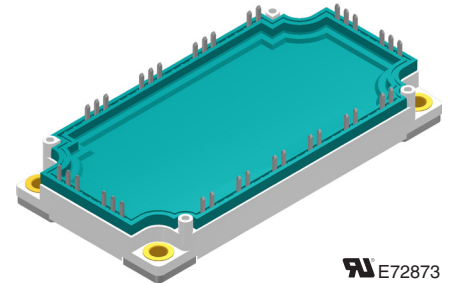


X2PT IGBT Module

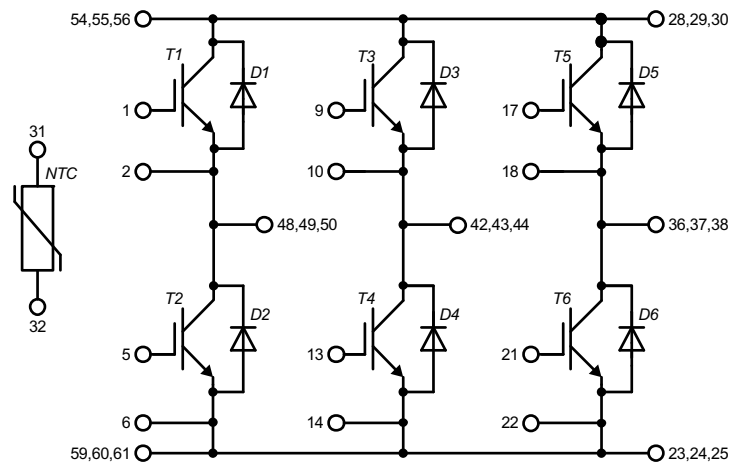
6-Pack + NTC

$$\begin{aligned} V_{CES} &= 1200 \text{ V} \\ I_{C25} &= 186 \text{ A} \\ V_{CE(sat)} &= 1.7 \text{ V} \end{aligned}$$

Part number
 MIXG120W1200TEH



E72873



Features / Advantages:

- X2PT - 2nd generation Xtreme light Punch Through
- $T_{vjm} = 175^{\circ}\text{C}$
- 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 @ $2 \times I_c$
- Low $V_{CE(sat)}$ and low thermal resistance
- SONICTM 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

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

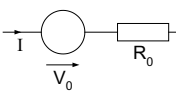


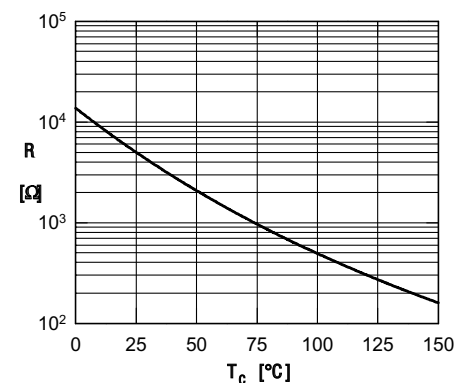
Inverter IGBT				Ratings			
Symbol	Definitions	Conditions	min.	typ.	max.		
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
V_{GES}	max. DC gate voltage		-20		+20	V	
V_{GEM}	max. transient gate emitter voltage		-30		+30	V	
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$			186	A	
I_{C80}		$T_C = 80^{\circ}\text{C}$			140	A	
I_{C100}		$T_C = 100^{\circ}\text{C}$			120	A	
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			625	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 100\text{ A}; V_{GE} = 15\text{ V}$		1.7 2.0	2.0	V	
		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$				V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 4\text{ mA}; V_{GE} = V_{GE}$	6		7	V	
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$		2		mA mA	
		$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$					
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20\text{ V}$			500	nA	
R_G	internal gate resistance			3.9		Ω	
C_{iss}	input capacitance	$V_{CE} = 100\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz}$		5.8		nF	
C_{oss}	output capacitance					pF	
C_{rss}	reverse transfer (Miller) capacitance					pF	
Q_g	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 0/15\text{ V}; I_C = 100\text{ A}$		340		nC	
Q_{gs}	gate source charge					nC	
Q_{gd}	gate drain (Miller) charge					nC	
$t_{d(on)}$	turn-on delay time	Inductive switching $V_{CE} = 600\text{ V}; I_C = 100\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 6.8\text{ }\Omega$ (external) $T_{VJ} = 25^{\circ}\text{C}$		140		ns	
t_r	current rise time			50		ns	
$t_{d(off)}$	turn-off delay time			260		ns	
t_f	current fall time			170		ns	
E_{on}	turn-on energy per pulse			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 $V_{CE} = 600\text{ V}; I_C = 100\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 6.8\text{ }\Omega$ (external) $T_{VJ} = 150^{\circ}\text{C}$		145		ns	
t_r	current rise time			58		ns	
$t_{d(off)}$	turn-off delay time			330		ns	
t_f	current fall time			275		ns	
E_{on}	turn-on energy per pulse			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	$V_{GE} = \pm 15\text{ V}; R_G = 6.8\text{ }\Omega$ $V_{CEmax} = 1200\text{ V}$			200	A	
		$T_{VJ} = 150^{\circ}\text{C}$					
SCSOA	short circuit safe operating area	$V_{CEmax} = 1200\text{ V}$ $V_{CE} = 800\text{ V}; V_{GE} = \pm 15\text{ V}$ non-repetitive			10	μs	
t_{sc}	short circuit duration	$T_{VJ} = 150^{\circ}\text{C}$		400		A	
I_{sc}	short circuit current						
R_{thJC}	thermal resistance junction to case	with heatsink compound; IXYS test setup		0.3	0.24	K/W	
R_{thJH}	thermal resistance junction to heatsink					K/W	



