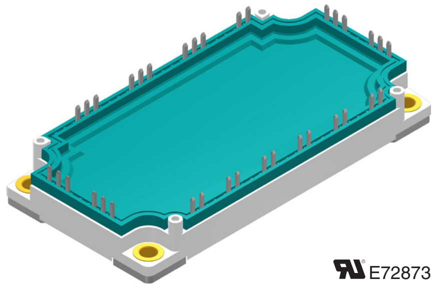
X2PT IGBT Module

V_{CES} = 1200 V
I_{C25} = 260 A
$V_{CE(sat)}$ = 1.7 V

6-Pack + NTC

Part number
MIXG180W1200TEH



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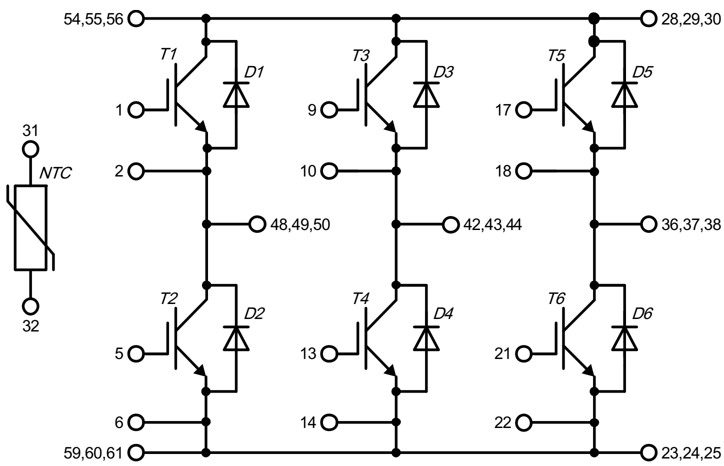


Features / Advantages:

- 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 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			260	A
I_{C80}			T_C = 80°C			195	A
I_{C100}			T_C = 100°C			165	A
P_{tot}	*total power dissipation*		T_C = 25°C			830	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 150 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 = 6 mA; V_{GE} = V_{GE}	T_{VJ} = 25°C	5.5		7	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES} ; V_{GE} = 0 V	T_{VJ} = 25°C			0.4	mA
			T_{VJ} = 150°C		3		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
R_G	*internal gate resistance*				2.5		Ω
C_{iss}	*input capacitance*	V_{CE} = 100 V; V_{GS} = 0 V; f = 1 MHz			8.5		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 V/15 V; I_C = 150 A			520		nC
Q_{gs}	*gate source charge*						nC
Q_{gd}	*gate drain (Miller) charge*						nC
$t_{d(on)}$	*urn-on delay time*	Inductive switching V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 25°C		172		ns
t_r	*current rise time*				62		ns
$t_{d(off)}$	*turn-off delay time*				296		ns
t_f	*current fall time*				162		ns
E_{on}	*turn-on energy per pulse*				14.2		mJ
E_{off}	*turn-off energy per pulse*				12.8		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				4.1		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 100°C		180		ns
t_r	*current rise time*				70		ns
$t_{d(off)}$	*turn-off delay time*				336		ns
t_f	*current fall time*				216		ns
E_{on}	*turn-on energy per pulse*				17.7		mJ
E_{off}	*turn-off energy per pulse*				15.7		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				6.8		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 150°C		108		ns
t_r	*current rise time*				76		ns
$t_{d(off)}$	*turn-off delay time*				360		ns
t_f	*current fall time*				256		ns
E_{on}	*turn-on energy per pulse*				20.9		mJ
E_{off}	*turn-off energy per pulse*				17.4		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				9.3		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 4.7 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			600		A
R_{thJC}	*thermal resistance junction to case*					0.18	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.22		K/W

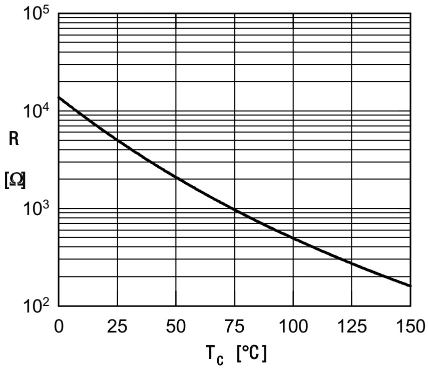
IXYS reserves the right to change limits, test conditions and dimensions.

