MagnaChip

MBQ60T65PES

High Speed Fieldstop Trench IGBT Second Generation

General Description

This IGBT is produced using advanced MagnaChip's Field Stop Trench IGBT 2nd Generation Technology, which is not only the highest efficiency capable of switching behavior, but also it is high ruggedness and excellent quality for solar inverter, UPS, IH, welder and PFC application where low conduction losses are essential

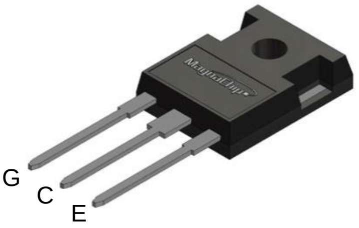
Features

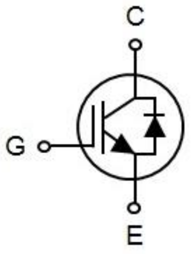
- High Speed Switching & Low Power Loss
- $V_{CE(sat)}$ = 1.85V @ I_C = 60A
- E_{off} = 0.53mJ @ T_C = 25°C
- High Input Impedance
- t_{rr} = 110ns (typ.) @di_F/dt = 500A/ μs
- Maximum Junction Temperature 175°C

Applications

- PFC
- UPS
- PV Inverter
- Welder
- IH Cooker

TO-247





Maximum Rating

Parameter		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	650	V
DC collector current, limited by T_{vjmax}	T_C=25°C	I_C	100	A
	T_C=100°C		60	A
Pulsed collector current, t_p limited by T_{vjmax}		I_{Cp}	180	A
Turn off safe operating area $V_{CE} \leq$ 650V, $T_{vj} \leq$ 175°C		-	180	A
Diode forward current limited by T_{vjmax}	T_C=25°C	I_F	60	A
	T_C=100°C		30	
Diode pulsed current, t_p limited by T_{vjmax}		I_{Fp}	200	A
Gate-emitter voltage		V_{GE}	±20	V
Power dissipation	T_C=25°C	P_D	428	W
	T_C=100°C		214	W
Short circuit withstand time $V_{CC} \leq$ 400V, R_G = 7Ω, V_{GE} = 15V, T_{vj} = 150°C		tsc	5	μs
Operating Junction temperature range		T_{vj}	-40~175	°C
Storage temperature range		T_{stg}	-55~150	°C
Soldering temperature Wave soldering 1.6 mm (0.063 in.) from case for 10s			260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3		M	0.6	Nm

Thermal Characteristic

Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°C/W
Thermal resistance junction-to-case for IGBT	$R_{\theta JC}$	0.35	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	1.2	

Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ60T65PESTH	60T65PES	-55~175°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 = 60A, V_{GE} =15V	T_{vj} = 25°C	-	1.85	2.4	V
			T_{vj} = 175°C	-	2.6	-	
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 25A	T_{vj} = 25°C	-	1.45	2.0	V
			T_{vj} = 175°C	-	1.35	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.5mA		4.0	5.0	6.0	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 = 60A, V_{GE} = 15V		-	95	-	nC
Gate-emitter charge	Q_{ge}			-	19	-	
Gate-collector charge	Q_{gc}			-	47	-	
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	2327	-	pF
Reverse transfer capacitance	C_{res}			-	55	-	
Output capacitance	C_{oes}			-	270	-	
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E			-	13.0	-	nH
Switching Characteristic							
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 60A, R_G = 7Ω, Inductive Load, T_{vj} = 25°C		-	42	-	ns
Rise time	t_r			-	54	-	
Turn-off delay time	$t_{d(off)}$			-	142	-	
Fall time	t_f			-	40	-	
Turn-on switching energy	E_{on}			-	0.92	-	mJ
Turn-off switching energy	E_{off}			-	0.53	-	
Total switching energy	E_{ts}			-	1.45	-	
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 60A, R_G = 7Ω, Inductive Load, T_{vj} = 175°C		-	45	-	ns
Rise time	t_r			-	58	-	
Turn-off delay time	$t_{d(off)}$			-	152	-	
Fall time	t_f			-	35	-	
Turn-on switching energy	E_{on}			-	1.43	-	mJ
Turn-off switching energy	E_{off}			-	0.53	-	
Total switching energy	E_{ts}			-	1.96	-	
Reverse recovery time	t_{rr}	I_F = 25A, di_F/dt = 500A/ μs, T_{vj} = 25°C		-	110	-	ns
Reverse recovery current	I_{rr}			-	18	-	A
Reverse recovery charge	Q_{rr}			-	1.10	-	μC
Reverse recovery time	t_{rr}	I_F = 25A, di_F/dt = 500A/ μs, T_{vj} = 175°C		-	205	-	ns
Reverse recovery current	I_{rr}			-	25	-	A
Reverse recovery charge	Q_{rr}			-	2.67	-	μC

