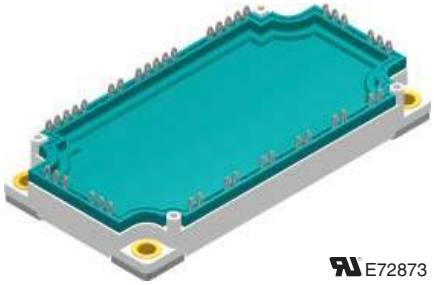
advanced

X2PT IGBT Module

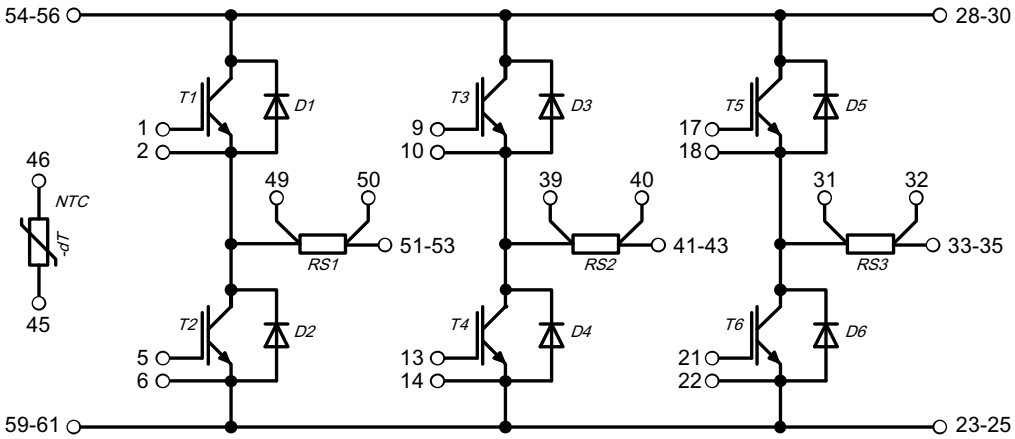
V_{CES} = 1200 V
I_{C25} = 312 A
$V_{CE(sat)}$ = 1.7 V

6-Pack + NTC + Shunt

Part number
MIXG240W1200PZTEH



E72873



Features / Advantages:

- X2PT - 2nd generation Xtreme light Punch Through
- Tvjm = 175°C
- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Rugged X2PT design results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 2x Ic
- Low $V_{CE(sat)}$ and low thermal resistance
- SONIC2™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

Applications:

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

Package: E3-Pack

- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- PressFit pins

Option:

- Phase Change Material printed on base plate

Inverter IGBT T1 - T6					Ratings			
Symbol	**Definitions**	**Conditions**			**min.**	**typ.**	**max.**	
V_{CES}	*collector emitter voltage*	I_R = 500 µA	T_{VJ} = 25°C		1200			V
V_{GES}	*max. DC gate voltage*				-20		+20	V
V_{GEM}	*max. transient gate emitter voltage*				-30		+30	V
I_{C25}	*collector current*		T_C = 25°C				312	A
I_{C80}			T_C = 80°C				233	A
I_{C100}			T_C = 100°C				200	A
P_{tot}	*total power dissipation*		T_C = 25°C				938	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 200 A; V_{GE} = 15 V	T_{VJ} = 25°C			1.7	2	V
	on die level		T_{VJ} = 150°C			2		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 8 mA; V_{GE} = V_{GE}	T_{VJ} = 25°C		6.0		7.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES} ; V_{GE} = 0 V	T_{VJ} = 25°C				0.15	mA
	(includes diode reverse current)		T_{VJ} = 150°C			2.5		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V					500	nA
R_G	*internal gate resistance*					6.5		Ω
C_{iss}	*input capacitance*	V_{CE} = 100 V; V_{GS} = 0 V; f = 1 MHz				10.6		nF
C_{oss}	*output capacitance*							pF
C_{rss}	*reverse transfer (Miller) capacitance*							pF
Q_g	*total gate charge*	V_{CE} = 600 V; V_{GE} = 0 /15 V; I_C = 200 A				630		nC
Q_{gs}	*gate source charge*							nC
Q_{gd}	*gate drain (Miller) charge*							nC
$t_{d(on)}$	*turn-on delay time*	Inductive switching				170		ns
t_r	*current rise time*					55		ns
$t_{d(off)}$	*turn-off delay time*					290		ns
t_f	*current fall time*	V_{CE} = 680 V; I_C = 200 A	T_{VJ} = 25°C			120		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 3.9 Ω (external)				17.1		mJ
E_{off}	*turn-off energy per pulse*					14.2		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*					3.5		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching				180		ns
t_r	*current rise time*					70		ns
$t_{d(off)}$	*turn-off delay time*					360		ns
t_f	*current fall time*	V_{CE} = 680 V; I_C = 200 A	T_{VJ} = 150°C			215		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 3.9 Ω (external)				23.5		mJ
E_{off}	*turn-off energy per pulse*					20.5		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*					9.2		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 3.9 Ω	T_{VJ} = 150°C					
I_{CM}		V_{CEmax} = 1200 V					400	A
SCSOA	*short circuit safe operating area*	V_{CEmax} = 1200 V						
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15 V	T_{VJ} = 150°C				10	µs
I_{SC}	*short circuit duration*	non-repetitive				900		A
R_{thJC}	*thermal resistance junction to case*						0.16	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup				0.24		K/W

