

General Description

This IGBT is produced using advanced MagnaChip's Field Stop Trench IGBT Technology, which provides low $V_{CE(SAT)}$, high switching performance and excellent quality.

This device is for PFC, UPS & Inverter applications.

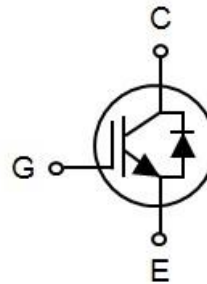
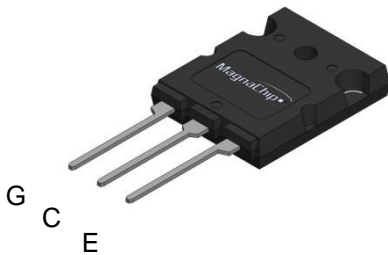
Applications

- PFC
- UPS
- Inverter

Features

- High Speed Switching & Low Power Loss
- $V_{CE(sat)} = 2.0V @ I_C = 40A$
- High Input Impedance
- $t_{rr} = 100ns$ (typ.)
- Ultra Soft, fast recovery anti-parallel diode
- Ultra narrowed VF distribution control
- Positive Temperature coefficient for easy paralleling

TO-247



Absolute Maximum Ratings

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	1200	V
Gate-emitter voltage		V_{GES}	± 20	V
Collector current	$T_C = 25^\circ C$	I_C	80	A
	$T_C = 100^\circ C$		40	A
Pulsed collector current, pulse time limited by T_{jmax}		I_{CM}	160	A
Diode forward current @ $T_C = 100^\circ C$		I_F	40	A
Diode pulsed current, Pulse time limited by T_{jmax}		I_{FM}	160	A
Power dissipation	$T_C = 25^\circ C$	P_D	357	W
	$T_C = 100^\circ C$		142	W
Short circuit withstand time $V_{CE} = 600V, V_{GE} = 15V, T_C = 150^\circ C$ Allowed number of short circuit < 1000 Time between short circuits $\geq 1.0s$		tsc	10	μs
Operating Junction and storage temperature range		T_J, T_{stg}	-55~150	$^\circ C$

Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	$^\circ C/W$
Thermal resistance junction-to-case for IGBT	$R_{\theta JC}$	0.35	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	0.8	

Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ40T120FESTH	40T120FES	-55~150°C	TO-247	Tube	Pb Free

Electrical Characteristics (T_c =25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Collector-emitter breakdown voltage	BV _{CEs}	I _C = 1mA, V _{GE} = 0V	1200	-	-	V
Gate-emitter threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 1mA	4.5	5.5	6.5	V
Zero gate voltage collector current	I _{CEs}	V _{CE} = 1200V, V _{GE} = 0V	-	-	1	mA
Gate-emitter leakage current	I _{GES}	V _{GE} = 20V, V _{CE} = 0V	-	-	±250	nA
Collector-emitter saturation voltage	V _{CE(sat)}	I _C = 40A, V _{GE} = 15V, T _C = 25°C		2.0	2.4	V
		I _C = 40A, V _{GE} = 15V, T _C = 150°C		2.45		
Dynamic and Switching Characteristics						
Total gate charge	Q _g	V _{CE} = 600V, I _C = 40A, V _{GE} = 15V	-	341		nC
Gate-emitter charge	Q _{ge}		-	52		
Gate-collector charge	Q _{gc}		-	126		
Input capacitance	C _{ies}	V _{CE} = 30V, V _{GE} = 0V, f = 1MHz	-	6030	-	pF
Reverse transfer capacitance	C _{res}		-	107	-	
Output capacitance	C _{oes}		-	206	-	
Turn-on delay time	t _{d(on)}	V _{GE} = 15V, V _{CC} = 600V, I _C = 40A, R _G = 10Ω Inductive Load, T _C = 25°C		65		ns
Rise time	t _r			55		
Turn-off delay time	t _{d(off)}			308		
Fall time	t _f			40		mJ
Turn-on switching energy	E _{on}			1.96		
Turn-off switching energy	E _{off}			0.54		
Total switching energy	E _{ts}		2.50			
Turn-on delay time	t _{d(on)}	V _{GE} = 15V, V _{CC} = 600V, I _C = 40A, R _G = 10Ω Inductive Load, T _C = 150°C		70		ns
Rise time	t _r			62		
Turn-off delay time	t _{d(off)}			325		
Fall time	t _f			62		mJ
Turn-on switching energy	E _{on}			2.35		
Turn-off switching energy	E _{off}			1.61		
Total switching energy	E _{ts}		3.96			

