

General Description

This IGBT is produced using advanced Magnachip's Field Stop Trench IGBT Technology, which provides high switching speed and excellent quality.

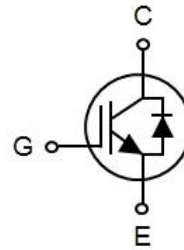
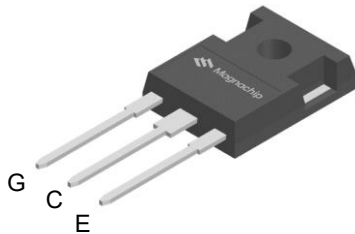
Features

- High Speed Switching & Low Power Loss
- $V_{CE(sat)} = 1.8V @ I_c = 40A$
- Maximum junction temperature 175°C

Applications

- Inverters
- Welding converters
- High range switching frequency converters

TO-247



Maximum Rating

Parameter	Symbol	Rating	Unit
Collector-emitter voltage	V_{CE}	650	V
DC collector current, limited by T_{vjmax}	I_c	$T_C=25^\circ C$	80
		$T_C=100^\circ C$	40
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	120	A
Diode forward current limited by T_{vjmax}	I_F	$T_C=25^\circ C$	40
		$T_C=100^\circ C$	20
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	120	A
Gate-emitter voltage	V_{GE}	± 20	V
Power dissipation	P_D	$T_C=25^\circ C$	230
		$T_C=100^\circ C$	115
Operating Junction temperature range	T_{vj}	-40~175	°C
Storage temperature range	T_{stg}	-55~150	°C

Thermal Characteristic

Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°C/W
Thermal resistance junction-to-case for IGBT	$R_{\theta JC}$	0.65	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	1.75	

Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ40T65QESTH	40T65QES	-55~150°C	TO-247	Tube	Halogen Free

Electrical Characteristic (T_{vj} = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Static Characteristic							
Collector-emitter breakdown voltage	BV _{CES}	I _C = 2mA, V _{GE} = 0V	650	-	-	V	
Collector-emitter saturation voltage	V _{CE(sat)}	I _C = 40A, V _{GE} = 15V	T _{vj} = 25°C	-	1.8	2.3	V
			T _{vj} = 175°C	-	2.3	-	
Diode forward voltage	V _F	V _{GE} = 0V, I _F = 20A	T _{vj} = 25°C	-	1.5	1.95	V
			T _{vj} = 175°C	-	1.5	-	
Gate-emitter threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 40mA	3.5	5.0	6.5	V	
Zero gate voltage collector current	I _{CES}	V _{CE} = 650V, V _{GE} = 0V, T _{vj} = 25°C	-	-	40	μA	
Gate-emitter leakage current	I _{GES}	V _{GE} = 20V, V _{CE} = 0V	-	-	±100	nA	
Dynamic Characteristic							
Total gate charge	Q _g	V _{CE} = 520V, I _C = 40A, V _{GE} = 15V	-	60	-	nC	
Gate-emitter charge	Q _{ge}		-	13	-		
Gate-collector charge	Q _{gc}		-	25	-		
Input capacitance	C _{ies}	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz	-	1565	-	pF	
Reverse transfer capacitance	C _{res}		-	37	-		
Output capacitance	C _{oes}		-	120	-		
Switching Characteristic							
Turn-on delay time	t _{d(on)}	V _{GE} = 15V, V _{CC} = 400V, I _C = 40A, R _G = 10Ω, Inductive Load, T _{vj} = 25°C	-	6	-	ns	
Rise time	t _r		-	36	-		
Turn-off delay time	t _{d(off)}		-	55	-		
Fall time	t _f		-	64	-	mJ	
Turn-on switching energy	E _{on}		-	0.5	-		
Turn-off switching energy	E _{off}		-	0.4	-		
Total switching energy	E _{ts}	-	0.9	-	ns		
Turn-on delay time	t _{d(on)}	V _{GE} = 15V, V _{CC} = 400V, I _C = 40A, R _G = 10Ω, Inductive Load, T _{vj} = 175°C	-	7		-	
Rise time	t _r		-	41		-	
Turn-off delay time	t _{d(off)}		-	60		-	
Fall time	t _f		-	102		-	mJ
Turn-on switching energy	E _{on}		-	1.04		-	
Turn-off switching energy	E _{off}		-	0.57	-		
Total switching energy	E _{ts}	-	1.61	-	ns		
Reverse recovery time	t _{rr}	I _F = 20A, di _F /dt = 820A/μs, T _{vj} = 25°C	-	60		-	
Reverse recovery current	I _{rr}		-	18		-	A
Reverse recovery charge	Q _{rr}		-	696		-	nC
Reverse recovery time	t _{rr}	I _F = 20A, di _F /dt = 820A/μs, T _{vj} = 175°C	-	72		-	ns
Reverse recovery current	I _{rr}		-	22		-	A
Reverse recovery charge	Q _{rr}		-	864	-	nC	