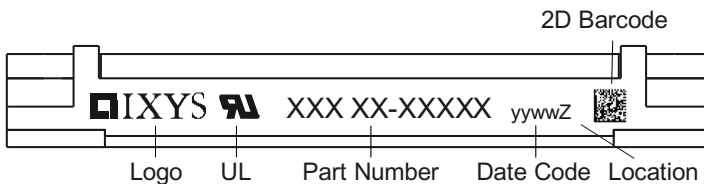
Inverter Diode				Ratings			
Symbol	Definitions	Conditions		min.	typ.	max.	
V_{RRM}	max. repetitive reverse voltage		$T_{VJ} = 25^{\circ}\text{C}$			1200	V
I_{F25}	forward current		$T_C = 25^{\circ}\text{C}$			161	A
I_{F80}			$T_C = 80^{\circ}\text{C}$			117	A
I_{F100}			$T_C = 100^{\circ}\text{C}$			100	A
V_F	forward voltage	$I_F = 100\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		1.7 1.7	2.0	V V
I_R	reverse current * not applicable, see I_{ces} at IGBT	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		*	*	mA mA
Q_{RM}	reverse recovery charge	Inductive switching $V_{CE} = 600\text{ V}; I_C = 100\text{ A}$ IGBT gate drive: $V_{GE} = \pm 15\text{ V}; R_G = 6.8\ \Omega$ (external)	$T_{VJ} = 25^{\circ}\text{C}$		8.2		μC
I_{RM}	max. reverse recovery current				65		A
t_{rr}	reverse recovery time				400		ns
dI_F/dt	current slew rate				2190		A/ μs
Q_{RM}	reverse recovery charge	Inductive switching $V_{CE} = 600\text{ V}; I_C = 100\text{ A}$ IGBT gate drive: $V_{GE} = \pm 15\text{ V}; R_G = 6.8\ \Omega$ (external)	$T_{VJ} = 150^{\circ}\text{C}$		16.4		μC
I_{RM}	max. reverse recovery current				84		A
t_{rr}	reverse recovery time				520		ns
dI_F/dt	current slew rate				1840		A/ μs
R_{thJC}	thermal resistance junction to case	with heatsink compound; IXYS test setup				0.4	K/W
R_{thJH}	thermal resistance junction to heatsink				0.5		K/W

Temperature Sensor NTC						
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_C = 25^{\circ}\text{C}$	4.75	5.0	5.25	k Ω
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation				* on die level	
				IGBT	Diode
V_0	threshold voltage	$T_{VJ} = 125^{\circ}\text{C}$			V
R_0	slope resistance *				m Ω
V_0	threshold voltage	$T_{VJ} = 175^{\circ}\text{C}$	1.2	1.2	V
R_0	slope resistance *		11.6	7	m Ω



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
$R_{pin-chip}$	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

