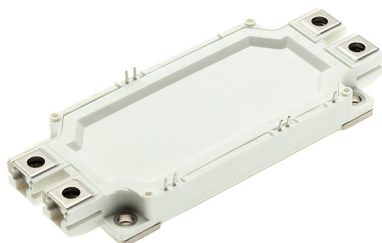


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**RoHS
Compliant**



Features

- Trench Gate, Generation 5, TMOS IGBT
- Cu Base with Enhanced Al₂O₃ Substrates
- 10μs Short Circuit Withstand

Key Parameters

V _{CES}	: 1200 V
V _{CE(sat)} * (typ)	: 1.7
I _C (max)	: 600 A
I _{C(PK)} (max)	: 1200 A

* Measured at the auxiliary terminals

Applications

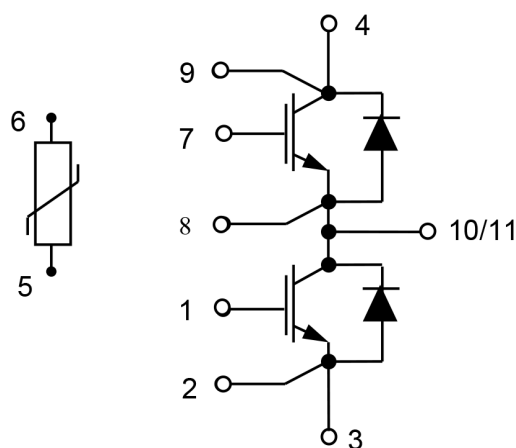
- Motor Drives
- Power Charging Equipment
- Renewable Energy Power Conversion
- High Reliability Inverters

The MP005808 is a half bridge 1200V, trench gate, insulated gate bipolar transistor (IGBT) module with enhanced field stop and implantation technology. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10μs short circuit withstand. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

Absolute Maximum Ratings

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.



Circuit configuration

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	V _{GE} = 0V, T _C = 25°C	1200	V
V _{GES}	Gate-emitter voltage	T _C = 25°C	±20	
I _C	Continuous collector current	T _C = 88°C	600	A
I _{C(PK)}	Peak collector current	t _P = 1ms, T _C = 133°C	1200	
P _{max}	Max. transistor power dissipation	T _C = 25°C, T _{vj} = 175°C	3	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _{vj} = 150°C	28.8	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V

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Thermal and Mechanical Ratings

Internal insulation material	: Al ₂ O ₃
Baseplate material	: Cu
Creepage distance – Terminal to heatsink	: 14.5mm
Creepage distance – Terminal to terminal	: 13mm
Clearance – Terminal to heatsink	: 12.5mm
Clearance – Terminal to terminal	: 10mm
CTI (Comparative Tracking Index)	: >200

Symbol	Parameter	Test Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance– IGBT	Continuous dissipation - junction to case	-	49	°C/kW
R _{th(j-c)}	Thermal resistance – diode			77	
R _{th(c-h)}	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm (with mounting grease: 1W/m °C)	-	34	
R _{th(c-h)}	Thermal resistance – case to heatsink (Diode)			40	
T _j	Junction temperature – under switching conditions	IGBT	-40	150	°C
		Diode			
F _{stg}	Storage temperature range	-			
	Screw torque	Mounting – M5	3	6	Nm
		Electrical connections – M6	3	6	

Electrical Characteristics

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Units
I _{CES}	Collector cut-off current	V _{GE} = 0V, V _{CE} = V _{CES}			1	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _c = 125°C			10	
		V _{GE} = 0V, V _{CE} = V _{CES} , T _c = 150°C			20	
I _{GES}	Gate leakage current	V _{GE} = ± 20V, V _{CE} = 0V			0.5	µA
V _{GE(TH)}	Gate threshold voltage	I _C = 15mA, V _{GE} = V _{CE}	5	6	7	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 600A		1.7		
		V _{GE} = 15V, I _C = 600A, T _j = 125°C		2		
		V _{GE} = 15V, I _C = 600A, T _j = 150°C		2.1		
I _F	Diode forward current	DC		600		A
I _{FM}	Diode maximum forward current	t _p = 1ms		1200		
V _F	Diode forward voltage	I _F = 600A		1.9		V
		I _F = 600A, T _j = 125°C		2.1		
		I _F = 600A, T _j = 150°C				
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		57		nF
Q _g	Gate charge	±15V		6.1		µC
Q _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		1.8		nF
L _M	Module inductance			22		nH
R _{INT}	Internal transistor resistance			1		mΩ
SC _{Data}	Short circuit current, I _{sc}	T _j = 150°C, V _{CC} = 800V t _p ≤ 10µs, V _{GE} ≤ 15V V _{CE(max)} = V _{CES} – L* x di/dt IEC 60747-9		2800		A

