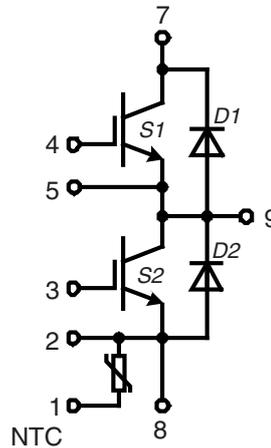
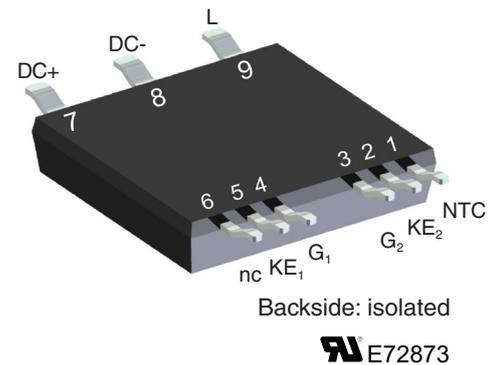


Trench IGBT phaseleg

ISOPLUS™
Surface Mount Power Device
 including a NTC

$V_{CES} = 1200\text{ V}$
 $I_{C25} = 60\text{ A}$
 $V_{CE(sat)} = 2.05\text{ V}$

Part number
 ITF40PF1200DHGTLB



Features / Advantages:

- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Fast Trench IGBT
 - very low $V_{CE(sat)}$
 - short circuit rated for 10 μsec .
 - very low gate charge
 - low EMI
 - square RBSOA @ $3x I_C$
- Sonic™ diode
 - fast and soft reverse recovery
 - low operating forward voltage

Applications:

- **Phaseleg**
 - buck-boost chopper
 - inductive heating
- **Full bridge**
 - power supplies
 - induction heating
 - four quadrant DC drives
 - controlled rectifier
- **Three phase bridge**
 - AC drives
 - controlled rectifier

Package: SMPD-B

- isolation voltage 3000 V
- isolated surface to heatsink
- low coupling capacity between pins and heatsink
- PCB space saving
- enlarged creepage towards heatsink
- application friendly pinout
- low inductive current path
- high reliability

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.

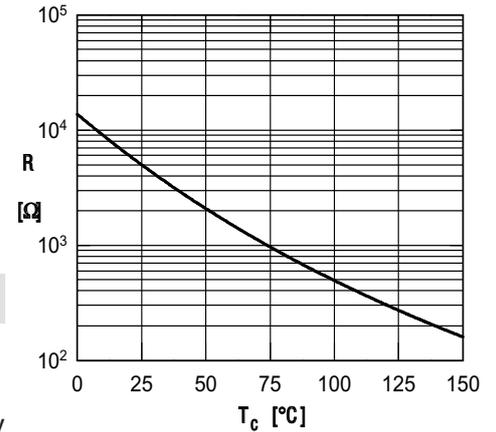
IGBTs S1/S2				Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	
V_{CES}	collector emitter voltage				1200	V
V_{GES}	max. DC gate voltage				+15	V
V_{GEM}	max. transient gate emitter voltage				+20	V
I_{C25}	collector current				60	A
I_{C80}					46	A
I_{C100}					38	A
P_{tot}	total power dissipation				270	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 40\text{ A}; V_{GE} = 15\text{ V}$		2.05 2.50	2.40	V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 1\text{ mA}; V_{GE} = V_{CE}$	5	5.8	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES(OP)}; V_{GE} = 0\text{ V}$		0.5	0.06	mA mA
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20\text{ V}$			600	nA
C_{iss}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ Mhz}$		2330		pF
C_{oss}	output capacitance			150		pF
C_{rss}	reverse transfer capacitance			130		pF
Q_{Gon}	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 0/15\text{ V}; I_C = 40\text{ A}$		175		nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 40\text{ A}$ $V_{GE} = 0/15\text{ V}; R_G = 12\ \Omega$		24		ns
t_r	current rise time			24		ns
$t_{d(off)}$	turn-off delay time			290		ns
t_f	current fall time			52		ns
E_{on}	turn-on energy per pulse			2.3		mJ
E_{off}	turn-off energy per pulse			1.4		mJ
$E_{rec(off)}$	reverse recovery losses at turn-off			0.4		mJ
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 40\text{ A}$ $V_{GE} = 0/15\text{ V}; R_G = 12\ \Omega$		26		ns
t_r	current rise time			26		ns
$t_{d(off)}$	turn-off delay time			350		ns
t_f	current fall time			110		ns
E_{on}	turn-on energy per pulse			3.0		mJ
E_{off}	turn-off energy per pulse			2.2		mJ
$E_{rec(off)}$	reverse recovery losses at turn-off			1.2		mJ
RBSOA	reverse bias safe operating area	$V_{GE} = 15\text{ V};$ $V_{CEmax} = 1000\text{ V}$			140	A
SCSOA	short circuit safe operation area	$V_{CE} = 600\text{ V}; V_{GE} = \pm 15\text{ V}$ $R_G = 12\ \Omega; \text{none repetitive}$			10	μs
t_{SC}	short circuit duration					A
I_{SC}	short circuit current			140		
R_{thJC}	thermal resistance junction to case				0.55	K/W
R_{thJH}	thermal resistance junction to heatsink	with heat transfer paste (IXYS test setup)		0.80		K/W