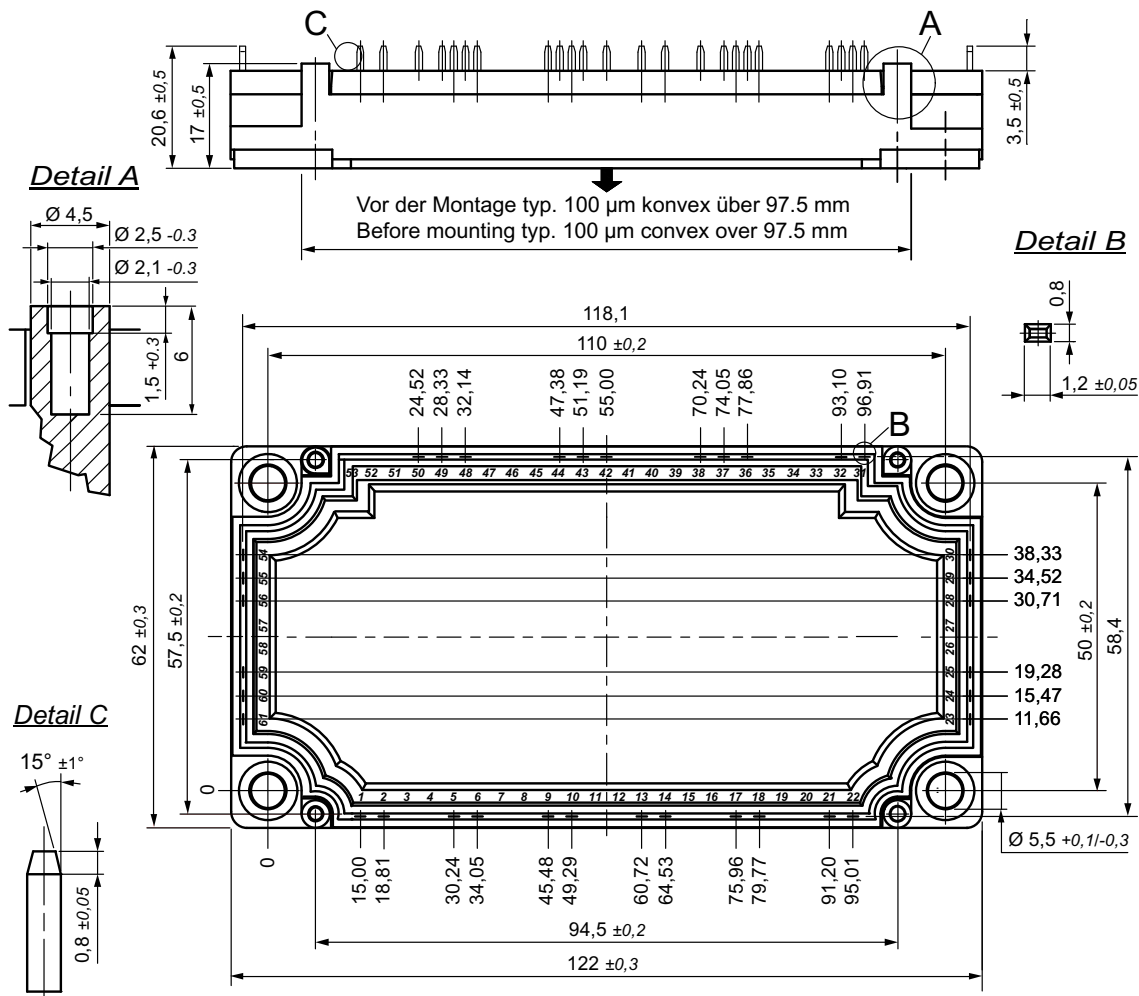

Part number

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

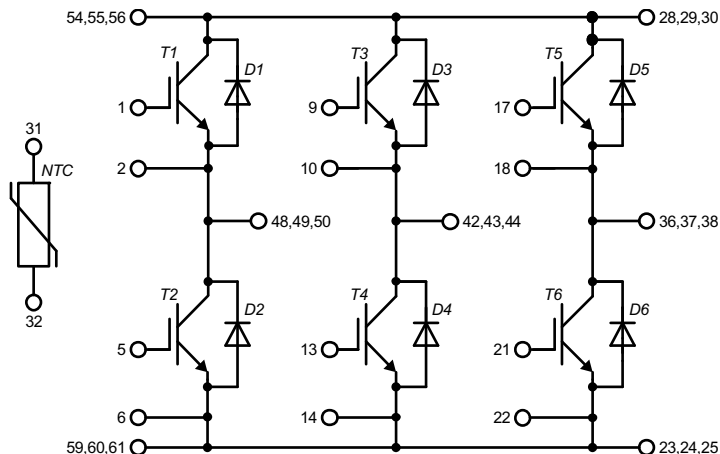
Options: ¹⁾ phase change material and ²⁾ press fit pin
 Please contact Littelfuse - IXYS sales office for availability

