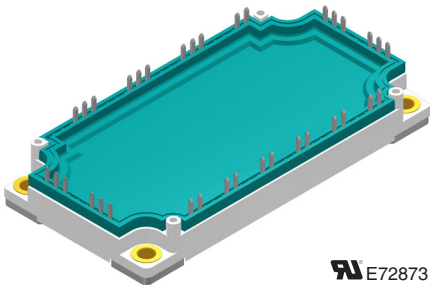
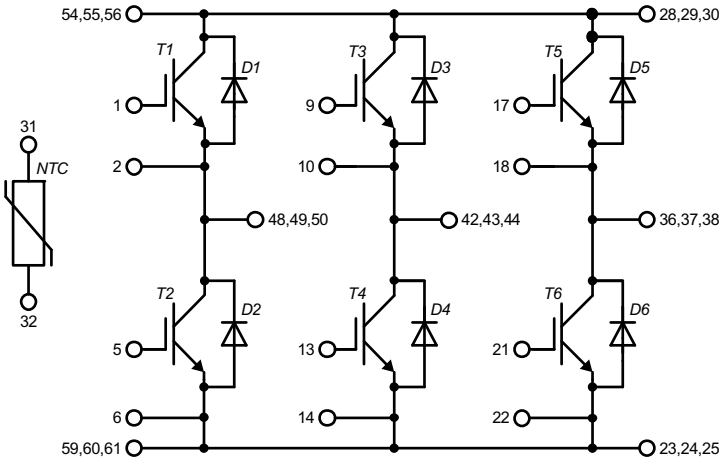
X2PT IGBT Module

V_{CES} = 1200 V
I_{C25} = 186 A
$V_{CE(sat)}$ = 1.7 V

6-Pack + NTC

Part number
MIXG120W1200TEH





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

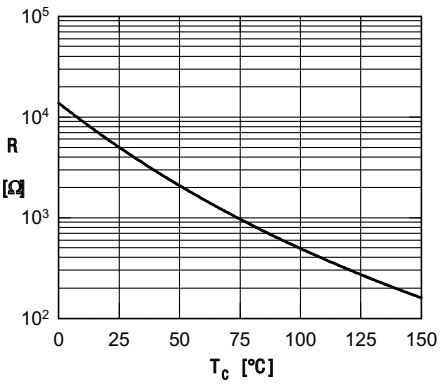
Package: E3-Pack
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Base plate: Copper internally DCB isolated
- Advanced power cycling

Option:
- Phase Change Material printed on base plate

Inverter IGBT				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			186	A
I_{C80}			T_C = 80°C			140	A
I_{C100}			T_C = 100°C			120	A
P_{tot}	*total power dissipation*		T_C = 25°C			625	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 100 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.7	2.0	V
			T_{VJ} = 150°C		2.0		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 4 mA; V_{GE} = V_{GE}	T_{VJ} = 25°C	6		7	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES} ; V_{GE} = 0 V	T_{VJ} = 25°C				mA
			T_{VJ} = 150°C		2		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
R_G	*internal gate resistance*				3.9		Ω
C_{iss}	*input capacitance*	V_{CE} = 100 V; V_{GS} = 0 V; f = 1 MHz			5.8		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 = 100 A			340		nC
Q_{gs}	*gate source charge*						nC
Q_{gd}	*gate drain (Miller) charge*						nC
$t_{d(on)}$	*urn-on delay time*	Inductive switching			140		ns
t_r	*current rise time*				50		ns
$t_{d(off)}$	*turn-off delay time*				260		ns
t_f	*current fall time*	V_{CE} = 600 V; I_C = 100 A	T_{VJ} = 25°C		170		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 6.8 Ω (external)			7.5		mJ
E_{off}	*turn-off energy per pulse*				8.4		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				3.3		mJ
$t_{d(on)}$	*turn-on delay time*	Inductive switching			145		ns
t_r	*current rise time*				58		ns
$t_{d(off)}$	*turn-off delay time*				330		ns
t_f	*current fall time*	V_{CE} = 600 V; I_C = 100 A	T_{VJ} = 150°C		275		ns
E_{on}	*turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 6.8 Ω (external)			10.9		mJ
E_{off}	*turn-off energy per pulse*				12.0		mJ
$E_{rec(off)}$	*reverse recovery losses at turn-off*				6.7		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 6.8 Ω	T_{VJ} = 150°C				
I_{CM}		V_{CEmax} = 1200 V				200	A
SCSOA	*short circuit safe operating area*	V_{CEmax} = 1200 V					
t_{SC}	*short circuit duration*	V_{CE} = 800 V; V_{GE} = ±15 V	T_{VJ} = 150°C			10	µs
I_{SC}	*short circuit duration*	non-repetitive			400		A
R_{thJC}	*thermal resistance junction to case*					0.24	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.3		K/W

