Magnachip

MBQ25T120FESC

High speed Fieldstop Trench IGBT

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 & PV inverter and Welder Applications.

Applications

- PFC
- UPS
- Welder
- PV Inverter

Features

- High Speed Switching & Low $V_{CE(sat)}$ Loss
- $V_{CE(sat)}$ = 2.0V @I_C = 25A
- High Input Impedance
- t_{rr} = 100ns (typ.) @ di_F/dt = 500A/ µs
- Maximum junction temperature 175°C
- Pb-free ; RoHS compliant
- Ultra Soft, fast recovery anti-parallel diode
- Ultra narrowed VF distribution control
- Positive Temperature coefficient for easy paralleling

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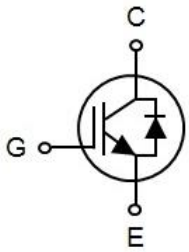


Maximum Rating

Parameter		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	1200	V
DC collector current, limited by T_{vjmax}	T_C=25°C	I_C	50	A
	T_C=100°C		25	A
Pulsed collector current, t_p limited by T_{jvjmax}		I_{Cpuls}	100	A
Turn off safe operating area $V_{CE} \leq$ 1200V, $T_{vj} \leq$ 175°C		-	100	A
Diode forward current limited by T_{vjmax}	T_C=25°C	I_F	25	A
	T_C=100°C		12.5	
Diode pulsed current, t_p limited by T_{vjmax}		I_{Fpuls}	100	A
Gate-emitter voltage		V_{GE}	±20	V
Power dissipation	T_C=25°C	P_D	348	W
	T_C=100°C		174	W
Short circuit withstand time $V_{CC} \leq$ 600V, V_{GE} = 15V, T_{vj} = 175°C		tsc	10	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	$R_{\theta JC}$	0.43	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	1.55	

Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ25T120FESCTH	25T120FESC	-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 = 500μA, V_{GE} = 0V		1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 25A, V_{GE} = 15V, T_{vj} = 25°C			2.0	2.4	V
		I_C = 25A, V_{GE} = 15V, T_{vj} = 150°C			2.4		
		I_C = 25A, V_{GE} = 15V, T_{vj} = 175°C			2.5		
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 12.5A	T_{vj} = 25°C		2.1	2.6	V
			T_{vj} = 175°C		1.9		
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 25A	T_{vj} = 25°C		2.5	3.0	V
			T_{vj} = 150°C		2.55		
			T_{vj} = 175°C		2.45		
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.85mA		5.0	6.0	7.0	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	T_{vj} = 25°C	-	-	250	μA
			T_{vj} = 175°C	-	-	2500	
Gate-emitter leakage current	I_{GES}	V_{GE} = 20V, V_{CE} = 0V		-	-	±250	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 25A,			16		S
Dynamic Characteristic							
Total gate charge	Q_g	V_{CE} = 960V, I_C = 25A, V_{GE} = 15V		-	204		nC
Gate-emitter charge	Q_{ge}			-	34		
Gate-collector charge	Q_{gc}			-	94		
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	3942	-	pF
Reverse transfer capacitance	C_{res}			-	72	-	
Output capacitance	C_{oes}			-	142	-	
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E			-	13.0	-	nH
Short circuit collector current Max. 1000 short circuits Time between short circuits: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15V, V_{CC} = 600V, t_{SC} ≤ 10μs, T_{vj} = 175°C		-	121	-	A
Switching Characteristic							
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 600V, I_C = 25A, R_G = 23Ω, Inductive Load, T_{vj} = 25°C		-	73	-	ns
Rise time	t_r			-	41	-	
Turn-off delay time	$t_{d(off)}$			-	269	-	
Fall time	t_f			-	39	-	
Turn-on switching energy	E_{on}			-	1.44	-	mJ
Turn-off switching energy	E_{off}			-	0.55	-	
Total switching energy	E_{ts}			-	1.99	-	
Reverse recovery time	t_{rr}	I_F = 25A, di_F/dt = 500A/ μs, V_R = 600V, T_{vj} = 25°C		-	100	-	ns
Reverse recovery current	I_{rr}			-	17	-	A
Reverse recovery charge	Q_{rr}			-	0.85	-	μC
Rate of fall of reverse recovery current during t_b	di_{rr}/dt			-	-376	-	A/μs

Switching Characteristic

Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 600V, I_C = 25A, R_G = 23Ω, Inductive Load, T_{vj} = 175°C	-	65	-	ns
Rise time	t_r		-	45	-	
Turn-off delay time	$t_{d(off)}$		-	292	-	
Fall time	t_f		-	75	-	
Turn-on switching energy	E_{on}		-	2.43	-	mJ
Turn-off switching energy	E_{off}		-	1.09	-	
Total switching energy	E_{ts}		-	3.52	-	
Reverse recovery time	t_{rr}	I_F = 25A, di_F/dt = 500A/ μs, V_R = 600V, T_{vj} = 175°C	-	150	-	ns
Reverse recovery current	I_{rr}		-	25	-	A
Reverse recovery charge	Q_{rr}		-	1.85	-	μC
Rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-374	-	A/μs

