RoHS Compliant

MBF15T65PEH

650V Field Stop IGBT

General Description

This IGBT is produced using advanced MagnaChip's Field Stop Trench IGBT Technology, which provides high performance, excellent quality and high ruggedness.

This device is for motor control.

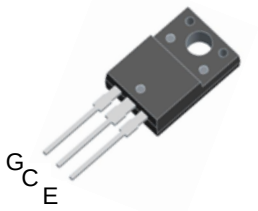
Features

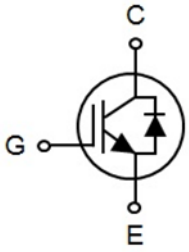
- High ruggedness for motor control
- $V_{CE(sat)}$ positive temperature coefficient
- Very soft, fast recovery anti-parallel diode
- Low EMI
- Maximum junction temperature 175°C

Applications

- Inverter for motor control

TO-220F





G : Gate
C : Collector
E : Emitter

Package outline and symbol

Maximum Ratings

Parameter		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	650	V
DC collector current, limited by T_{vjmax}	T_C=25°C	I_C	30	A
	T_C=100°C		15	A
Pulsed collector current, t_p limited by T_{vjmax}		I_{Cpuls}	60	A
Diode forward current, limited by T_{vjmax}	T_C=25°C	I_F	30	A
	T_C=100°C		15	
Diode pulsed current, t_p limited by T_{vjmax}		I_{Fpuls}	60	A
Gate-emitter voltage		V_{GE}	±20	V
Power dissipation	T_C=25°C	P_D	48	W
	T_C=100°C		24	W
Short circuit withstand time $V_{CC} \leq$ 360V, V_{GE} = 15V, T_{vj} = 150°C		t_{sc}	5	μs
Operating Junction temperature range		T_{vj}	-40~175	°C
Storage temperature range		T_{stg}	-55~150	°C

Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	62	°C/W
Thermal resistance junction-to-case for IGBT	$R_{th(j-c)}$	3.0	
Thermal resistance junction-to-case for Diode	$R_{th(j-c)}$	5.0	

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Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBF15T65PEHTH	15T65PEH	-55~150°C	TO-220F	Tube	Halogen Free

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

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Static Characteristics							
Collector-emitter breakdown voltage	BV_{CES}	I_C = 2mA, V_{GE} = 0V		650	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 15A, V_{GE}= 15V	T_{vj} = 25°C		1.65	2.00	V
			T_{vj} = 175°C		1.90		
Diode forward voltage	V_F	V_{GE} = 0V, I_F = 15A	T_{vj} = 25°C		1.85	2.30	V
			T_{vj} = 175°C		1.95		
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.5mA		4.5	5.5	6.5	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V, T_{vj} = 25°C		-	-	20	μA
Gate-emitter leakage current	I_{GES}	V_{GE} = 20V, V_{CE} = 0V		-	-	±100	nA
Dynamic Characteristics							
Total gate charge	Q_G	V_{CE} = 520V, I_C = 15A, V_{GE} = 15V		-	61		nC
Gate-emitter charge	Q_{GE}			-	11		
Gate-collector charge	Q_{GC}			-	35		
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	1129	-	pF
Output capacitance	C_{oes}			-	57	-	
Reverse transfer capacitance	C_{res}			-	31	-	
Switching Characteristics							
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 15A, R_G = 10Ω, Inductive Load, T_{vj} = 25°C		-	19	-	ns
Rise time	t_r			-	27	-	
Turn-off delay time	$t_{d(off)}$			-	128	-	
Fall time	t_f			-	32	-	
Turn-on switching energy	E_{on}			-	270	-	μJ
Turn-off switching energy	E_{off}			-	86	-	
Total switching energy	E_{ts}			-	356	-	
Turn-on delay time	$t_{d(on)}$	V_{GE} = 15V, V_{CC} = 400V, I_C = 15A, R_G = 10Ω, Inductive Load, T_{vj} = 175°C		-	17	-	ns
Rise time	t_r			-	29	-	
Turn-off delay time	$t_{d(off)}$			-	150	-	
Fall time	t_f			-	130	-	
Turn-on switching energy	E_{on}			-	342	-	μJ
Turn-off switching energy	E_{off}			-	288	-	
Total switching energy	E_{ts}			-	630	-	
Reverse recovery time	t_{rr}	I_F = 15A, di_F/dt = 200A/ μs, T_{vj} = 25°C		-	150	-	ns
Reverse recovery current	I_{rr}			-	5.2	-	A
Reverse recovery charge	Q_{rr}			-	390	-	nC
Reverse recovery time	t_{rr}	I_F = 15A, di_F/dt = 200A/ μs, T_{vj} = 175°C		-	207	-	ns
Reverse recovery current	I_{rr}			-	6.1	-	A
Reverse recovery charge	Q_{rr}			-	631	-	nC