Diodes D1/D2				Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	
V_{RRM}	max. repetitive reverse voltage				1200	V
I_{F25}	forward current				52	A
I_{F80}					38	A
I_{F100}					30	A
V_F	forward voltage	$I_F = 40$ A		2.55	2.50	V
Q_{rr}	reverse recovery charge	$V_R = 600$ V; $I_F = 40$ A $V_{GE} = 0 / 15$ V; $R_G = 12$ Ω $-di_F/dt = -1700$ A/ μ s		1.8		μ C
I_{RM}	max. reverse recovery current			45		A
t_{rr}	forward recovery time			105		ns
E_{rec}	reverse recovery losses			0.4		mJ
Q_{rr}	reverse recovery charge	$V_R = 600$ V; $I_F = 40$ A $V_{GE} = 0 / 15$ V; $R_G = 12$ Ω $-di_F/dt = -1800$ A/ μ s		3.7		μ C
I_{RM}	max. reverse recovery current			55		A
t_{rr}	forward recovery time			235		ns
E_{rec}	reverse recovery losses			1.2		mJ
R_{thJC}	thermal resistance junction to case				1.00	K/W
R_{thJH}	thermal resistance junction to heatsink	with heat transfer paste (IXYS test setup)		1.35		K/W

Package ISOPLUS-SMPD				Ratings		
Symbol	Definitions	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per wide pins 7, 8, 9 per slim pins 1,2,3 and 4,5,6 Max current may be additionally limited by external connections (PCB tracks)			100 50	A A
C_P	coupling capacity	between shorted pins and back side metallization		90		pF
$R_{pin-chip}$	resistance terminal to chip	$V_{CE} = V_{CE(sat)} + 2 \cdot I_C \cdot R_{pin-chip}$		0.5		m Ω
T_{VJM}	max. virtual junction temperature		-55		175	$^{\circ}$ C
T_{OP}	operation temperature		-55		150	$^{\circ}$ C
T_{stg}	storage temperature		-55		125	$^{\circ}$ C
Weight				8.5		g
F_C	mounting force with clip		40		130	N
$d_{Spp/App}$	creepage distance on surface / striking distance through air	slim pin to slim pin	1.6			mm
$d_{Spb/Apb}$		wide pin to wide pin	6.8			mm
$d_{Spb/Apb}$		pin to backside	4.0			mm
V_{ISOL}	isolation voltage	$t = 1$ second	3000			V
		$t = 1$ minute				2500
		50/60 Hz, RMS, $I_{ISOL} \leq 1$ mA				

Temperature Sensor NTC

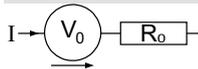
Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
R_{25}	resistance	$T_c = 25^\circ\text{C}$	4.75	5	5.25	k Ω
$B_{25/50}$	temperature coefficient			3375		K



