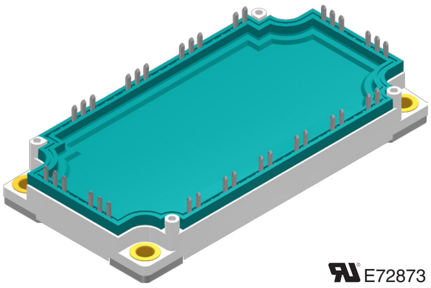
X2PT IGBT Module

V_{CES} = 1200 V
I_{C25} = 325 A
$V_{CE(sat)}$ = 1.7 V

6-Pack + NTC

Part number

MIXG240W1200TEH



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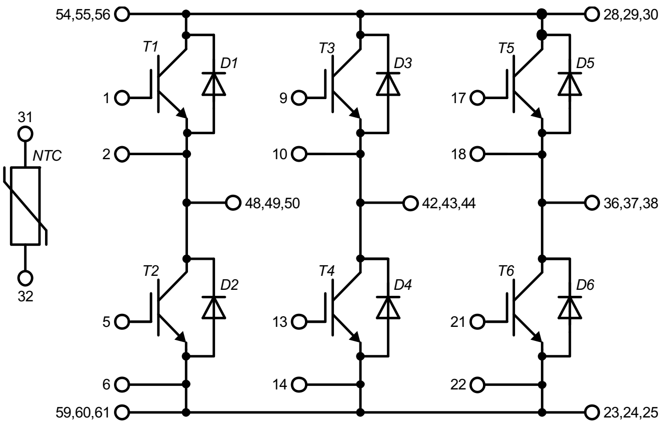


Features / Advantages:
- X2PT - 2nd generation Xtreme light Punch Through
- Tvjm = 175°C
- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Rugged X2PT design results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @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

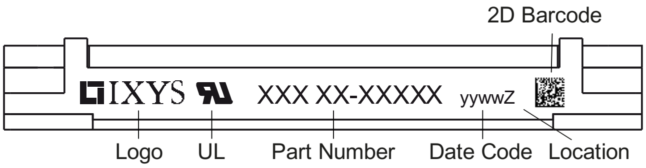
Package: E3-Pack
- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Solder pins

Option:
- Phase Change Material printed on base plate

Inverter IGBT T1 - T6				**Ratings**			
Symbol	**Definitions**	**Conditions**		**min.**	**typ.**	**max.**	
V_{CES}	*collector emitter voltage*		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			325	A
I_{C80}	*on die level*		T_C = 80°C			243	A
I_{C100}			T_C = 100°C			208	A
P_{tot}	*total power dissipation*		T_C = 25°C			1000	W
$V_{CE(sat)}$	*collector emitter saturation voltage on die level*	I_C = 200 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.7	2	V
			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	5.5		7.5	V
I_{CES}	*collector emitter leakage current*	$V_{CE} = V_{CES}$; V_{GE} = 0 V	T_{VJ} = 25°C			0.6	mA
			T_{VJ} = 150°C		5		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
R_G	*internal gate resistance*				5.6		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} = 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 V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 25°C		170		ns
t_r	*current rise time*				54		ns
$t_{d(off)}$	*turn-off delay time*				298		ns
t_f	*current fall time*				138		ns
E_{on}	*turn-on energy per pulse*				15.5		mJ
E_{off}	*turn-off energy per pulse*				16.1		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				4.7		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 100°C		176		ns
t_r	*current rise time*				64		ns
$t_{d(off)}$	*turn-off delay time*				336		ns
t_f	*current fall time*				188		ns
E_{on}	*turn-on energy per pulse*				19.6		mJ
E_{off}	*turn-off energy per pulse*				19.7		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				7.7		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 150°C		182		ns
t_r	*current rise time*				66		ns
$t_{d(off)}$	*turn-off delay time*				366		ns
t_f	*current fall time*				232		ns
E_{on}	*turn-on energy per pulse*				21.4		mJ
E_{off}	*turn-off energy per pulse*				22.0		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				10.3		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*					0.15	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.195		K/W

