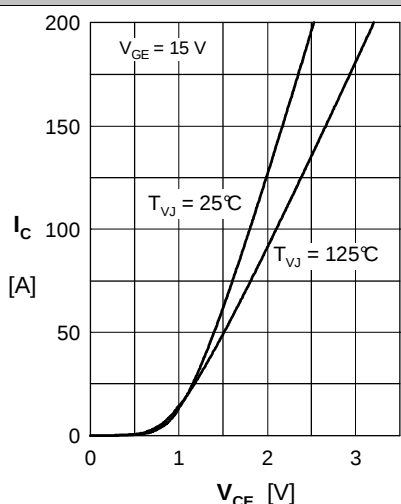


Fig. 1 Typ. output characteristics

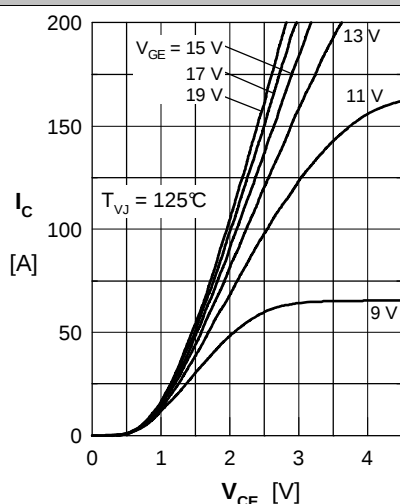


Fig. 2 Typ. output characteristics

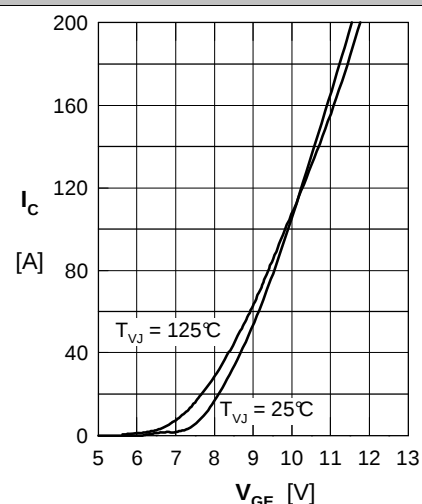


Fig. 3 Typ. transfer characteristics

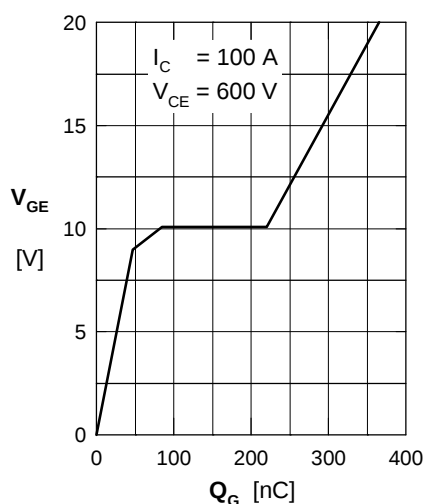


Fig. 4 Typ. turn-on gate charge

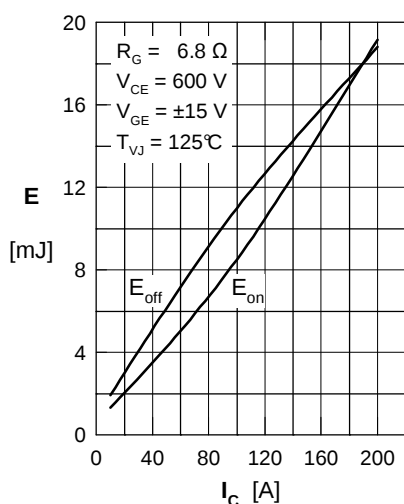


Fig. 5 Typ. switching energy versus collector current

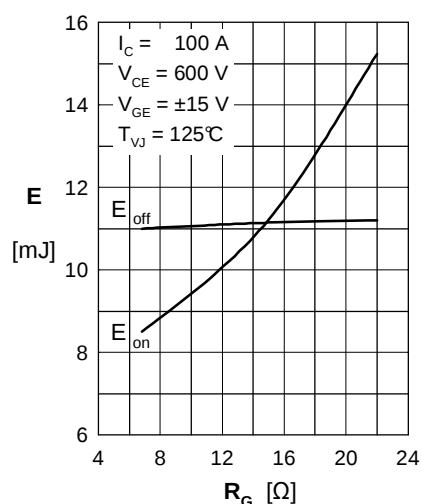