Diode Characteristics (T_c =25°C unless otherwise specified)

Forward voltage	V _F	I _F = 40A, T _C = 25°C	-	2.4	3.0	V
		I _F = 40A, T _C = 150°C	-	2.45		
Reverse recovery time	t _{rr}	I _F = 40A, di/dt = 200A/μs, T _C = 25°C	-	100	-	ns
Reverse recovery current	I _{rr}		-	7	-	A
Reverse recovery charge	Q _{rr}		-	350	-	nC
Reverse recovery time	t _{rr}	I _F = 40A, di/dt = 200A/μs, T _C = 150°C	-	180	-	ns
Reverse recovery current	I _{rr}		-	10	-	A
Reverse recovery charge	Q _{rr}		-	900	-	nC

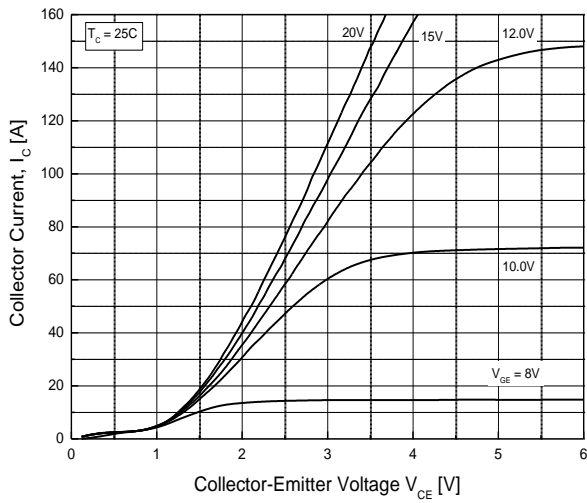


Fig.1 Typical Output Characteristics

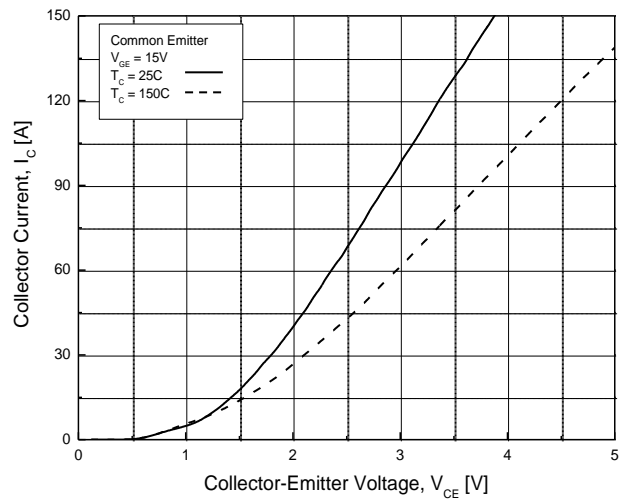


Fig.2 Typical Collector-Emitter Saturation Voltage

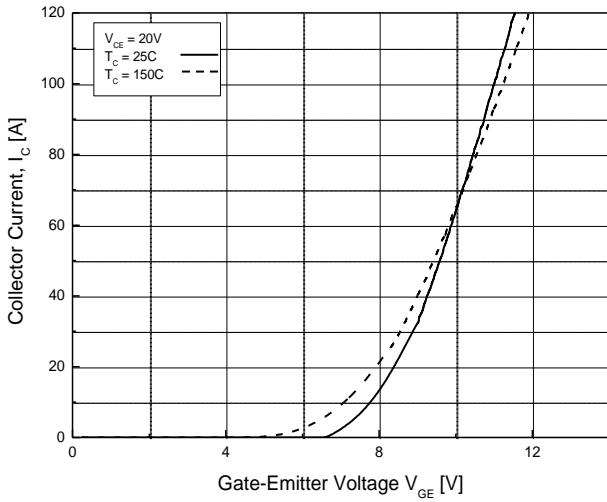


