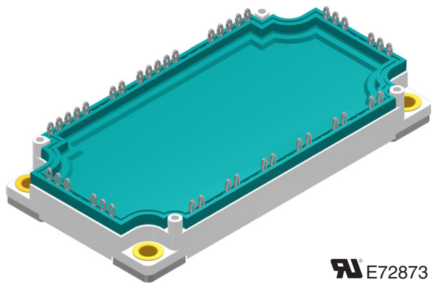
advanced

X2PT IGBT Module

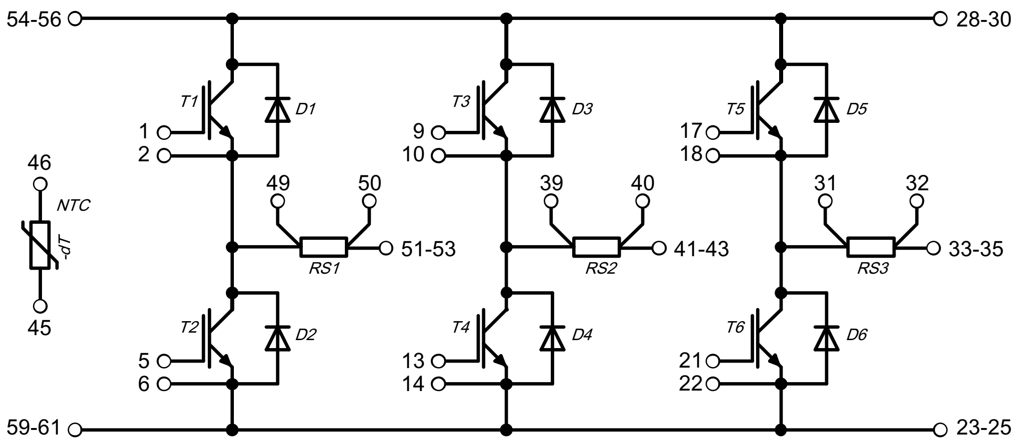
V_{CES} = 1200 V
I_{C25} = 312 A
$V_{CE(sat)}$ = 1.7 V

6-Pack + NTC + Shunt

Part number
MIXG240W1200PZTEH



E72873



Features / Advantages:
- X2PT - 2nd generation Xtreme light Punch Through
- T_{VJm} = 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 I_C
- 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: 3600 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

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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} V_{GEM}	*max. DC gate voltage* *max. transient gate emitter voltage*			-20 -30		+20 +30	V V
I_{C25} I_{C80} I_{C100}	*collector current*		T_C = 25°C T_C = 80°C T_C = 100°C			312 233 200	A A A
P_{tot}	*total power dissipation*		T_C = 25°C			938	W
$V_{CE(sat)}$	*collector emitter saturation voltage on die level*	I_C = 200 A; V_{GE} = 15 V	T_{VJ} = 25°C T_{VJ} = 150°C		1.7 2	2	V 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 (includes diode reverse current)*	V_{CE} = V_{CES} ; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 150°C		 2	0.15	mA mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
R_G	*internal gate resistance*				6.5		Ω
C_{iss} C_{oss} C_{rss}	*input capacitance* *output capacitance* *reverse transfer (Miller) capacitance*	V_{CE} = 100 V; V_{GS} = 0 V; f = 1 MHz			10.6		nF pF pF
Q_g Q_{gs} Q_{gd}	*total gate charge* *gate source charge* *gate drain (Miller) charge*	V_{CE} = 600 V; V_{GE} = 0 /15 V; I_C = 200 A			630		nC nC nC
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off} $E_{rec(off)}$	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse* *reverse recovery losses at turn-off*	Inductive switching V_{CE} = 680 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 25°C		170 55 290 120 17.1 14.2 4.6		ns ns ns ns mJ mJ mJ
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off} $E_{rec(off)}$	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse* *reverse recovery losses at turn-off*	Inductive switching V_{CE} = 680 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 150°C		180 70 360 215 23.5 20.5 12.2		ns ns ns ns mJ mJ mJ
RBSOA I_{CM}	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 3.9 Ω V_{CEmax} = 1200 V	T_{VJ} = 150°C			400	A
SCSOA t_{SC} I_{SC}	*short circuit safe operating area* *short circuit duration* *short circuit duration*	V_{CEmax} = 1200 V V_{CE} = 900 V; V_{GE} = ±15 V non-repetitive	T_{VJ} = 150°C		 900	 10	 µs A
R_{thJC} R_{thJH}	*thermal resistance junction to case* *thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			 0.24	0.16	K/W K/W