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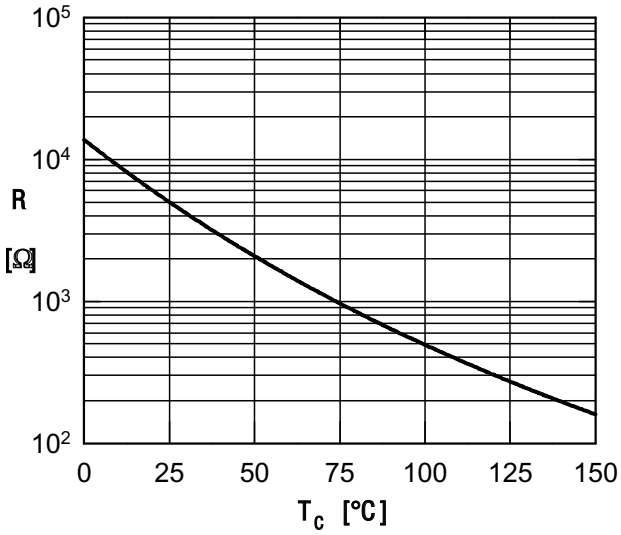
Inverter Diode D1 - D6				Ratings			
Symbol	Definitions	Conditions		min.	typ.	max.	
V_{RRM}	*max. repetitive reverse voltage*	I_R = 500 µA, see V_{CES}	T_{VJ} = 25°C	1200		1200	V
I_{F25}	*forward current*		T_C = 25°C			189	A
I_{F80}			T_C = 80°C			136	A
I_{F100}			T_C = 100°C			114	A
V_F	*forward voltage*	I_F = 150 A	T_{VJ} = 25°C		1.7	2.0	V
	on die level		T_{VJ} = 150°C		1.65	1.95	V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C			*	mA
	* not applicable, see Ices at IGBT		T_{VJ} = 150°C		*		mA
Q_{RM}	*reverse recovery charge*	V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 25°C		11.4		µC
I_{RM}	*max. reverse recovery current*				150		A
t_{rr}	*reverse recovery time*				230		ns
E_{rec}	*reverse recovery energy*				3.5		mJ
Q_{RM}	*reverse recovery charge*	V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 150°C		25.3		µC
I_{RM}	*max. reverse recovery current*				170		A
t_{rr}	*reverse recovery time*				420		ns
E_{rec}	*reverse recovery energy*				9.2		mJ
R_{thJC}	*thermal resistance junction to case*					0.38	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.48		K/W

Shunt Resistor				Ratings			
Symbol	Definitions	Conditions		min.	typ.	max.	Unit
R_{SHUNT}	*resistance*		T_C = 25°C		0.5		mΩ
	tolerance			-1		+1	%
R_{thSH}	*thermal resistance shunt to heatsink*	with heatsink compound; IXYS test setup *				10	K/W

* Note: Continous shunt temperature should not exceed 170°C

Temperature Sensor NTC						
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