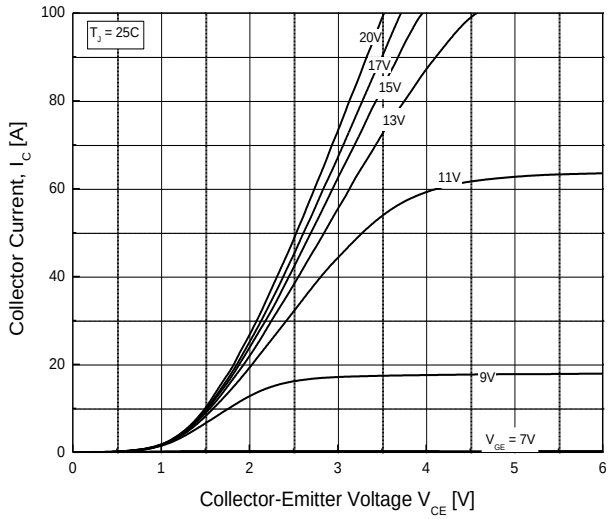


Fig.1 Typical Output Characteristic(T_J=25℃)

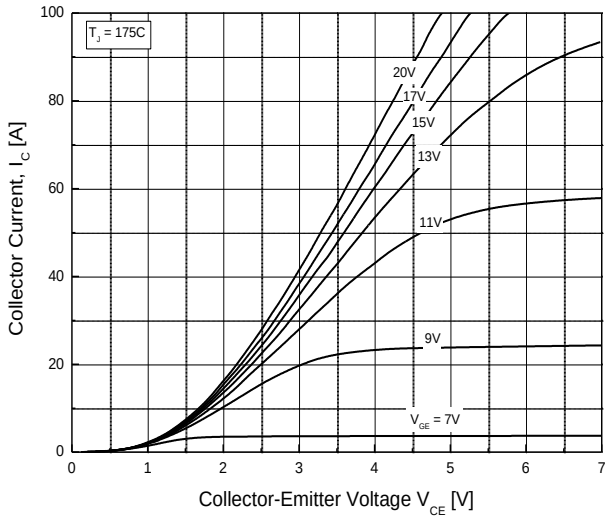


Fig.2 Typical Output Characteristic(T_J=175℃)