Fig. 6 Typ. switching energy versus gate resistance

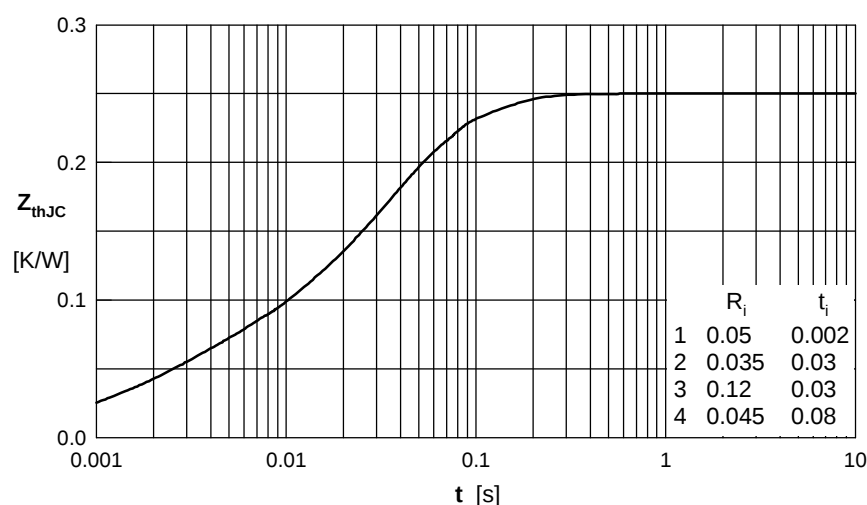


Fig. 7 Transient thermal impedance junction to case

Brake Diode

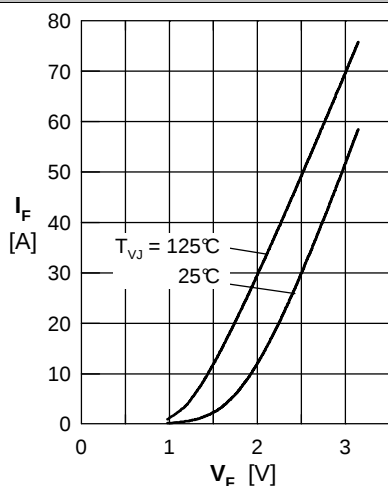


Fig. 1 Typ. forward current I_F vs. V_F

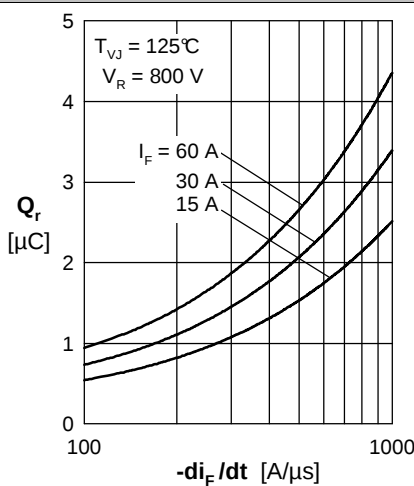


Fig. 2 Typ. reverse recovery charge Q_r versus $-di_F/dt$

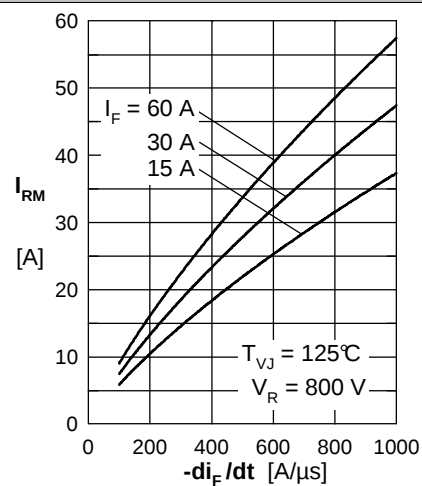