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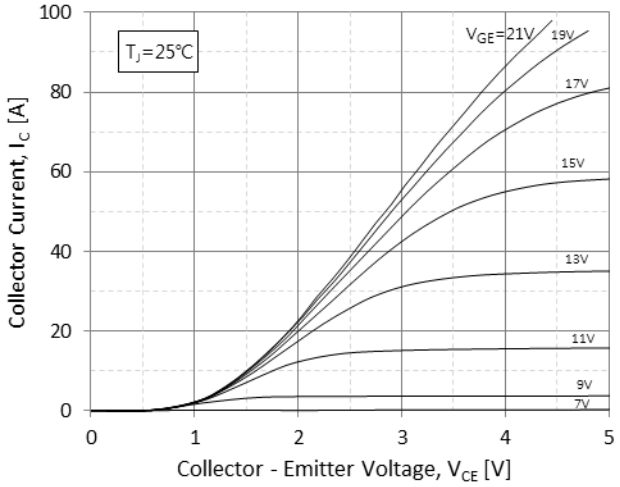

Fig.1 Typical Output Characteristics(T_J=25℃)

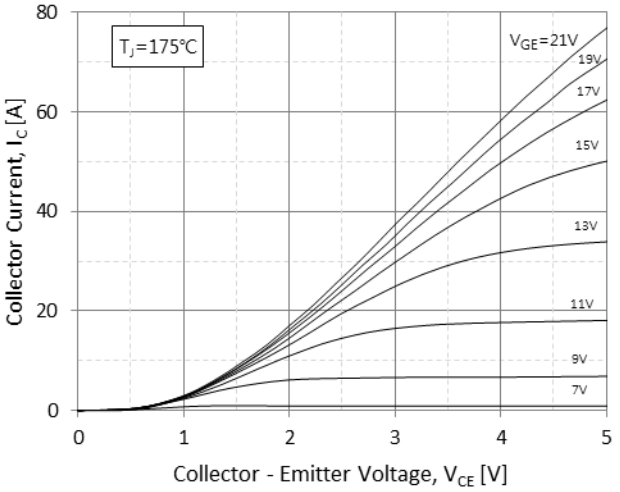

Fig.2 Typical Output Characteristics(T_J=175℃)