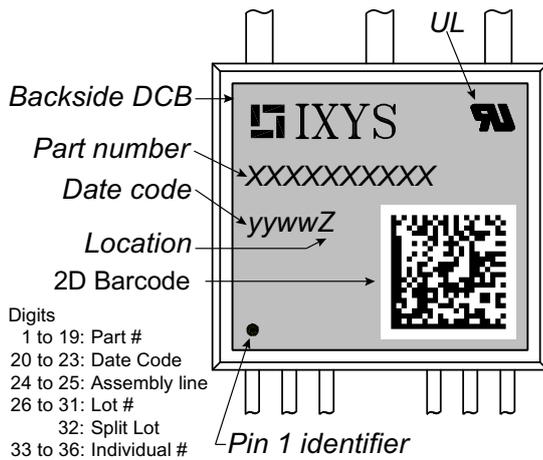
Typ. NTC resistance vs. temperature

Equivalent Circuits for Simulation

*on die level

 $T_{vj} = 175^\circ\text{C}$


		IGBT	Diode	
$V_{0\max}$	threshold voltage	1.05	1.25	V
$R_{0\max}$	slope resistance *	50	28.3	m Ω

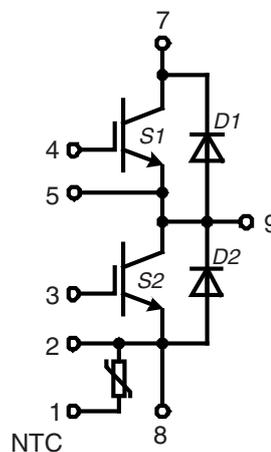
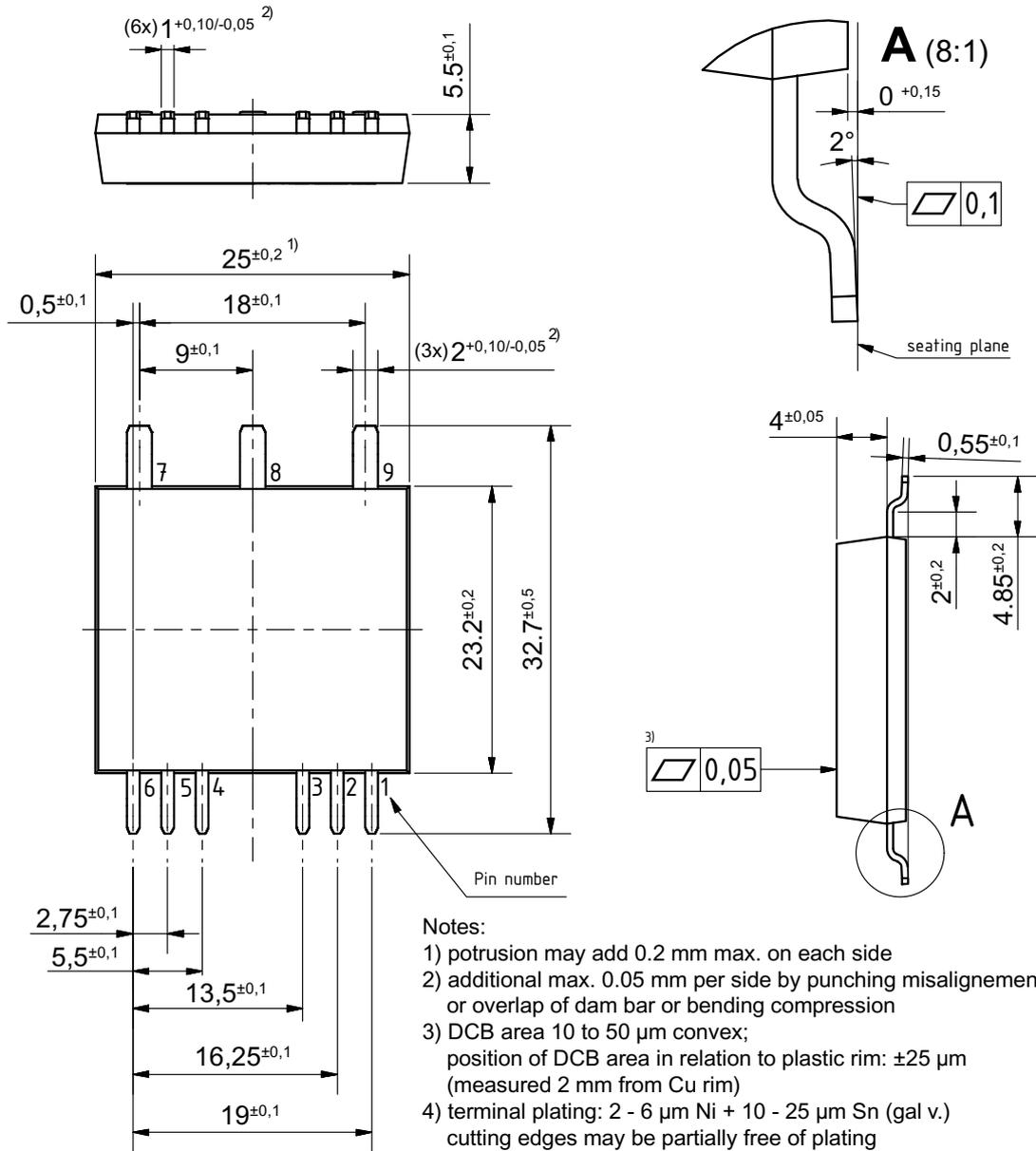
Package ISOPLUS-SMPD