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Inverter Diode D1 - D6

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	
V_{RRM}	*max. repetitive reverse voltage*	I_R = 500 µA, see V_{CES}	T_{VJ} = 25°C	1200			V
I_{F25} I_{F80} I_{F100}	*forward current*		T_C = 25°C T_C = 80°C T_C = 100°C			189 136 114	A A A
V_F	*forward voltage* *on die level*	I_F = 200 A	T_{VJ} = 25°C T_{VJ} = 150°C		1.87 1.85	2.2 2,2	V V
I_R	*reverse current* * not applicable, see Ices at IGBT	V_R = V_{RRM}	T_{VJ} = 25°C T_{VJ} = 150°C		 *	* 	mA mA
Q_{RM} I_{RM} t_{rr} di /dt E_{rec}	*reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *rate of change of current* *reverse recovery energy*	V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 25°C		12 170 240 4200 4.6		µC A ns A/µs mJ
Q_{RM} I_{RM} t_{rr} di /dt E_{rec}	*reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *rate of change of current* *reverse recovery energy*	V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 150°C		26 195 480 3600 12.2		µC A ns A/µs mJ
R_{thJC} R_{thJH}	*thermal resistance junction to case* *thermal resistance junction to heatsink*	 with heatsink compound; IXYS test setup			 0.48	0.38 	K/W K/W

Shunt Resistor

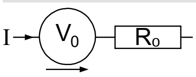
Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
R_{SHUNT}	*resistance* *temperature coefficient*		T_C = 25°C	0.495	0.500	0.505 50	mΩ ppm/K
R_{thSH}	*thermal resistance shunt to heatsink*	with heatsink compound; IXYS test setup *			10		K/W

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

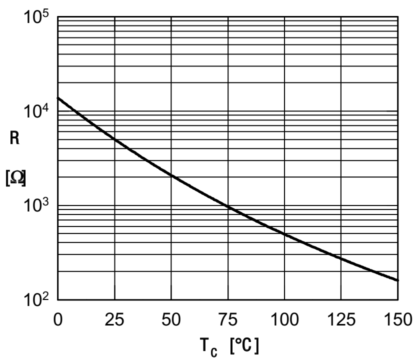
Temperature Sensor NTC

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

Equivalent Circuits for Simulation *on die level*



Symbol	Definitions	Conditions	IGBT	Boost Diode	Unit
$V_{0\,max}$	*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



Typ. NTC resistance vs. temperature

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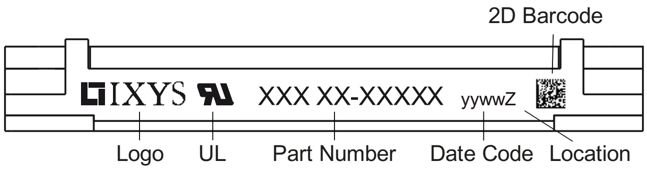
Package	E3-Pack		Ratings			
Symbol	**Definitions**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			30	A
T_{stg} T_{op} T_{VJ}	*storage temperature* *operation temperature* *virtual junction temperature*		-40 -40 -40		125 150 175	°C °C °C
Weight				320		g
M_D	*mounting torque*		3		6	Nm
d_{Spp} d_{Spb}	*creepage distance on surface*	*terminal to terminal* *terminal to backside*	6.0 12.0			mm mm
d_{App} d_{Apb}	*striking distance through air*	*terminal to terminal* *terminal to backside*	6.0 12.0			mm mm
V_{ISOL}	*isolation voltage*	t = 1 second t = 1 minute 50 / 60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4300 3600			V 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	MIXG240W1200PZTEH
with Phase Change Material	MIXG240W1200PZTEH -PC[1)]	MIXG240W1200PZTEH	Blister	24	