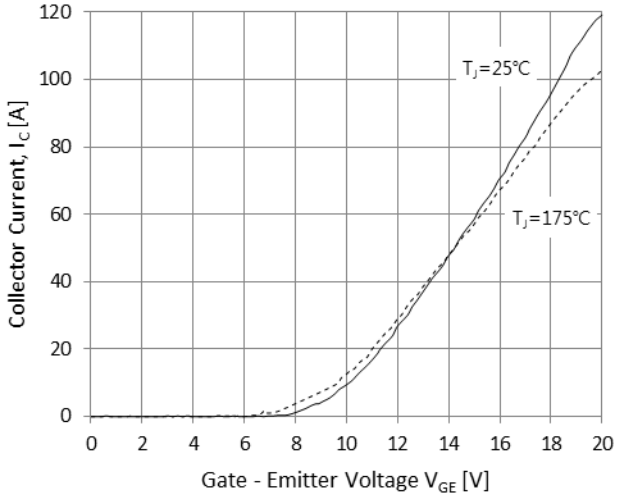

Fig.3 Typical Transfer Characteristics

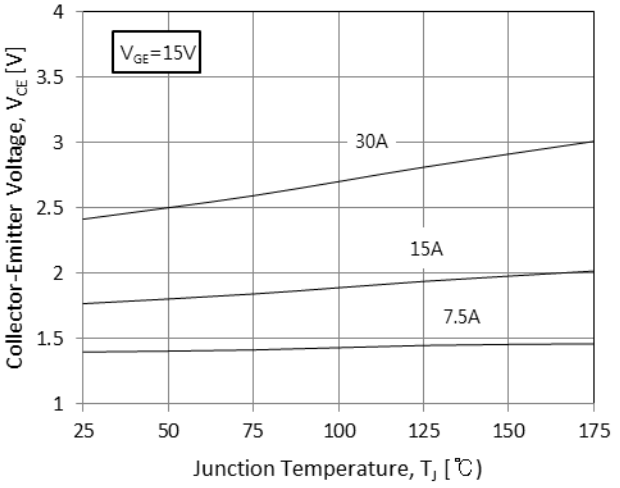

Fig.4 Typical Collector-Emitter Saturation Voltage -Junction Temperature

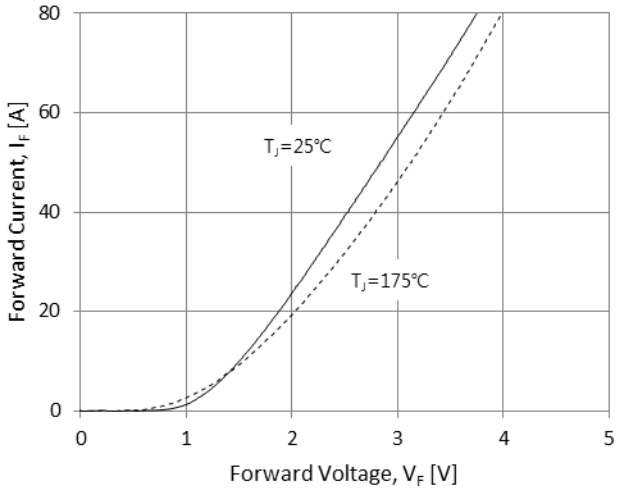

Fig.5 Diode Forward Characteristics

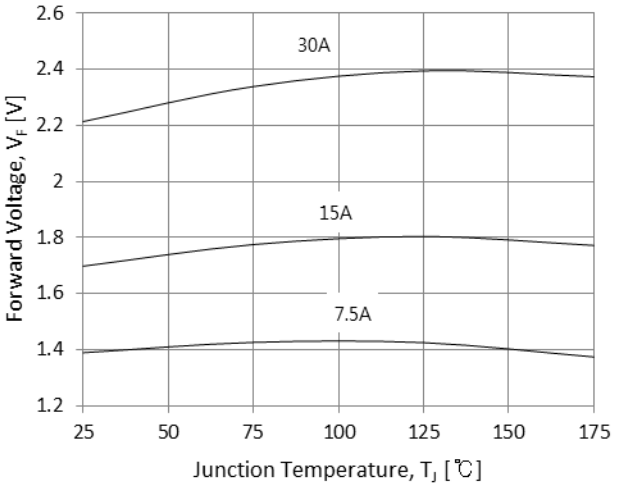

Fig.6 Diode Forward-Junction Temperature

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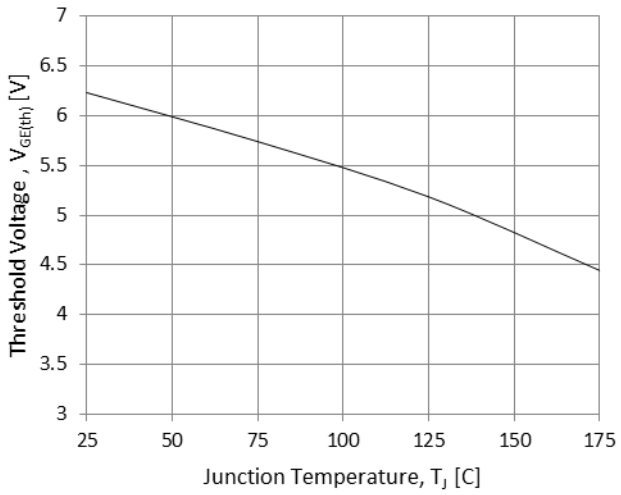