Digits
 1 to 19: Part #
 20 to 23: Date Code
 24 to 25: Assembly line
 26 to 31: Lot #
 32: Split Lot
 33 to 36: Individual #

Part number

I = IGBT
 T = IGBT Trench
 F = Fast
 40 = Current Rating [A]
 PF = Phase leg + free wheeling diodes
 1200 = Reverse Voltage [V]
 D = Diode
 H = Sonic Fast Recovery Diode
 G = extreme fast
 T = NTC
 LB = SMPD-B

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	ITF40PF1200DHGTLB-TRR	ITF40PF1200DHGTLB	Tape&Reel	200	IX526119
	ITF40PF1200DHGTLB-TUB	ITF40PF1200DHGTLB	Tube	20	IX526112

Outlines SMPD-B


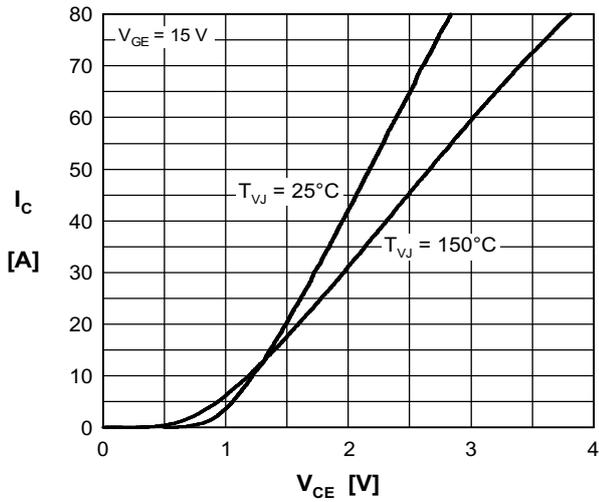
IGBTs S1/S2


Fig. 1 Typ. output characteristics

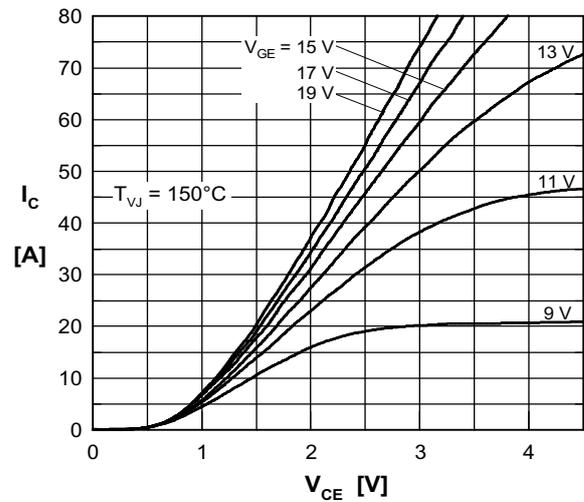


Fig. 2 Typ. output characteristics

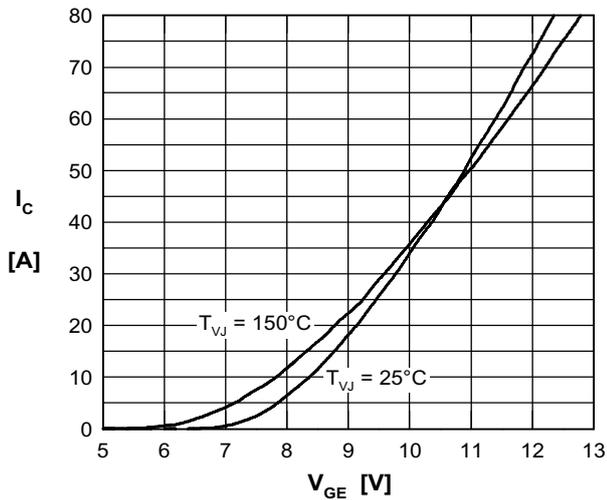


Fig. 3 Typ. transfer characteristics

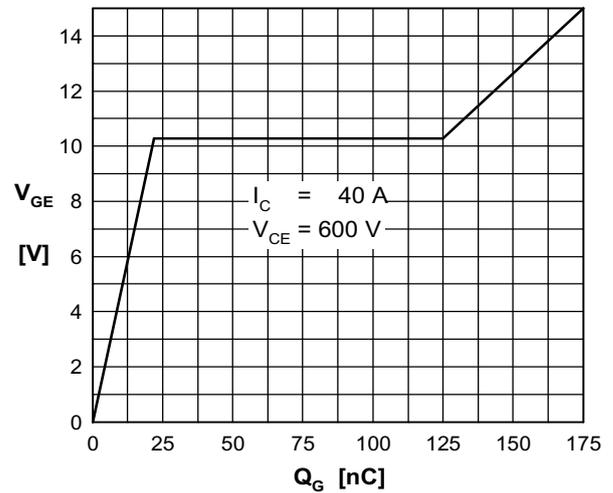


Fig. 4 Typ. turn-on gate charge

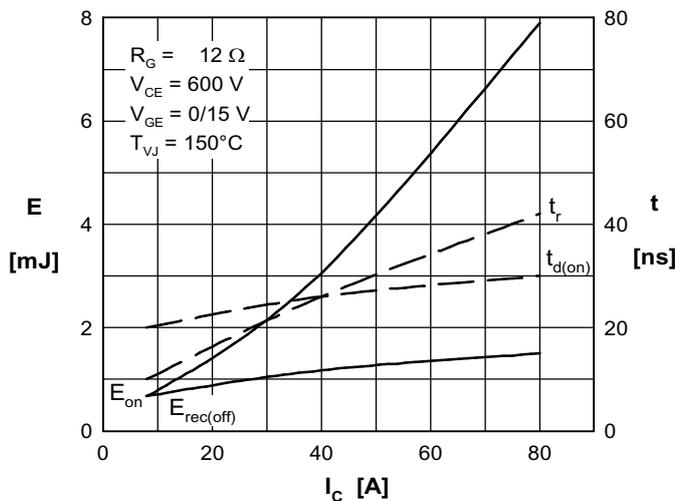