Similar Part	Package	Voltage class
MIXG240W1200TEH	E3- Pack	1200
MIXG240W1200PTEH[2)]	E3- Pack, press fit pin	1200

Options: [1)] phase change material and [2)] press fit pin
Please contact Littelfuse - IXYS sales office for availability

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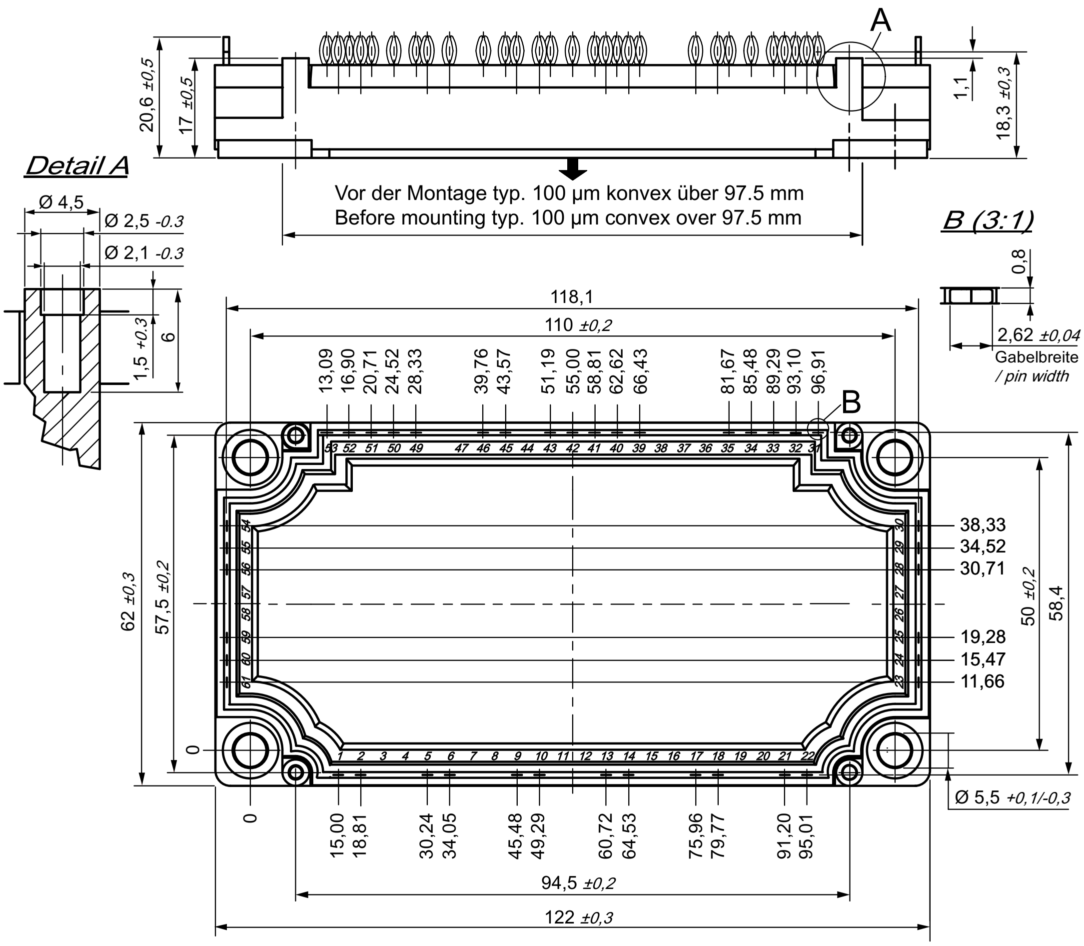
Outlines E3-Pack