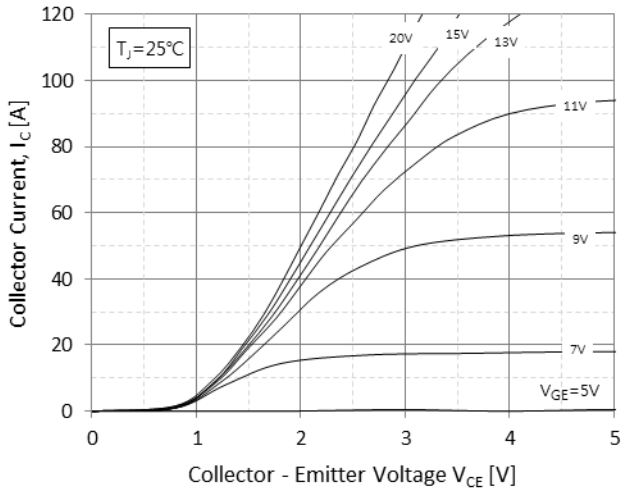


Fig.1 Typical Output Characteristics($T_J=25^\circ\text{C}$)

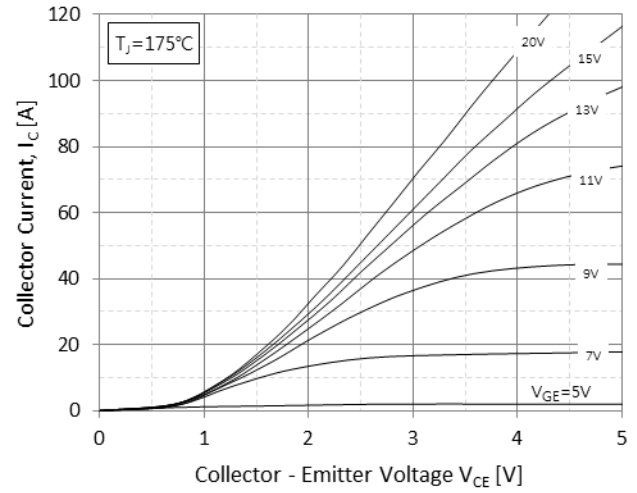


Fig.2 Typical Output Characteristics($T_J=175^\circ\text{C}$)