20220513b

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} I_{F80} I_{F100}	*forward current*		T_C = 25°C T_C = 80°C T_C = 100°C			225 162 136	A A
V_F	*forward voltage*	I_F = 150 A	T_{VJ} = 25°C T_{VJ} = 150°C		1.7 1.7	2.0	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
di/dt Q_{RM} I_{RM} t_{rr} E_{rec}	*rate of change of current* *reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 25°C		2550 12 103 346 4.1		A/µs µC A ns mJ
di/dt Q_{RM} I_{RM} t_{rr} E_{rec}	*rate of change of current* *reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 100°C		2210 19 114 458 6.8		A/µs µC A ns mJ
di/dt Q_{RM} I_{RM} t_{rr} E_{rec}	*rate of change of current* *reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_{CE} = 600 V; I_C = 150 A V_{GE} = ±15 V; R_G = 4.7 Ω (external)	T_{VJ} = 150°C		2040 25 125 540 9.3		A/µs µC A ns mJ
R_{thJC} R_{thJH}	*thermal resistance junction to case* *thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			 0.38	0.30	K/W K/W

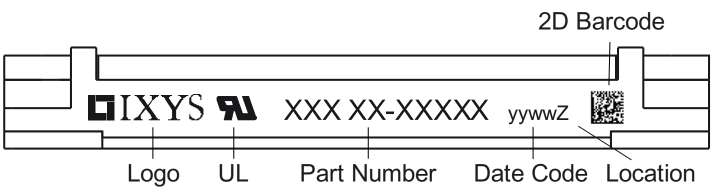
Temperature Sensor NTC						
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K

Equivalent Circuits for Simulation **on die level*					
I → V_0 — R_0			IGBT	Inverter Diode	
$V_{0\ max}$	*threshold voltage*	T_{VJ} = 175°C	1.2	1.2	V
$R_{0\ max}$	*slope resistance **		7.7	4.7	mΩ



Typ. NTC resistance vs. temperature

Package E3-Pack				Ratings			
Symbol	**Definitions**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			50		A
T_{stg}	*storage temperature*			-40		125	°C
T_{op}	*operation temperature*			-40		150	°C
T_{VJ}	*virtual junction temperature*			-40		175	°C
Weight					270		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*	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	*t = 1 second*	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. $V = V_F + 2 \cdot R \cdot I_F$			2.3		mΩ
C_P	*coupling capacity per switch*	between shorted pins of switch and back side metallization					pF