Inverter Diode				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			161	A
I_{F80}			T_C = 80°C			117	A
I_{F100}			T_C = 100°C			100	A
V_F	*forward voltage*	I_F = 100 A	T_{VJ} = 25°C		1.7	2.0	V
			T_{VJ} = 150°C		1.7		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*	Inductive switching			8.2		µC
I_{RM}	*max. reverse recovery current*	V_{CE} = 600 V; I_C = 100 A	T_{VJ} = 25°C		65		A
t_{rr}	*reverse recovery time*	IGBT gate drive:			400		ns
dI_F/dt	*current slew rate*	V_{GE} = ±15 V; R_G = 6.8 Ω (external)			2190		A/µs
Q_{RM}	*reverse recovery charge*	Inductive switching			16.4		µC
I_{RM}	*max. reverse recovery current*	V_{CE} = 600 V; I_C = 100 A	T_{VJ} = 150°C		84		A
t_{rr}	*reverse recovery time*	IGBT gate drive:			520		ns
dI_F/dt	*current slew rate*	V_{GE} = ±15 V; R_G = 6.8 Ω (external)			1840		A/µs
R_{thJC}	*thermal resistance junction to case*					0.4	K/W
R_{thJH}	*thermal resistance junction to heatsink*	with heatsink compound; IXYS test setup			0.5		K/W

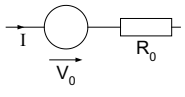
Temperature Sensor NTC						
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_C = 25°C	4.75	5.0	5.25	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

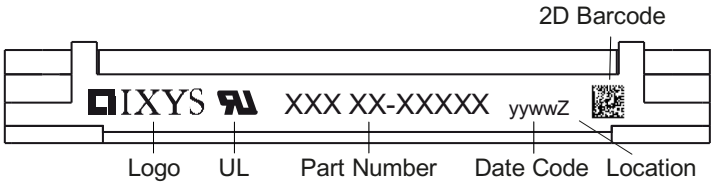
Equivalent Circuits for Simulation

** on die level*



			IGBT	Diode	
V_0	*threshold voltage*	T_{VJ} =			V
R_0	*slope resistance **	125°C			mΩ
V_0	*threshold voltage*	T_{VJ} =	1.2	1.2	V
R_0	*slope resistance **	175°C	11.6	7	mΩ

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					305		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