Fig.3 Typical Transfer Characteristics

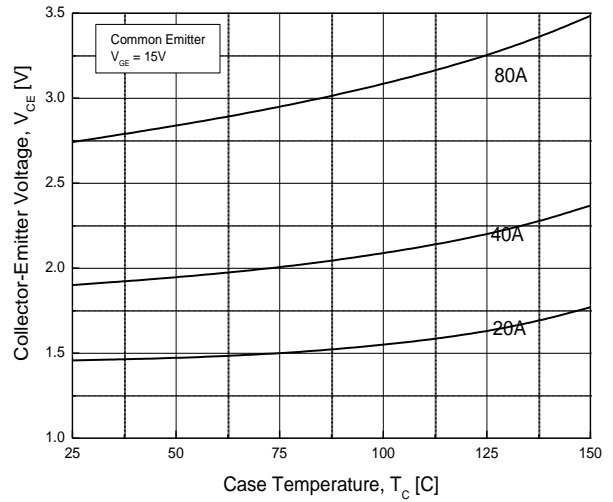


Fig.4 Typical Collector-Emitter Saturation Voltage at Case Temperature

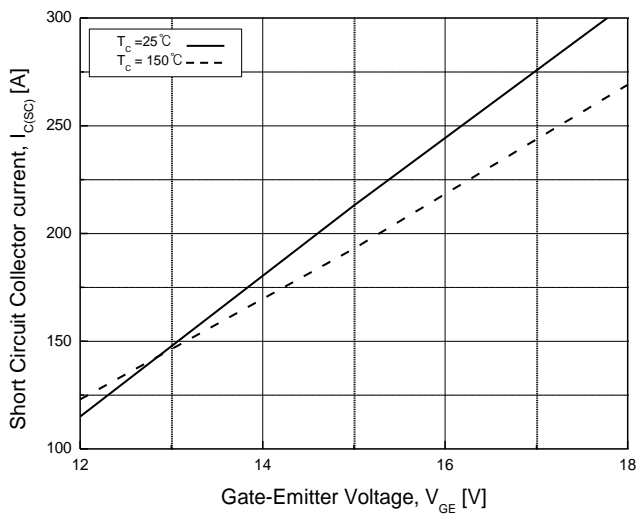


Fig.5 Typical Short Circuit Collector Current

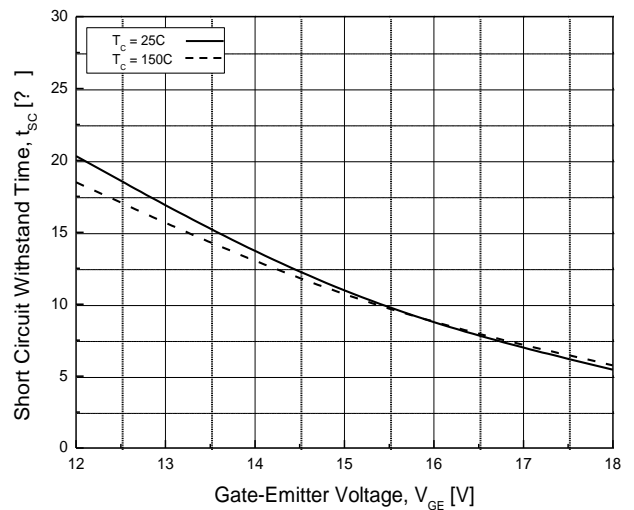


Fig.6 Typical Short Circuit Withstand Time

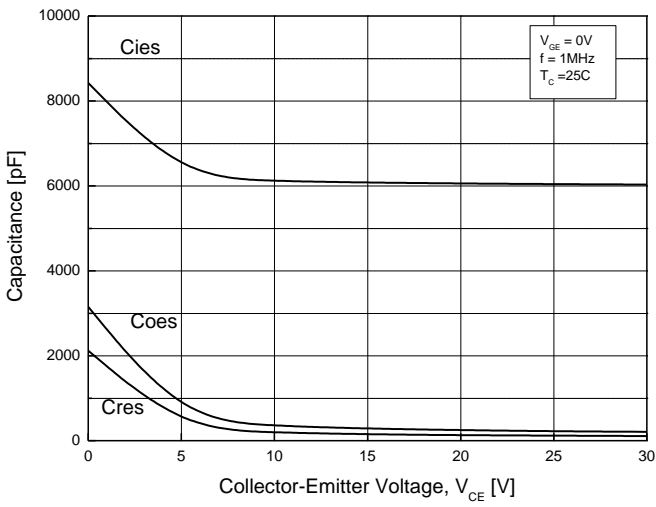