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Note:

* L is the circuit inductance + L_M

NTC-Thermistor Data

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Units
R ₂₅	Rated Resistance	T _C = 25°C		5		kΩ
ΔR/R	Deviation of R ₁₀₀	T _C = 100°C, R ₁₀₀ = 493Ω	-5		5	%
P ₂₅	Power Dissipation	T _C = 25°C			20	m/W
B _{25/50}	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15K))]$		3375		K
B _{25/80}		$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15K))]$		3411		
B _{25/100}		$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15K))]$		3433		

Electrical Characteristics

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 600A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 0.5Ω R _{G(ON)} = 0.5Ω L _S ~ 40nH	dv/dt = 3500V/μs		710		ns
t _f	Fall time				280		
E _{OFF}	Turn-off energy loss				90		
t _{d(on)}	Turn-on delay time		di/dt = 6000A/μs		185		ns
t _r	Rise time				92		
E _{ON}	Turn-on energy loss				22		
Q _{rr}	Diode reverse recovery charge	I _F = 600A V _{CE} = 600V di/dt = 7000A/μs			52		μC
I _{rr}	Diode reverse recovery current				365		A
E _{rec}	Diode reverse recovery energy				29		mJ

T_{case} = 125°C unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 600A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 0.5Ω R _{G(ON)} = 0.5Ω L _S ~ 40nH	dv/dt = 3500V/μs		780		ns
t _f	Fall time				400		
E _{OFF}	Turn-off energy loss				102		
t _{d(on)}	Turn-on delay time		di/dt = 6000A/μs		180		ns
t _r	Rise time				98		
E _{ON}	Turn-on energy loss				32		
Q _{rr}	Diode reverse recovery charge	I _F = 600A V _{CE} = 600V di/dt = 6000A/μs			78		μC
I _{rr}	Diode reverse recovery current				420		A
E _{rec}	Diode reverse recovery energy				43		mJ

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$T_{case} = 150^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 600A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 0.5Ω R _{G(ON)} = 0.5Ω L _s ~ 40nH	dv/dt = 3500V/μs		800		ns
t _f	Fall time				430		
E _{OFF}	Turn-off energy loss				105		
t _{d(on)}	Turn-on delay time		di/dt = 6000A/μs		180		ns
t _r	Rise time				100		
E _{ON}	Turn-on energy loss				34		
Q _{rr}	Diode reverse recovery charge	I _F = 600A V _{CE} = 600V di/dt = 6000A/μs			100		μC
I _{rr}	Diode reverse recovery current				450		A
E _{rec}	Diode reverse recovery energy				55		mJ