Fig. 3 Typ. peak reverse current I_{RM} versus $-di_F/dt$

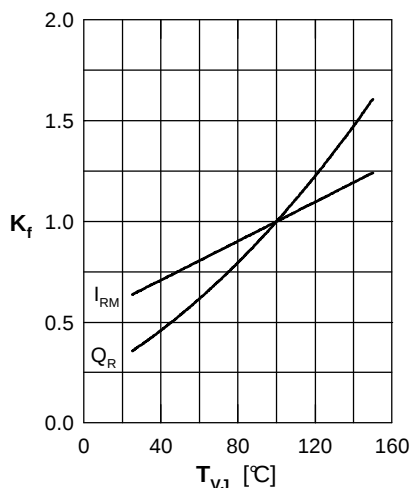


Fig. 4 Typ. dynamic parameters Q_r , I_{RM} , versus T_{VJ}

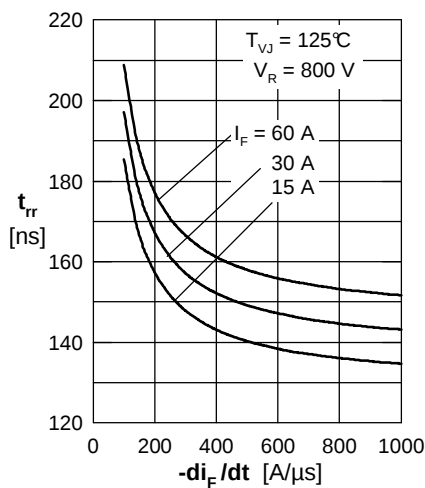


Fig. 5 Typ. recovery time t_{rr} vs. $-di_F/dt$

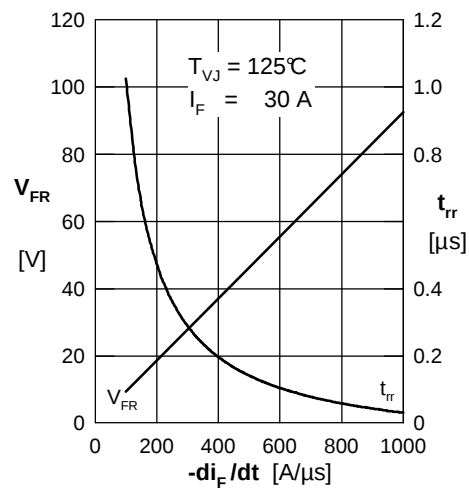


Fig. 6 Typ. peak forward voltage V_{FR} and t_{rr} versus di_F/dt

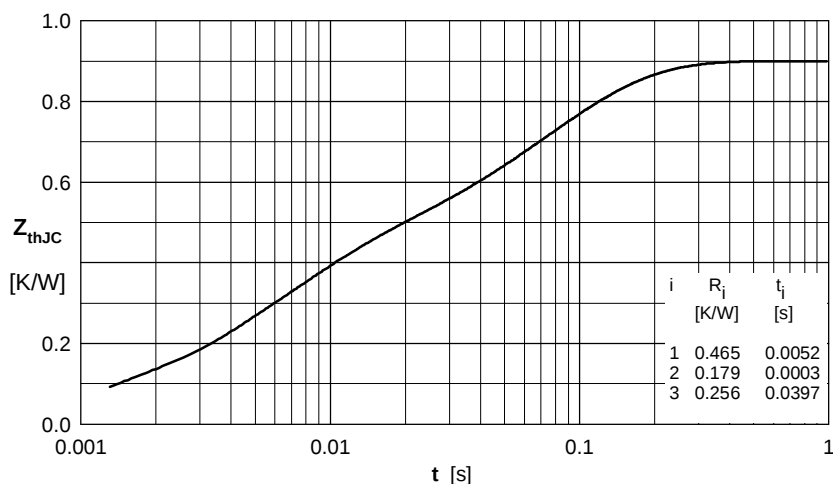


Fig. 7 Typ. transient thermal impedance junction to case