Fig. 5 Typ. turn-on energy & switching times versus collector current

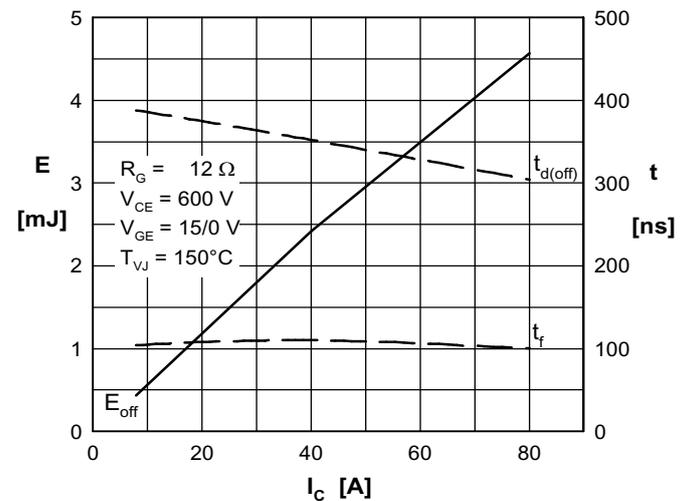


Fig. 6 Typ. turn-off energy & switching times versus collector current

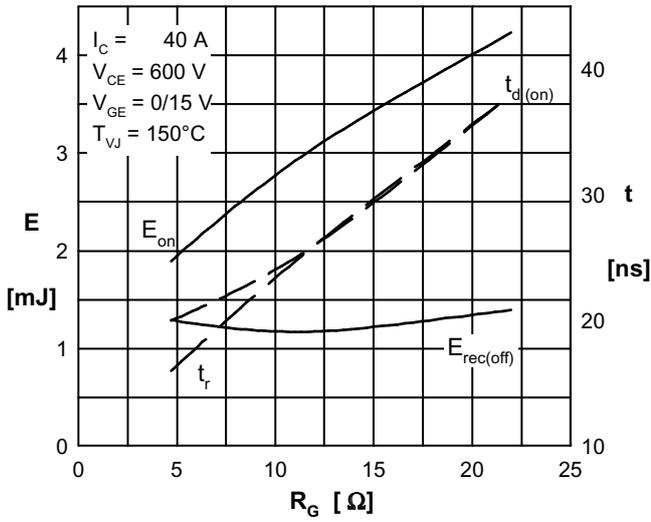
IGBTs S1/S2


Fig. 7 Typ. turn-on energy and switching times versus gate resistor

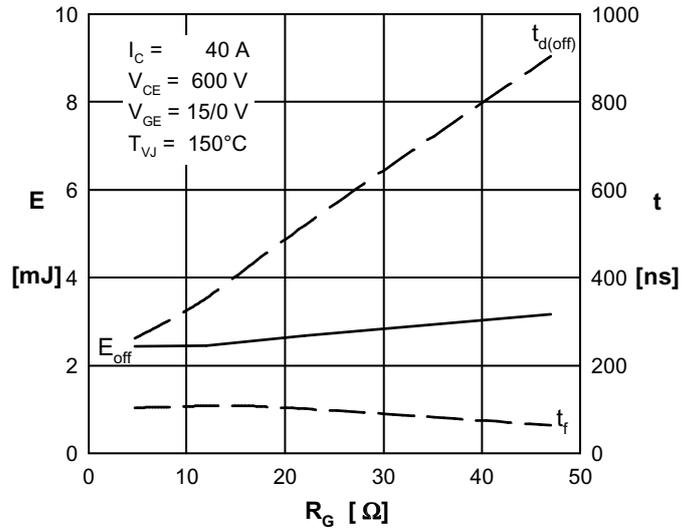


Fig. 8 Typ. turn-off energy and switching times versus gate resistor

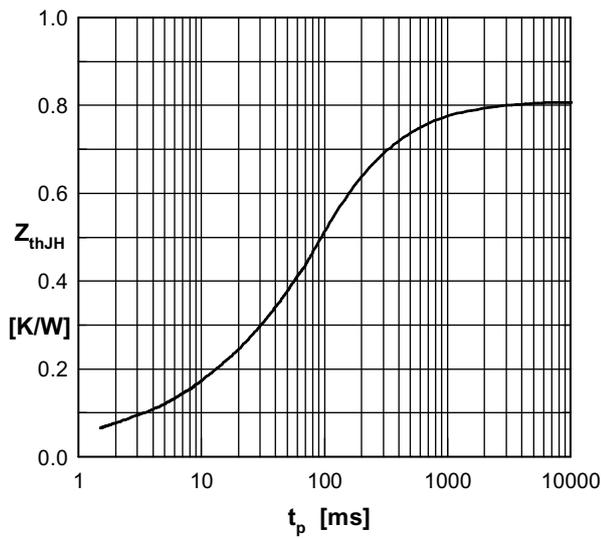