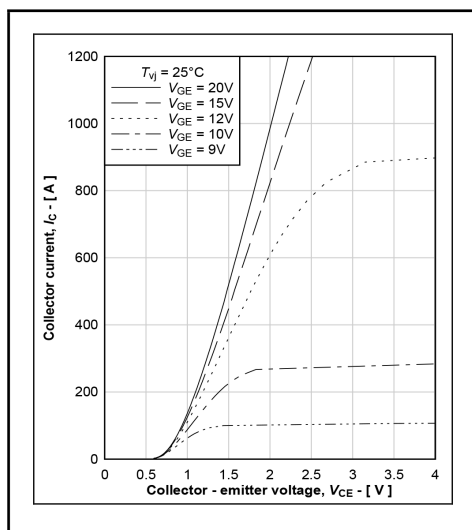


Fig. 3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

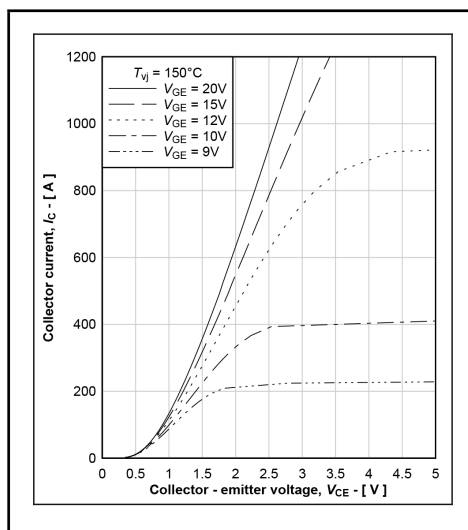


Fig. 4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

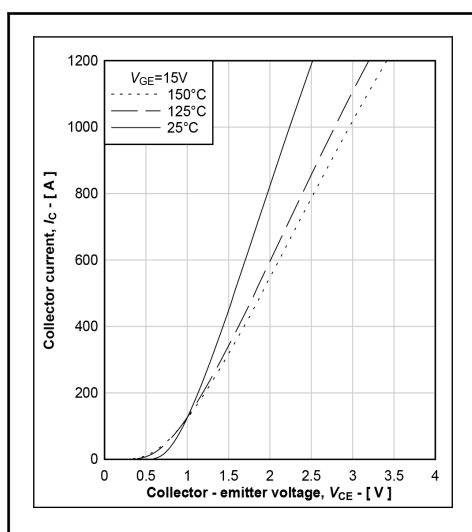


Fig. 5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

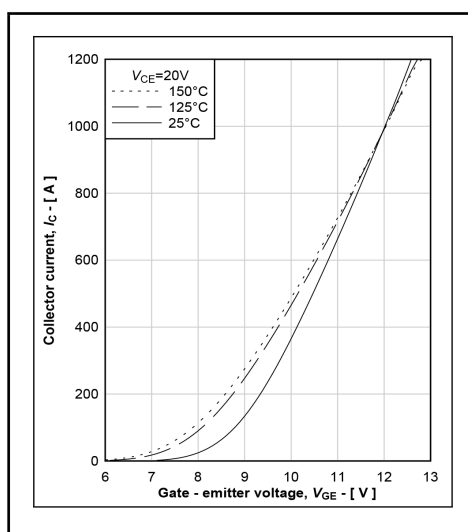


Fig. 6 Typical IGBT transfer characteristics, $I_C = f(V_{GE})$

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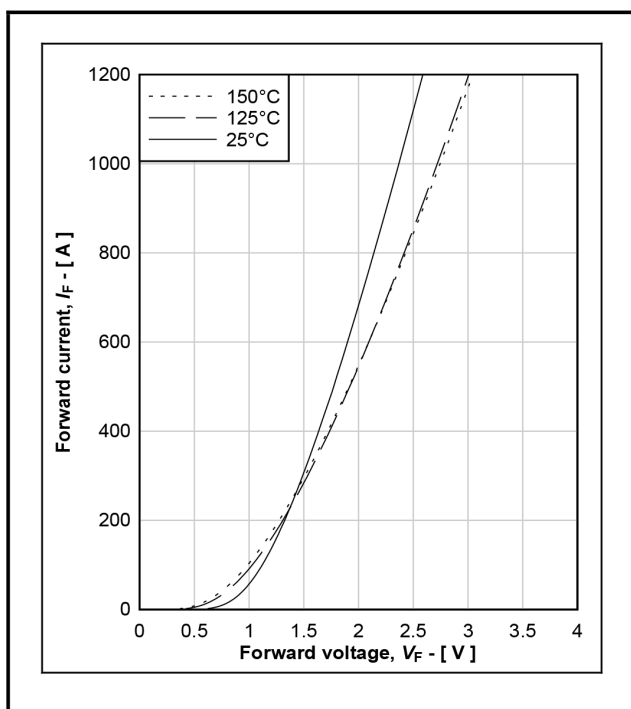