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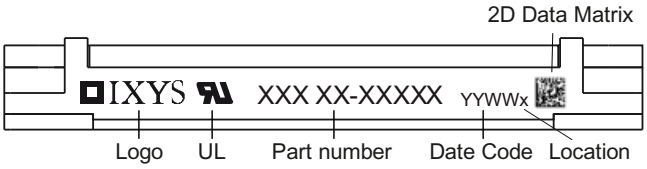
Package E3-Pack				Ratings			
Symbol	Definitions	Conditions		min.	typ.	max.	Unit
I_{RMS}	*RMS current*	per terminal				30	A
T_{stg}	*storage temperature*			-40		125	°C
T_{op}	*operation temperature*			-40		150	°C
T_{VJ}	*virtual junction temperature*			-40		175	°C
Weight					320		g
M_D	*mounting torque*			3		6	Nm
d_{Spp}	*creepage distance on surface*		*terminal to terminal*	6			mm
d_{Spb}			*terminal to backside*	12			mm
d_{App}	*striking distance through air*		*terminal to terminal*	6			mm
d_{Apb}			*terminal to backside*	12			mm
V_{ISOL}	*isolation voltage*	t = 1 second	50 / 60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4300			V
		t = 1 minute		3600			V
$R_{pin\text{-}chip}$	*resistance pin to chip*	$V = V_{CEsat} + 2 \cdot R \cdot I_C$ resp. $V = V_F + 2 \cdot R \cdot I_F$					mΩ
C_P	*coupling capacity per switch*	between shorted pins of switch and back side metallization					pF



Part number

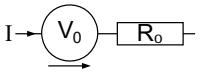
M = Module
I = IGBT
X = XPT IGBT
G = Gen 2 / std
240 = Current Rating [A]
W = 6-pack
1200 = Reverse Voltage [V]
PZT = PressFit Pin + Shunt 0.5mΩ, Thermistor
EH = E3-Pack

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXG240W1200PZTEH	MIXG240W1200PZTEH	Blister	24	522740
with Phase Change Material	MIXG240W1200PZTEH -PC	MIXG240W1200PZTEH	Blister	24	522733

Similar Part	Package	Voltage class
MIXG240W1200TEH	E3- Pack	1200
MIXG240W1200PTEH	E3- Pack, press fit pin	1200

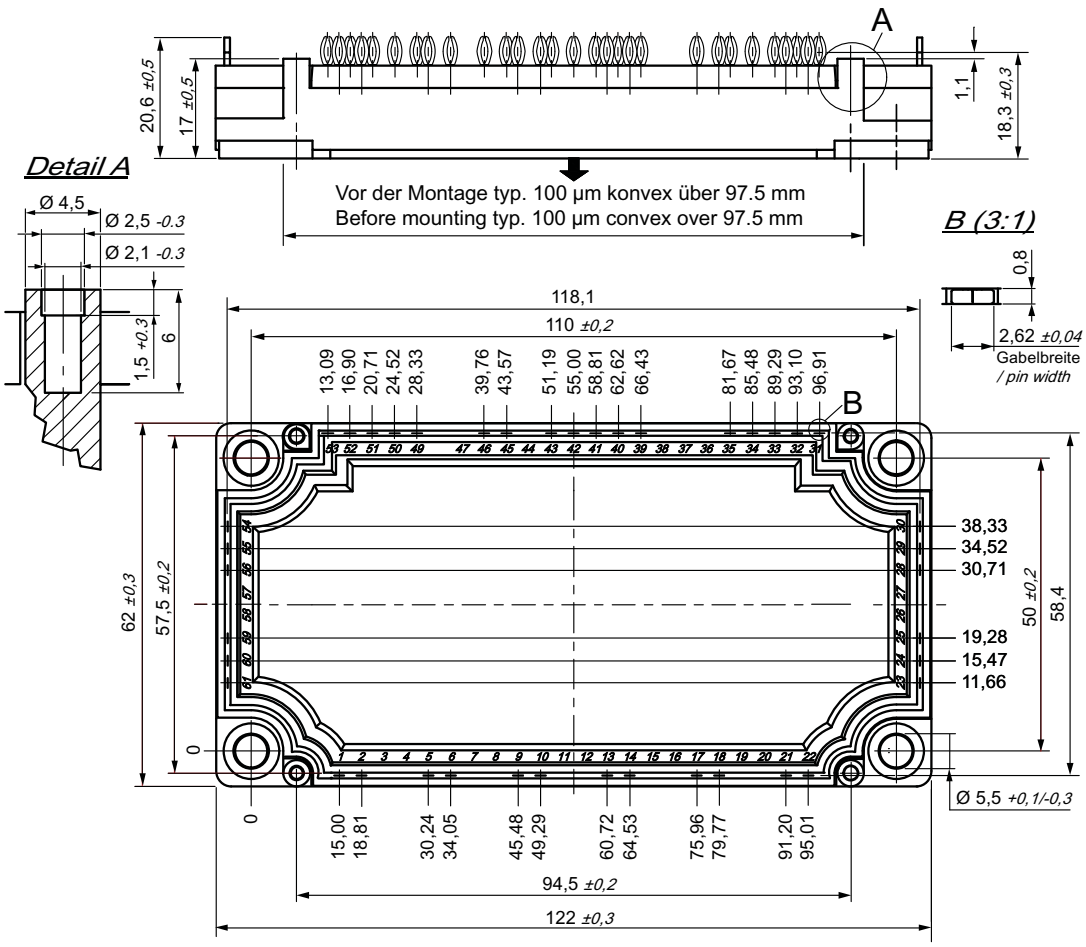
Option: phase change material; please contact IXYS sales office for availability