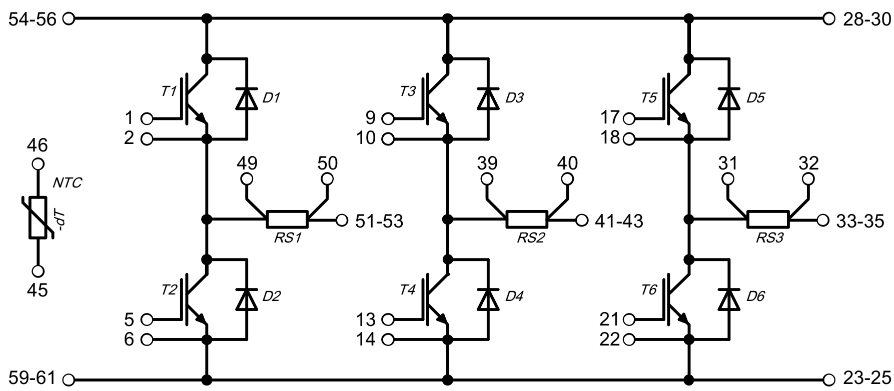


Bemerkung / *Note:*

- 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**



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IGBT T1 - T6

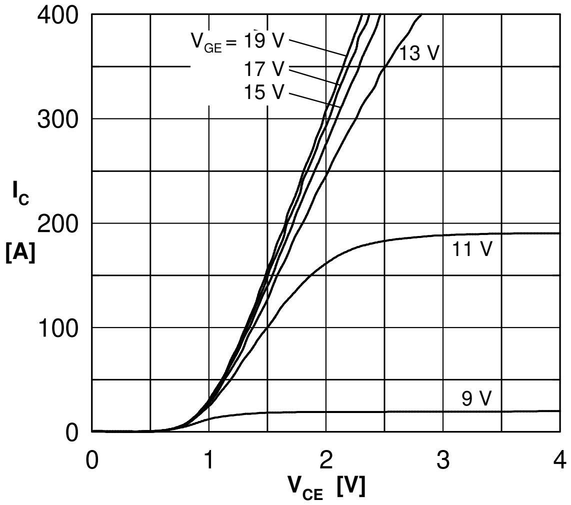

Fig. 1 Typ. output characteristics (T_{VJ} = 25°C)

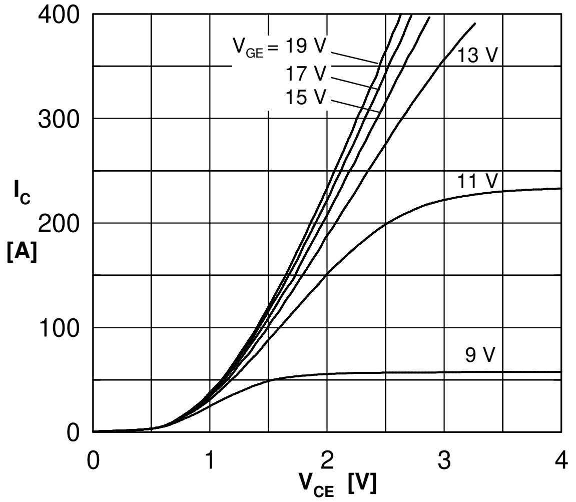

Fig. 2 Typ. output characteristics (T_{VJ} = 150°C)

