

General Description

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

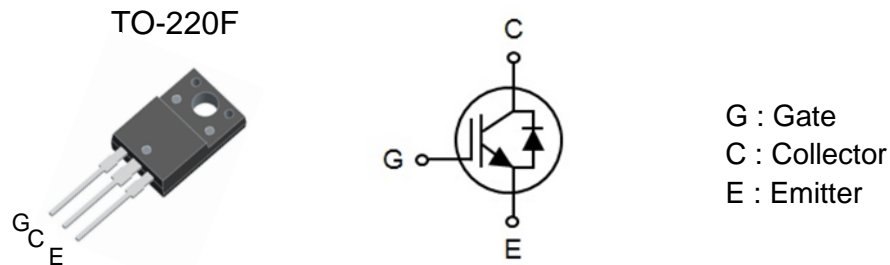
This device is for motor control.

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



Package outline and symbol

G : Gate
C : Collector
E : Emitter

Maximum Ratings

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

Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	62	$^\circ C/W$
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	

Ordering Information

Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBF15T65PEH	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	-	μJ
Turn-on switching energy	E _{on}		-	270	-	
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	-	μJ
Turn-on switching energy	E _{on}		-	342	-	
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

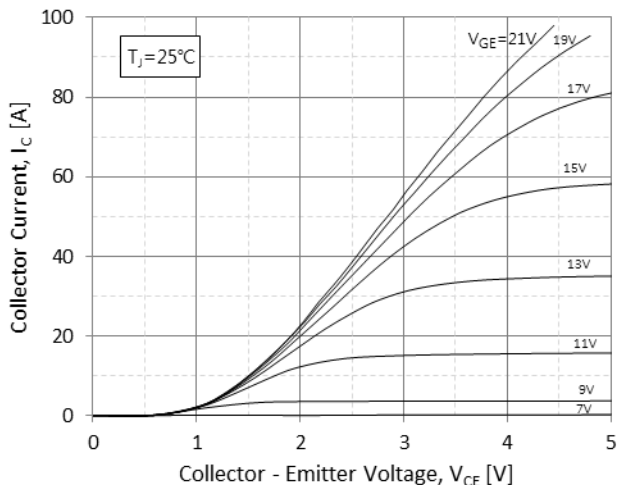


Fig.1 Typical Output Characteristics ($T_J = 25^\circ\text{C}$)

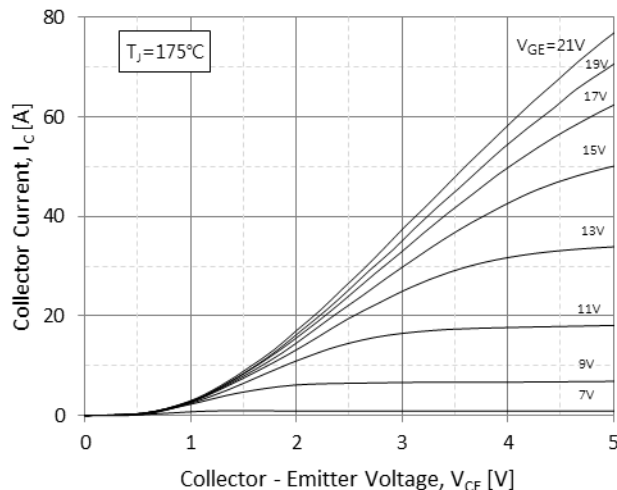


Fig.2 Typical Output Characteristics ($T_J = 175^\circ\text{C}$)