Equivalent Circuits for Simulation **on die level*



			IGBT	Inverter Diode	
$V_{0\ max}$	*threshold voltage*	T_{VJ} = 125°C			V
$R_{0\ max}$	*slope resistance* *				mΩ
$V_{0\ max}$	*threshold voltage*	T_{VJ} = 175°C	1.2	1.2	V
$R_{0\ max}$	*slope resistance* *		5.8	4.7	mΩ

Outlines E3-Pack

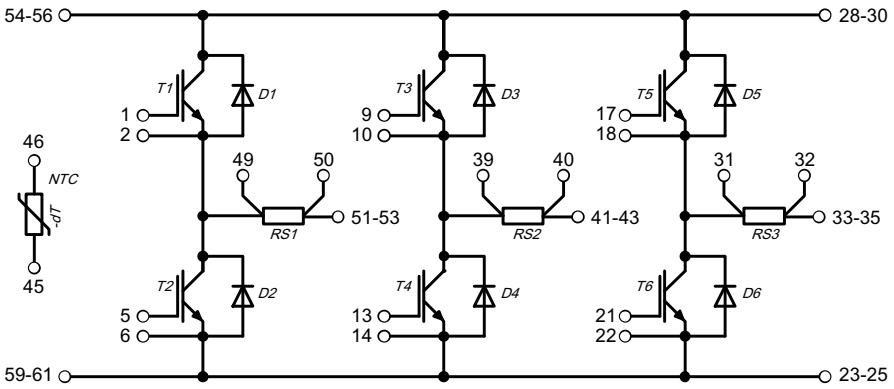


Bemerkung / *Note:*

- 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**
- Bohrlochdurchmesser / *Diameter of drill:* **Ø 2.35 mm**
- Endlochdurchmesser / *Diameter of plated holes:* **Ø 2.14 - 2.29 mm** (Cu thickness in via typ. 50 µm)
- Beschichtung / *Plating:* **chem. Sn max. 15 µm**
- Einpresskraft / *Insert Force:* per terminal with a typ. insert speed of 7 mm/s: **typ. 90 N**
- Weitere Angaben / *Further information:* www.ixys.com **Application note IXAN0077**
- 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**



IGBT T1 - T6

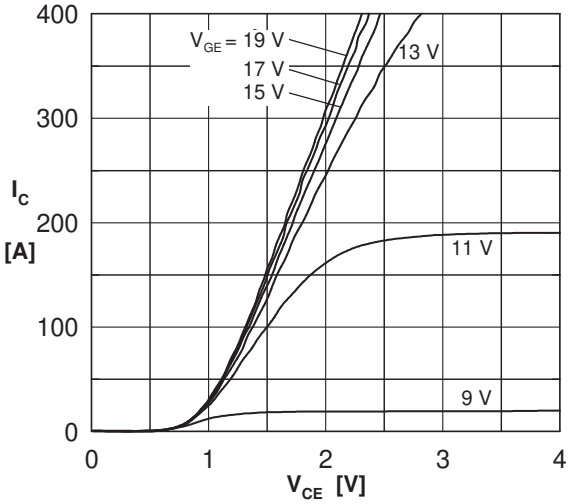


Fig. 1 Typ. output characteristics (T_{VJ} = 25°C)