Part number

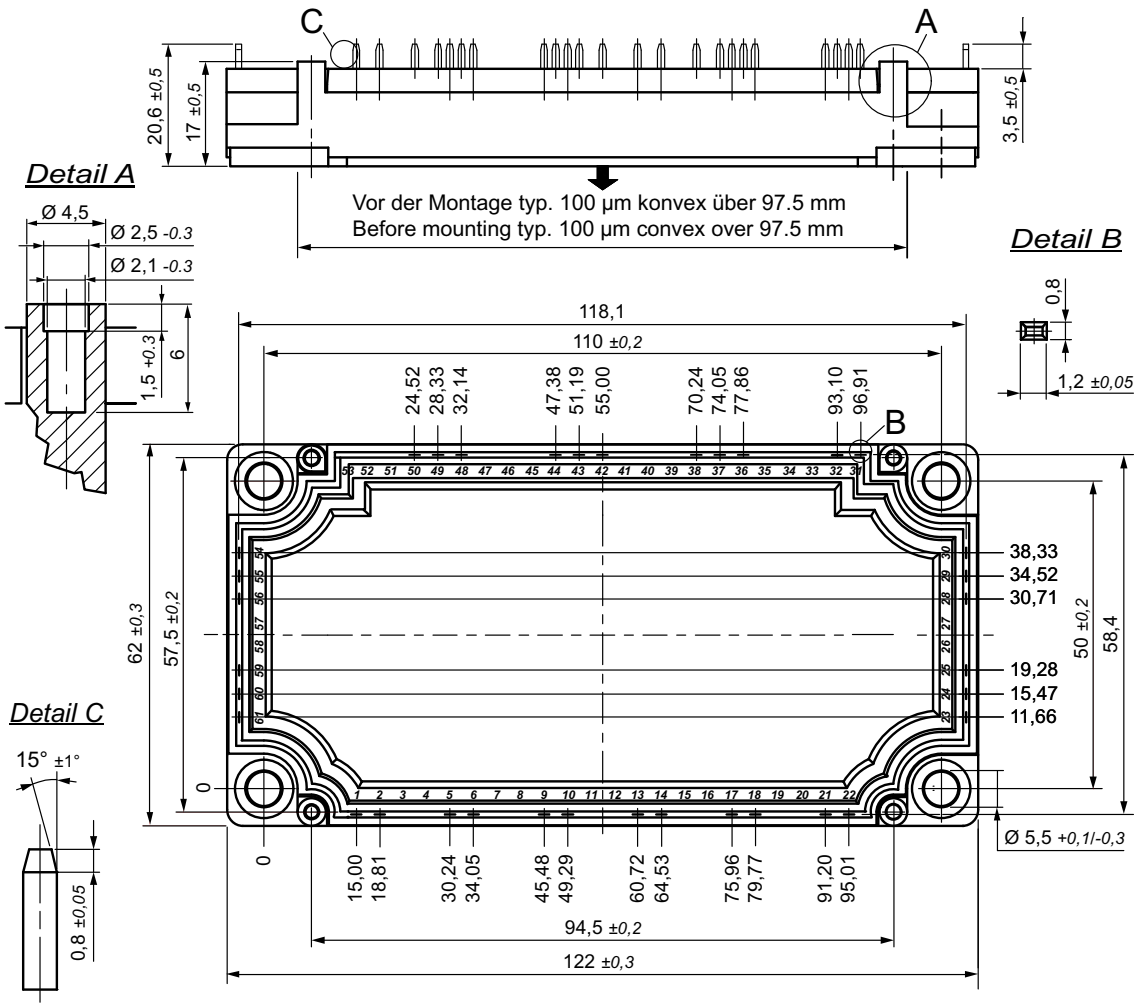
M = Module
I = IGBT
X = XPT IGBT
G = Gen 2 / std
120 = Current Rating [A]
W = 6-pack
1200 = Reverse Voltage [V]
T = Thermistor
EH = E3-Pack
- = Hyphen
PC = Phase Change Material

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXG120W1200TEH	MIXG120W1200TEH	Box	5	MIXG120W1200TEH
with Phase Change Material	MIXG120W1200TEH-PC[1)]	MIXG120W1200TEH	Blister	24	

Similar Part	Package	Voltage class
MIXG120W1200PTEH[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