Inverter Diode D1 - D6				**Ratings**			
Symbol	**Definitions**	**Conditions**		**min.**	**typ.**	**max.**	
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1200	V
I_{F25}	*forward current*		T_C = 25°C			235	A
I_{F80}	*on die level*		T_C = 80°C			170	A
I_{F100}			T_C = 100°C			145	A
V_F	*forward voltage*	I_F = 200 A	T_{VJ} = 25°C		1.9	2.2	V
	on die level		T_{VJ} = 150°C		1.9		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
di/dt	*rate of change of current*	V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 25°C		3300		A/µs
Q_{RM}	*reverse recovery charge*				13		µC
I_{RM}	*max. reverse recovery current*				129		A
t_{rr}	*reverse recovery time*				286		ns
E_{rec}	*reverse recovery energy*				4.7		mJ
di/dt	*rate of change of current*	V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 100°C		3080		A/µs
Q_{RM}	*reverse recovery charge*				20.4		µC
I_{RM}	*max. reverse recovery current*				145		A
t_{rr}	*reverse recovery time*				384		ns
E_{rec}	*reverse recovery energy*				7.7		mJ
di/dt	*rate of change of current*	V_{CE} = 600 V; I_C = 200 A V_{GE} = ±15 V; R_G = 3.9 Ω (external)	T_{VJ} = 150°C		2715		A/µs
Q_{RM}	*reverse recovery charge*				27		µC
I_{RM}	*max. reverse recovery current*				158		A
t_{rr}	*reverse recovery time*				458		ns
E_{rec}	*reverse recovery energy*				10.3		mJ
R_{thJC}	*thermal resistance junction to case*					0.28	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.37		K/W

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					295		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; $I_{ISOL} \le 1$ 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. $V = V_F + 2 \cdot R \cdot I_F$				1.5	mΩ
C_P	*coupling capacity per switch*	between shorted pins of switch and back side metallization					pF



Part number

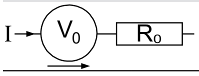
M = Module
I = IGBT
X = XPT IGBT
G = Gen 2 / std
240 = Current Rating [A]
W = 6-pack
1200 = Reverse Voltage [V]
T = Thermistor
EH = E3-Pack

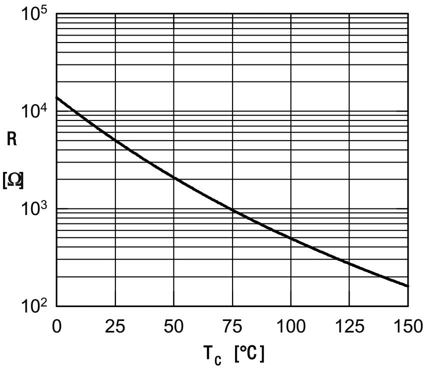
Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXG240W1200TEH	MIXG240W1200TEH	Box	5	517094
with Phase Change Material	MIXG240W1200TEH -PC	MIXG240W1200TEH	Blister	24	

Similar Part	Package	Voltage class
MIXG240W1200PTEH	E3- Pack, press fit pin	1200
MIXG240W1200PSTEH	E3- Pack, press fit pin + shunt	1200
MIXG240W1200STEH	E3- Pack, shunt	1200