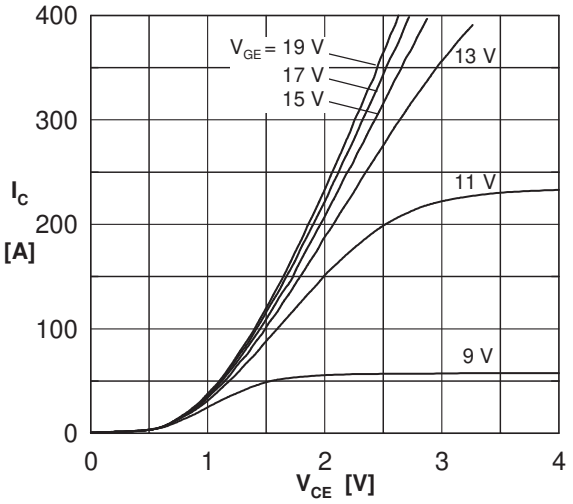


Fig. 2 Typ. output characteristics (T_{VJ} = 150°C)

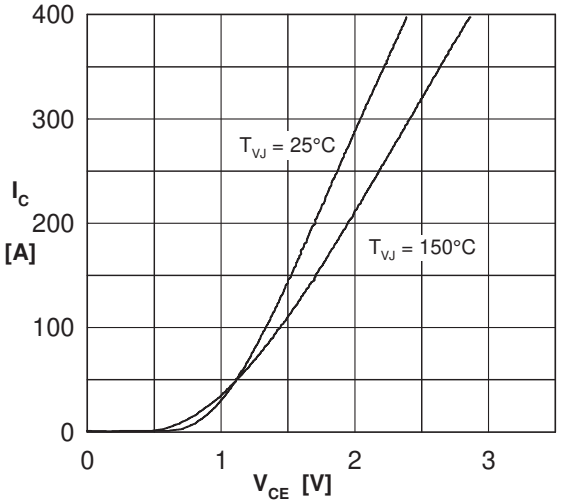


Fig. 3 Typ. output characteristics (V_{GE} = 15V)

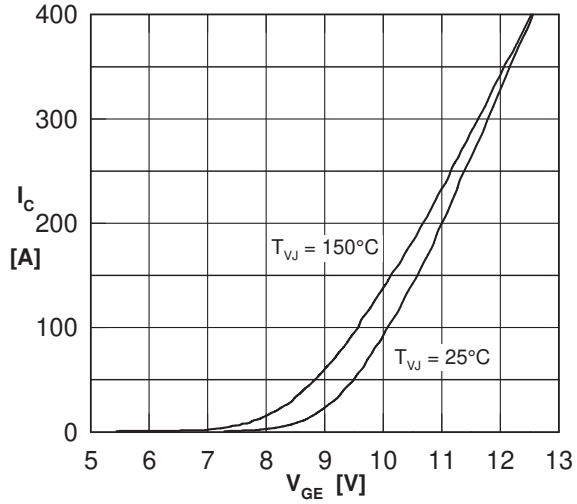


Fig. 4 Typ. tranfer characteristics (V_{CE} = 20V)