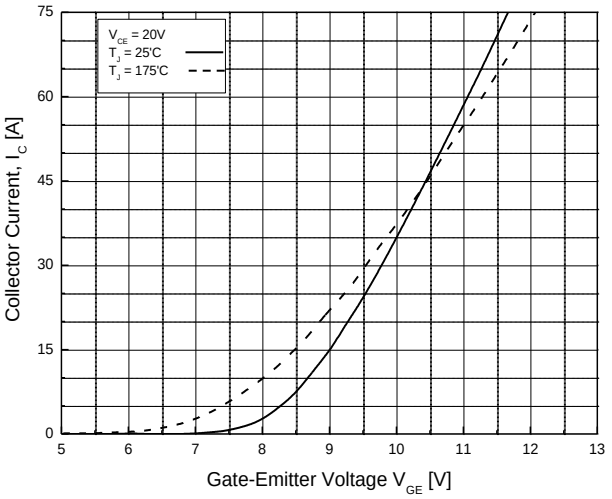


Fig.3 Typical Transfer Characteristic

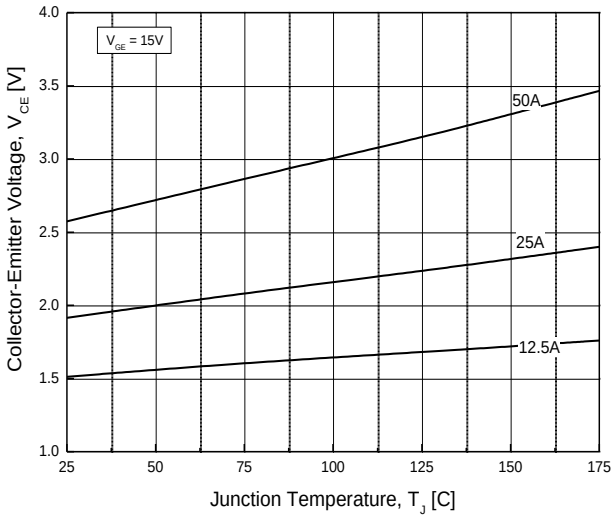


Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

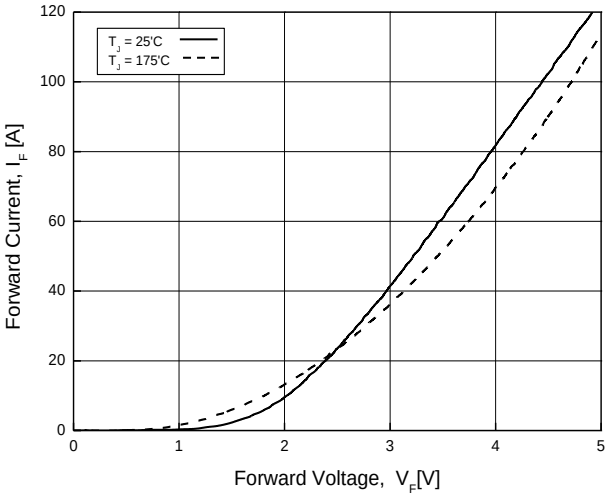


Fig.5 Diode Forward Characteristic

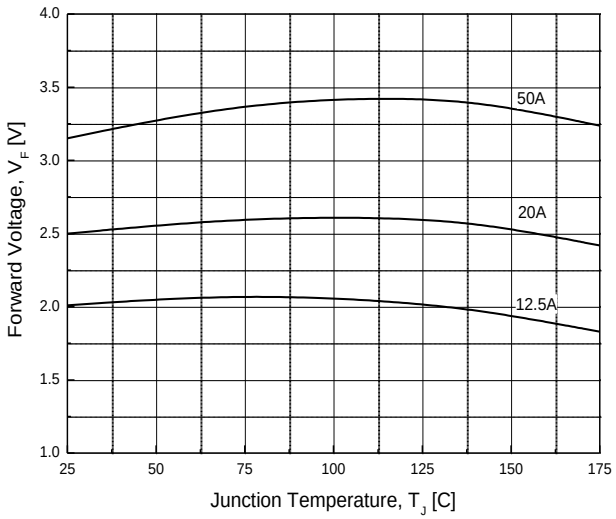


Fig.6 Diode Forward-Junction Temperature

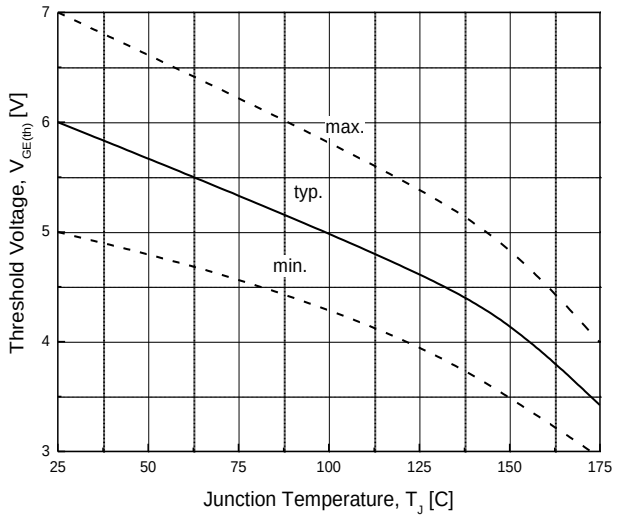


Fig.7 Threshold Voltage-Junction Temperature