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

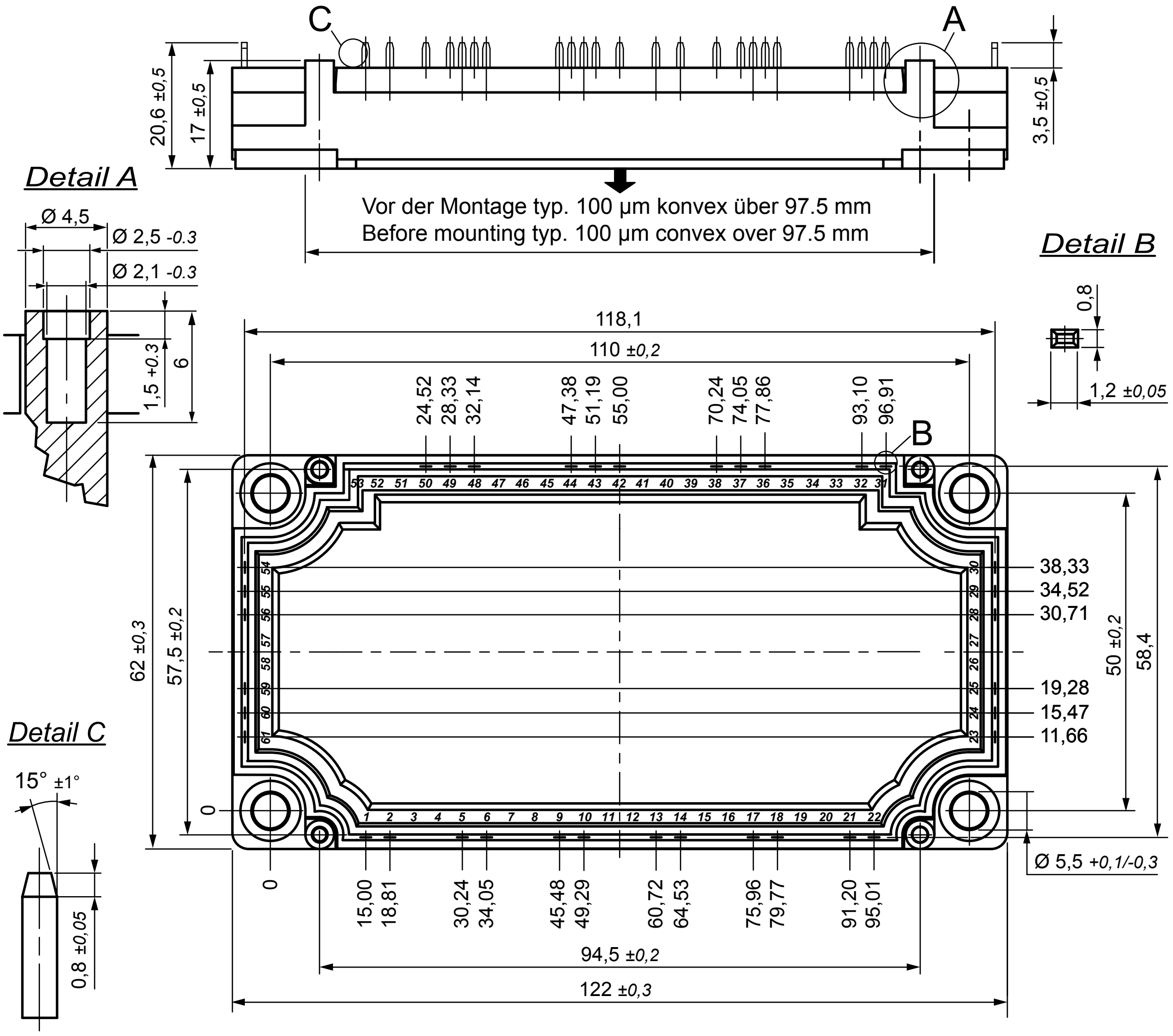
Temperature Sensor NTC						
Symbol	**Definitions**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
R_{25}	*resistance*	$T_{VJ} = 25°C$	4.75	5.0	5.25	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K

Equivalent Circuits for Simulation	**on die level*				
			IGBT	Inverter Diode	
$V_{0\,max}$	*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

Outlines E3-Pack



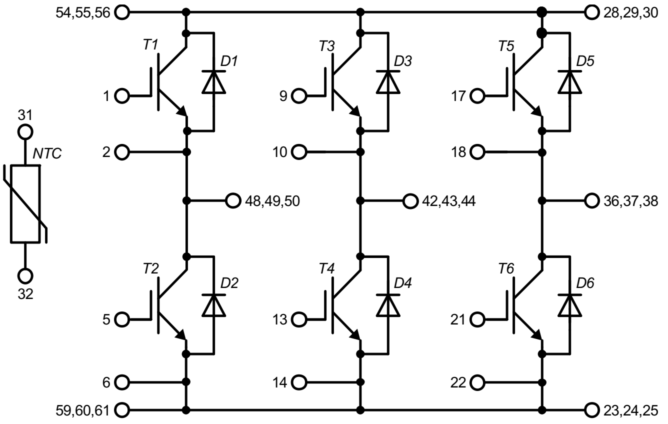
Vor der Montage typ. 100 µm konvex über 97.5 mm
Before mounting typ. 100 µm convex over 97.5 mm

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**



IGBT T1 - T6

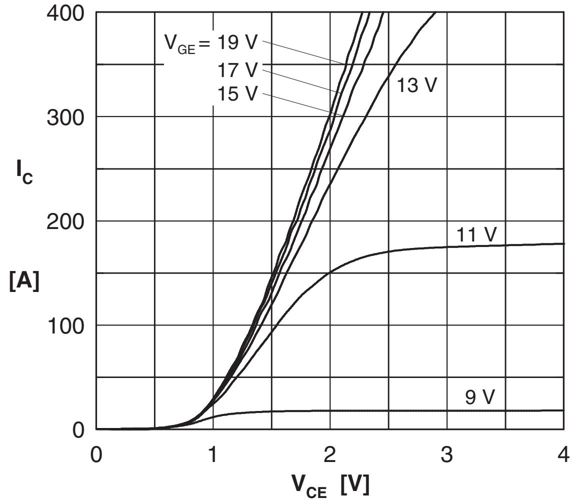


Fig. 1 Typ. output characteristics (T_{VJ} = 25°C)