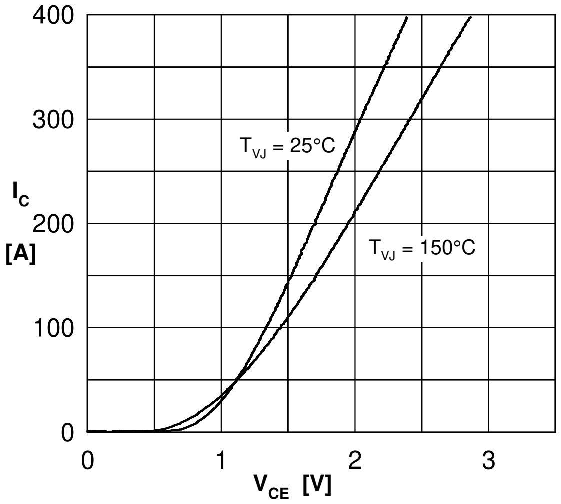

Fig. 3 Typ. output characteristics (V_{GE} = 15V)

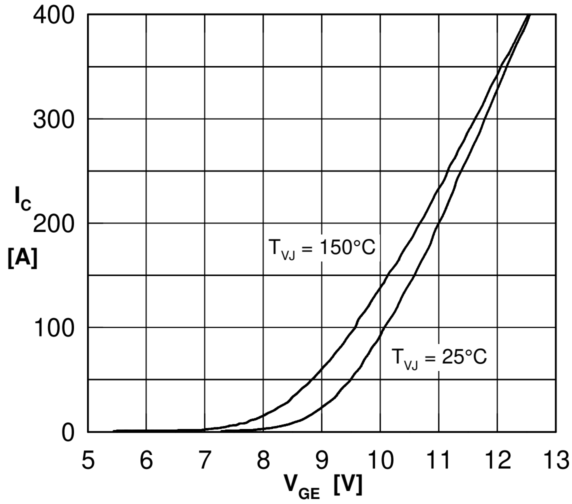

Fig. 4 Typ. tranfer characteristics (V_{CE} = 20V)