Fig.7 Typical Capacitance

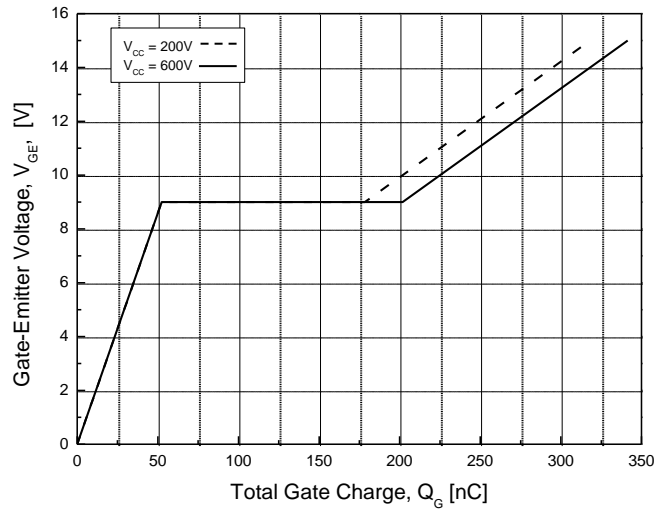


Fig.8 Typical Gate Charge

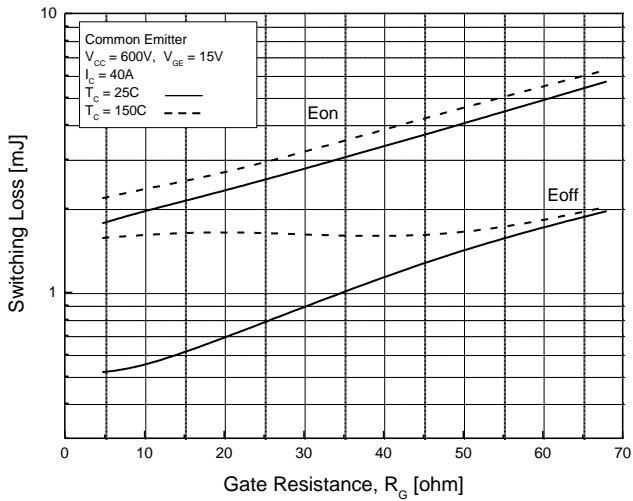


Fig.9 Switching Loss-Gate Resistance

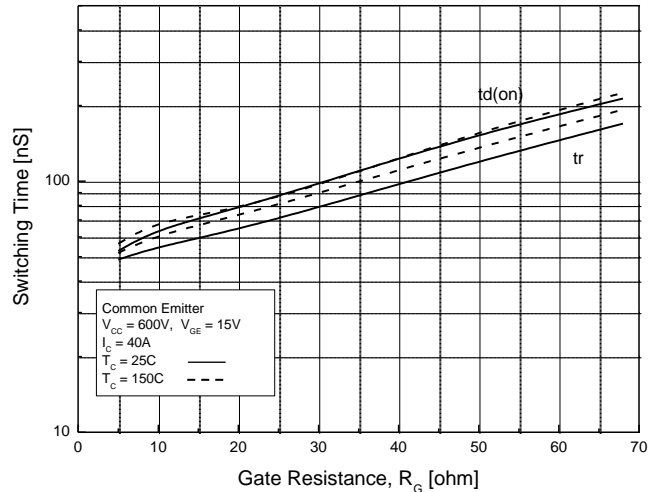


Fig.10 Turn on Characteristics-Gate Resistance

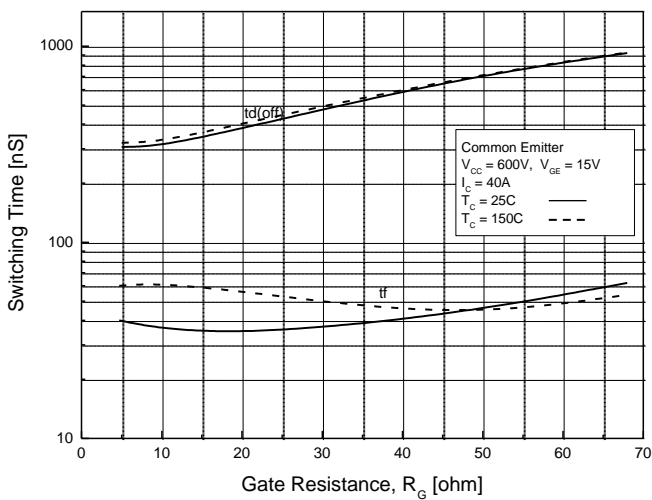


Fig.11 Turn off Characteristics-Gate Resistance