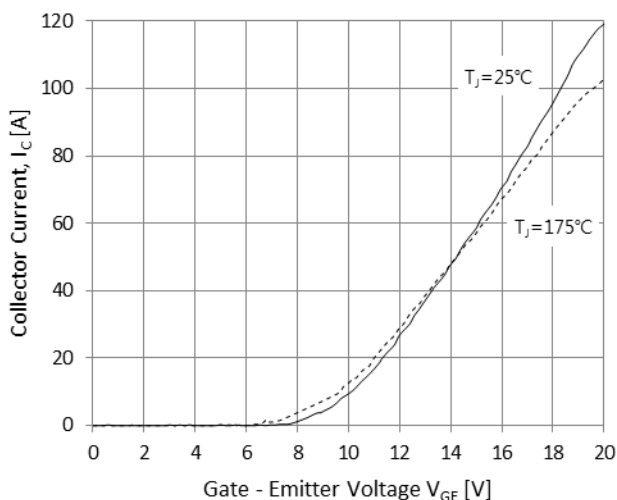


Fig.3 Typical Transfer Characteristics

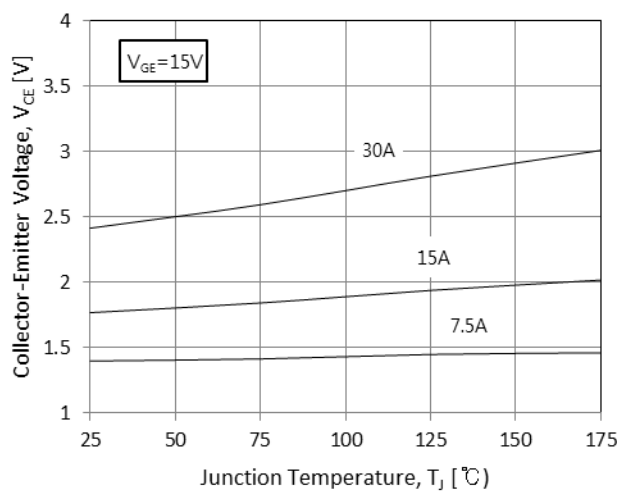


Fig.4 Typical Collector-Emitter Saturation Voltage - Junction Temperature

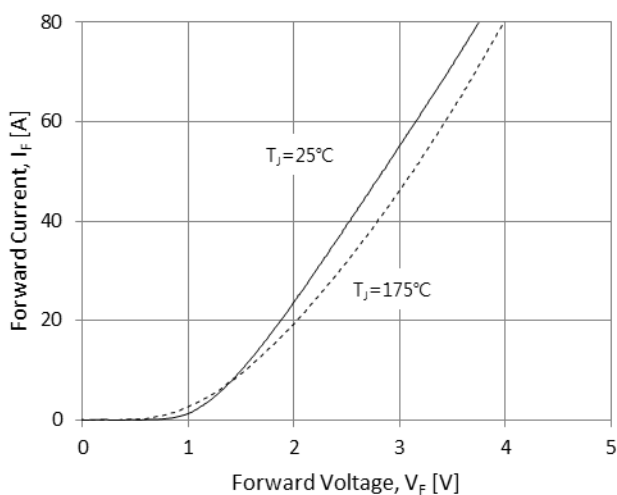


Fig.5 Diode Forward Characteristics

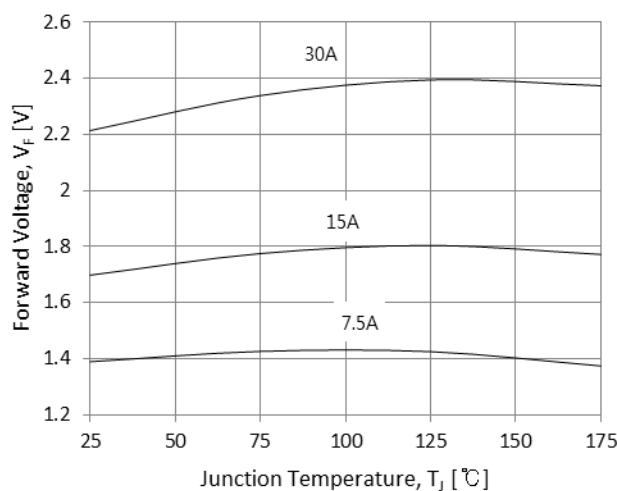


Fig.6 Diode Forward-Junction Temperature