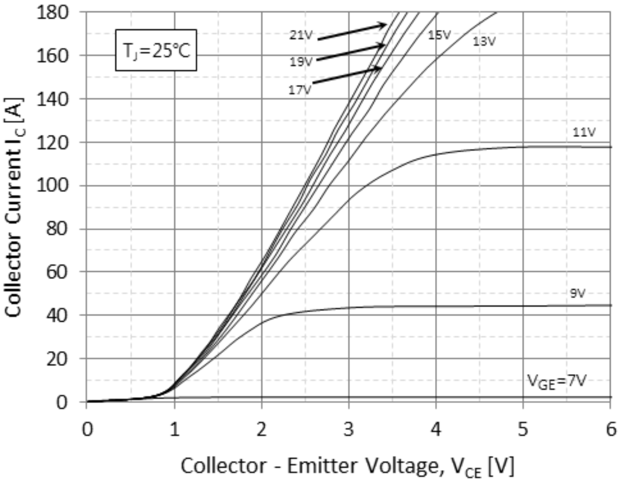


Fig.1 Typical Output Characteristics(T_J=25℃)

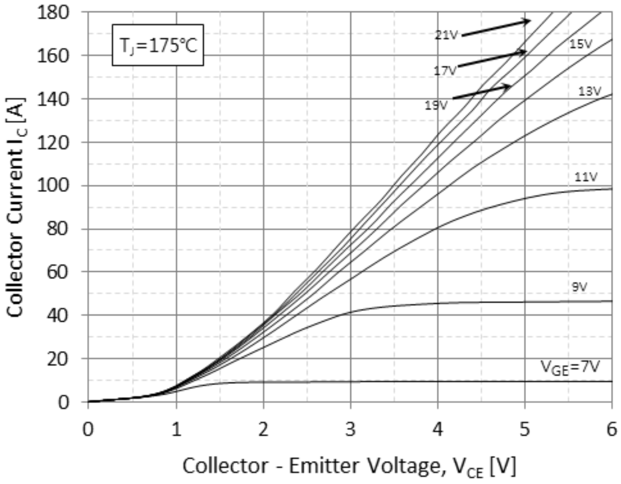


Fig.2 Typical Output Characteristics(T_J=175℃)