Part number

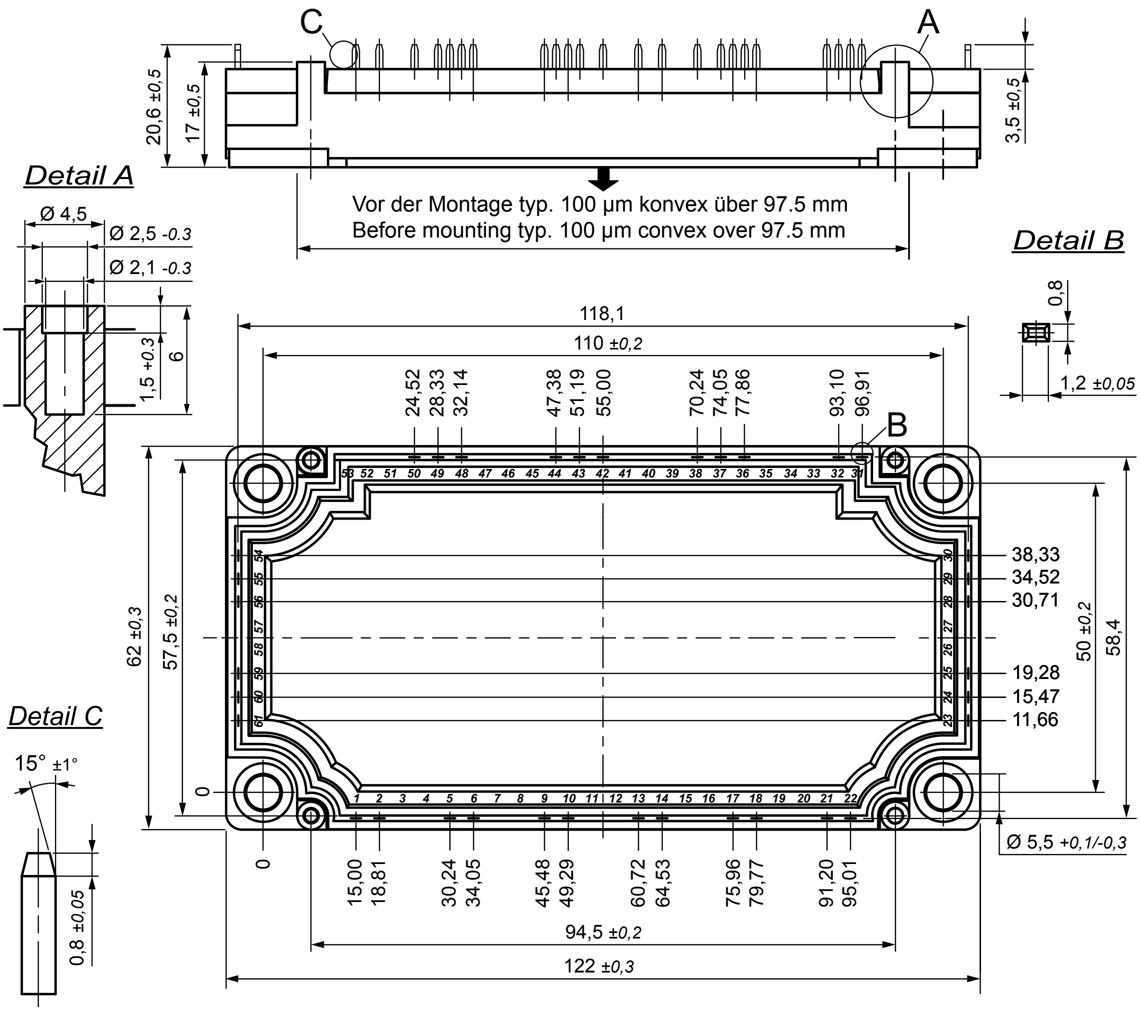
- M = Module
- I = IGBT
- X = XPT IGBT
- G = Gen 2 / std
- 180 = Current Rating [A]
- W = 6-pack
- 1200 = Reverse Voltage [V]
- T = Thermistor
- EH = E3-Pack

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXG180W1200TEH	MIXG180W1200TEH	Box	5	MIXG180W1200TEH
with Phase Change Material	MIXG180W1200TEH-PC	MIXG180W1200TEH	Blister	24	

Similar Part	Package	Voltage class
MIXG180W1200PTEH	E3- Pack, press fit pin	1200
MIXG180W1200STEH	E3- Pack, shunt	1200
MIXG180W1200PSTEH	E3- Pack, shunt and press fit pin	1200

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

Outlines E3-Pack

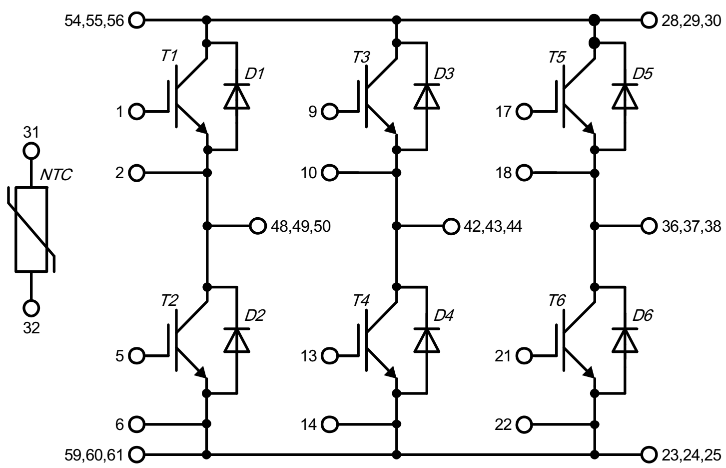


Bemerkung / *Note:*

- 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**
- 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