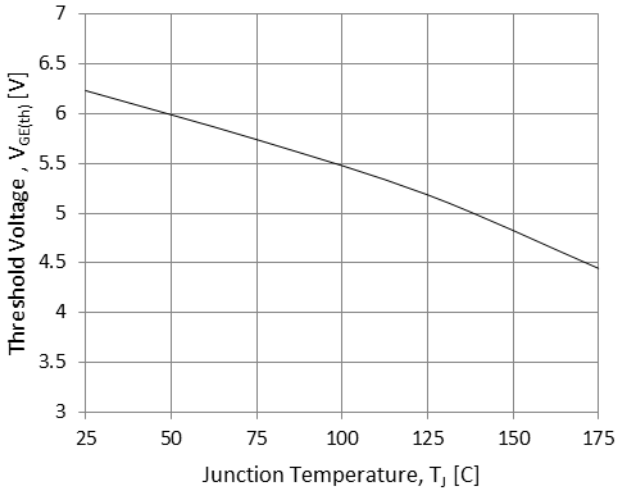


Fig.7 Threshold Voltage-Junction Temperature

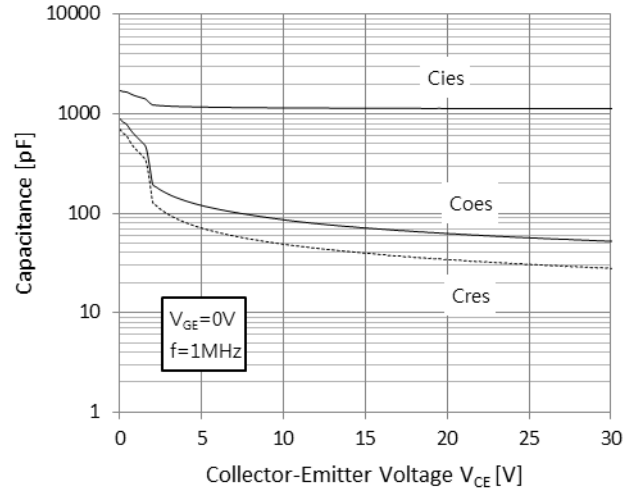


Fig.8 Typical Capacitance

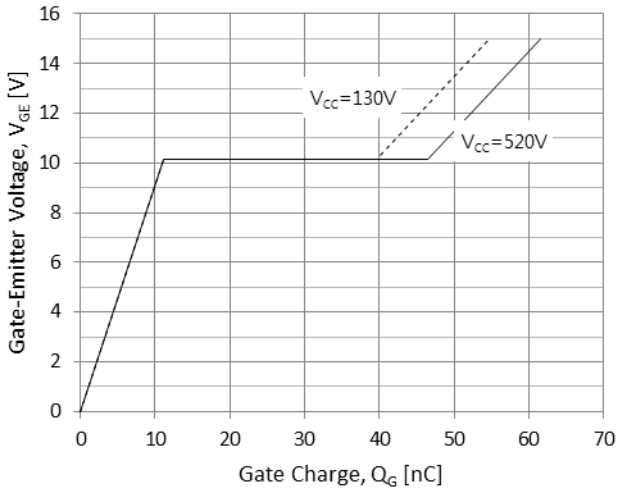


Fig.9 Typical Gate Charge

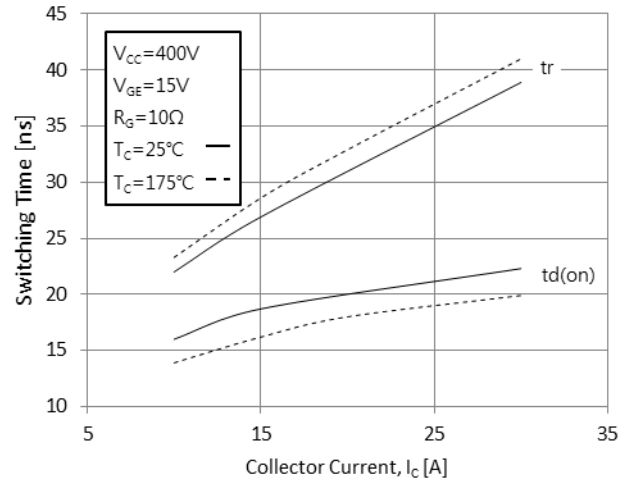


Fig.10 Typical Turn on-Collector Current

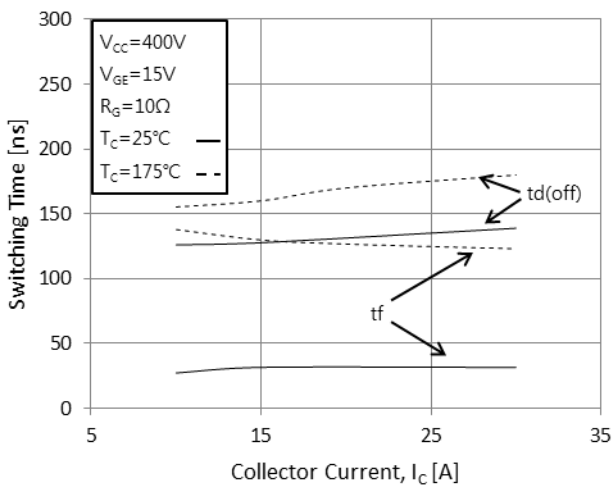