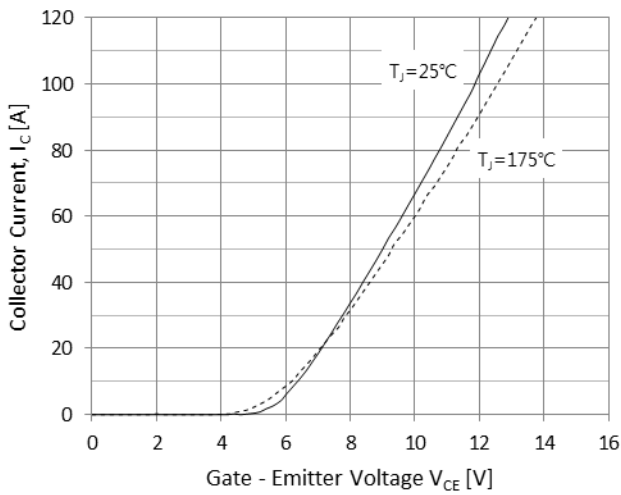


Fig.3 Typical Transfer Characteristics

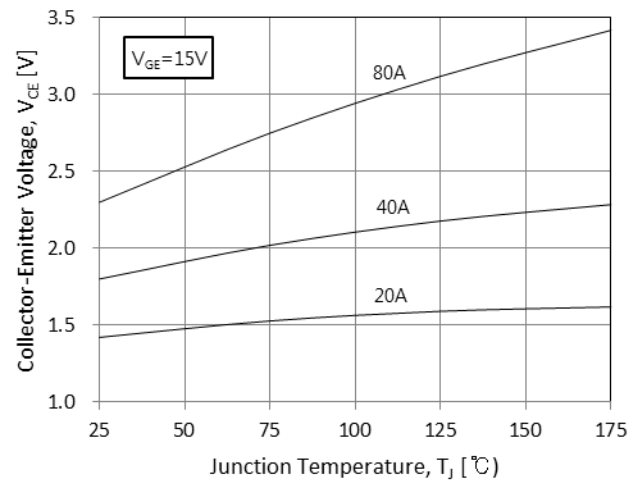


Fig.4 Typical Collector-Emitter Saturation Voltage - Junction Temperature

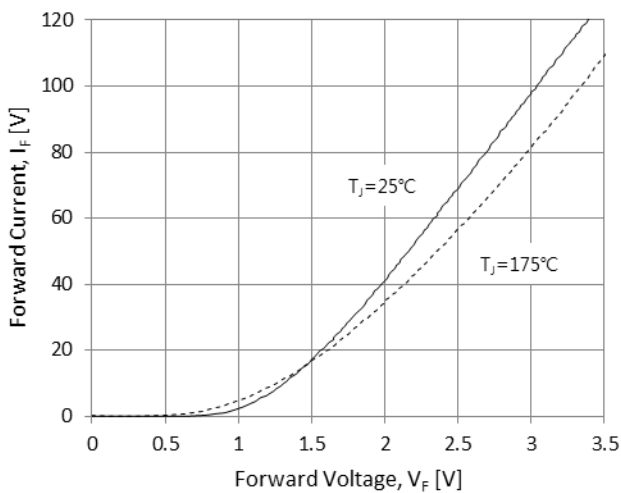


Fig.5 Diode Forward Characteristics

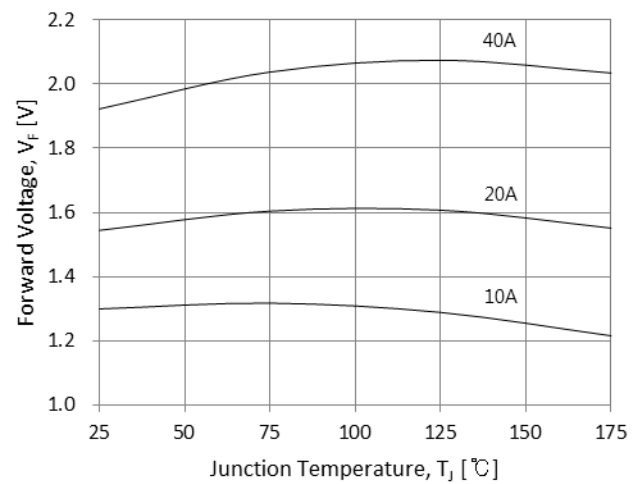


Fig.6 Diode Forward-Junction Temperature

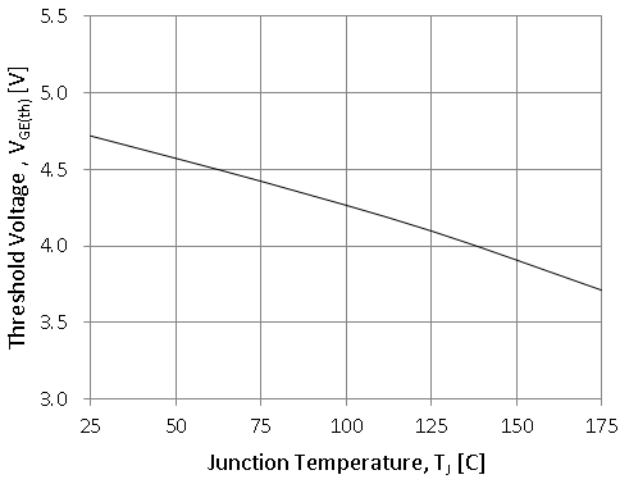


Fig.7 Threshold Voltage-Junction Temperature