Fig. 7 Diode typical forward characteristics, $I_F = f(V_F)$

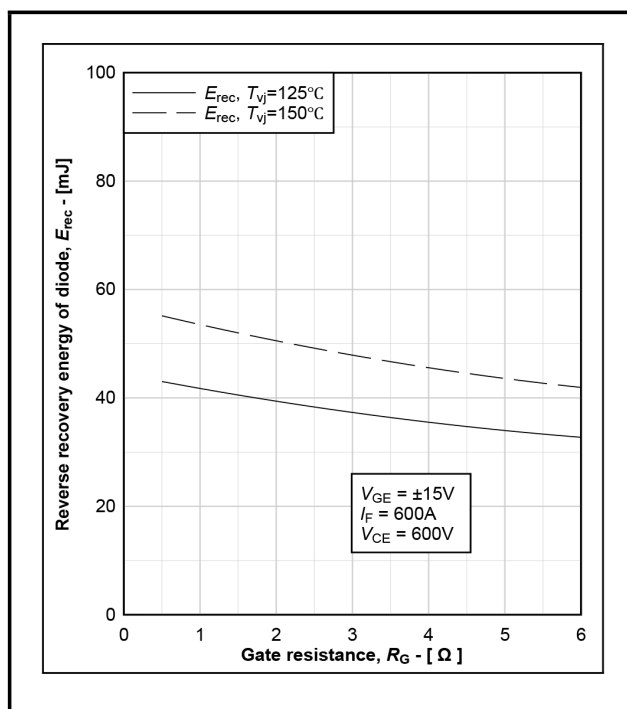


Fig. 8 Typical FRD E_{rec} , $E_{rec} = f(R_G)$

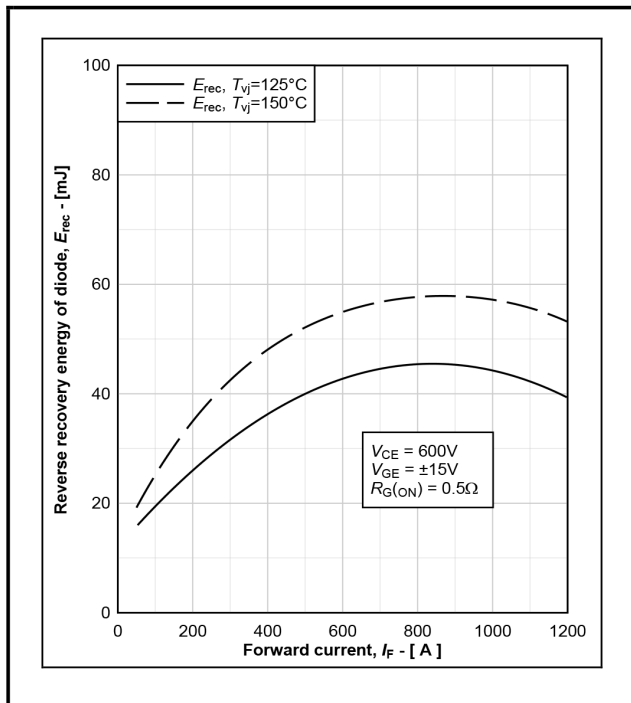


Fig. 9 Typical FRD E_{rec} , $E_{rec} = f(I_F)$

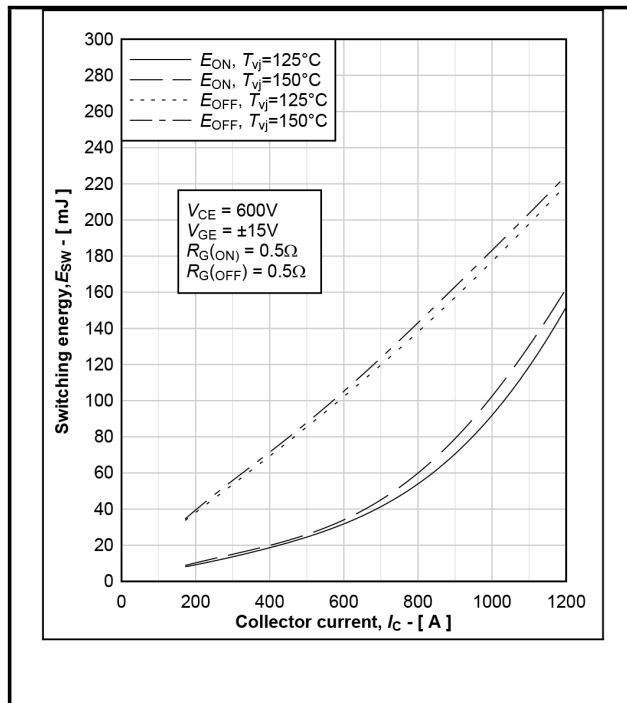


Fig. 10 Typical IGBT switching energy, $E_{ON} = f(I_C)$, $E_{OFF} = f(I_C)$

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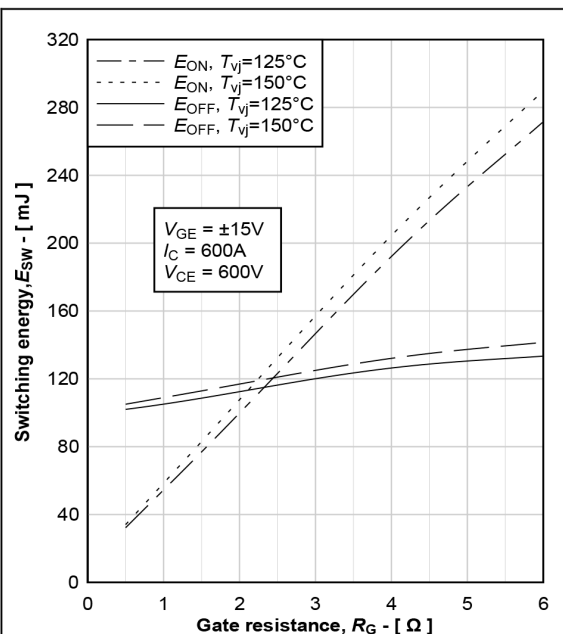