Fig.11 Typical Turn off-Collector Current

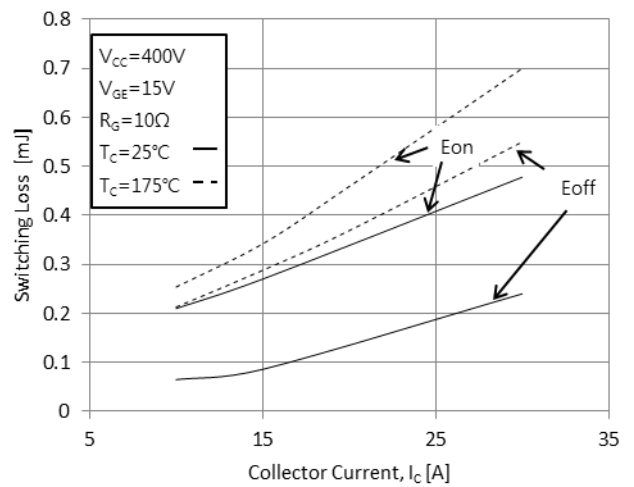


Fig.12 Switching Loss-Collector Current

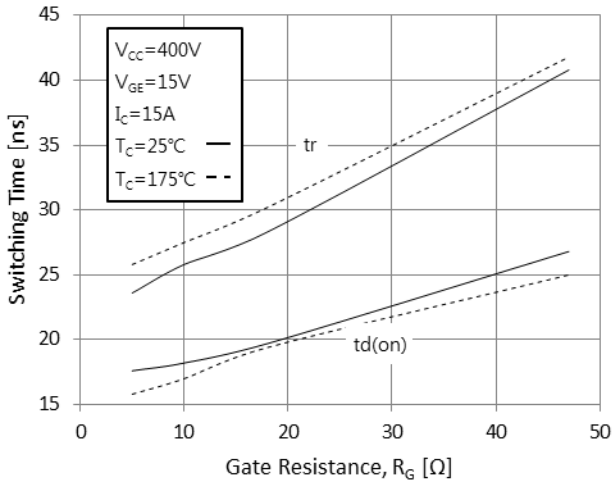


Fig.13 Turn on Characteristics-Gate Resistance

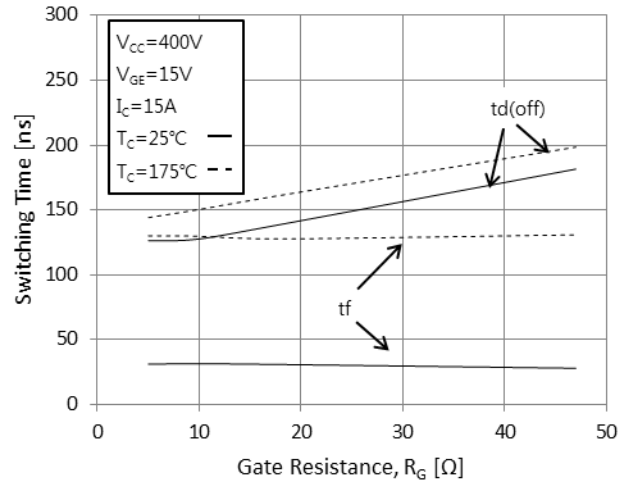


Fig.14 Turn off Characteristics-Gate Resistance

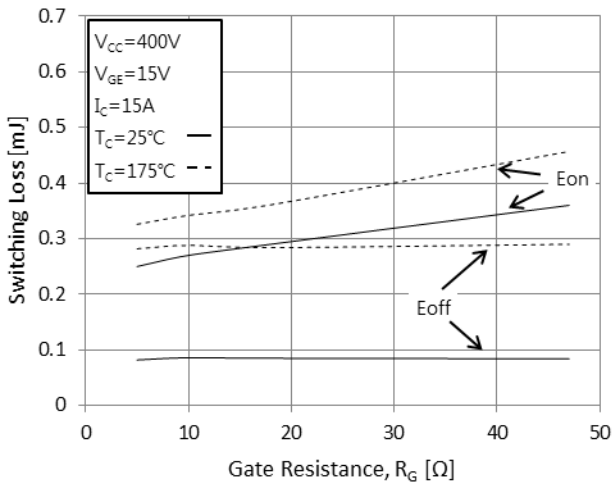