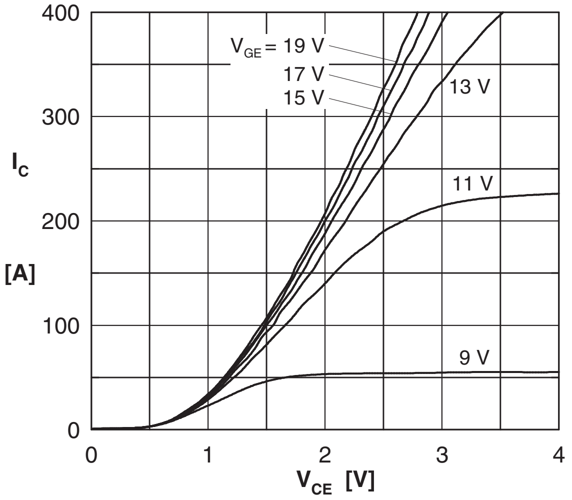


Fig. 2 Typ. output characteristics (T_{VJ} = 150°C)

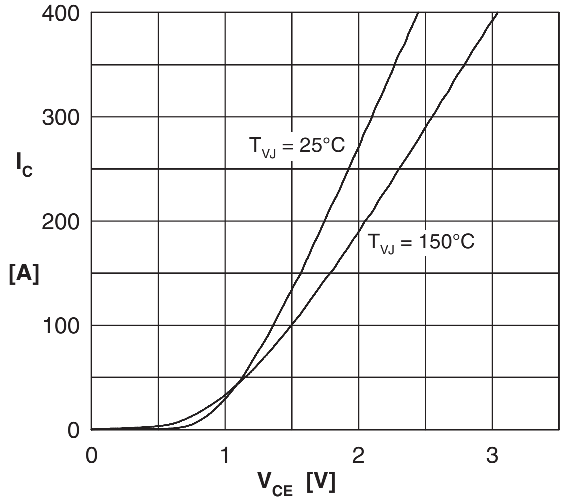


Fig. 3 Typ. output characteristics (V_{GE} = 15V)

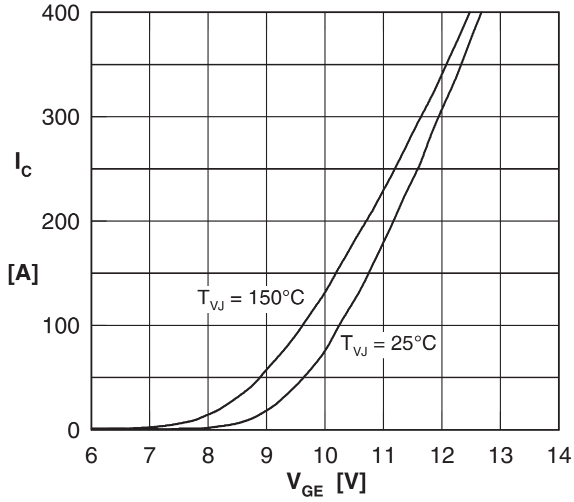


Fig. 4 Typ. tranfer characteristics (V_{CE} = 20V)