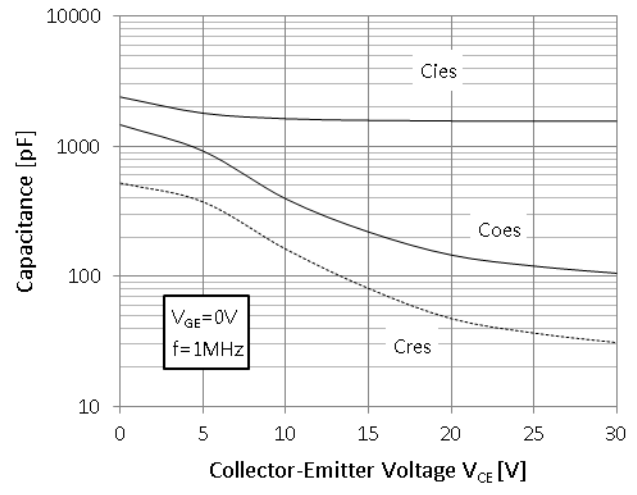


Fig.8 Typical Capacitance

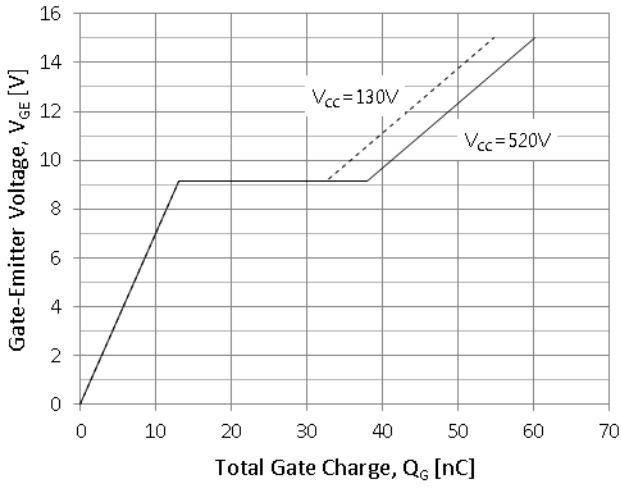


Fig.9 Typical Gate Charge

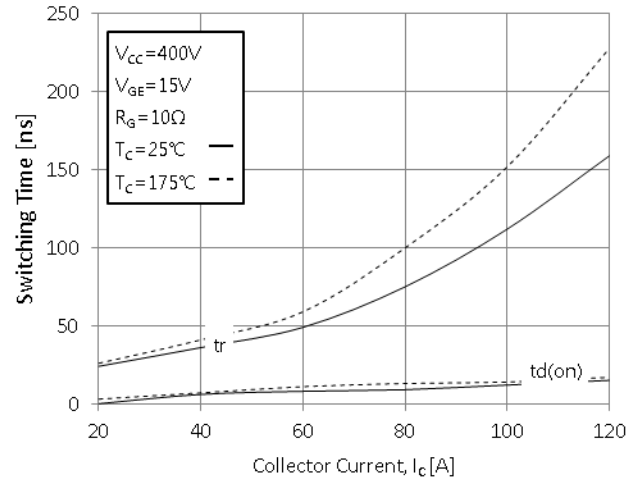


Fig.10 Typical Turn on-Collector Current

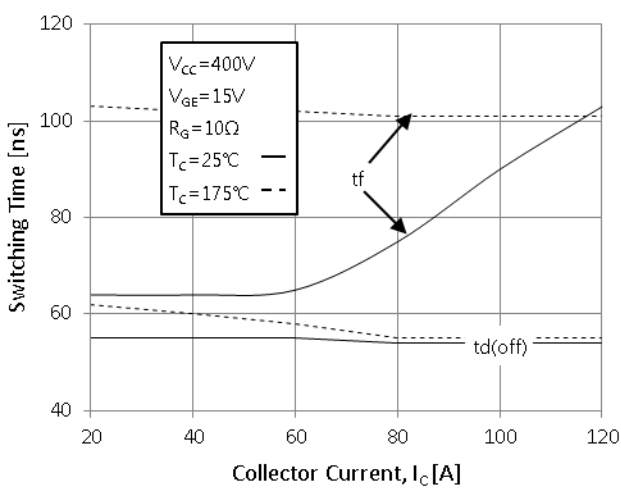


Fig.11 Typical Turn off-Collector Current

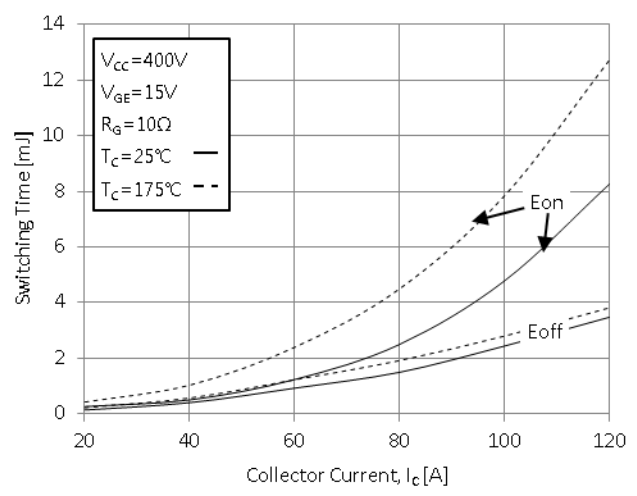


Fig.12 Switching Loss-Collector Current