Fig.15 Switching Loss-Gate Resistance

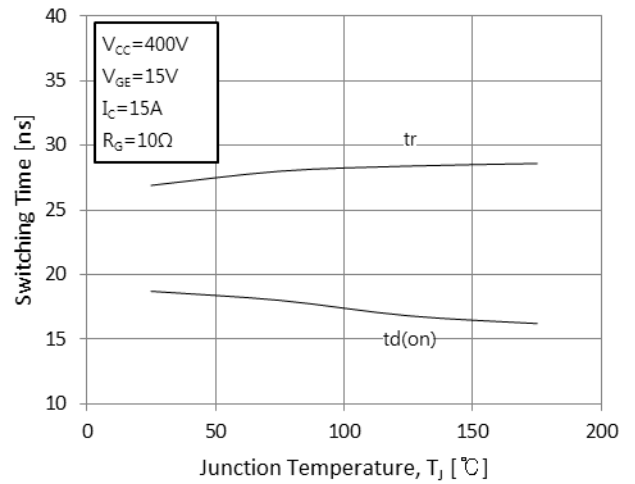


Fig.16 Turn on Characteristics-Junction Temperature

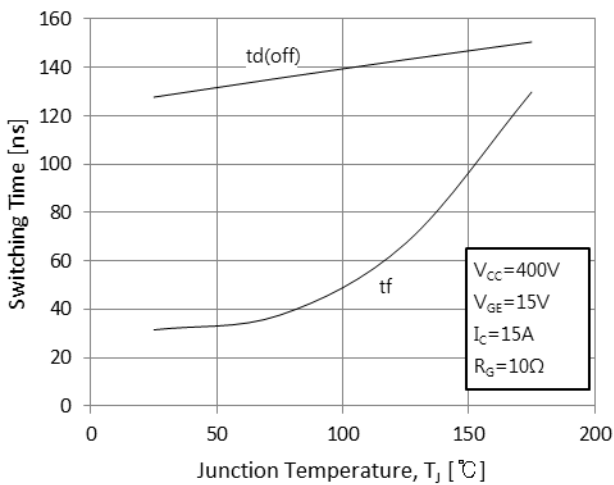


Fig.17 Turn off Characteristics-Junction Temperature

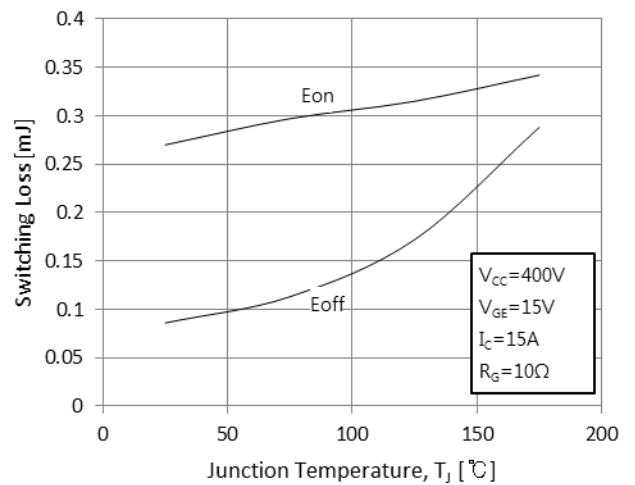


Fig.18 Switching Loss-Junction Temperature

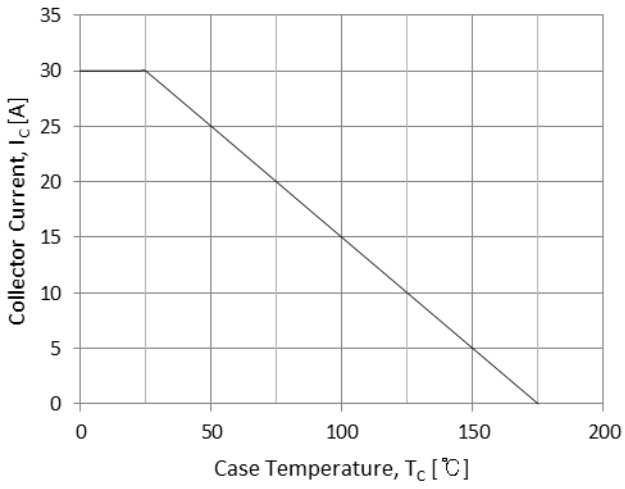