Outlines E3-Pack

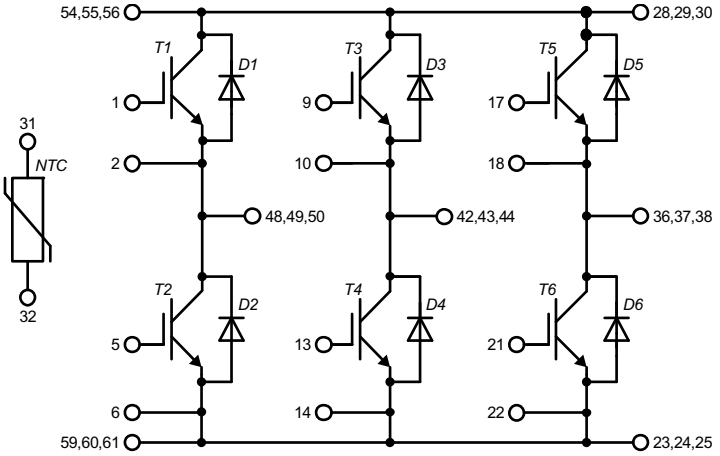


Bemerkung / *Note:*

- 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**



IGBTs T1 - T6

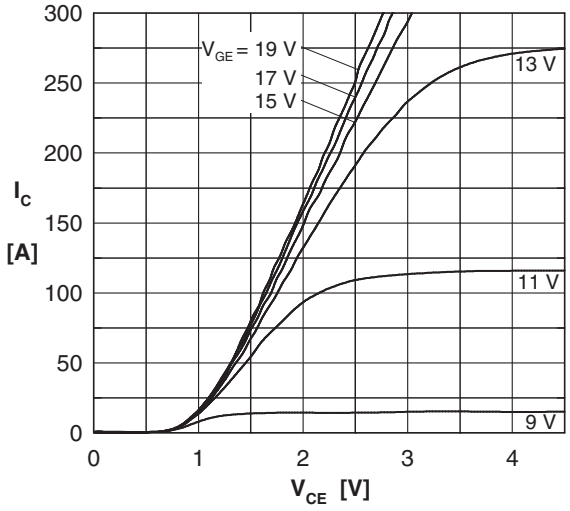


Fig. 1 Typ. output characteristics (T_{VJ} = 25°C)

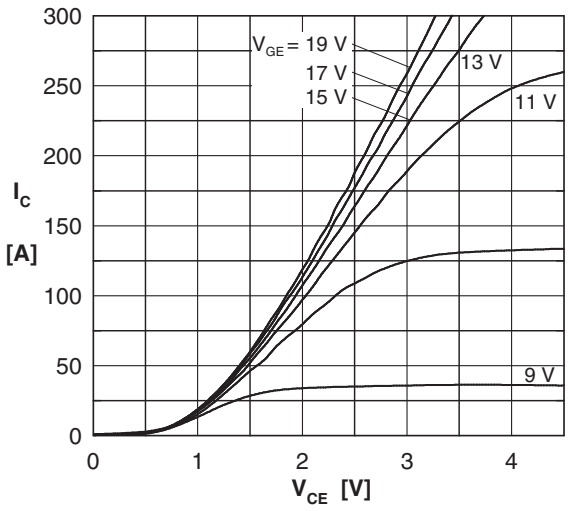


Fig. 2 Typ. output characteristics (T_{VJ} = 150°C)

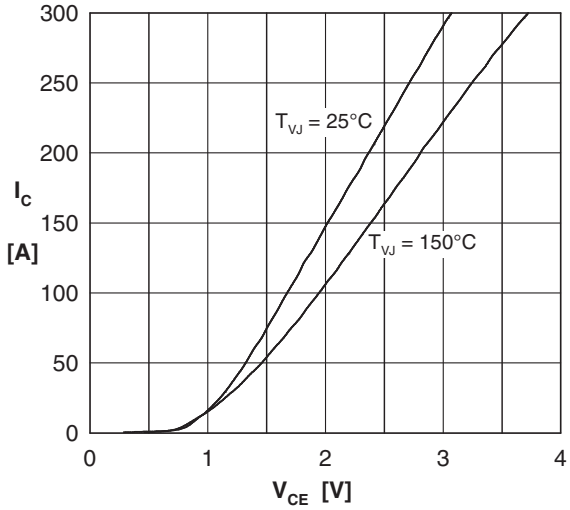


Fig. 3 Typ. output characteristics (V_{GE} = 15V)

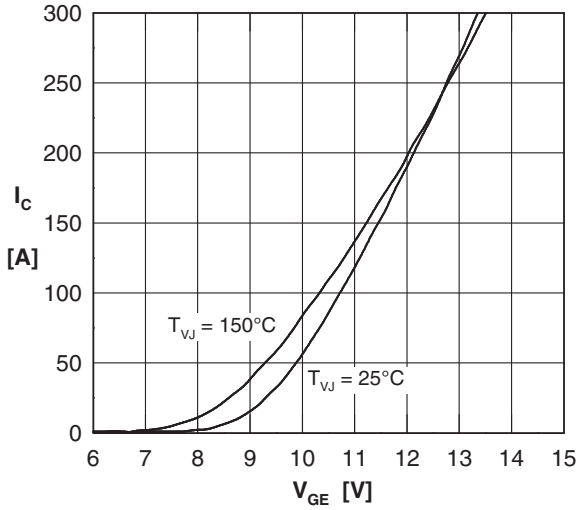


Fig. 4 Typ. transfer characteristics (V_{CE} = 20V)