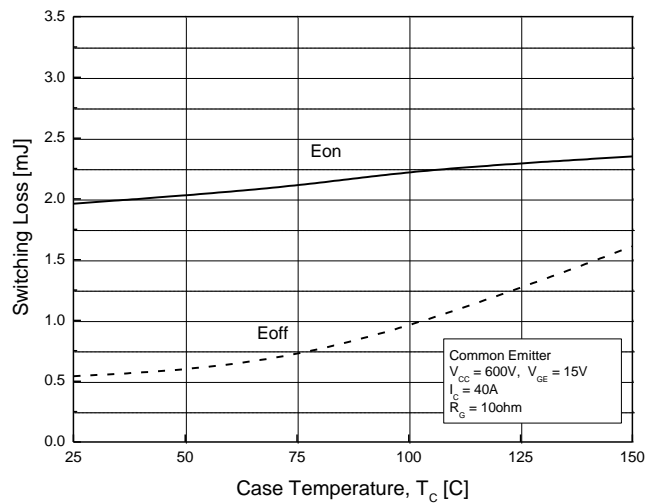


Fig.12 Switching Loss-Case Temperature

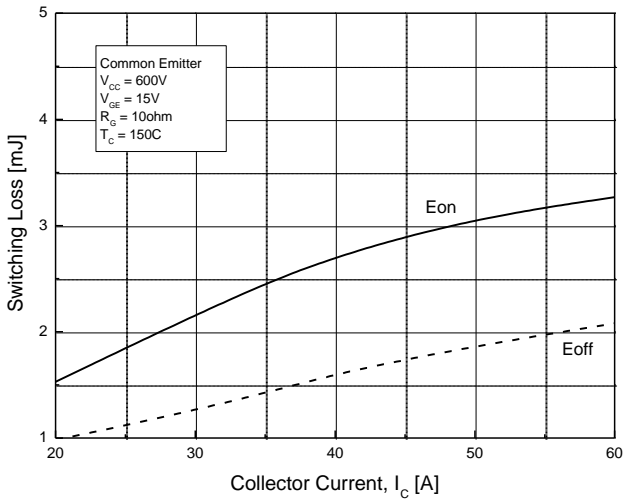


Fig.13 Switching Loss-Collector Current

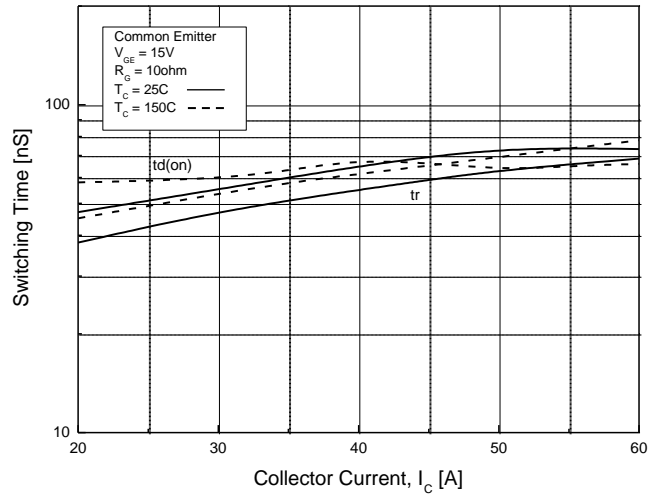


Fig.14 Typical Turn on-Collector Current

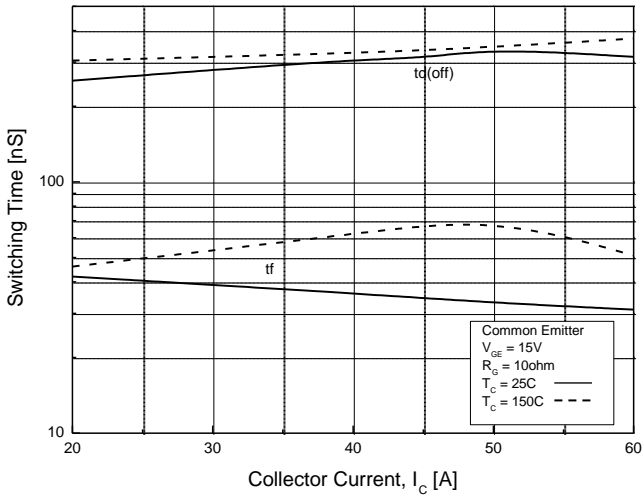


Fig.15 Typical Turn off-Collector Current

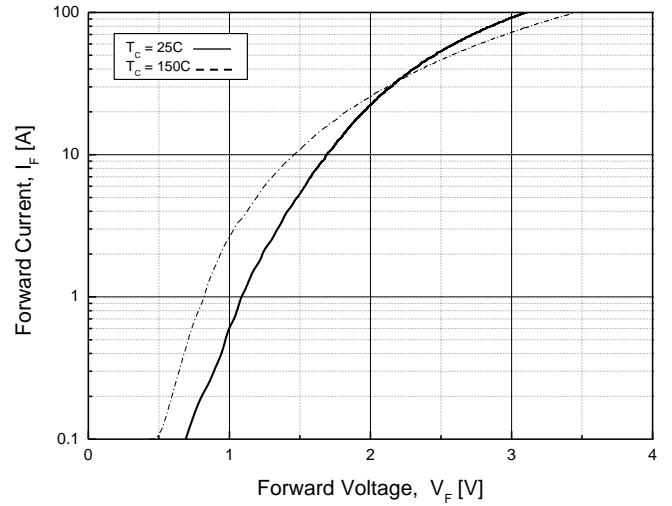