Fig.7 Threshold Voltage-Junction Temperature

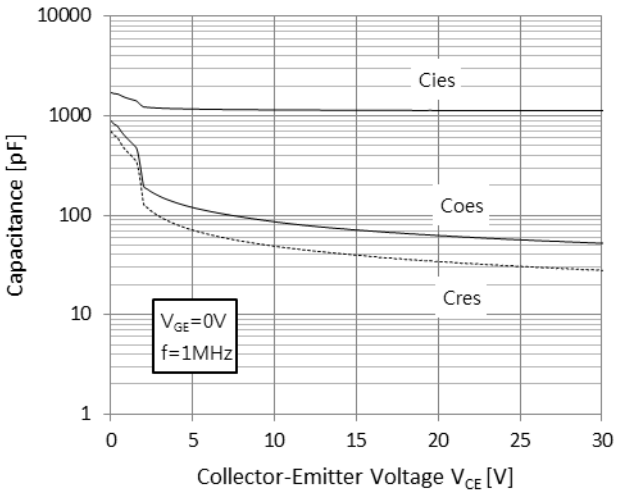

Fig.8 Typical Capacitance

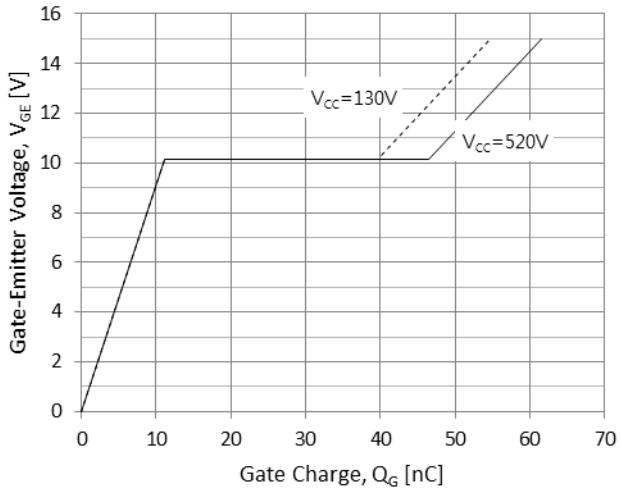

Fig.9 Typical Gate Charge

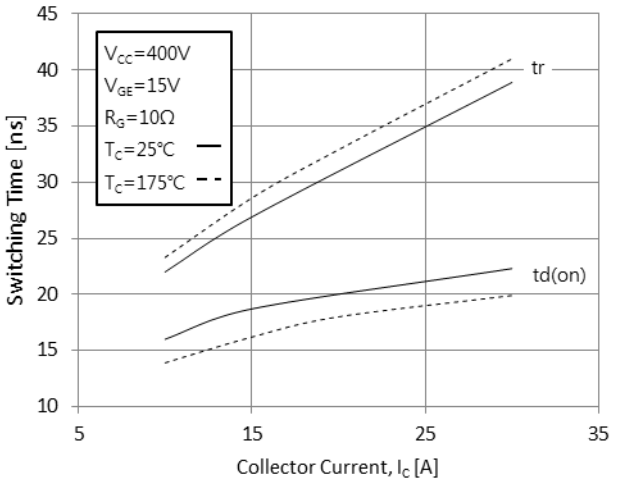

Fig.10 Typical Turn on-Collector Current