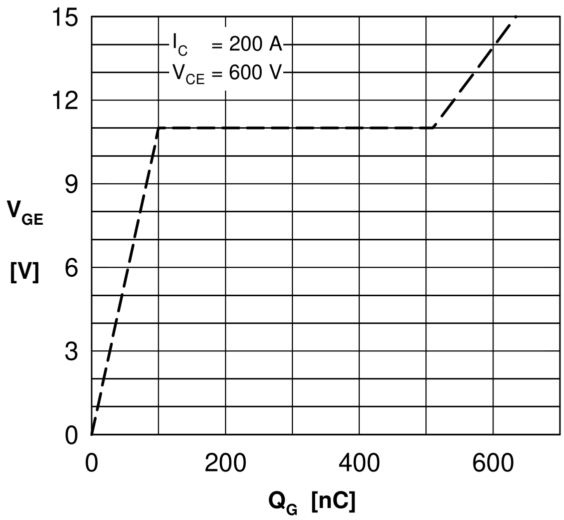

Fig. 5 Typ. turn-on gate charge 0/15V

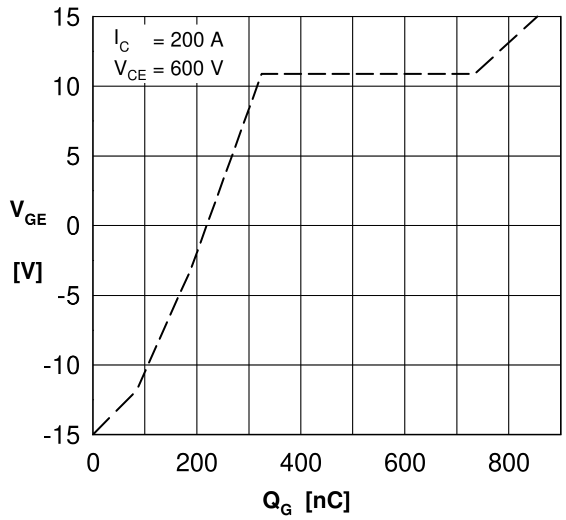

Fig. 6 Typ. turn-on gate charge -15/+15V

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IGBT T1 - T6

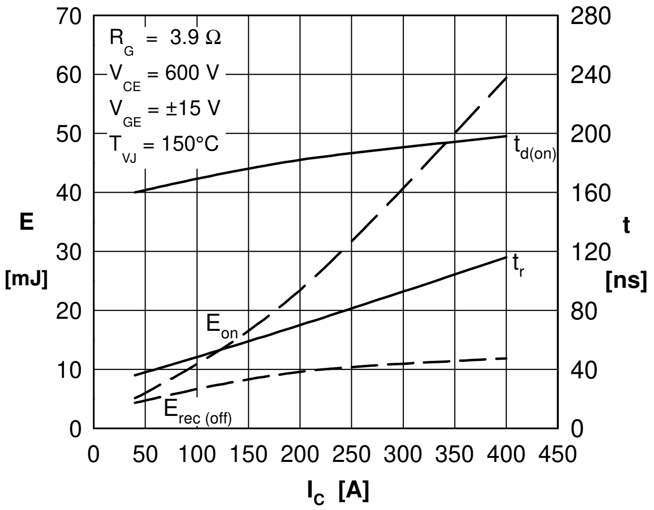

Fig. 7 Typ. switching energy versus collector current (turn on)

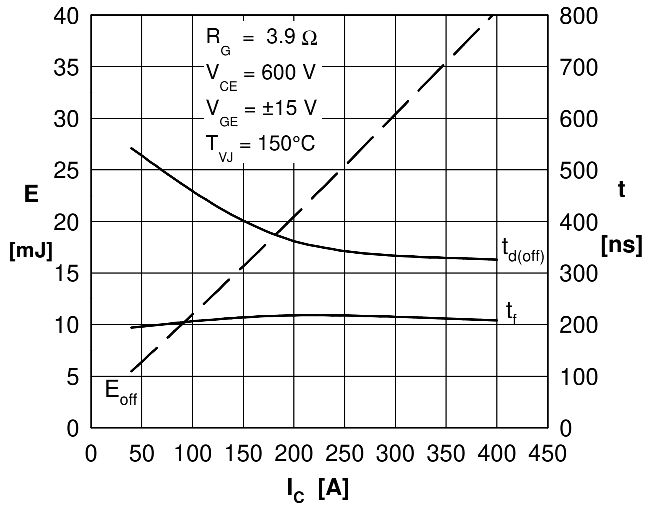

Fig. 8 Typ. switching energy versus collector current (turn off)

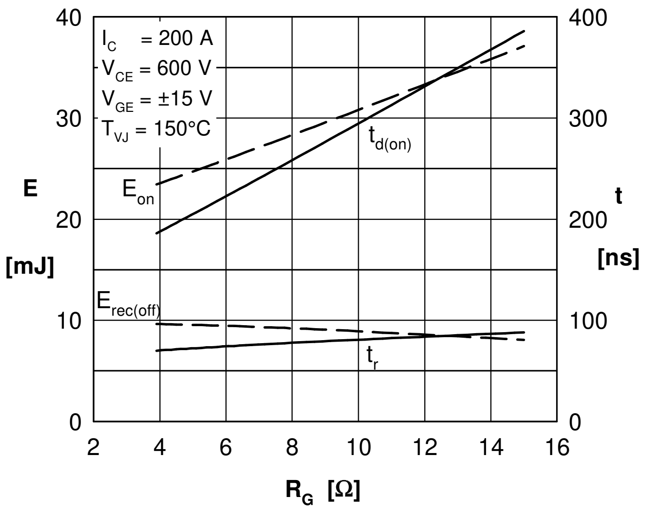

Fig. 9 Typ. switching energy versus gate resistor (turn on)