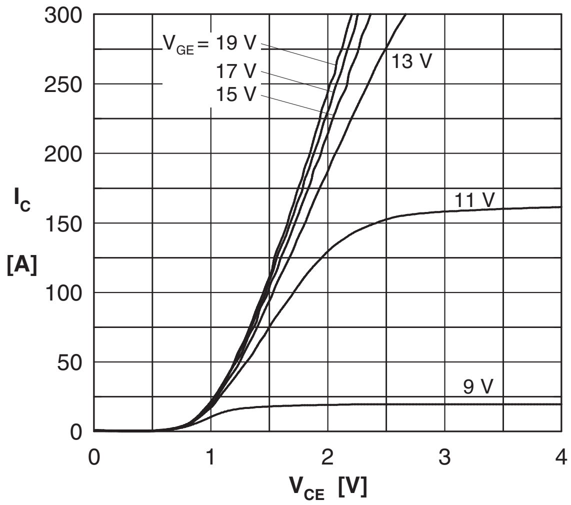


Fig. 1 Typ. output characteristics (T_{VJ} = 25°C)

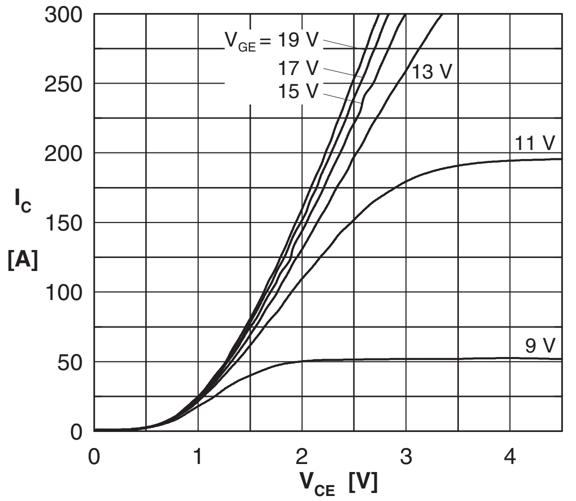


Fig. 2 Typ. output characteristics (T_{VJ} = 150°C)

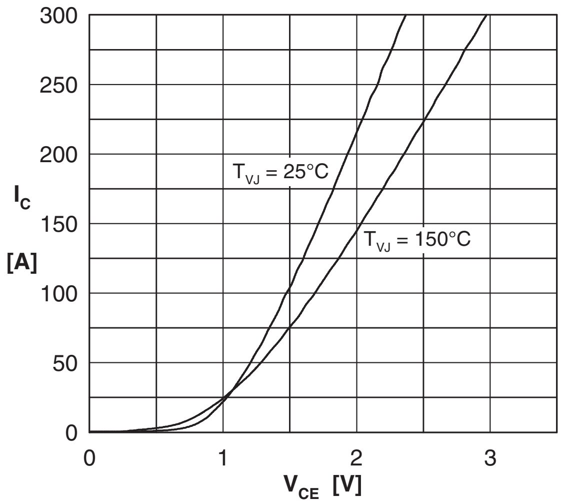


Fig. 3 Typ. output characteristics (V_{GE} = 15V)

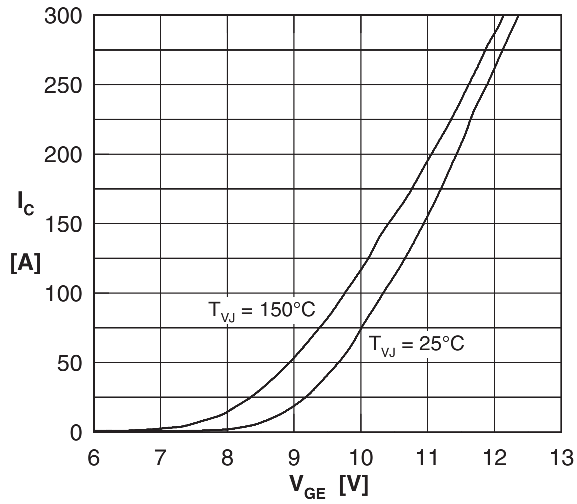


Fig. 4 Typ. tranfer characteristics (V_{CE} = 20V)