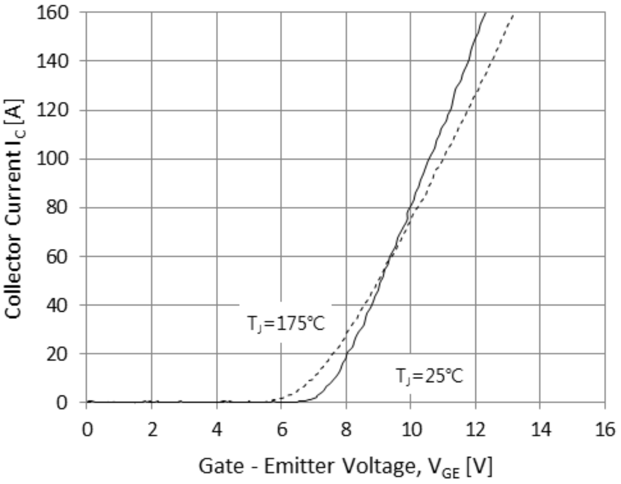


Fig.3 Typical Transfer Characteristics

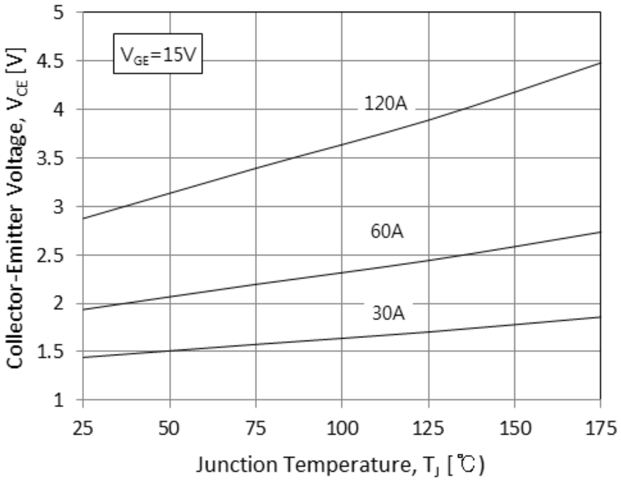


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

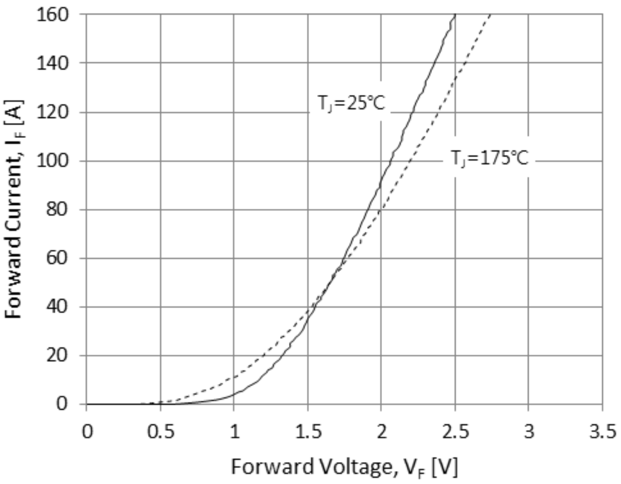


Fig.5 Diode Forward Characteristics

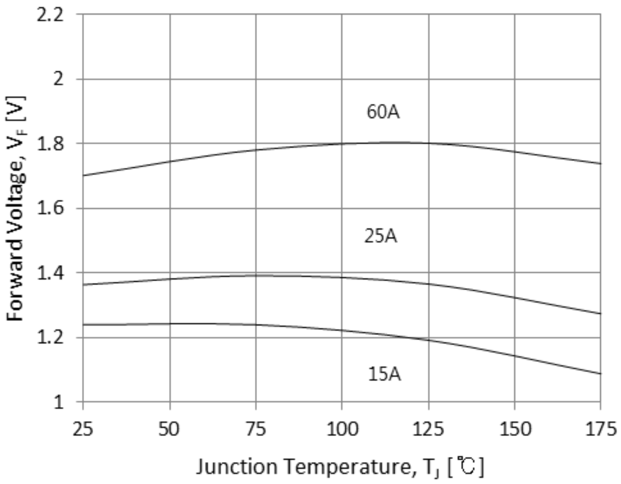


Fig.6 Diode Forward-Junction Temperature