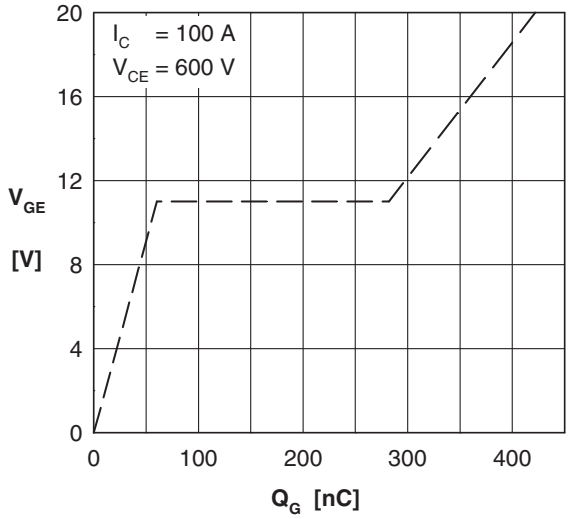


Fig. 5 Typ. turn-on gate charge 0/20V

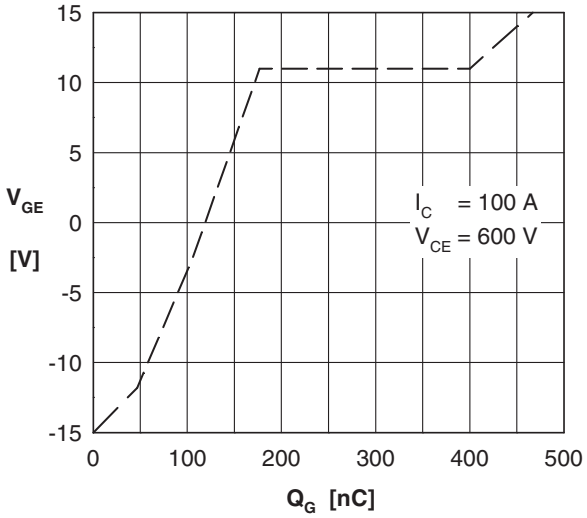


Fig. 6 Typ. turn-on gate charge -15/+15V

IGBTs T1 - T6

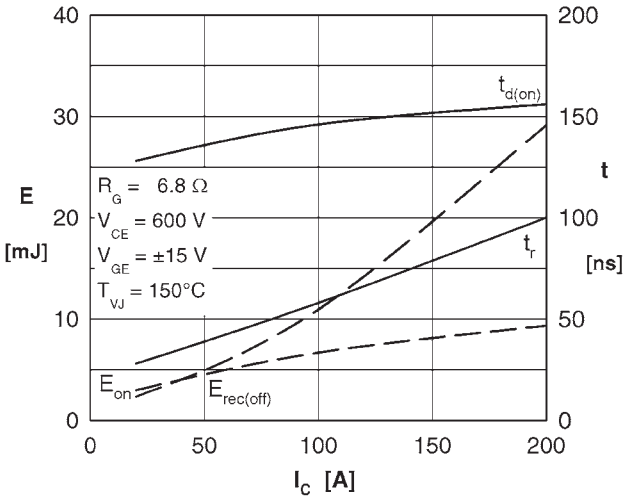


Fig. 7 Typ. switching energy versus collector current (turn on)

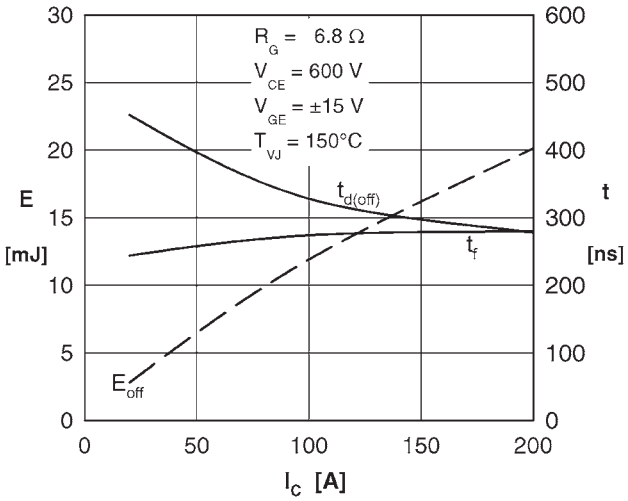


Fig. 8 Typ. switching energy versus collector current (turn off)