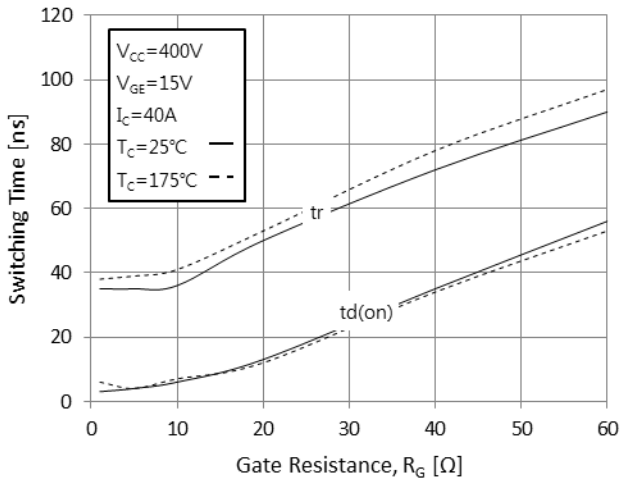


Fig.13 Turn on Characteristics-Gate Resistance

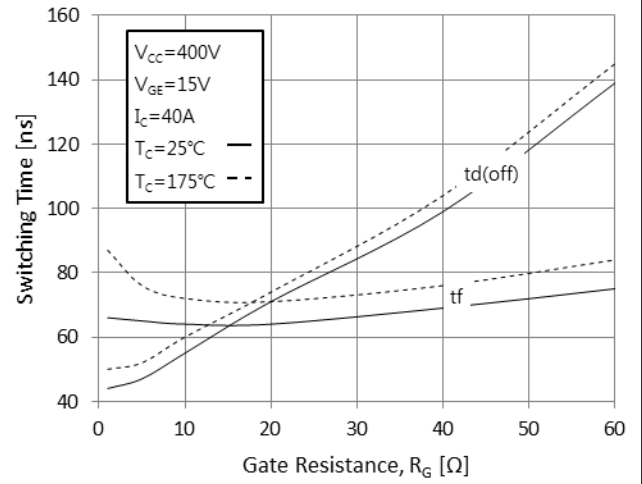


Fig.14 Turn off Characteristics-Gate Resistance

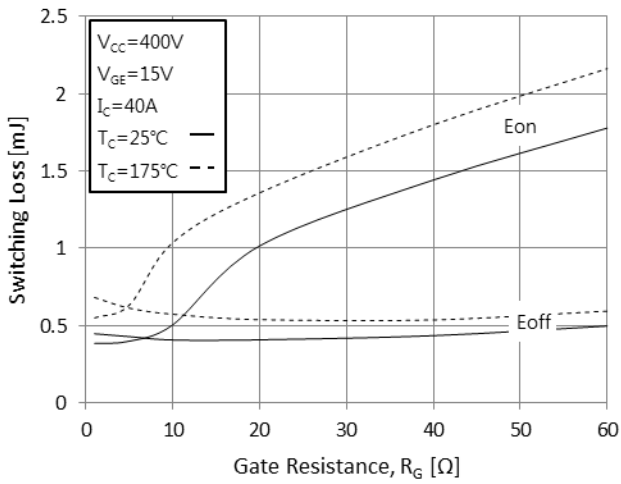


Fig.15 Switching Loss-Gate Resistance

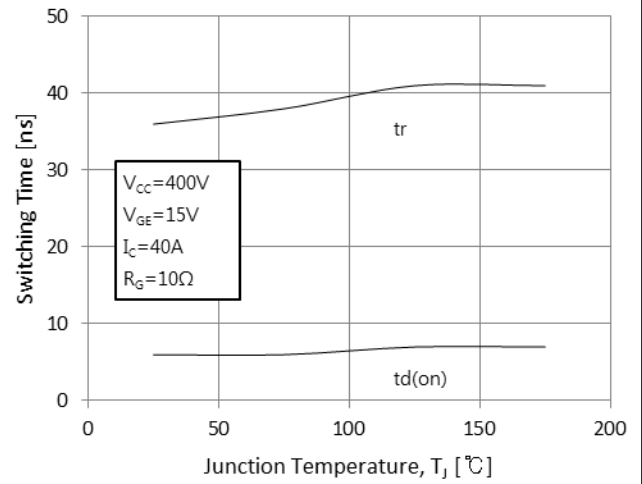


Fig.16 Turn on Characteristics-Junction Temperature

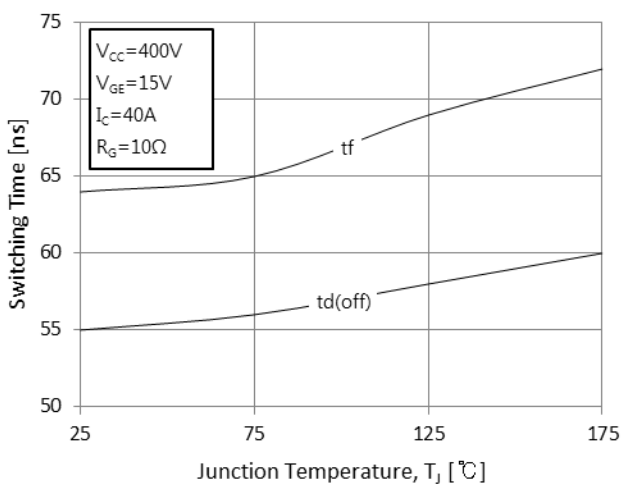


Fig.17 Turn off Characteristics-Junction Temperature