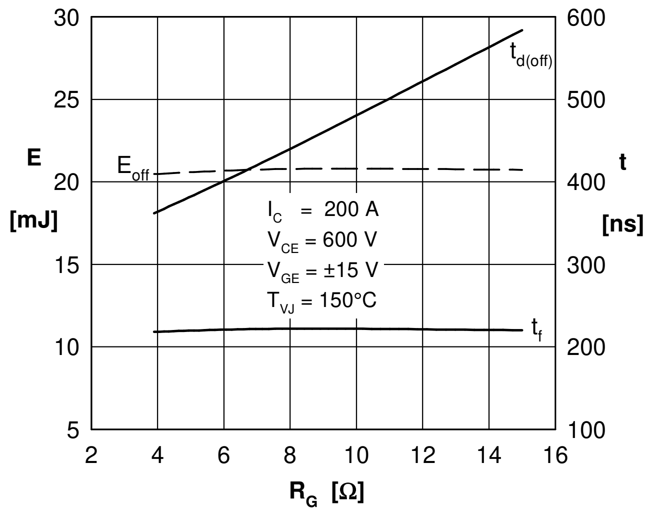

Fig. 10 Typ. switching energy versus gate resistor (turn off)

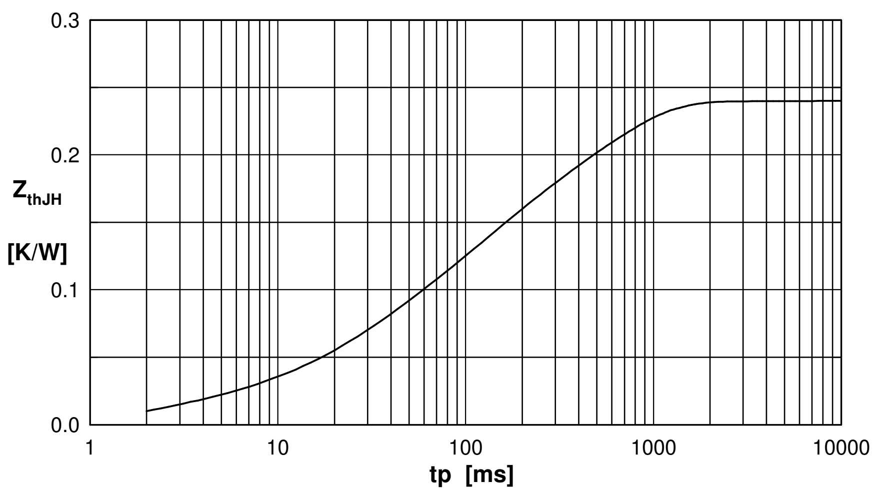

Fig. 11 IGBT: typ. transient thermal impedance to heat sink

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DIODE D1 - D6

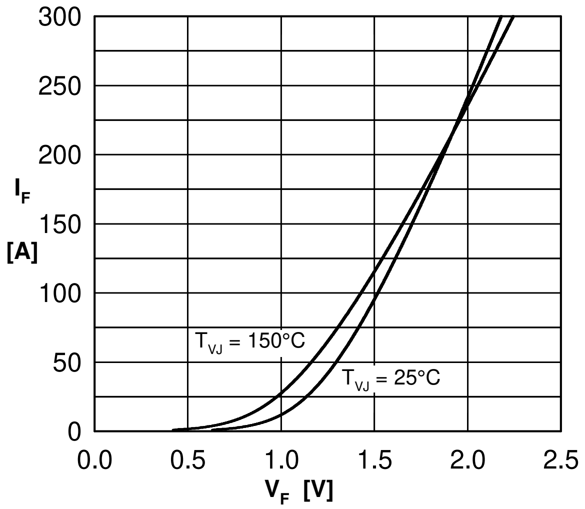