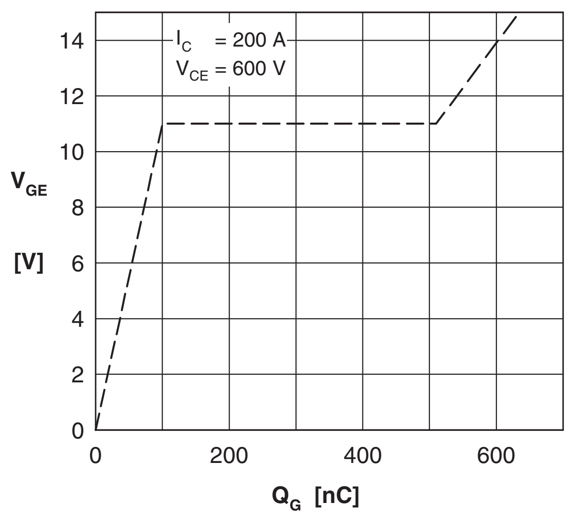


Fig. 5 Typ. turn-on gate charge 0/15V

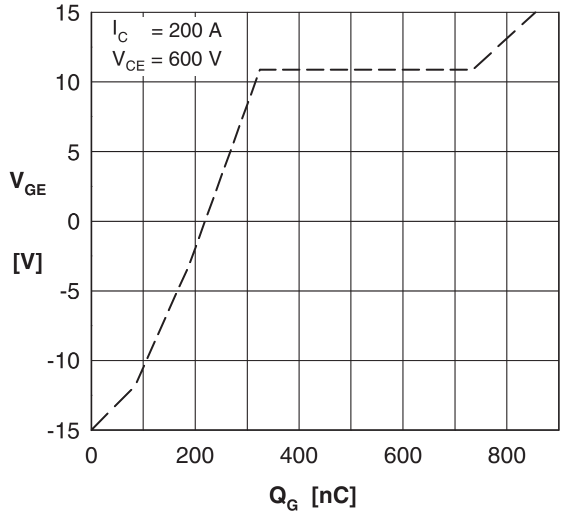


Fig. 6 Typ. turn-on gate charge -15/+15V

IGBT T1 - T6

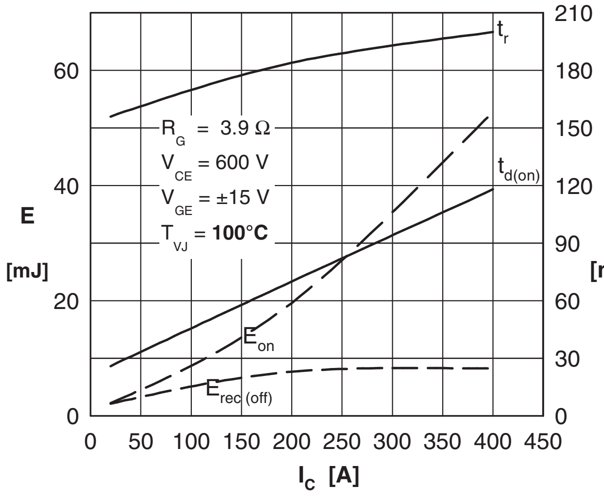


Fig. 7 Typ. switching energy versus collector current (turn on)

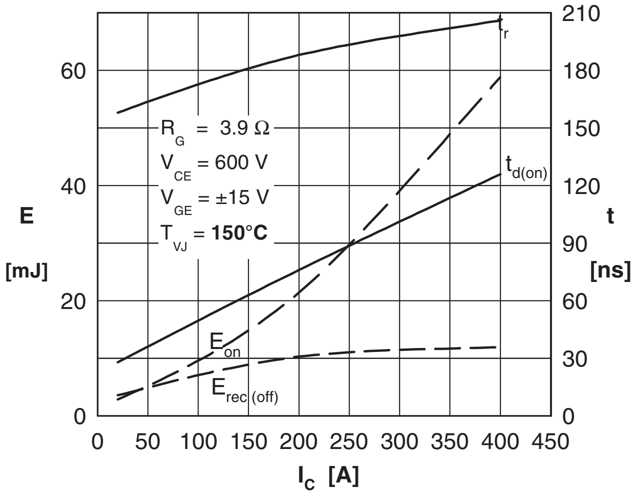


Fig. 8 Typ. switching energy versus collector current (turn on)

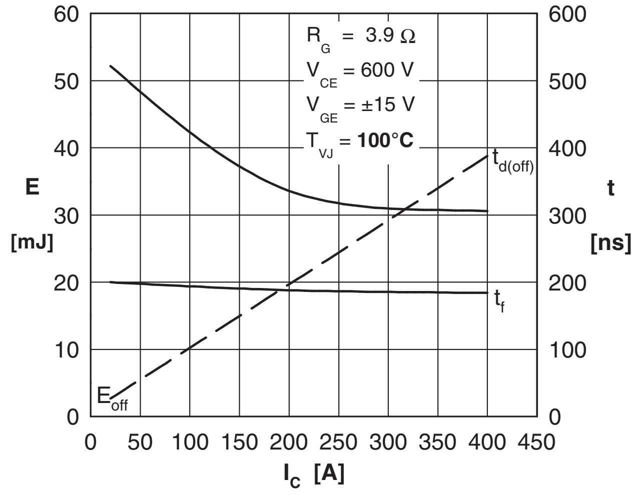


Fig. 9 Typ. switching energy versus collector current (turn off)