Fig.16 Diode Forward Characteristics

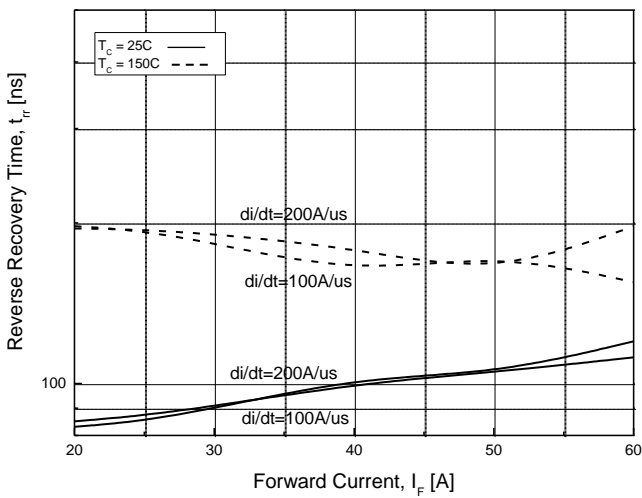


Fig.17 Typical Turn off-Collector Current

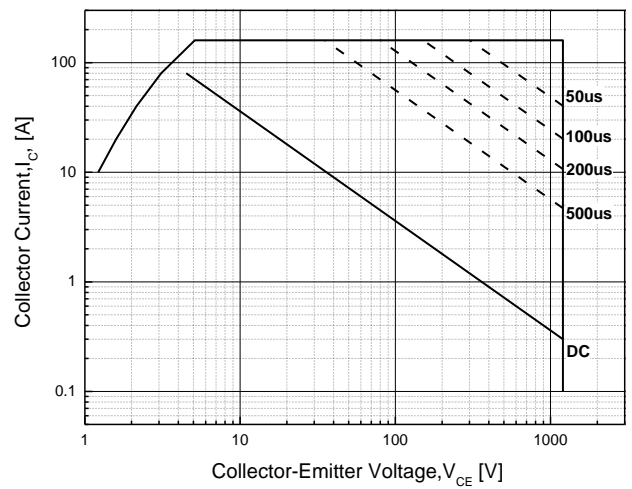


Fig.18 Forward Bias Safe Operating Area

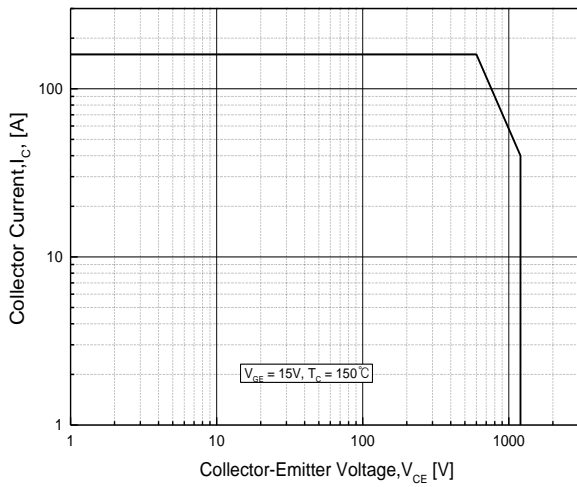


Fig.19 Reverse Bias Safe Operating Area

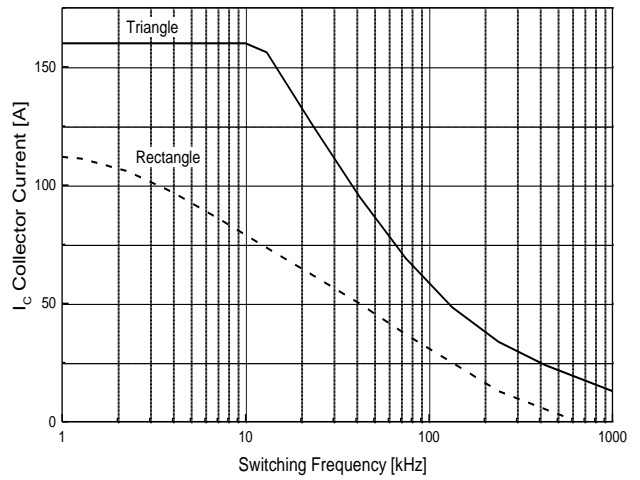