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: $\oplus 0,1$
- 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**



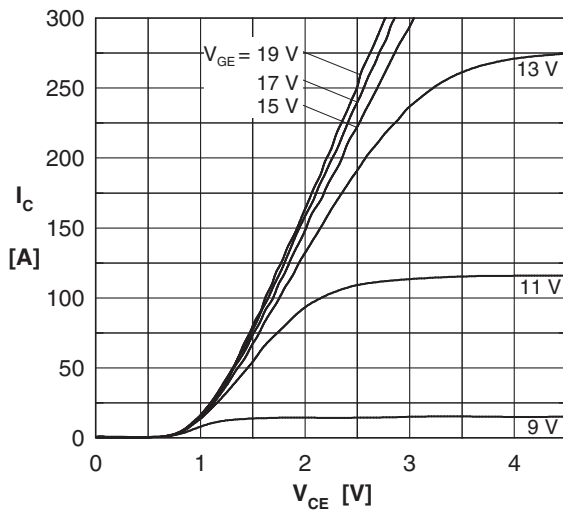
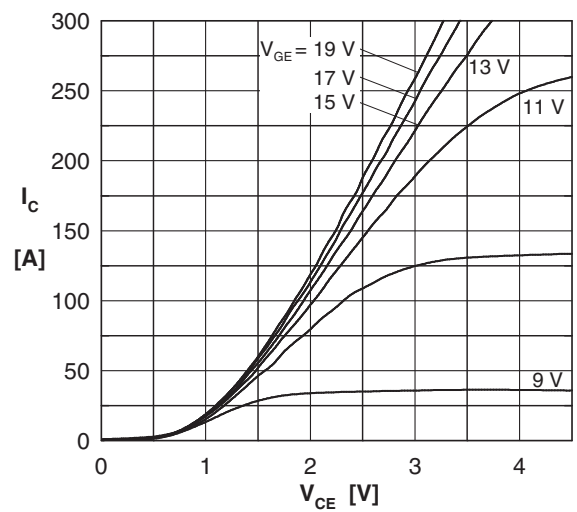
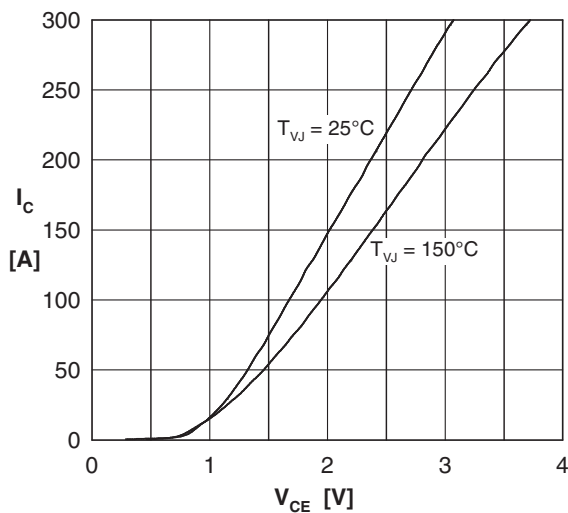
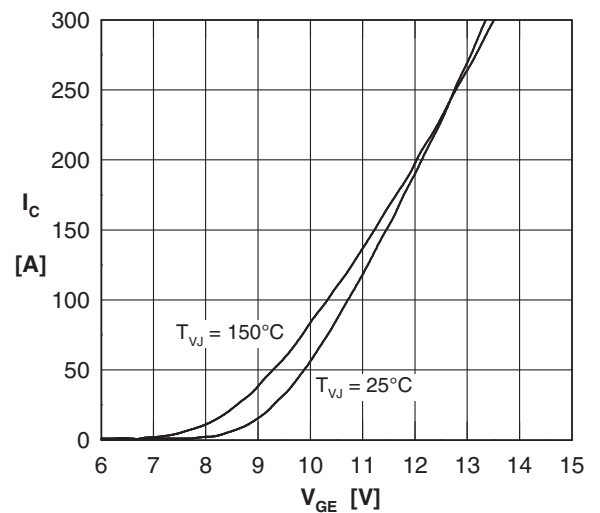
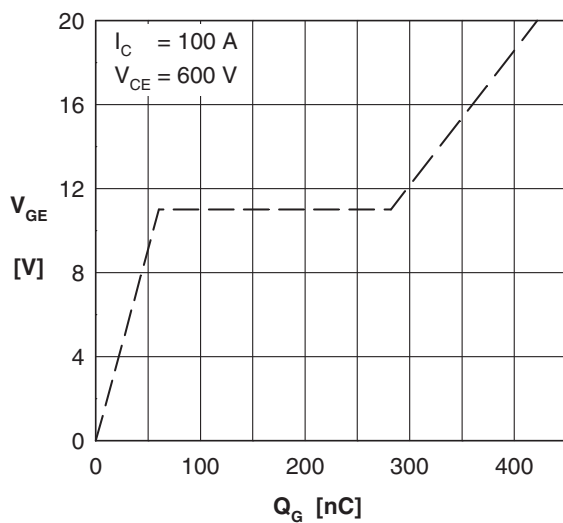
IGBTs T1 - T6