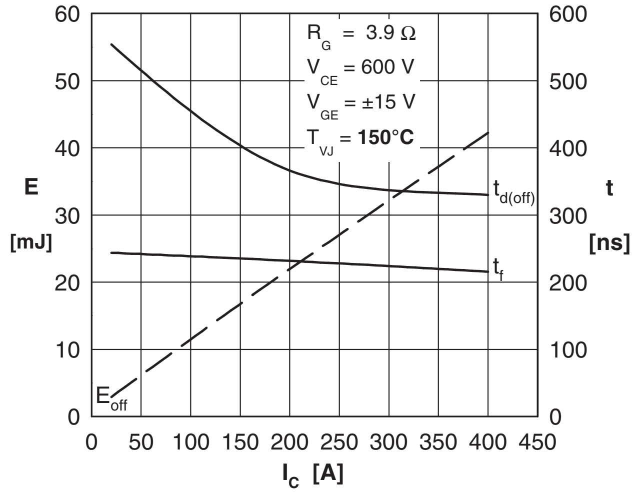


Fig. 10 Typ. switching energy versus collector current (turn off)

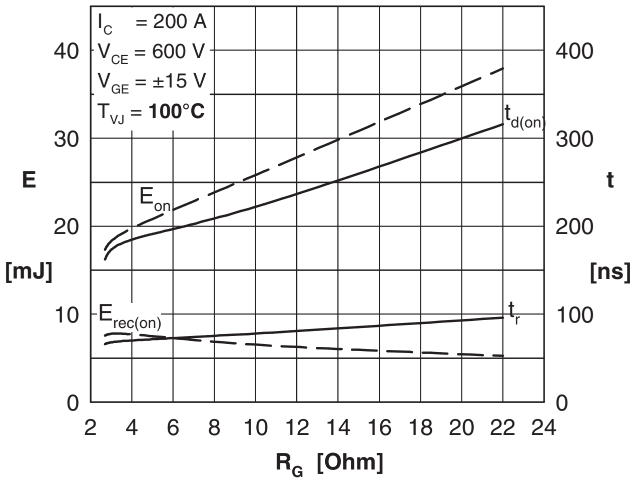


Fig. 11 Typ. switching energy versus gate resistor (turn on)

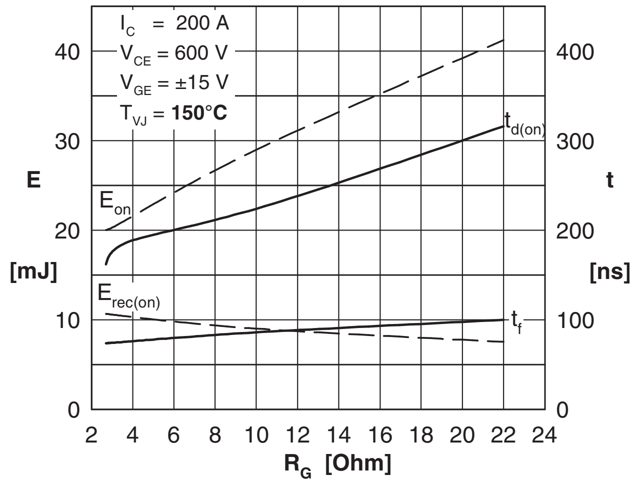


Fig. 12 Typ. switching energy versus gate resistor (turn on)

IGBT T1 - T6

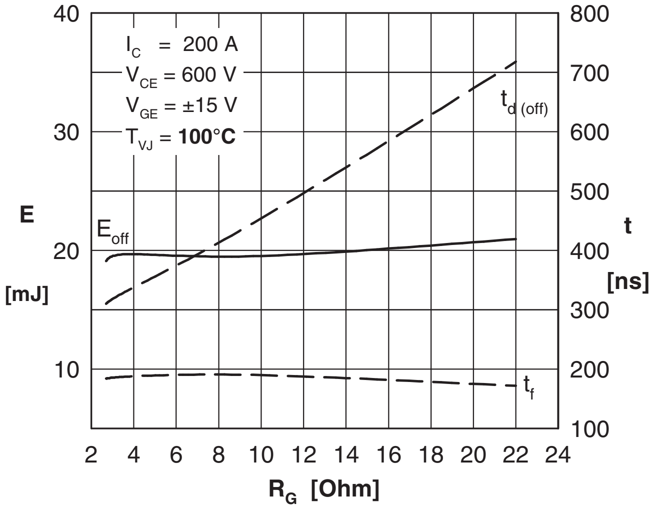


Fig .13 Typ. switching energy versus gate resistor (turn off)