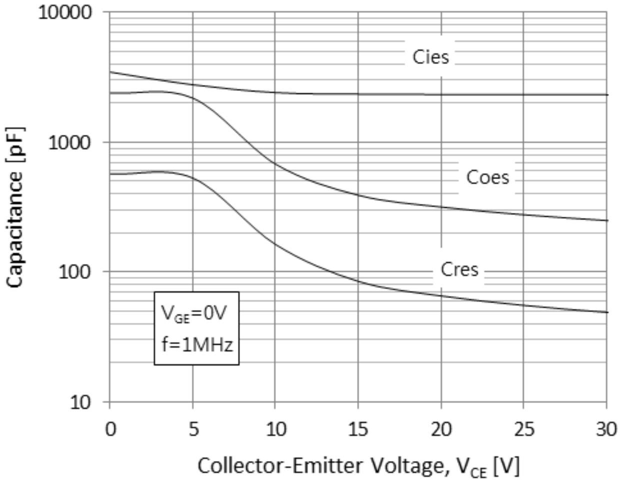


Fig.7 Typical Capacitance

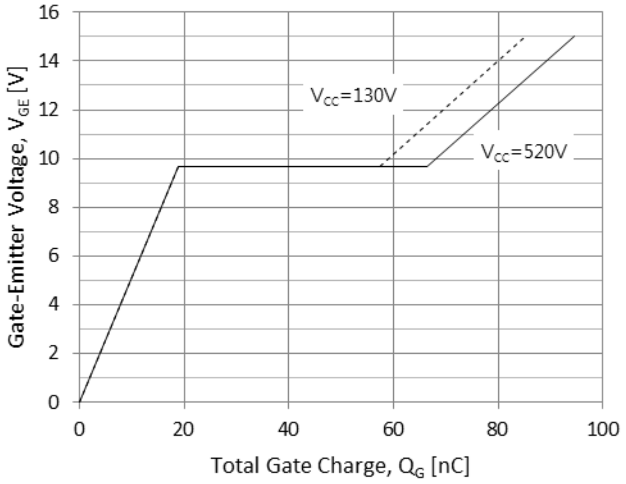


Fig.8 Typical Gate Charge

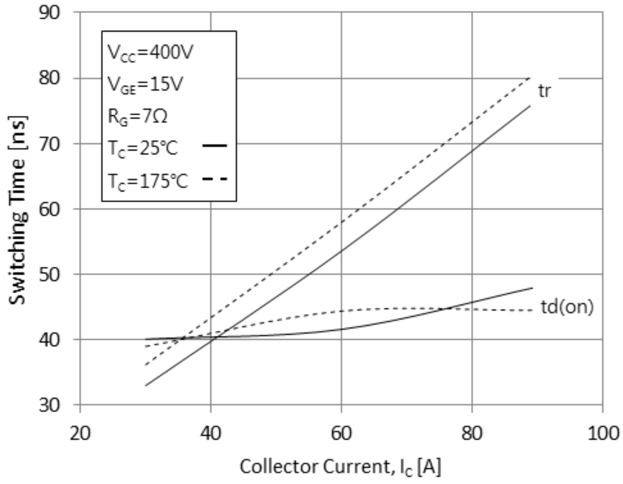


Fig.9 Typical Turn on-Collector Current

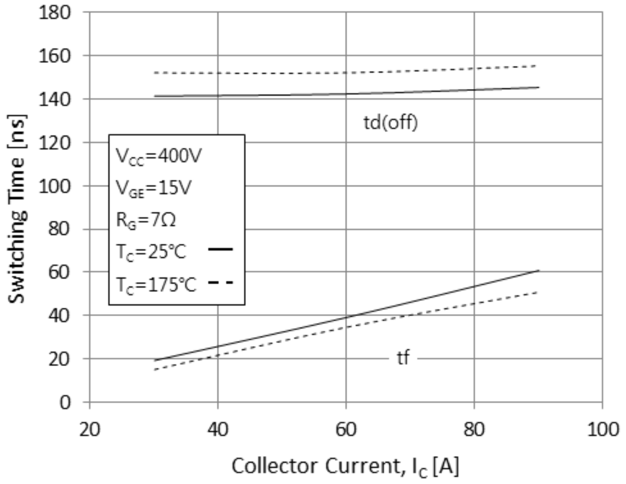


Fig.10 Typical Turn off-Collector Current