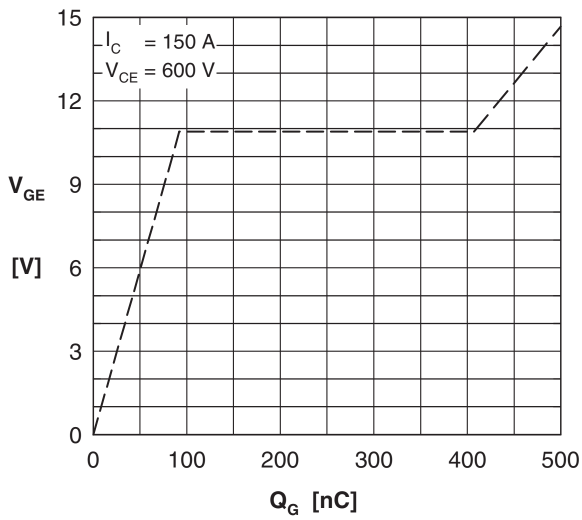


Fig. 5 Typ. turn-on gate charge 0/15V

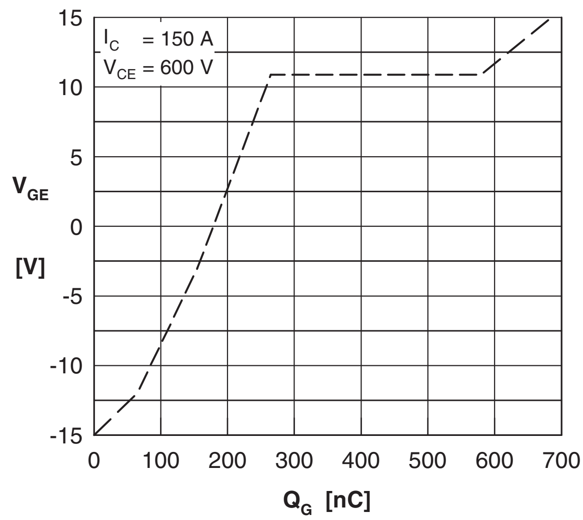


Fig. 6 Typ. turn-on gate charge -15/+15V

IGBT T1 - T6

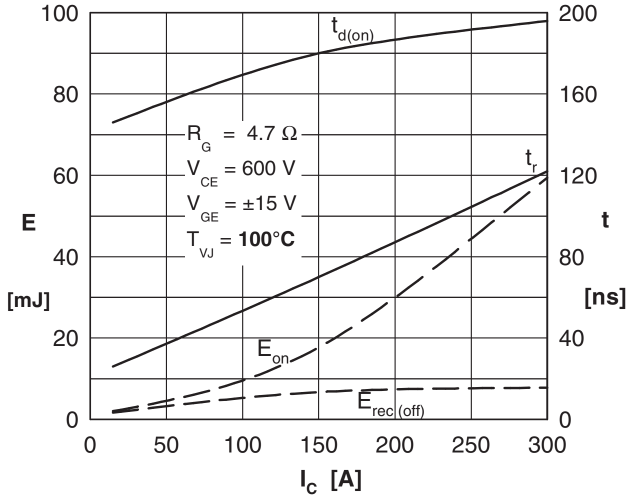


Fig. 7 Typ. switching energy versus collector current (turn on)

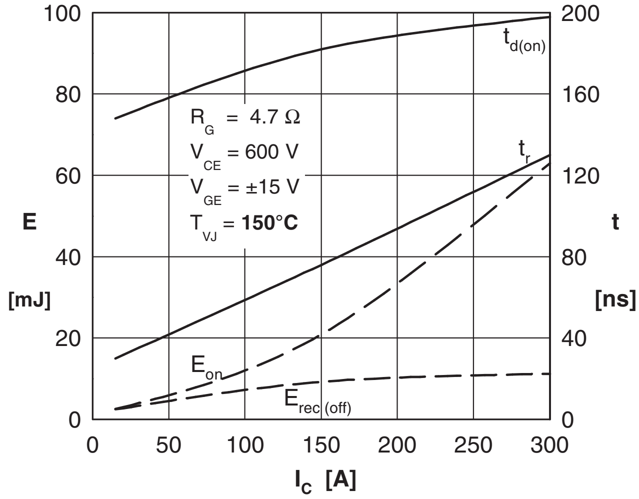


Fig. 8 Typ. switching energy versus collector current (turn on)