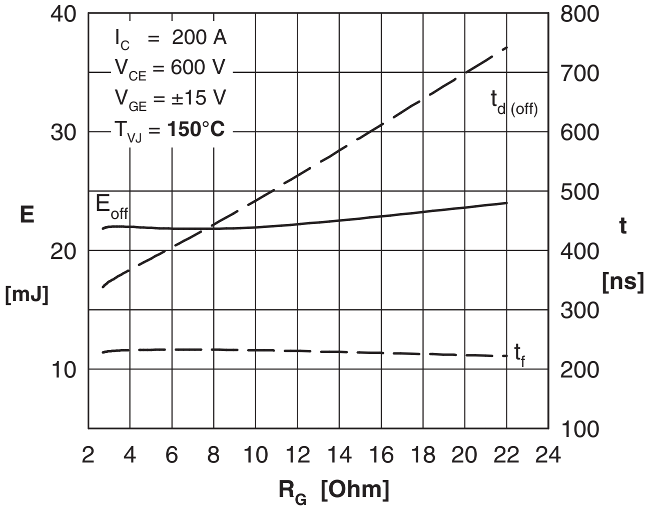


Fig. 14 Typ. switching energy versus gate resistor (turn off)

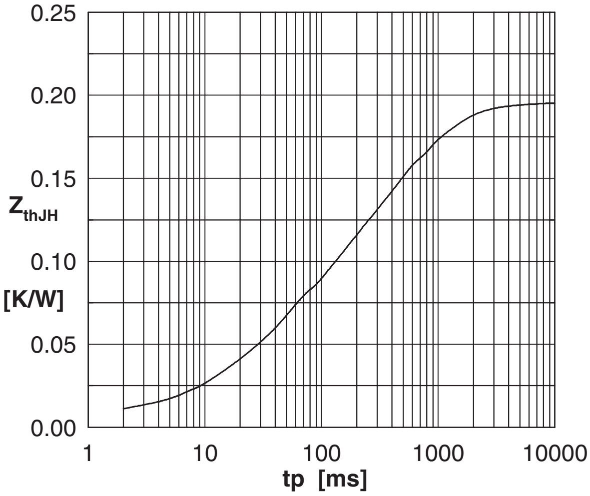


Fig. 15 IGBT: Typ. transient thermal impedance junction to heat sink

DIODE D1 - D6

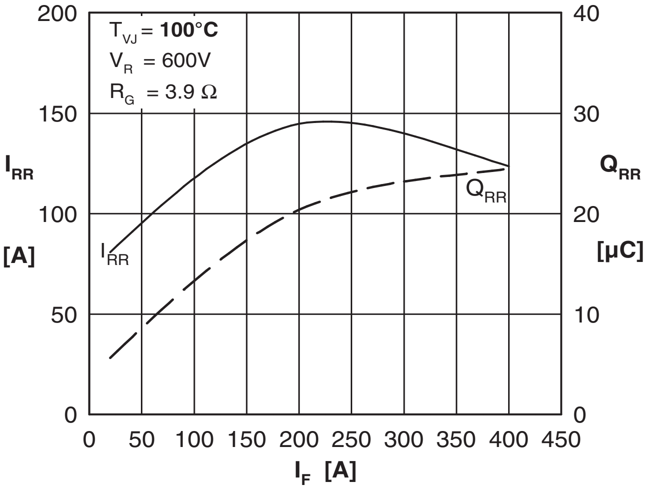


Fig. 16 Typ. reverse recovery characteristics versus diode current I_F

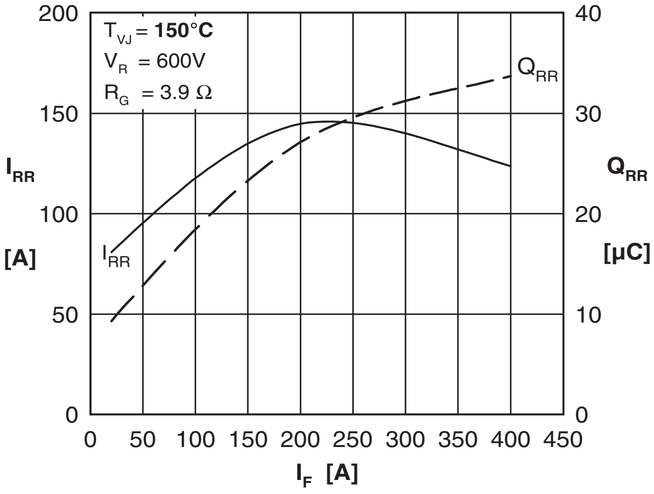


Fig. 17 Typ. reverse recovery characteristics versus diode current I_F