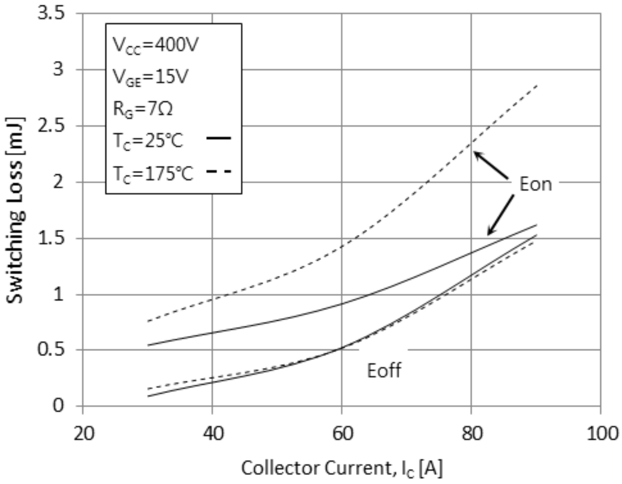


Fig.11 Switching Loss-Collector Current

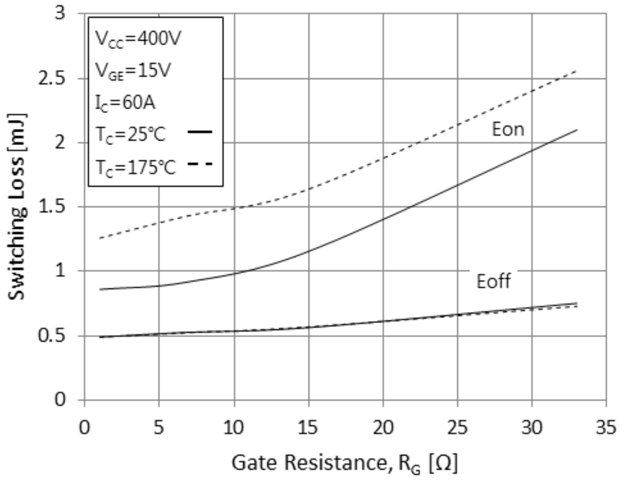


Fig.12 Switching Loss-Gate Resistance

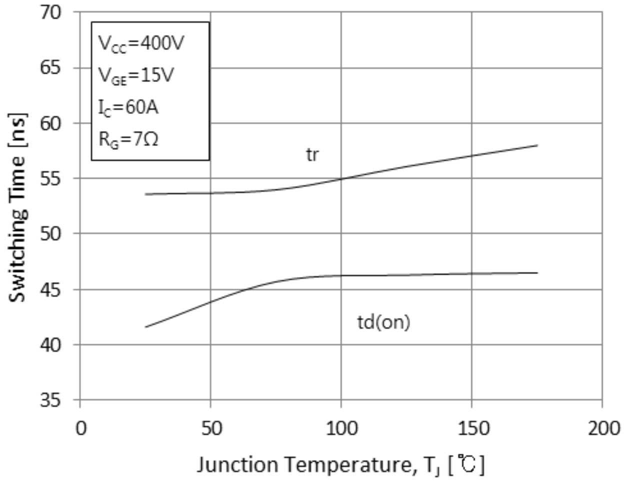


Fig.13 Turn on Characteristics-Junction Temperature

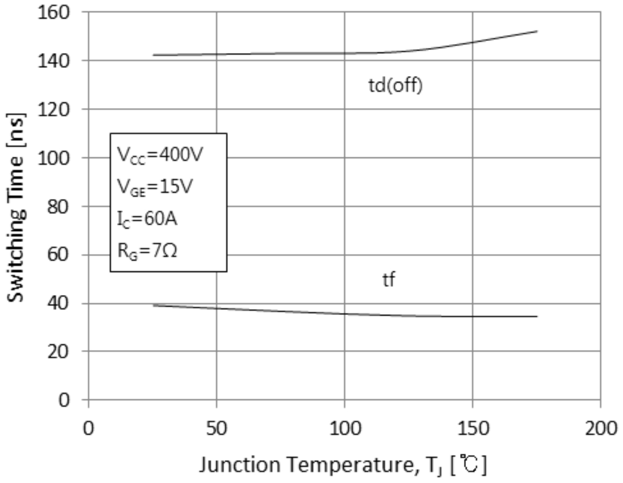


Fig.14 Turn off Characteristics-Junction Temperature