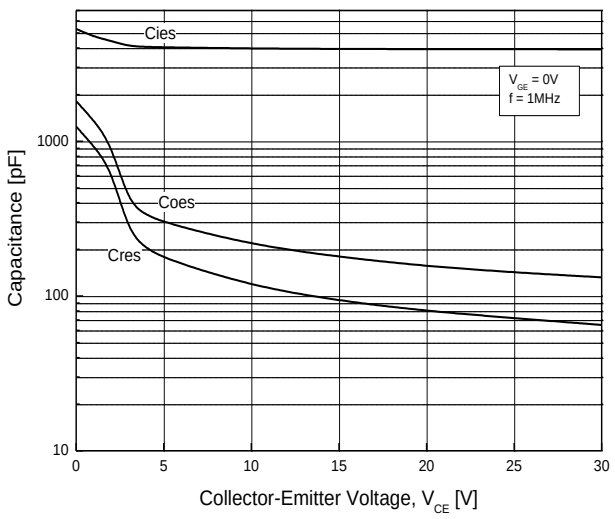


Fig.8 Typical Capacitance

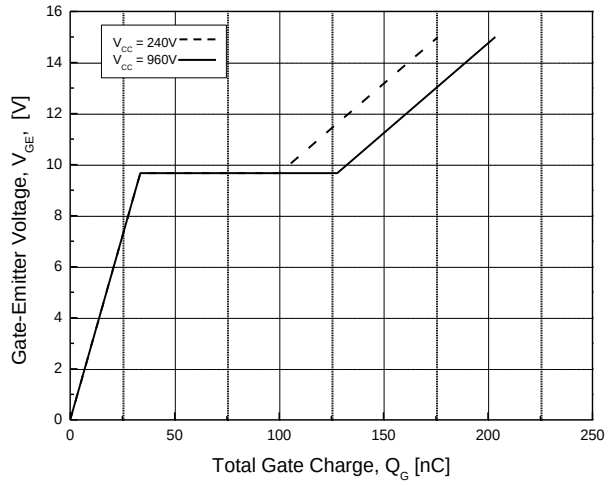


Fig.9 Typical Gate Charge

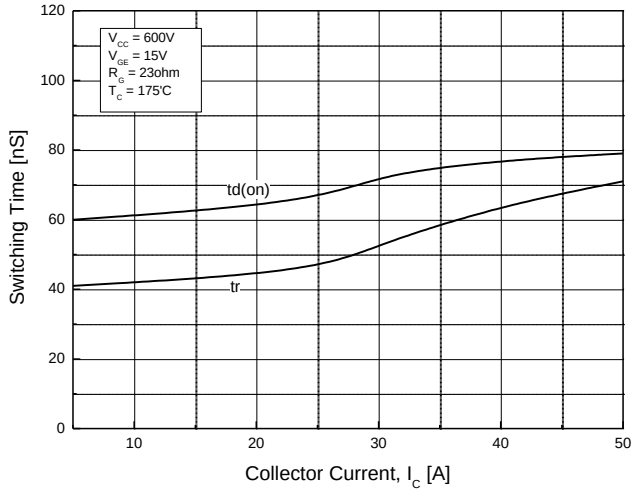


Fig.10 Typical Turn on-Collector Current

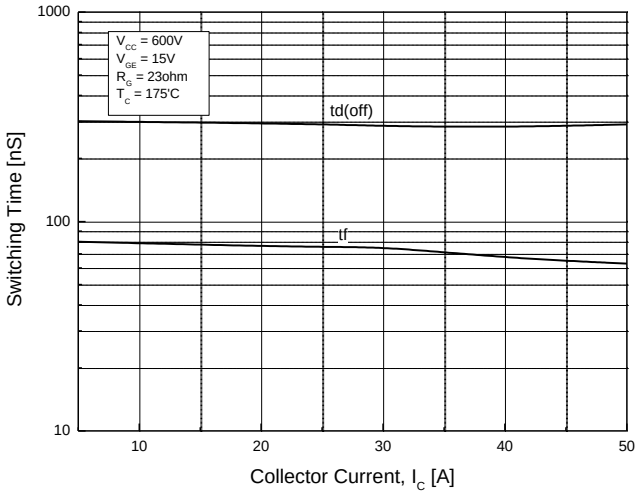


Fig.11 Typical Turn off-Collector Current

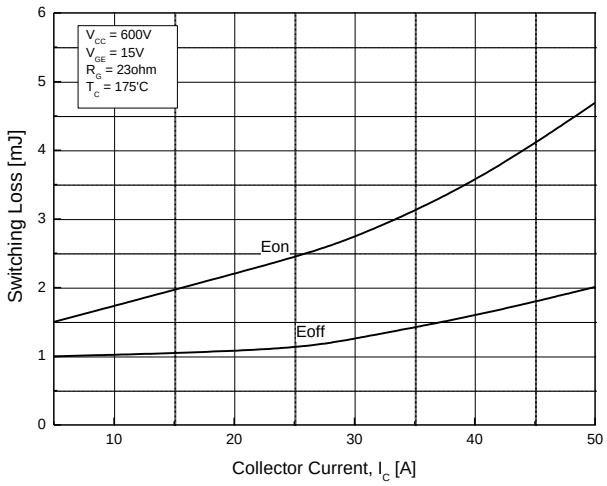


Fig.12 Switching Loss-Collector Current

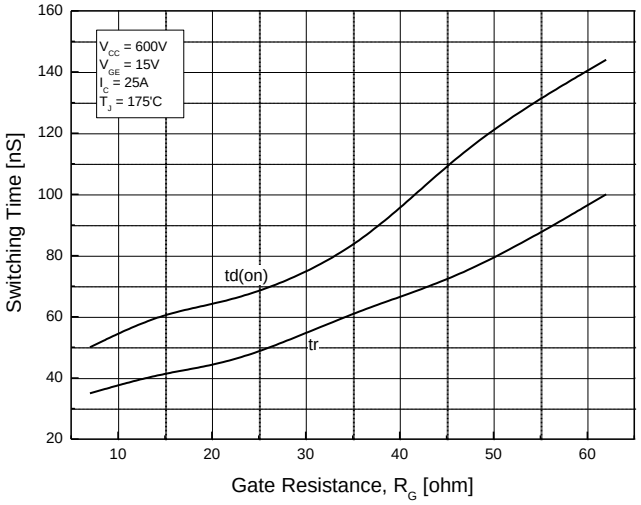