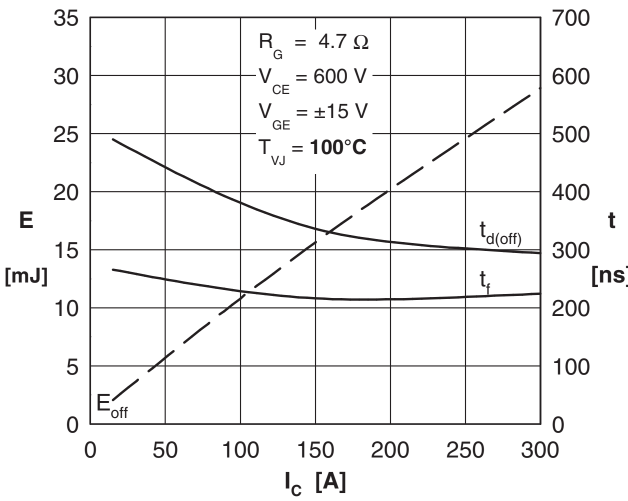


Fig. 9 Typ. switching energy versus collector current (turn off)

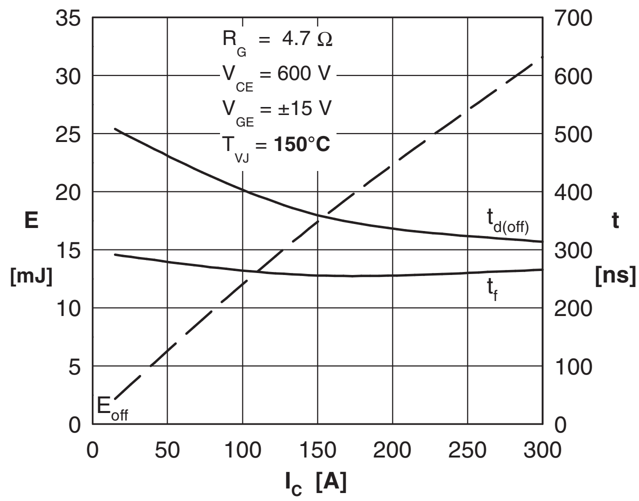


Fig. 10 Typ. switching energy versus collector current (turn off)

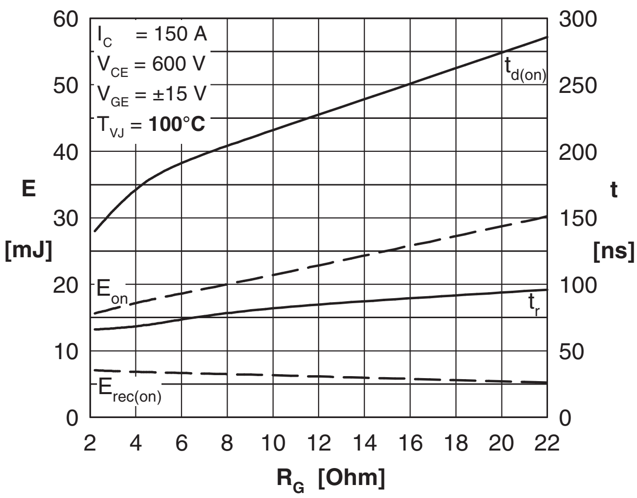


Fig. 11 Typ. switching energy versus gate resistor (turn on)

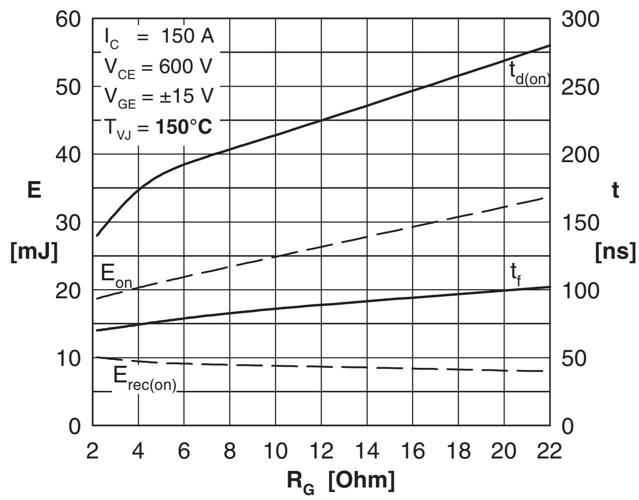


Fig. 12 Typ. switching energy versus gate resistor (turn on)