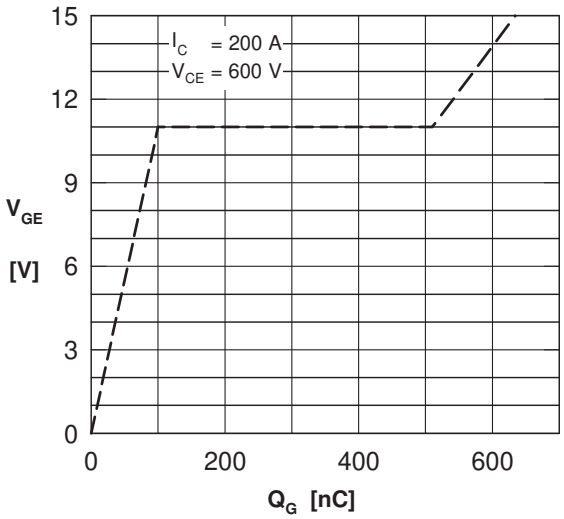


Fig. 5 Typ. turn-on gate charge 0/15V

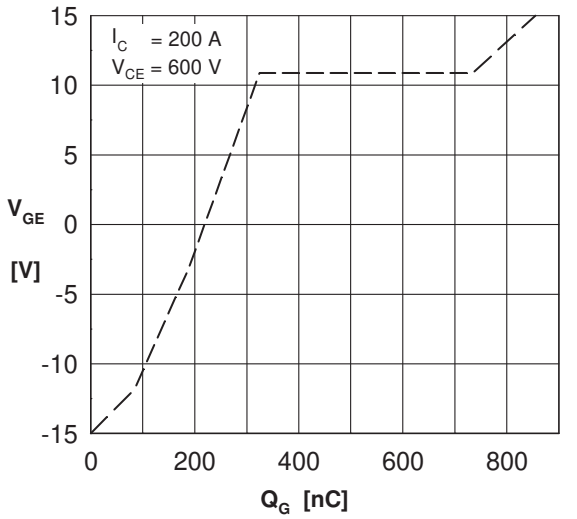


Fig. 6 Typ. turn-on gate charge -15/+15V

IGBT T1 - T6

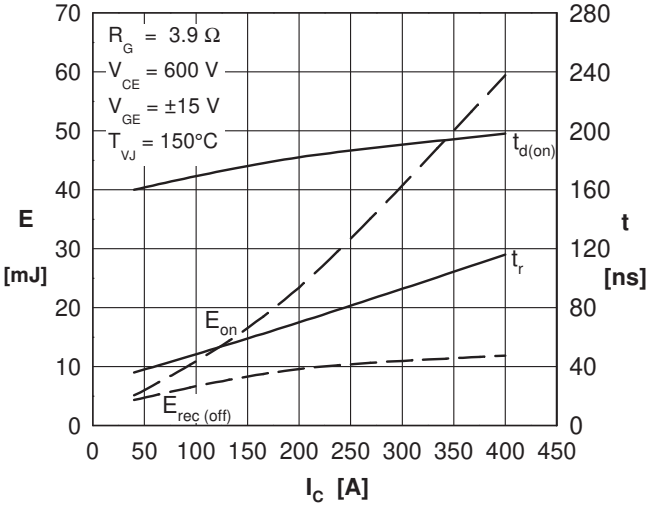


Fig. 7 Typ. switching energy versus collector current (turn on)

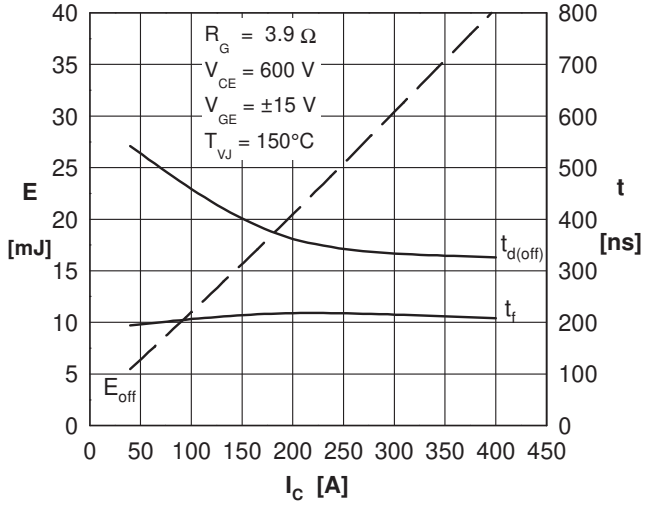


Fig. 8 Typ. switching energy versus collector current (turn off)