 Fig. 1 Typ. output characteristics ($T_{VJ} = 25^\circ\text{C}$)

 Fig. 2 Typ. output characteristics ($T_{VJ} = 150^\circ\text{C}$)

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

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


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

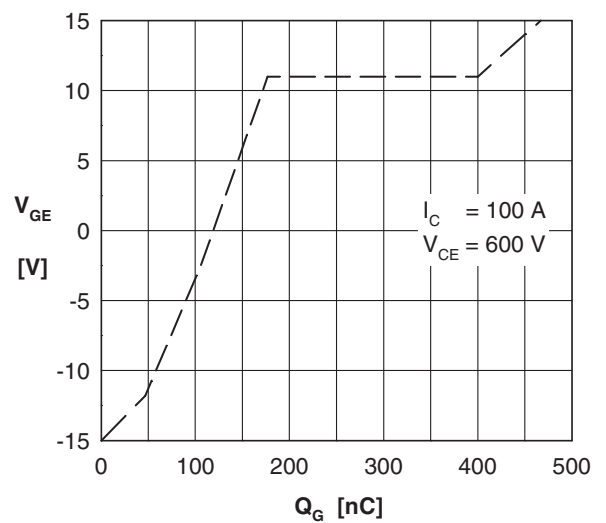
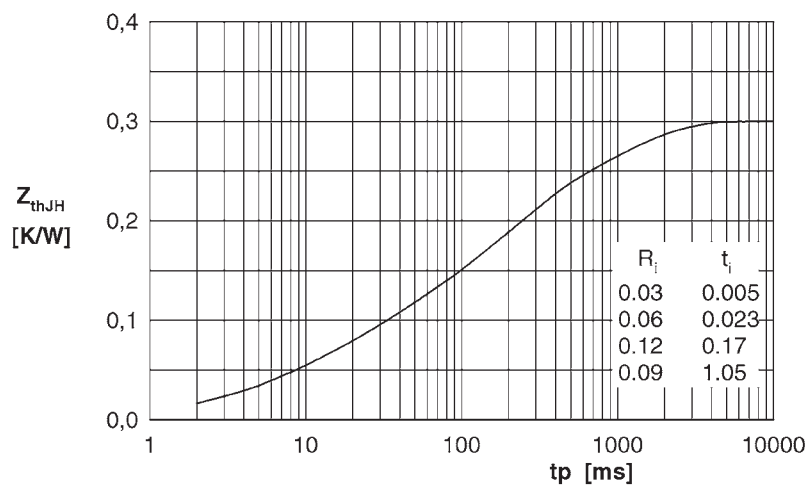
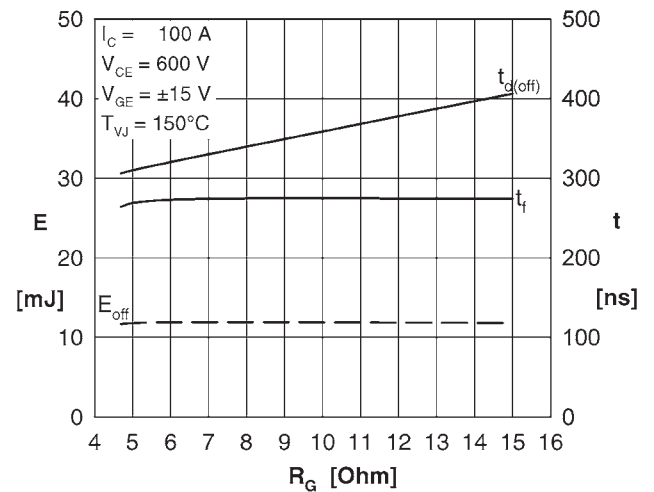
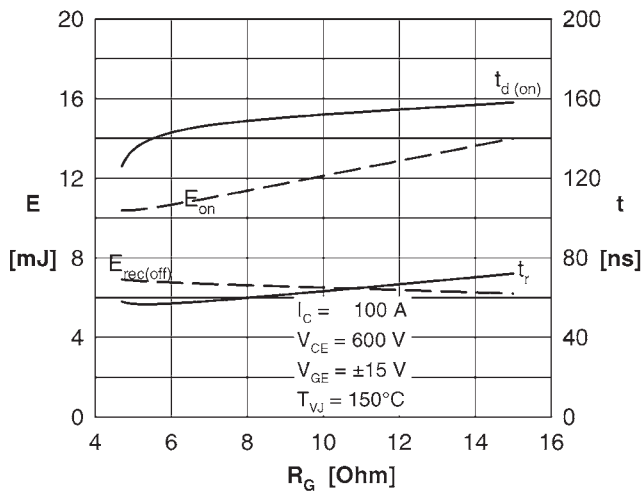
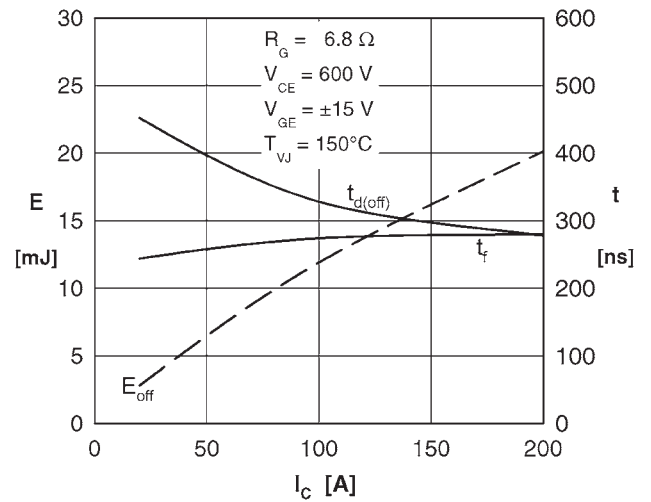
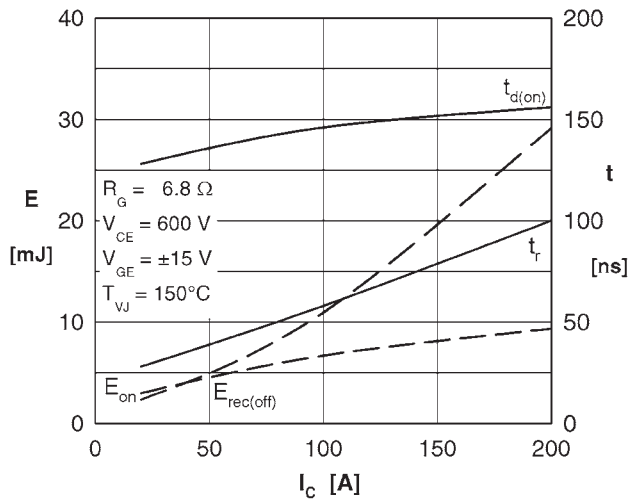