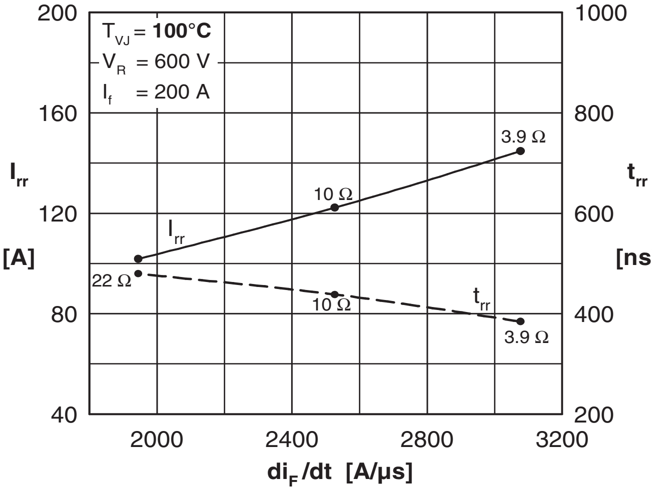


Fig. 18 Typ. reverse recovery characteristics versus -di/dt

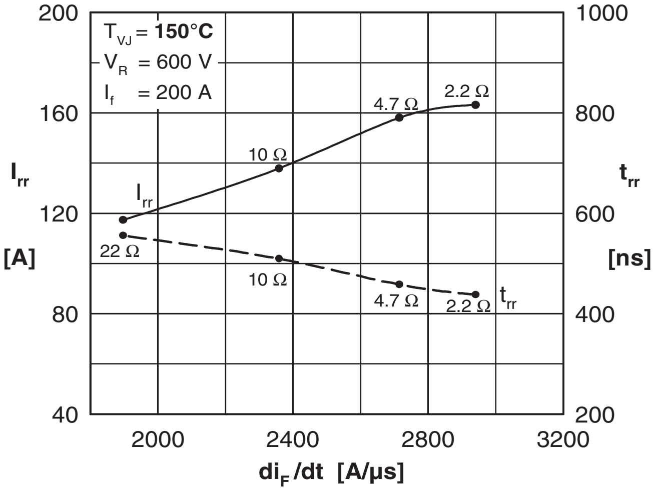


Fig. 19 Typ. reverse recovery characteristics versus -di/dt

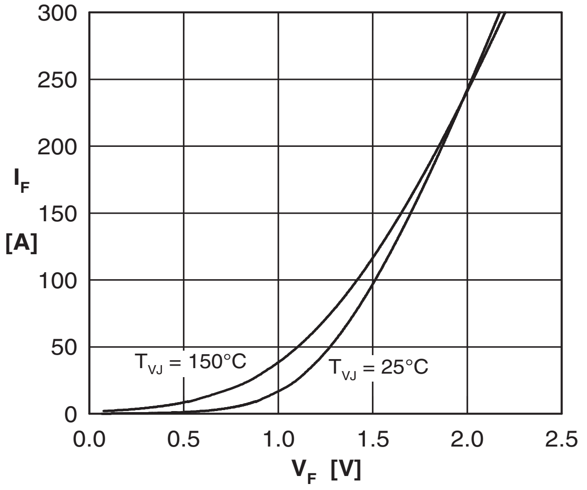


Fig. 20 Typ. forward characteristics of free wheeling diode

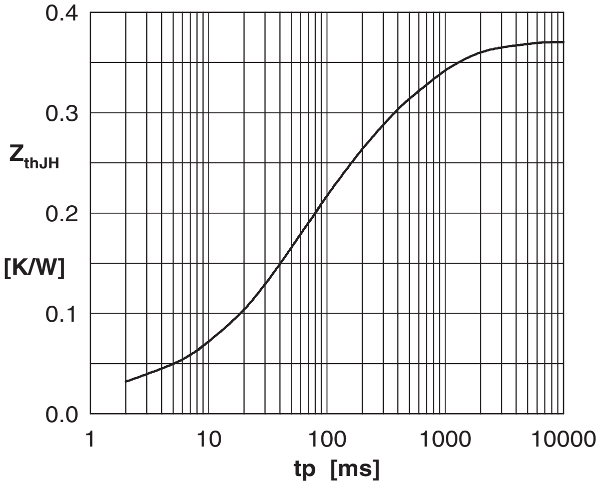


Fig. 21 Diode: Typ. transient thermal impedance junction to heat sink