IGBT T1 - T6

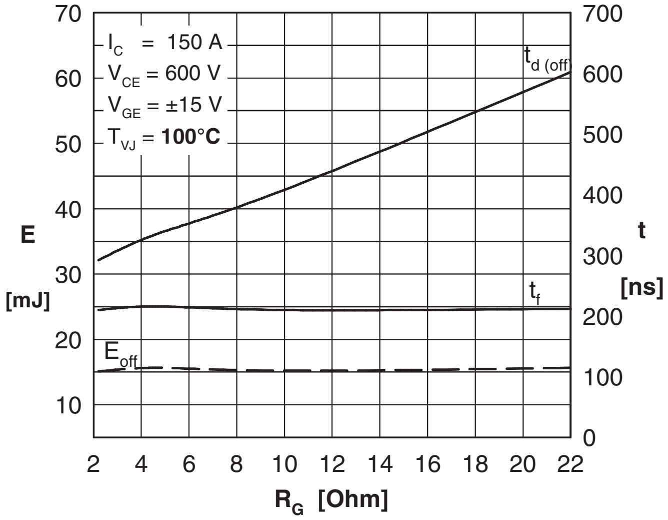


Fig .13 Typ. switching energy versus gate resistor (turn off)

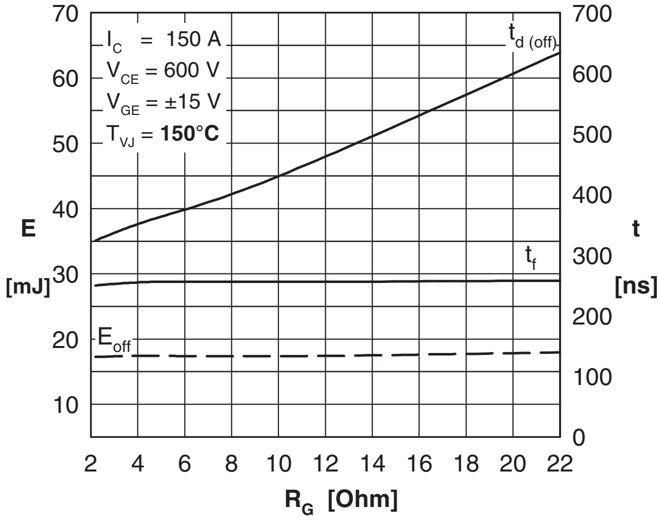


Fig. 14 Typ. switching energy versus gate resistor (turn off)