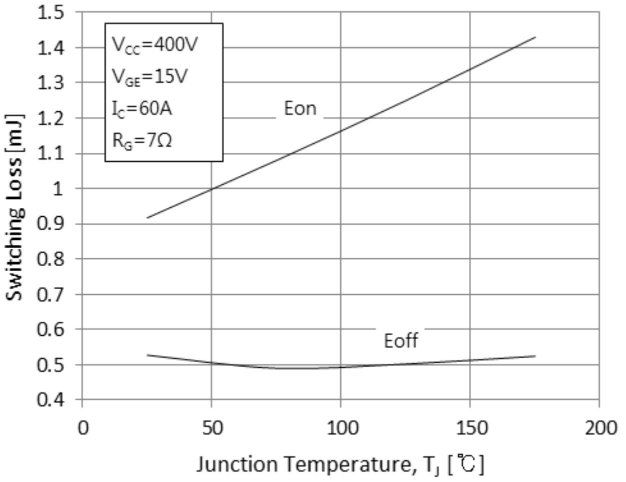


Fig.15 Switching Loss-Junction Temperature

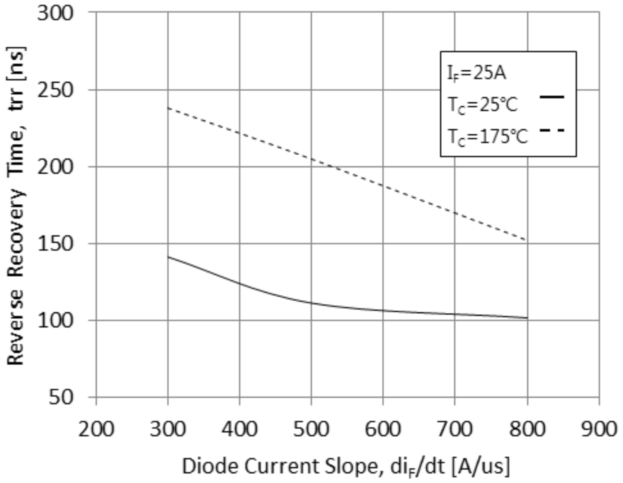


Fig.16 Reverse Recovery Time
- Diode Current Slope

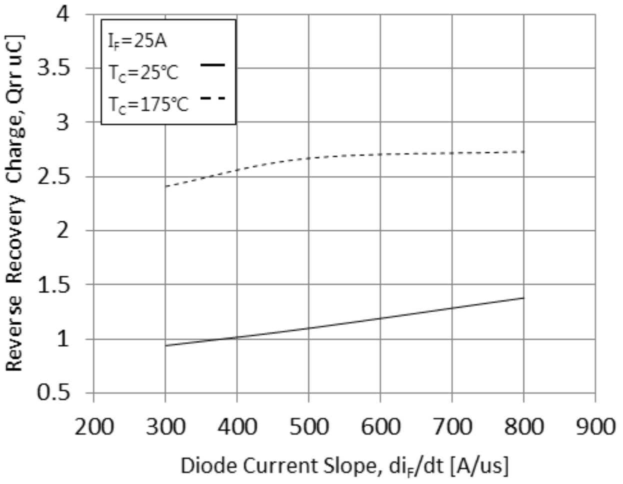


Fig.17 Reverse Recovery Charge
- Diode Current Slope

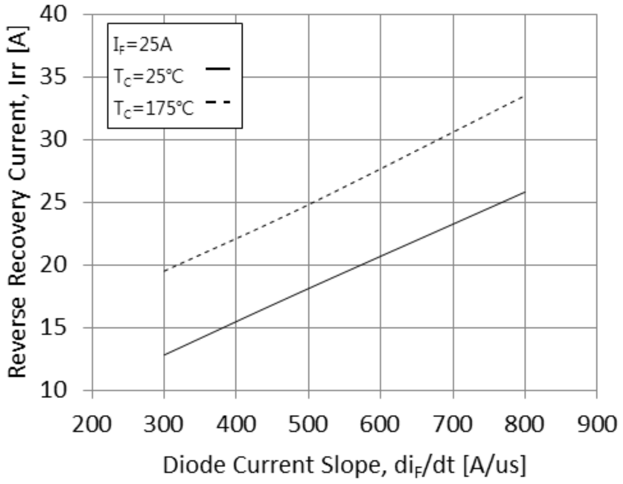