Fig. 9 Typ. transient thermal impedance junction to heatsink

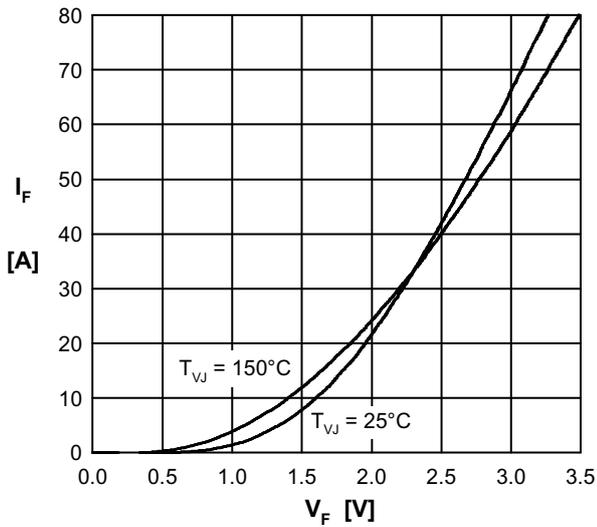
Diodes D1/D2


Fig. 10 Typ. forward characteristics

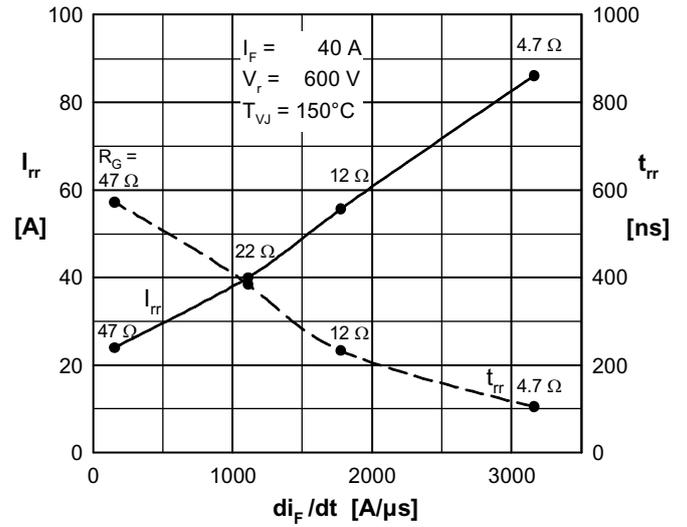


Fig. 11 Typ. reverse recovery characteristics

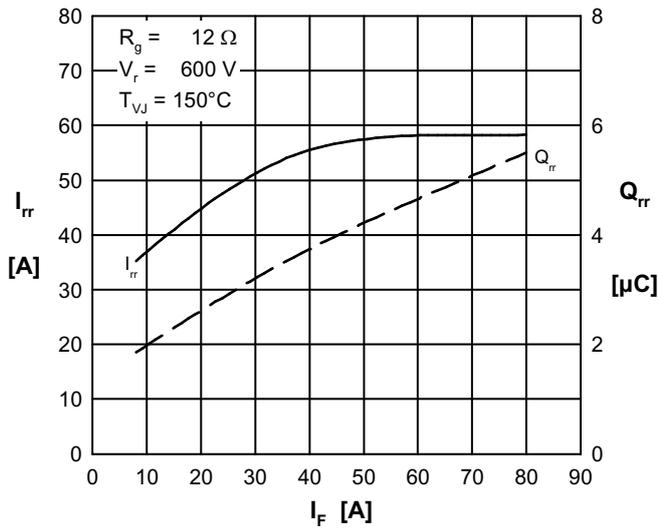


Fig. 12 Typ. reverse recovery characteristics

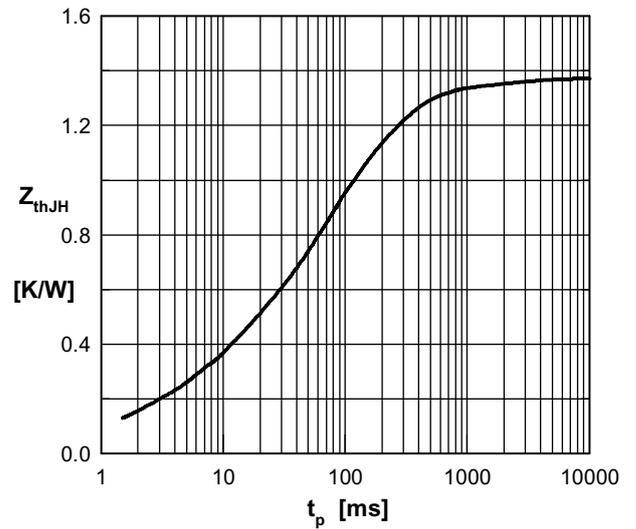


Fig. 13 Typ. transient thermal impedance junction to heatsink