Fig. 11 Typical IGBT switching energy
 $E_{ON} = f(R_G)$, $E_{OFF} = f(R_G)$

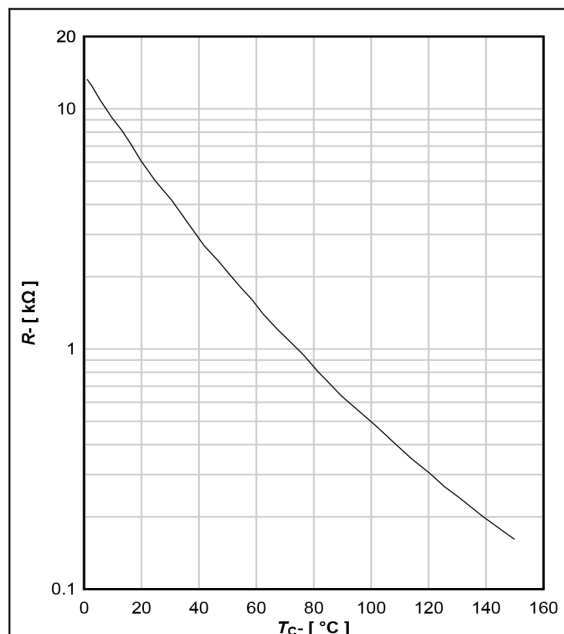


Fig. 12 Typical NTC thermistor characteristic, $R = f(T_c)$

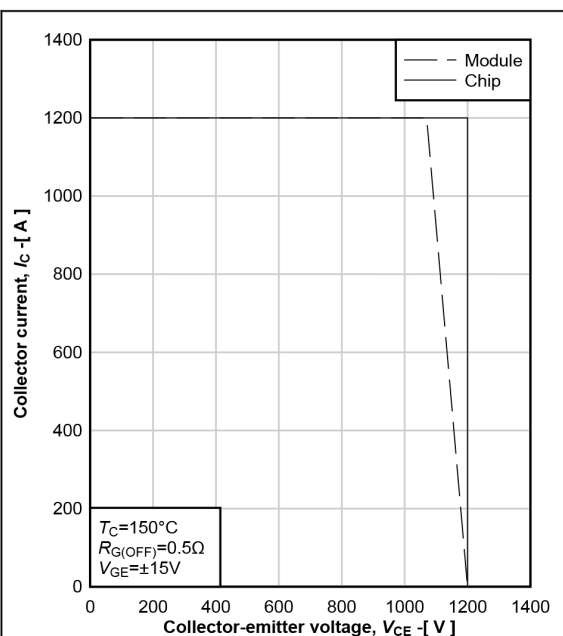


Fig. 13 Reverse bias safe operating area of IGBT,
 $I_C = f(V_{CE})$

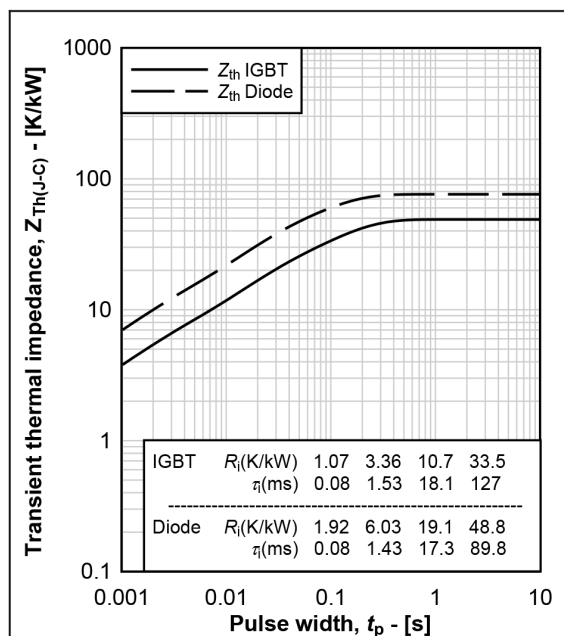
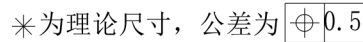


Fig. 14 Transient thermal impedance, $Z_{th(J-c)} = f(t)$

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Nominal Weight: 345g

Part Number Table

Description	Part Number
Half Bridge IGBT Module, 1200V, 600A, M1 Case Code	MPIM600M112TG5

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