Fig.20 Switching frequency – Collector current

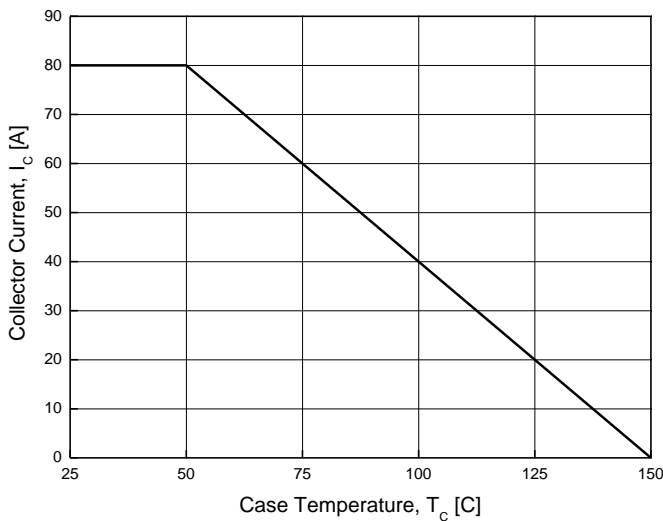


Fig.21 Case Temperature – Collector Current

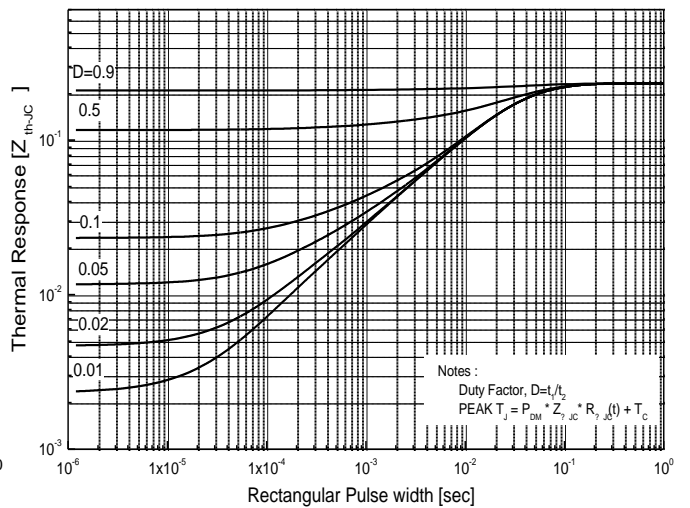
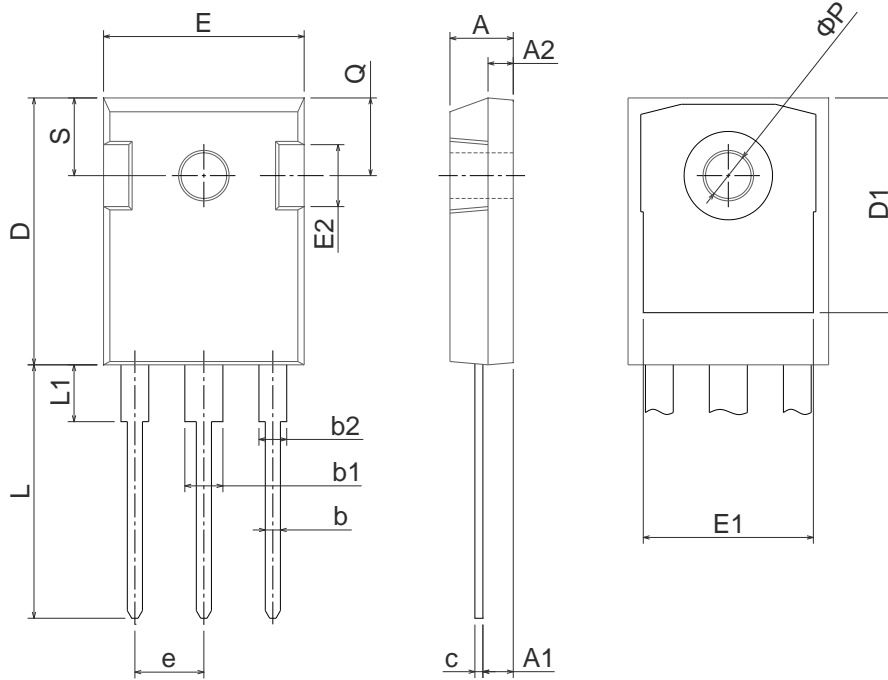


Fig.22 IGBT Transient Thermal Impedance

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	

DISCLAIMER:

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