Fig. 12 Typ. forward charakteristics FWD

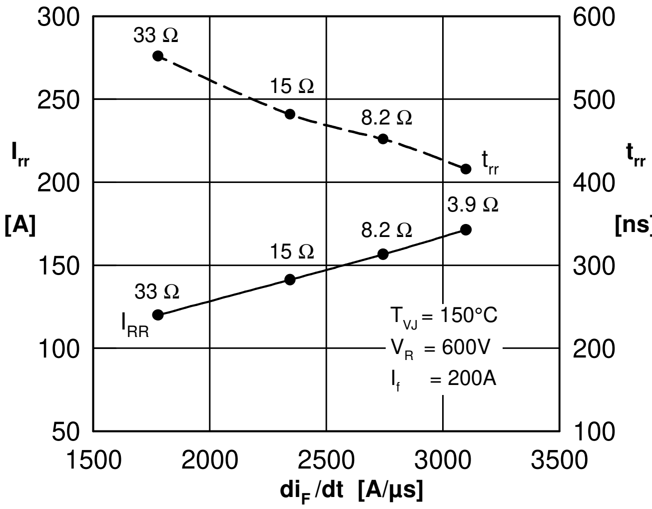

Fig. 13 Typ. recovery energy $E_{rec\ (off)}$ versus -di/dt

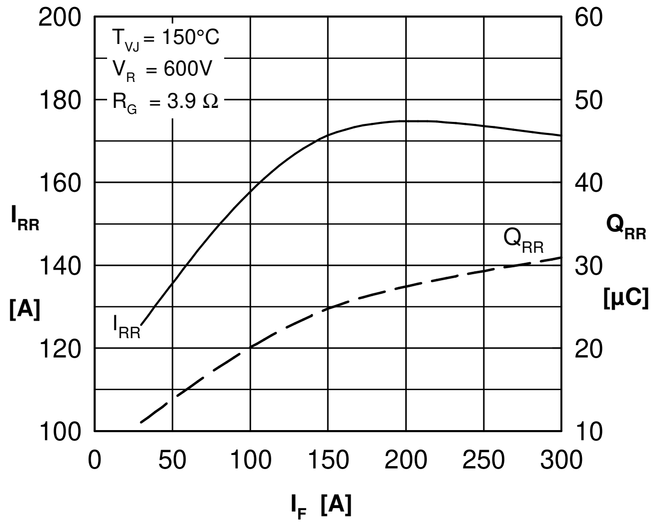

Fig. 14 typ. reverse recovery characteristics

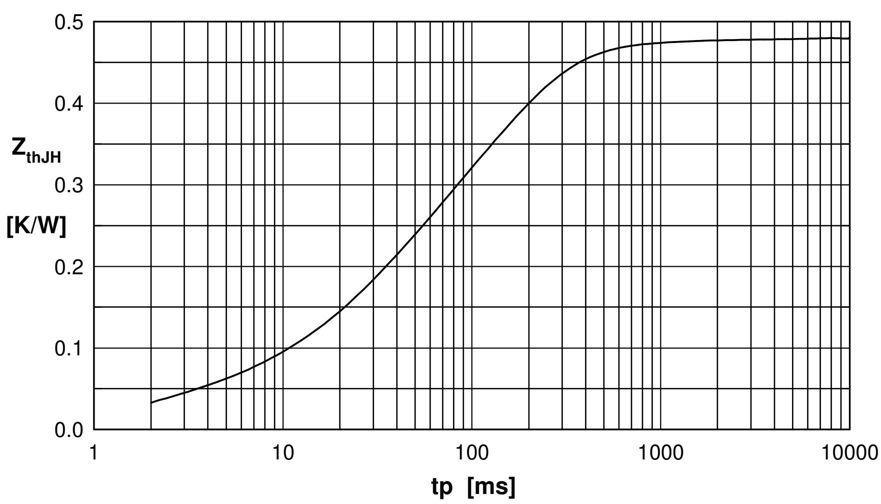

Fig. 15 Diode: typ. transient thermal impedance junction to heat sink