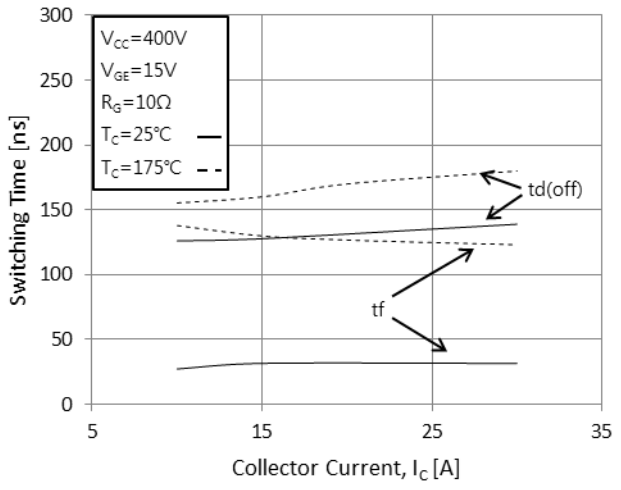

Fig.11 Typical Turn off-Collector Current

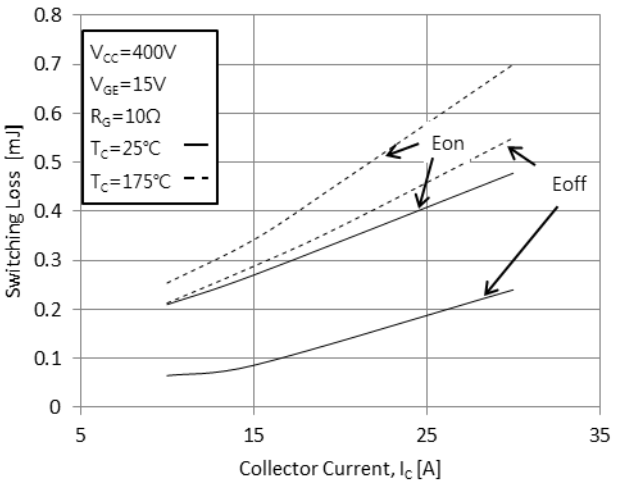

Fig.12 Switching Loss-Collector Current

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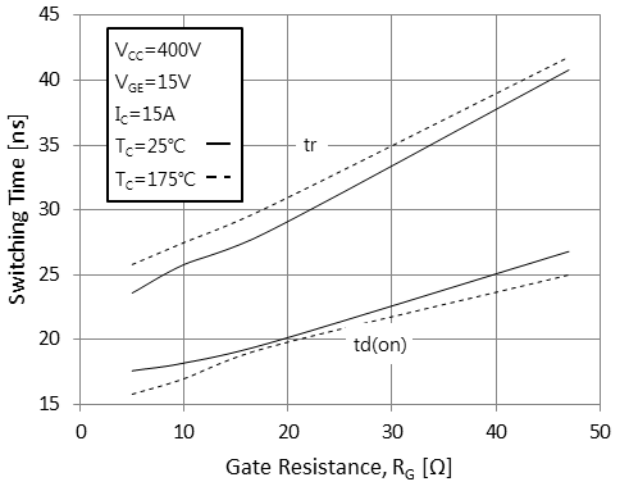