Fig. 6 Typ. turn-on gate charge -15/+15V

IGBTs T1 - T6


Diodes D1 - D6

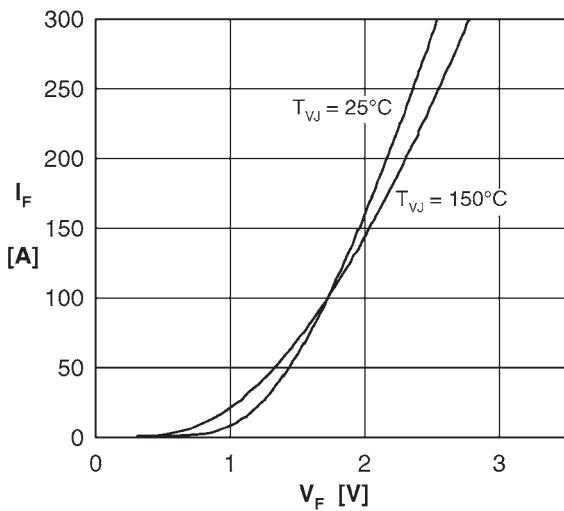


Fig. 12 Typ. forward characteristics FWD

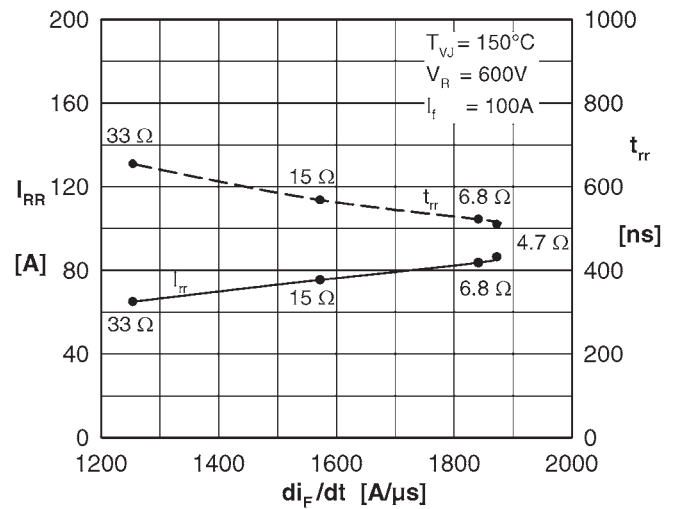


Fig. 13 Typ. recovery energy $E_{rec(off)}$ versus $-di/dt$ and gate resistor R_G

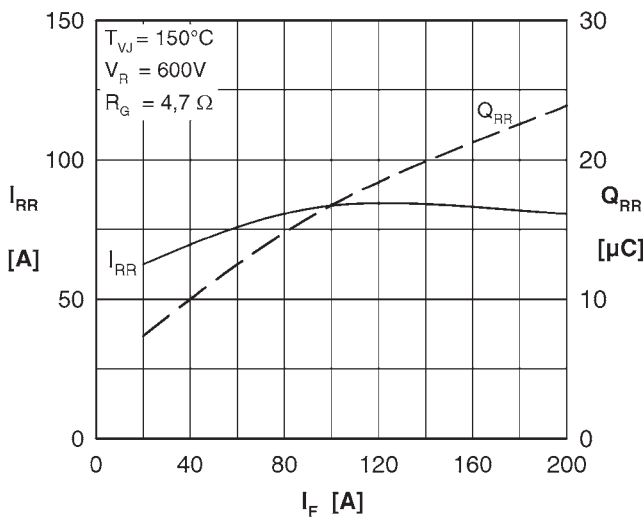


Fig. 14 typ. reverse recovery characteristics

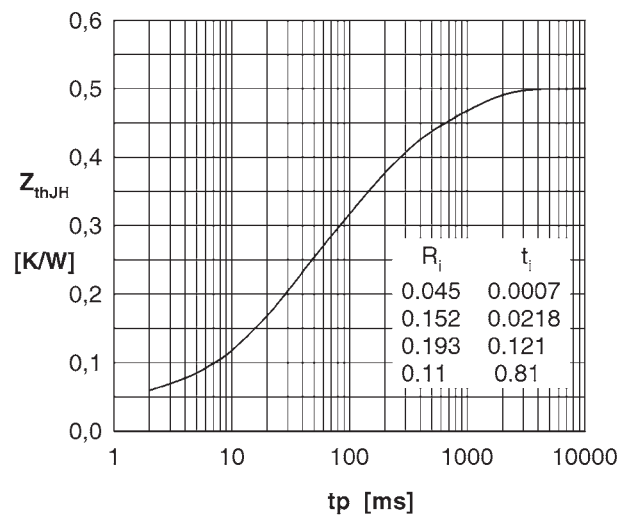


Fig. 15 Diode: Typ. transient thermal impedance junction to heat sink