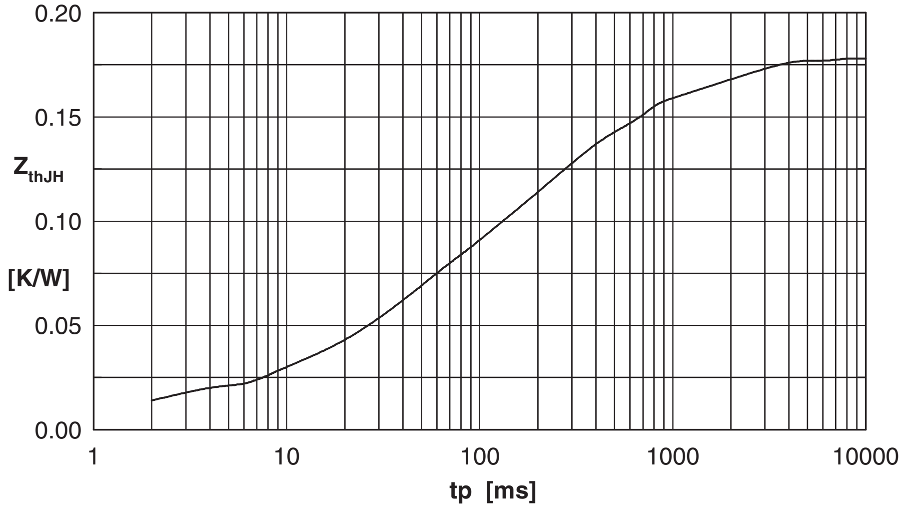


Fig. 15 IGBT: typ. transient thermal impedance to heat sink

DIODE D1 - D6

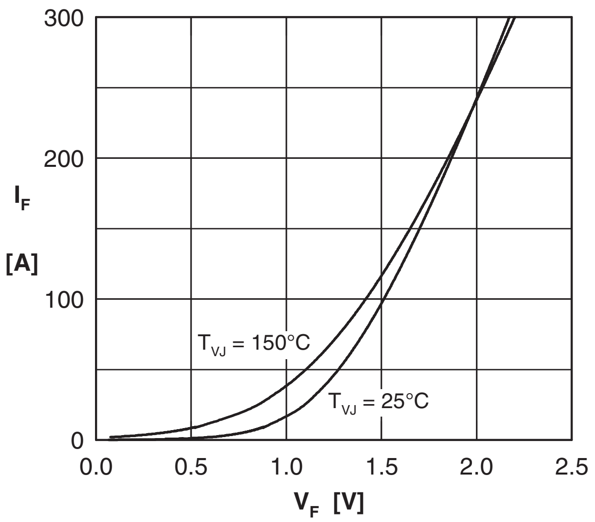


Fig. 16 FWD: typ. forward charakteristics

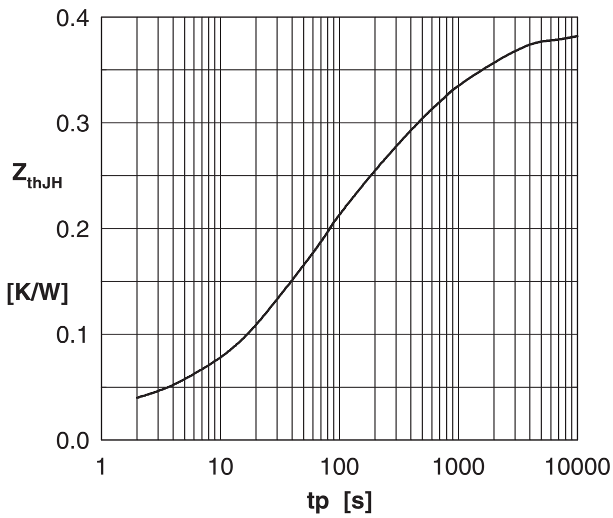


Fig. 17 Diode: typical transient thermal impedance junction to heat sink

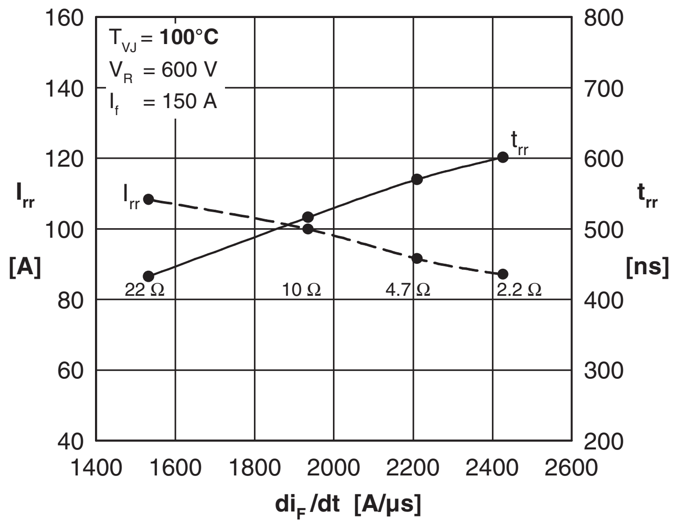


Fig. 18 Typ. recovery energy $E_{rec\ (off)}$ versus -di/dt

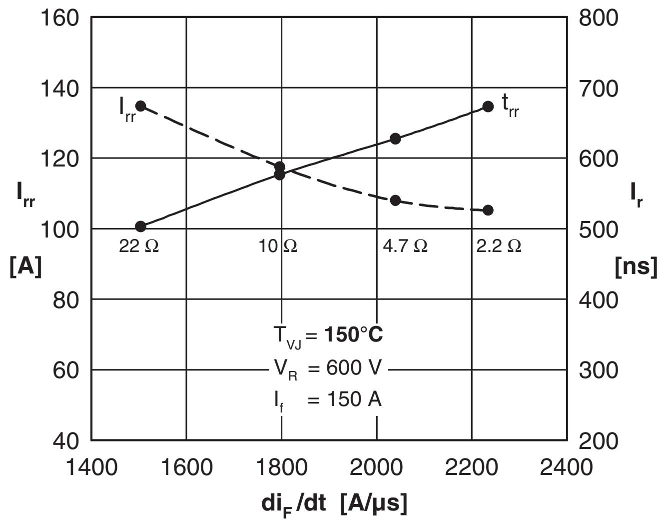


Fig. 19 Typ. recovery energy $E_{rec\ (off)}$ versus -di/dt