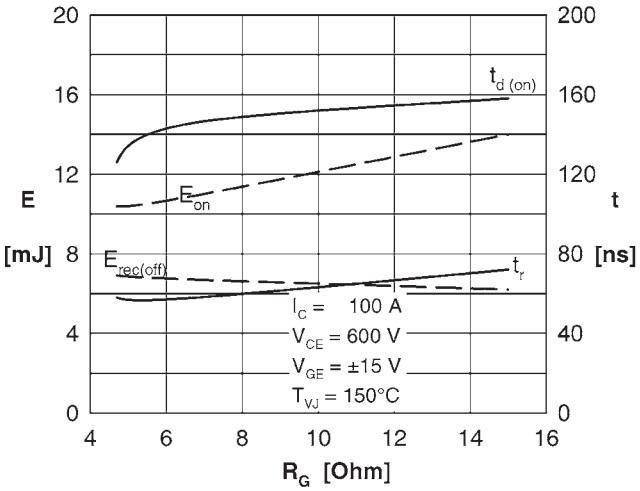


Fig. 9 Typ. switching energy versus gate resistor (turn on)

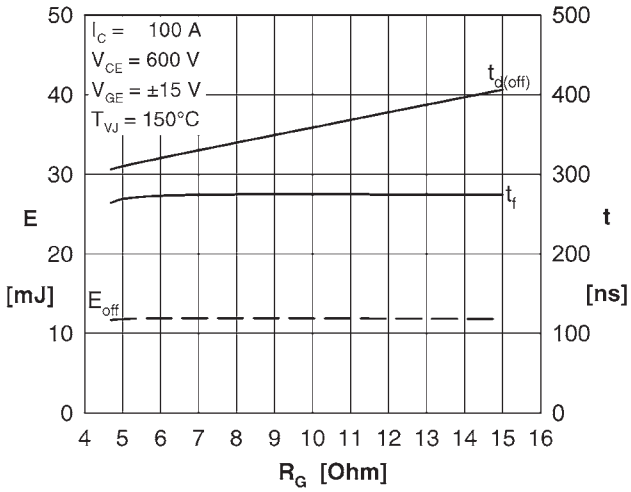


Fig. 10 Typ. switching energy versus gate resistor (turn off)