Fig.18 Reverse Recovery Current
- Diode Current Slope

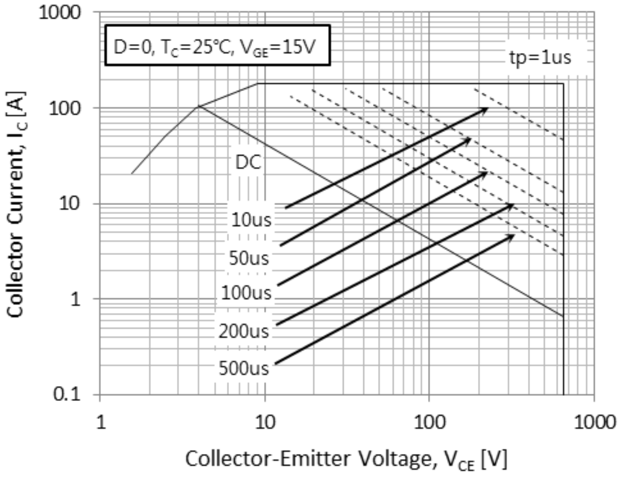


Fig.19 Forward Bias Safe Operating Area

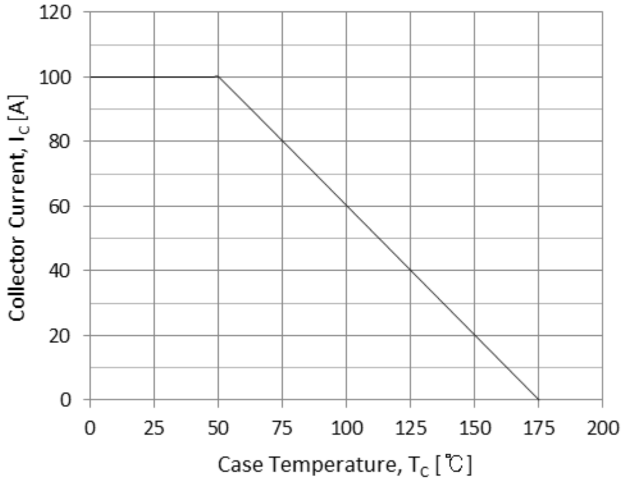


Fig.20 Case Temperature-Collector Current

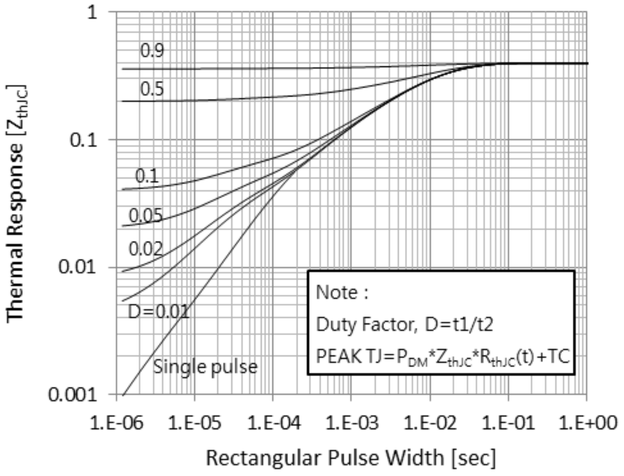


Fig.21 IGBT Transient Thermal Impedance

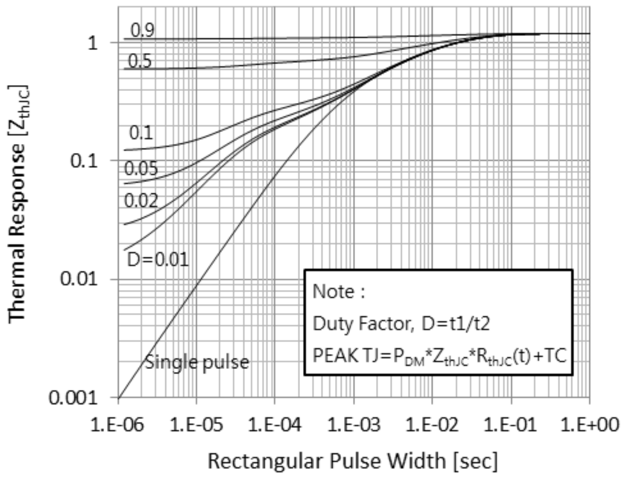