Fig.19 Case Temperature-Collector Current

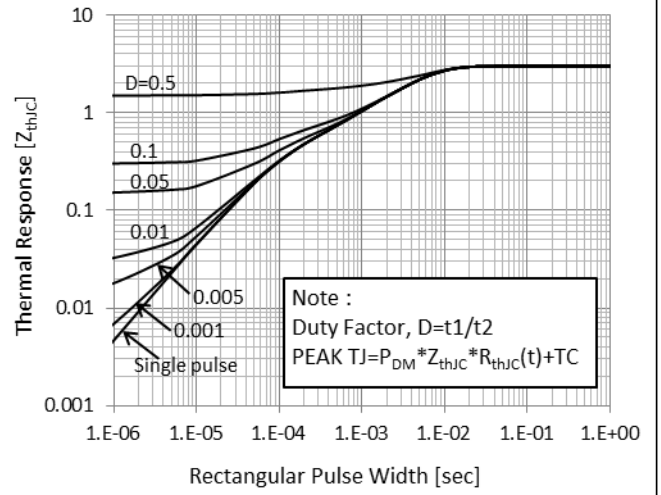


Fig.20 IGBT Transient Thermal Impedance

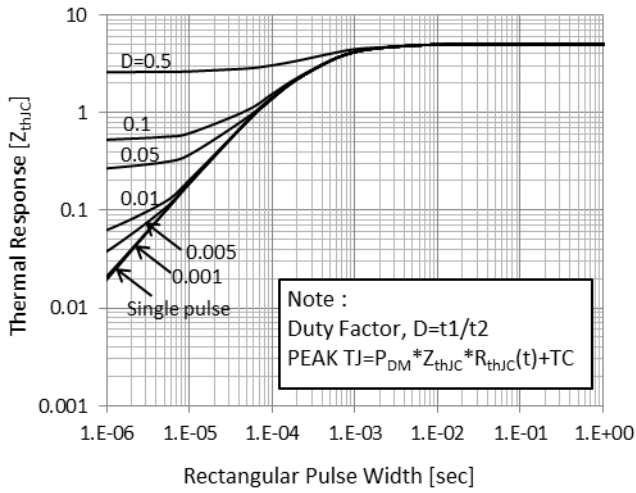
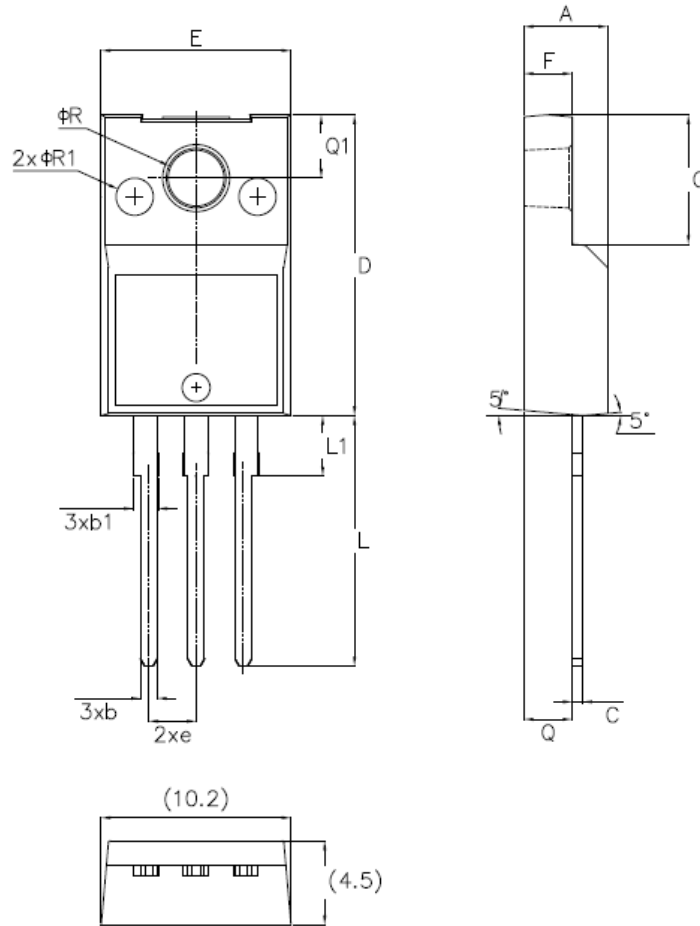


Fig.21 FRD Transient Thermal Impedance

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
$\Phi R1$	2.0		

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