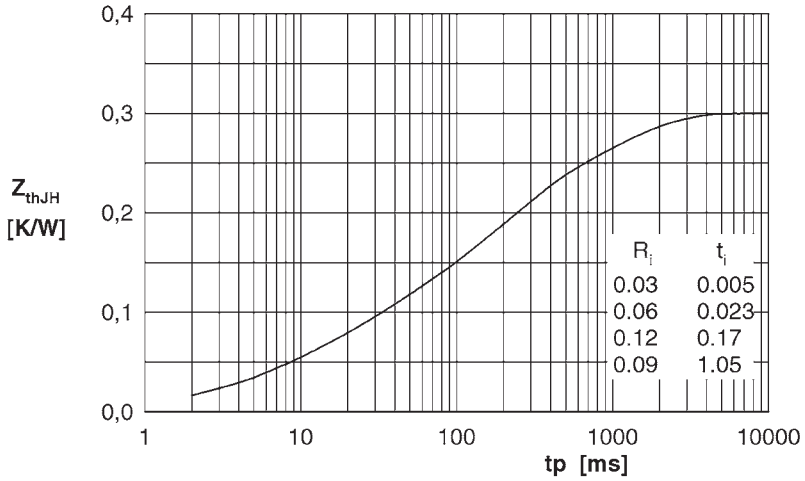


Fig. 11 IGBT: Typ. transient thermal impedance to heat sink

Diodes D1 - D6

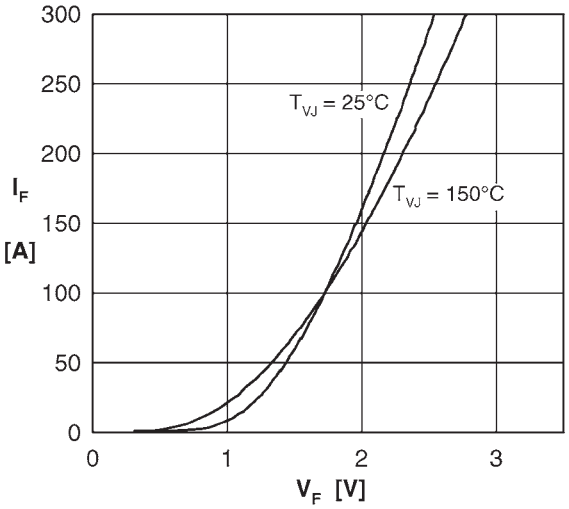


Fig. 12 Typ. forward charakteristics FWD

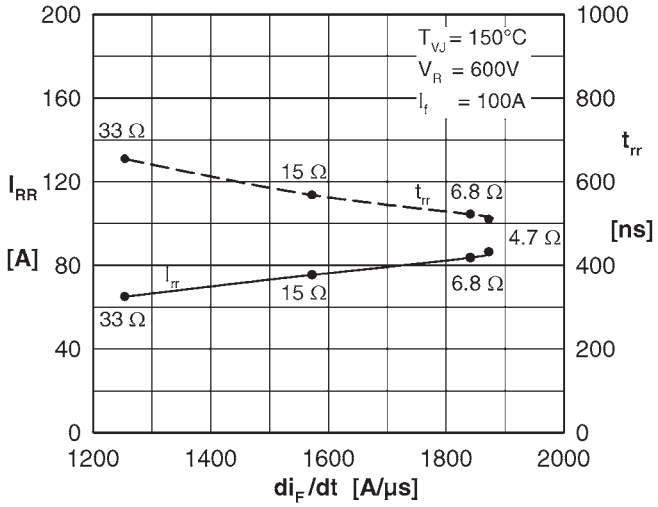


Fig. 13 Typ. recovery energy $E_{rec(off)}$ versus -di/dt and gate resistor R_G

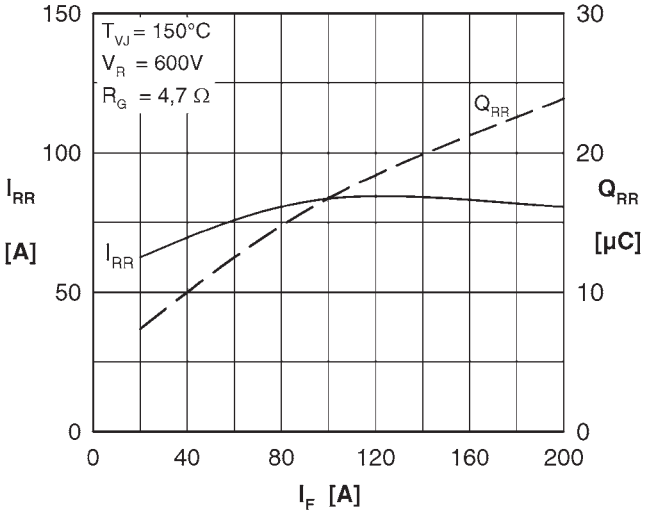


Fig. 14 typ. reverse recovery characteristics

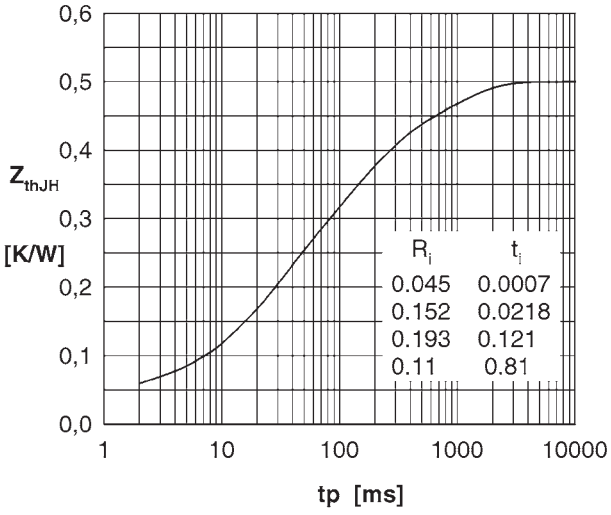


Fig. 15 Diode: Typ. transient thermal impedance junction to heat sink