Fig.13 Turn on Characteristics-Gate Resistance

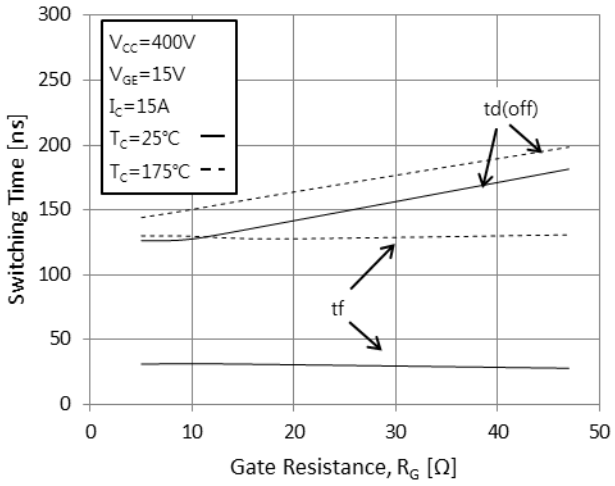

Fig.14 Turn off Characteristics-Gate Resistance

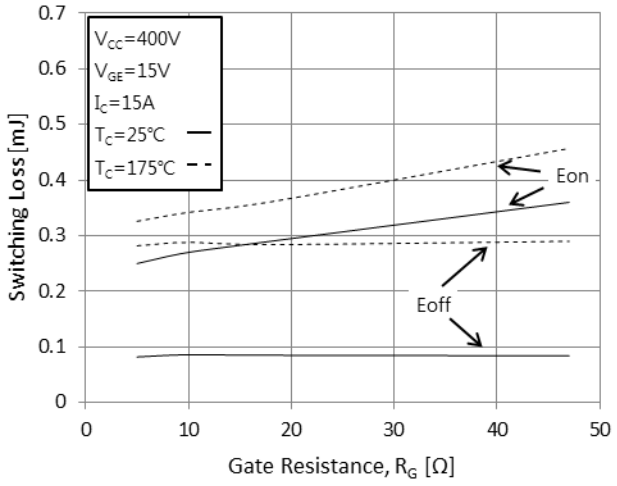

Fig.15 Switching Loss-Gate Resistance

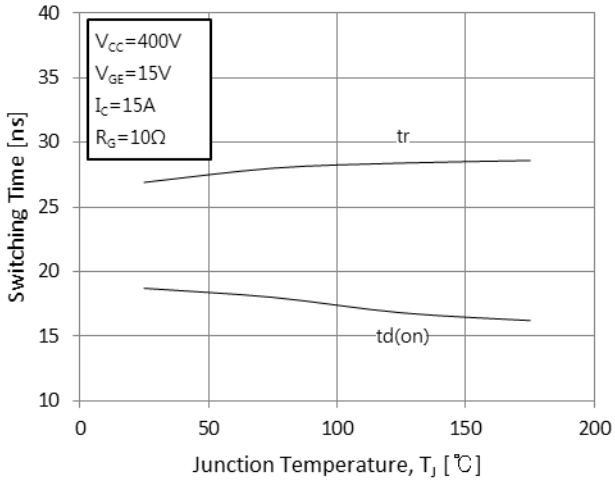

Fig.16 Turn on Characteristics-Junction Temperature

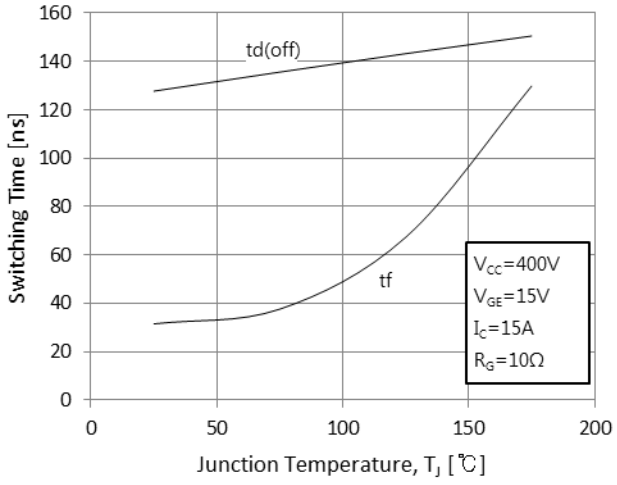

Fig.17 Turn off Characteristics -Junction Temperature

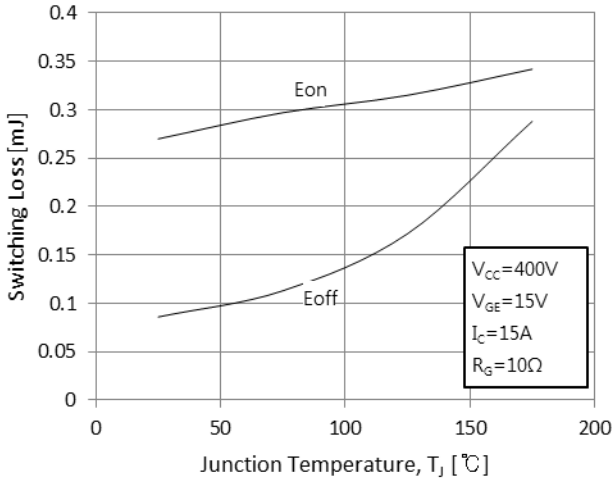

Fig.18 Switching Loss-Junction Temperature

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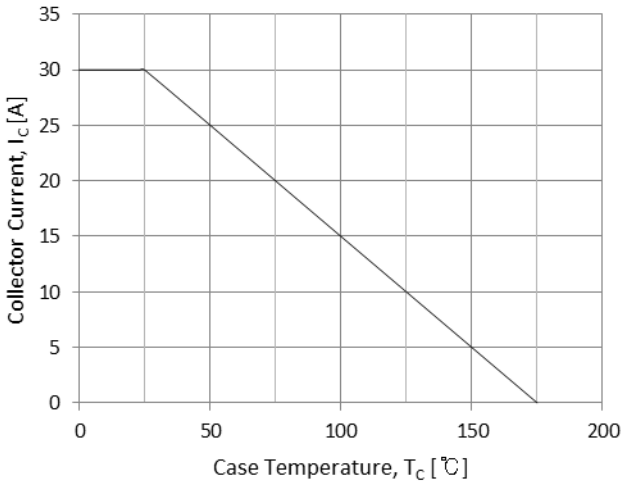