Fig.13 Turn on Characteristic-Gate Resistance

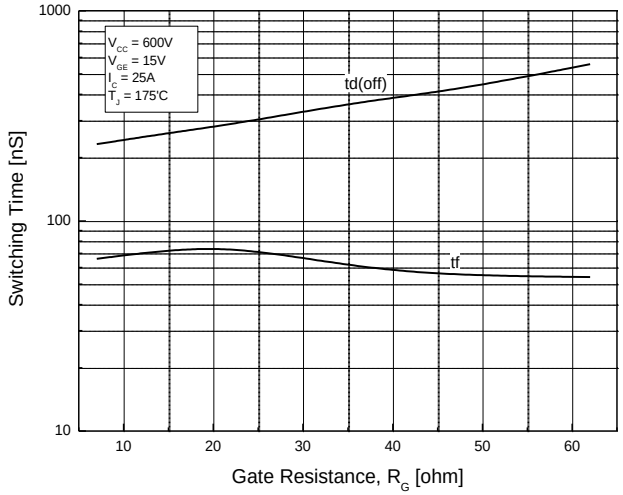


Fig.14 Turn off Characteristic-Gate Resistance

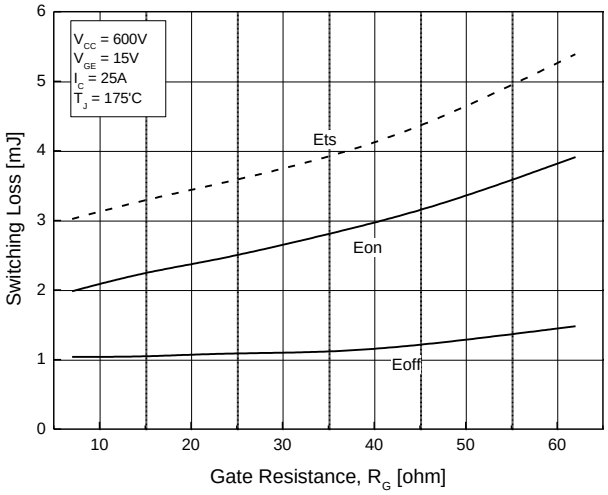


Fig.15 Switching Loss-Gate Resistance

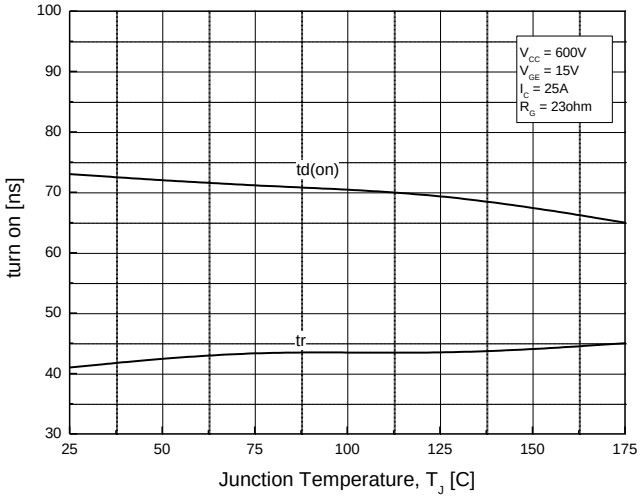


Fig.16 Turn on Characteristic -Junction Temperature

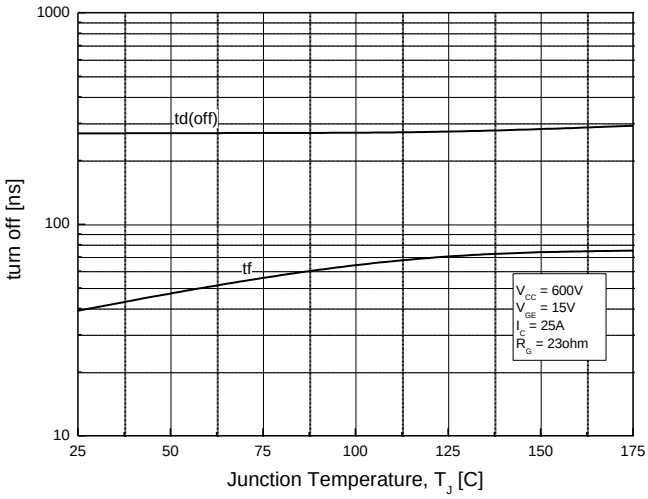


Fig.17 Turn off Characteristic -Junction Temperature

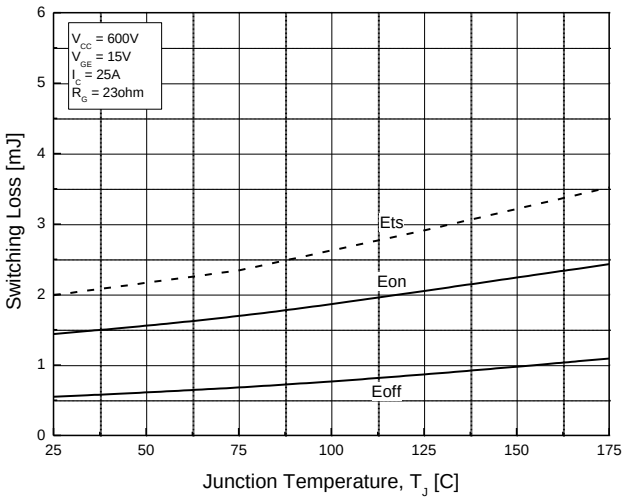