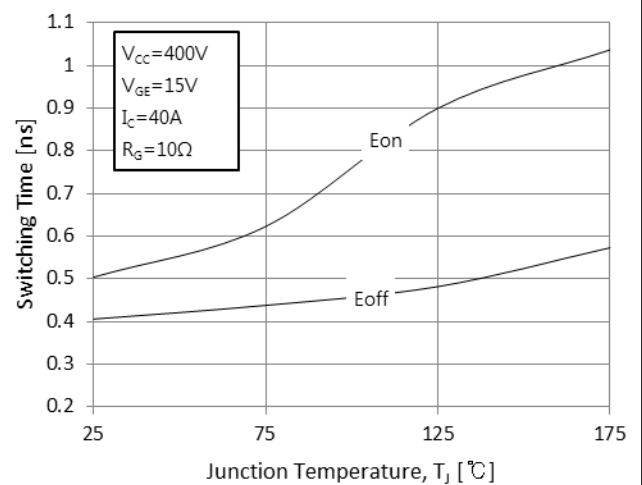


Fig.18 Switching Loss-Junction Temperature

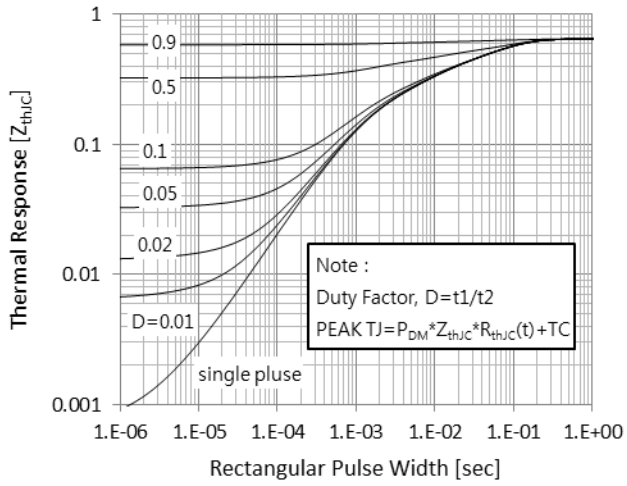


Fig.19 IGBT Transient Thermal Impedance

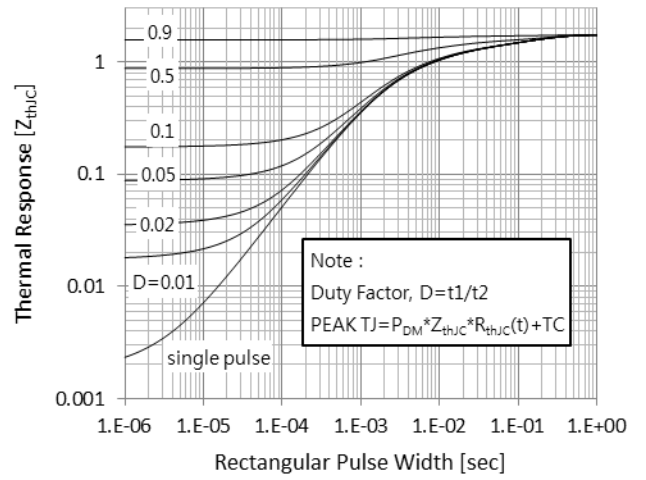
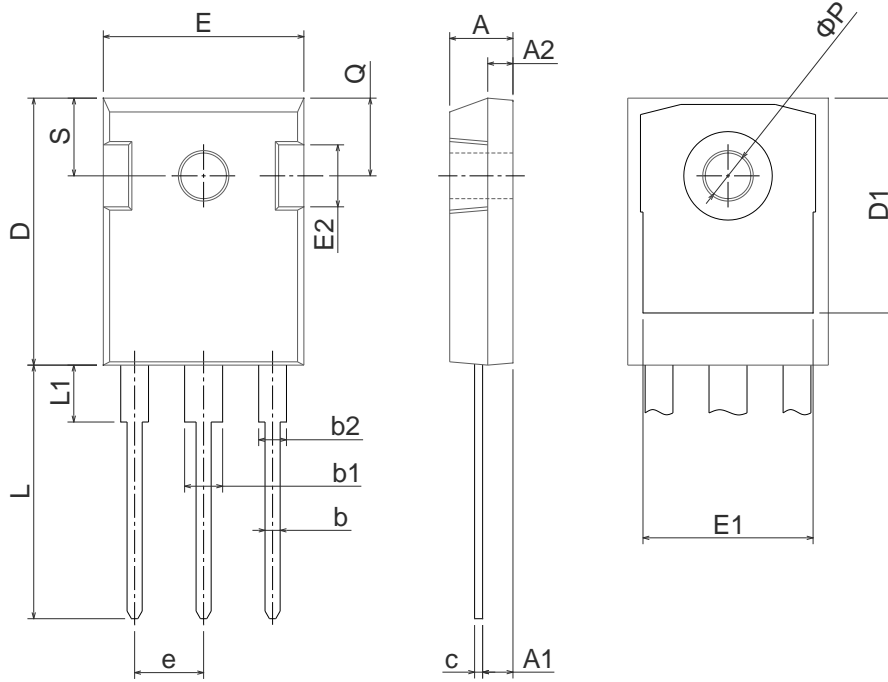


Fig.20 FRD Transient Thermal Impedance

Physical Dimension

TO-247

Dimensions are in millimeters, unless otherwise specified




Dimension	Min(mm)	Max(mm)
A	4.70	5.31
A1	2.20	2.60
A2	1.50	2.49
b	0.99	1.40
b1	2.59	3.43
b2	1.65	2.39
c	0.38	0.89
D	20.30	21.46
D1	13.08	-
E	15.45	16.26
E1	13.06	14.02
E2	4.32	5.49
e	5.45BSC	
L	19.81	20.57
L1	-	4.50
ΦP	3.50	3.70
Q	5.38	6.20
S	6.15BSC	

Note : Package body size, length and width do not include mold flash, protrusions and gate burrs.

DISCLAIMER:

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.

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