Fig.19 Case Temperature-Collector Current

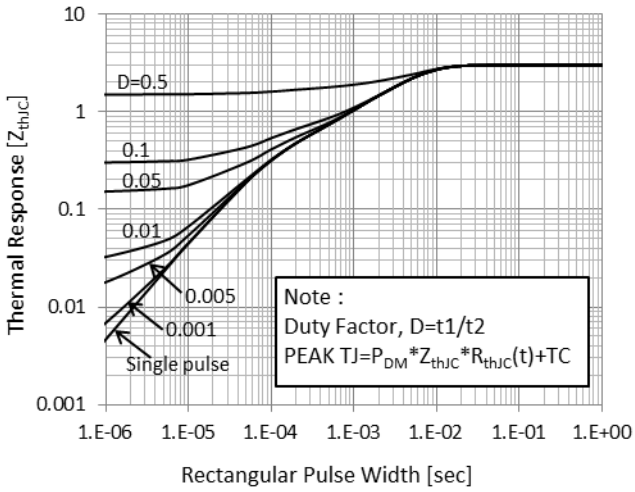

Fig.20 IGBT Transient Thermal Impedance

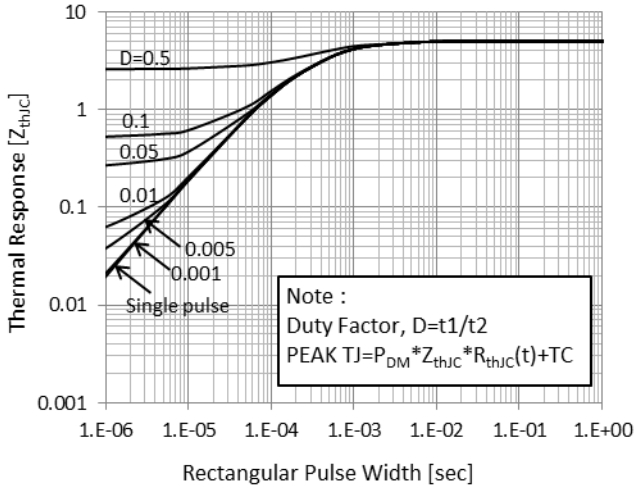

Fig.21 FRD Transient Thermal Impedance

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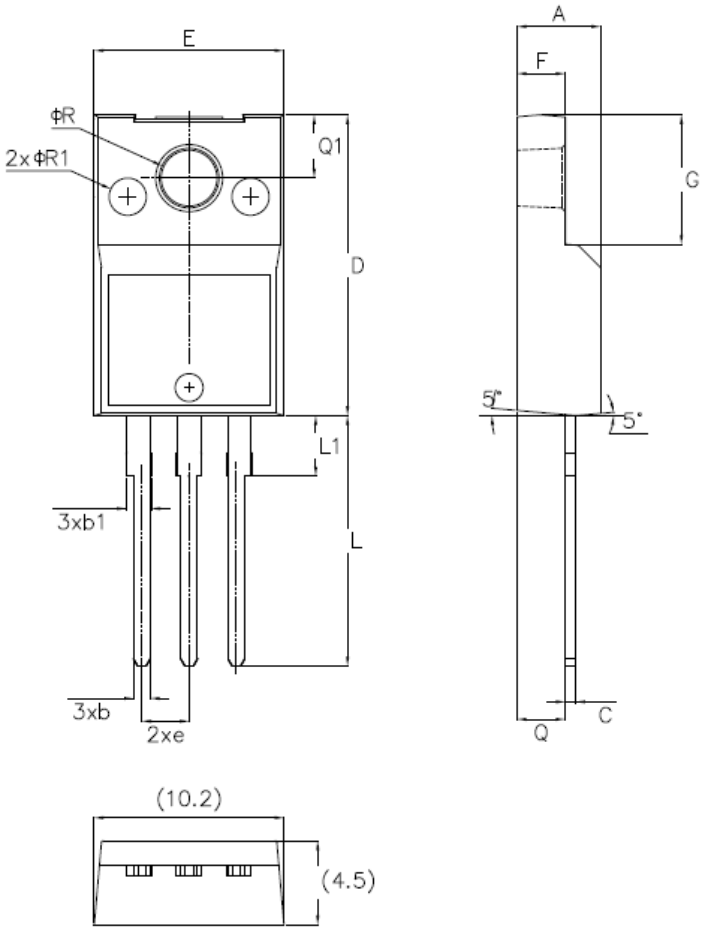
Package outline dimension

TO-220F



Symbol	Dimension (mm)		
	Min	Nom	Max
A	4.3	–	4.8
b	0.5	–	1.0
b1	0.95	–	1.7
C	0.4	–	0.8
D	14.5	–	16.4
E	9.6	–	10.4
e	2.54 BSC		
F	2.5	–	3.1
G	6.2		7.2
L	12.2	–	14.2
L1	2.9	–	4.7
Q	2.3	–	2.9
Q1	2.4		3.5
ΦR	3.00	–	3.4
ΦR1	2.0		

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