Fig.18 Switching Loss-Junction Temperature

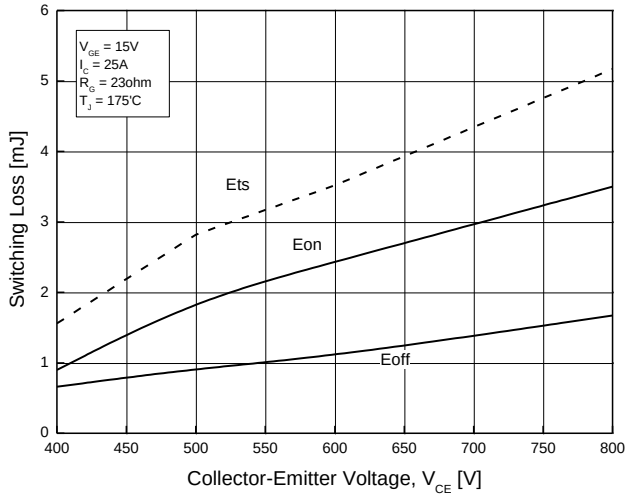


Fig.19 Switching Loss-Collector Emitter Voltage

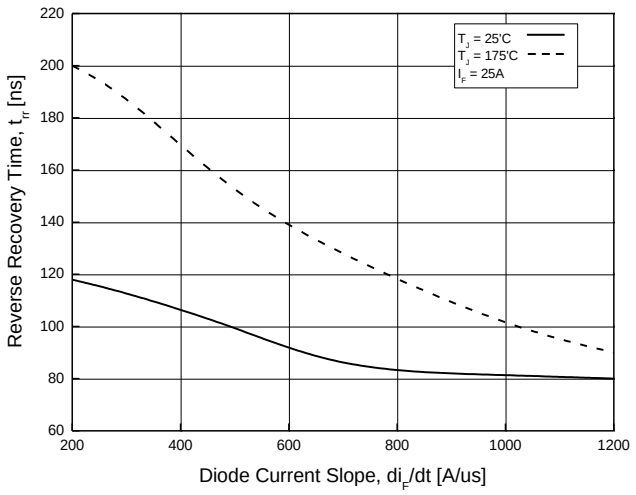


Fig.20 Reverse Recovery Time -Diode current slope

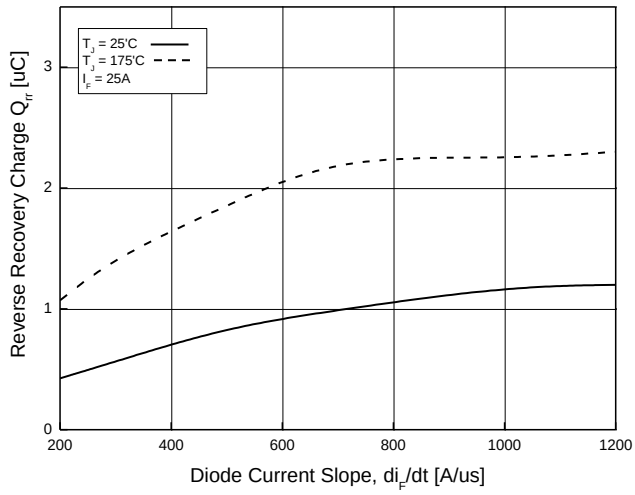


Fig.21 Reverse Recovery Charge -Diode Current Slope

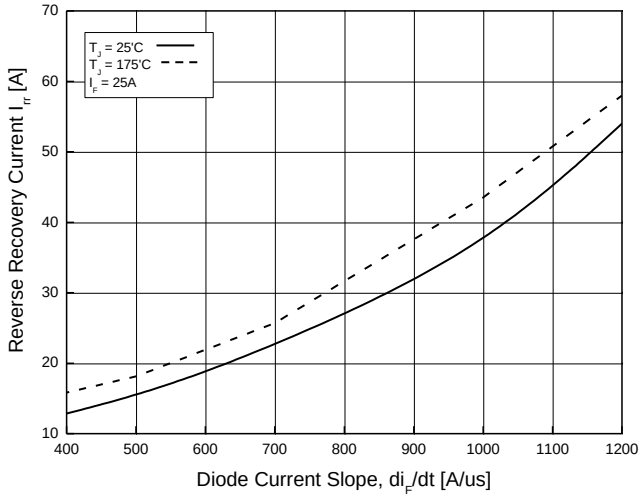


Fig.22 Reverse Recovery Current -Diode current slope