Fig.22 FRD Transient Thermal Impedance

Physical Dimension

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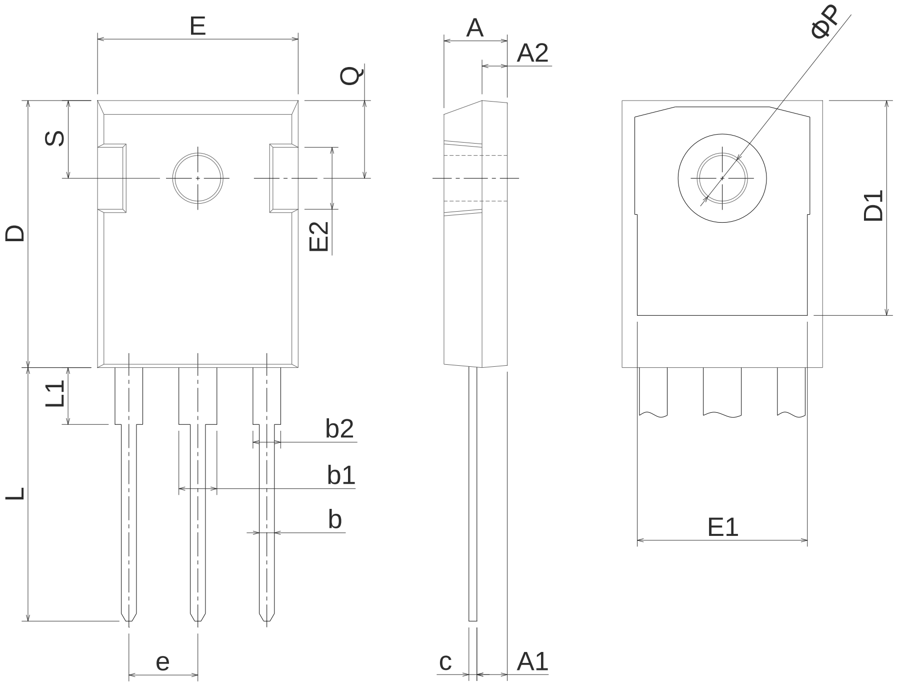
Dimensions are in millimeters, unless otherwise specified



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	

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.