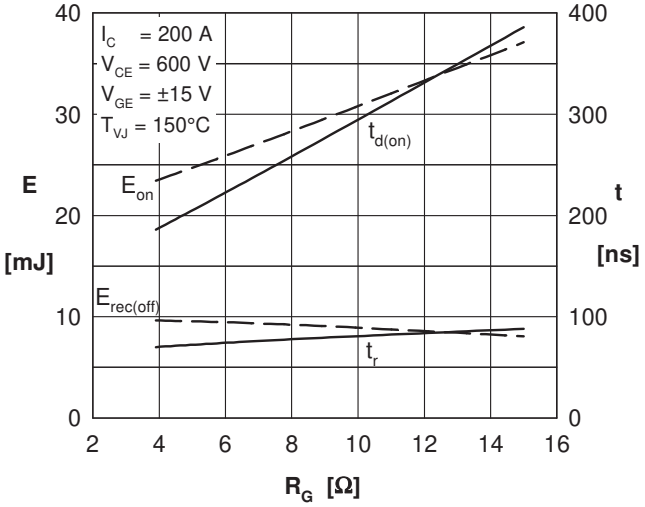


Fig. 9 Typ. switching energy versus gate resistor (turn on)

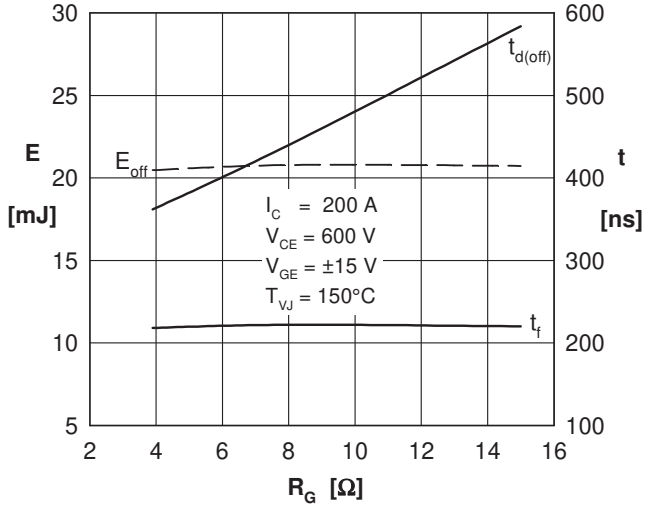


Fig. 10 Typ. switching energy versus gate resistor (turn off)