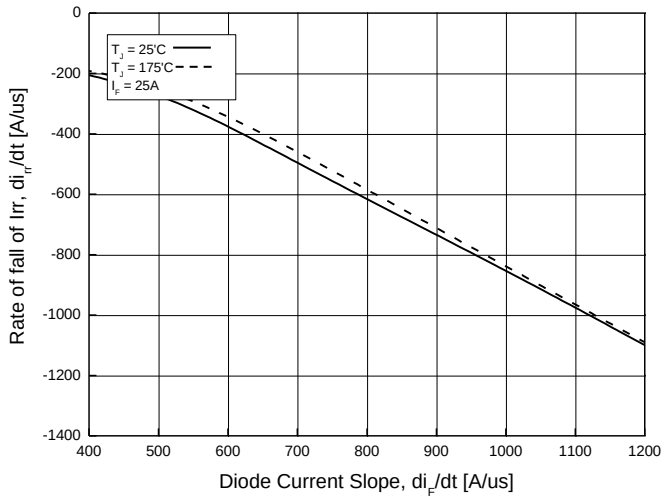


Fig.23 Rate of fall of reverse recovery current -Diode Current Slope

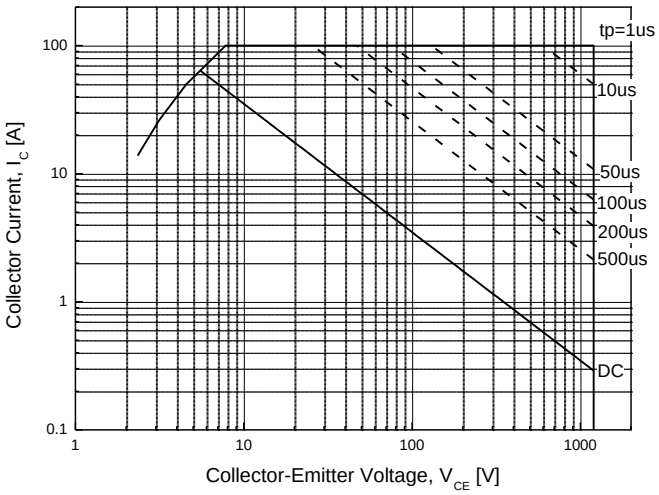


Fig.24 Forward Bias Safe Operating Area

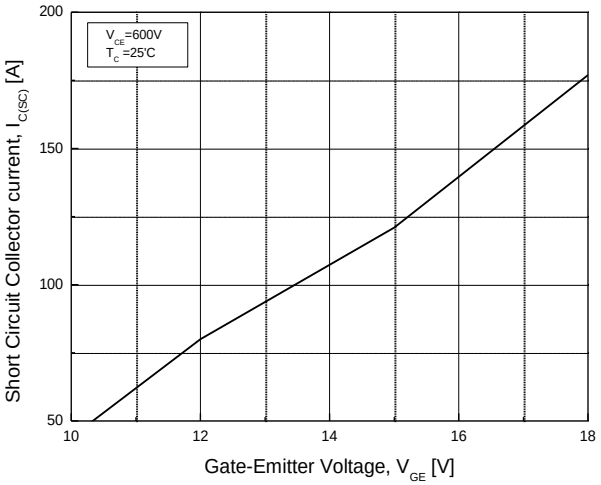


Fig.25 Typical Short Circuit Collector Current

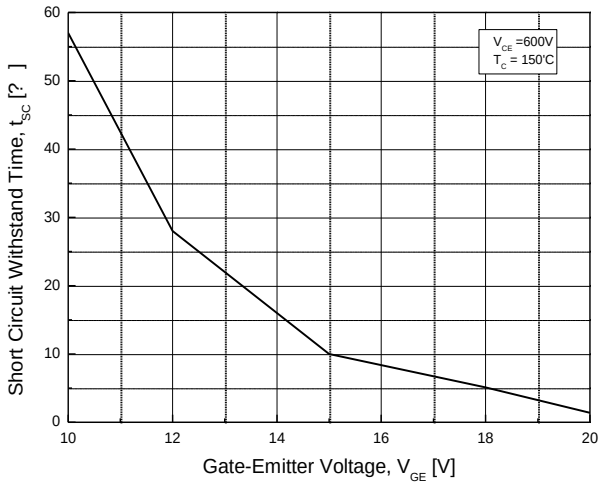


Fig.26 Typical Short Circuit Withstand Time

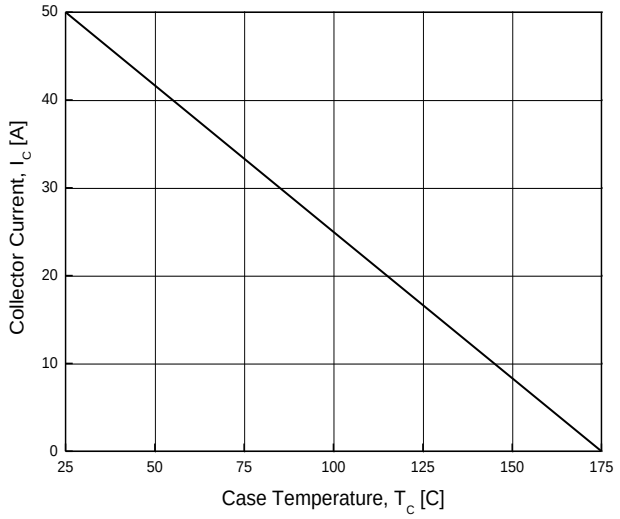