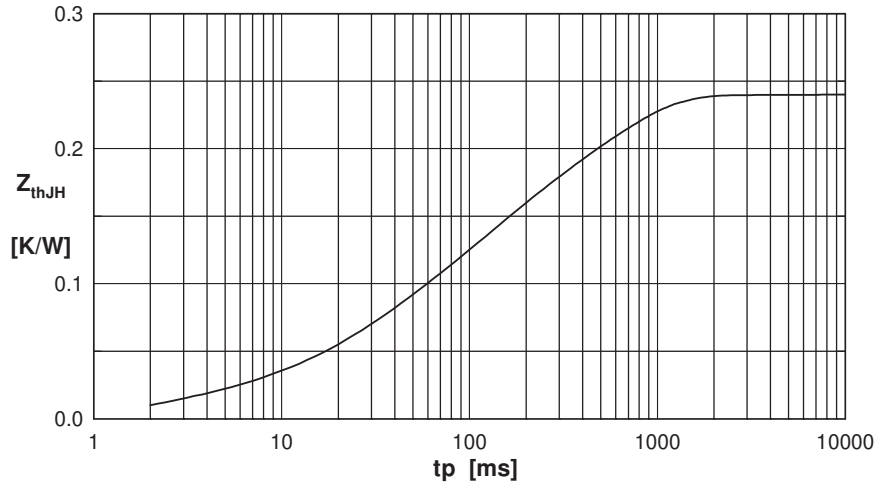


Fig. 11 IGBT: typ. transient thermal impedance to heat sink

DIODE D1 - D6

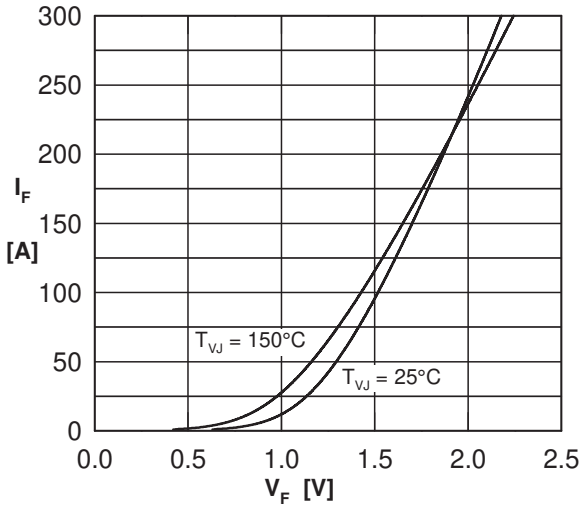


Fig. 12 Typ. forward charakteristics FWD

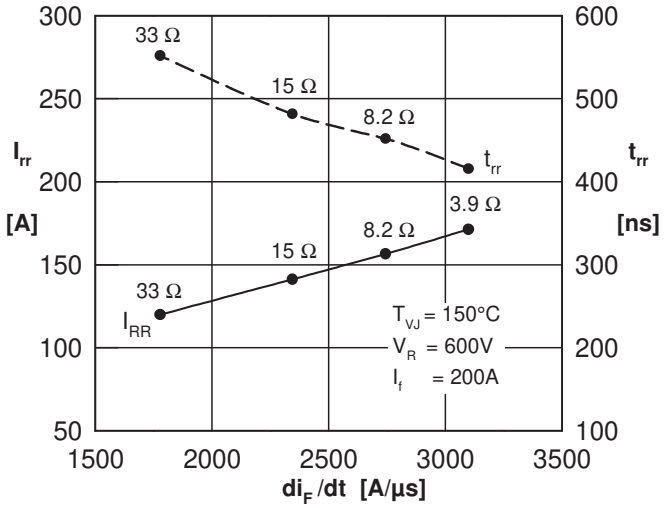


Fig. 13 Typ. recovery energy $E_{rec\ (off)}$ versus -di/dt

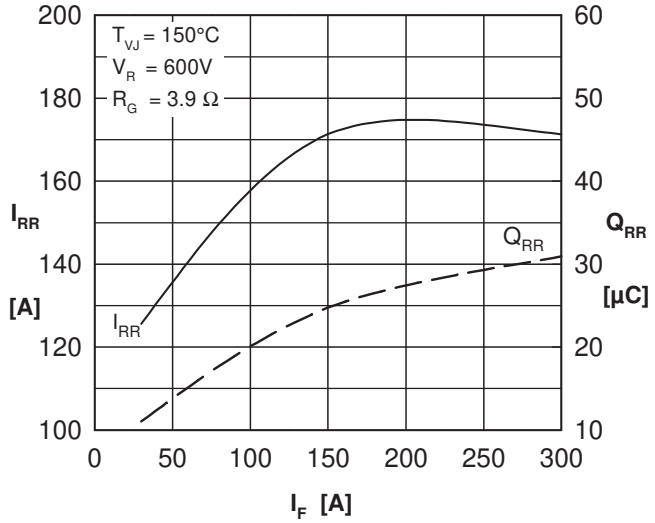


Fig. 14 typ. reverse recovery characteristics

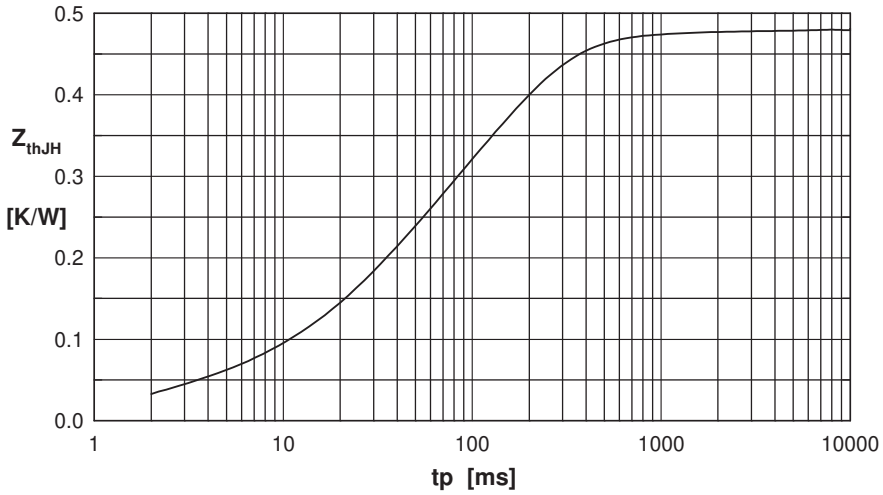


Fig. 15 Diode: typ. transient thermal impedance junction to heat sink