Fig.27 Case Temperature-Collector Current

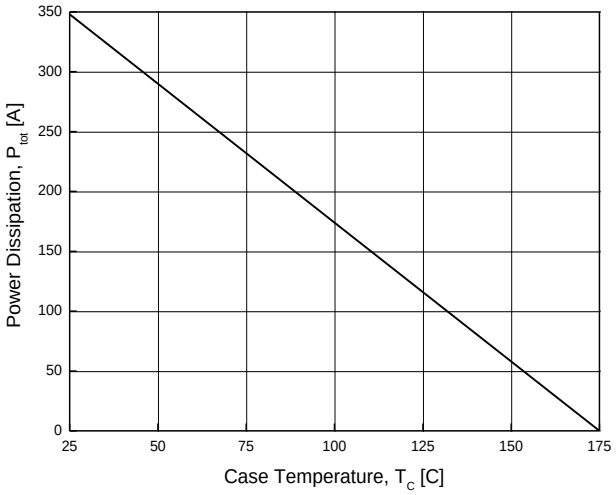


Fig.28 Power Dissipation-Case Temperature

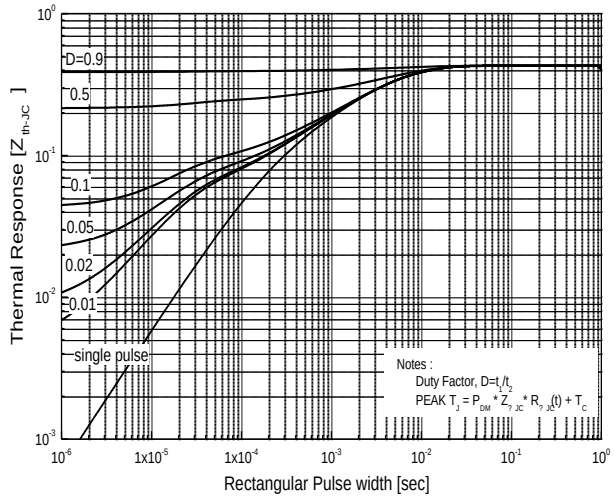


Fig.29 IGBT Transient Thermal Impedance

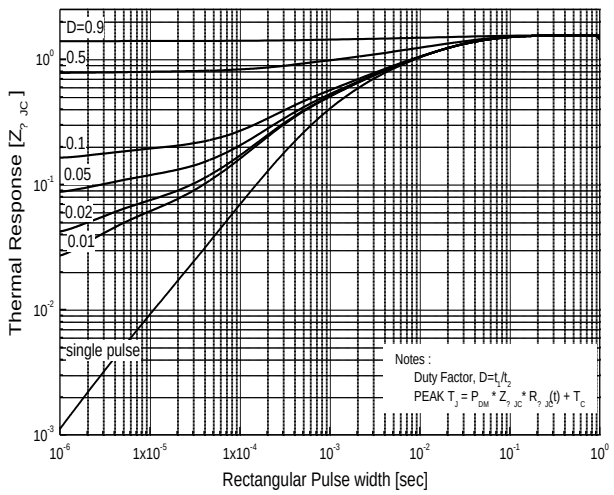
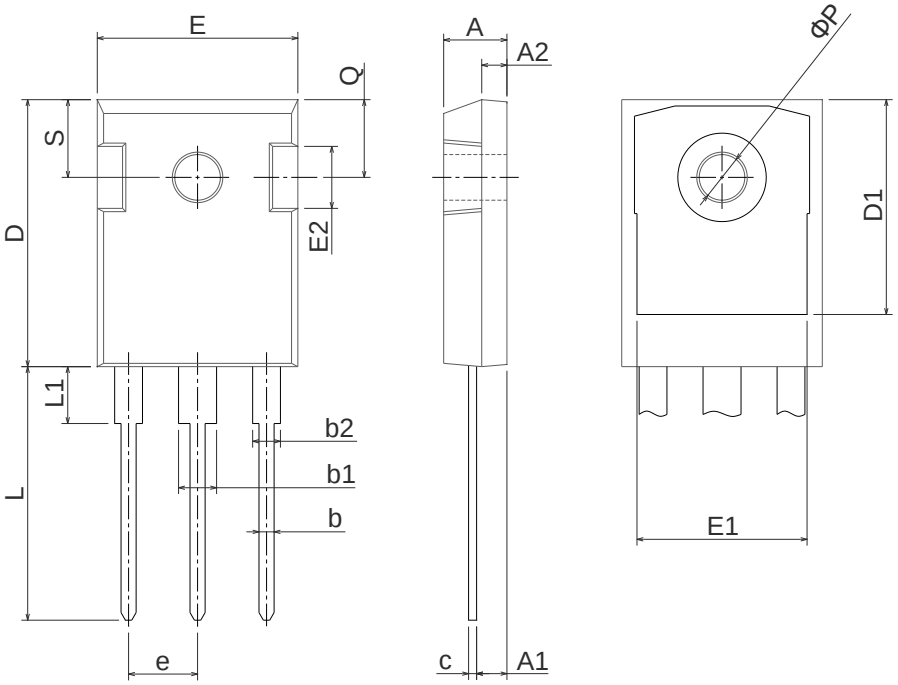


Fig.30 FRD Transient Thermal Impedance

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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