

### General Description

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

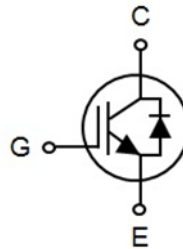
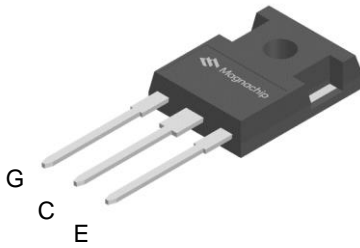
### Features

- 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

- PV Inverter
- UPS Power
- Welder

TO-247



G : Gate  
C : Collector  
E : Emitter

### Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector-emitter voltage	$V_{CE}$	650	V
DC collector current, limited by $T_{vjmax}$	$I_C$	$T_C=25^\circ C$	100
		$T_C=100^\circ C$	75
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpuls}$	225	A
Diode forward current, limited by $T_{vjmax}$	$I_F$	$T_C=25^\circ C$	80
		$T_C=100^\circ C$	50
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	225	A
Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Power dissipation	$P_D$	$T_C=25^\circ C$	428
		$T_C=100^\circ C$	214
Short circuit withstand time $V_{CC} \leq 360V, V_{GE} = 15V, T_{vj} = 150^\circ C$	$t_{sc}$	5	$\mu s$
Operating Junction temperature range	$T_{vj}$	-40~175	$^\circ C$
Storage temperature range	$T_{stg}$	-55~150	$^\circ C$

### Thermal Characteristics

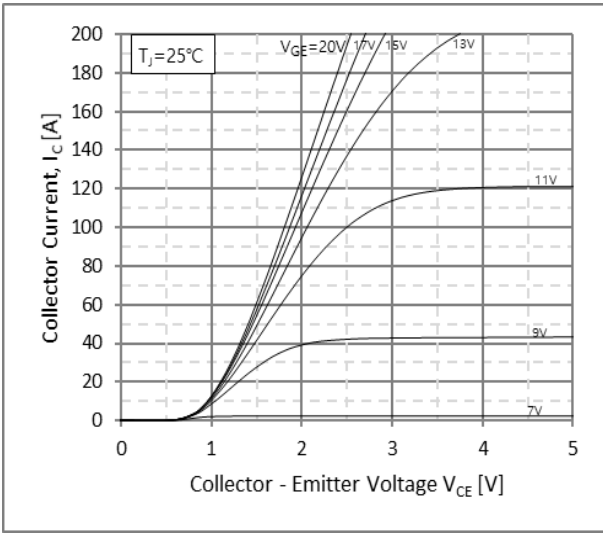
Parameter	Symbol	Rating	Unit
Thermal resistance junction-to-ambient	$R_{th(j-a)}$	40	$^\circ C/W$
Thermal resistance junction-to-case for IGBT	$R_{th(j-c)}$	0.35	
Thermal resistance junction-to-case for Diode	$R_{th(j-c)}$	0.70	

### Ordering Information

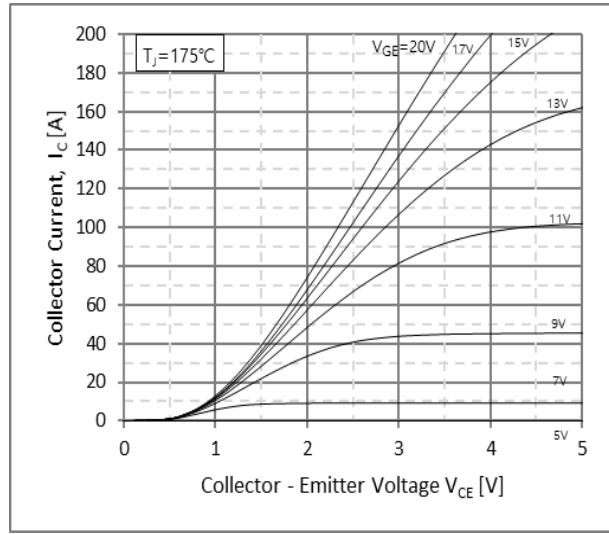
Part Number	Marking	Temp. Range	Package	Packing	RoHS Status
MBQ75T65PEH	75T65PEH	-55~175°C	TO-247	Tube	Halogen Free

### Electrical Characteristics (T<sub>vj</sub> = 25°C unless otherwise specified)

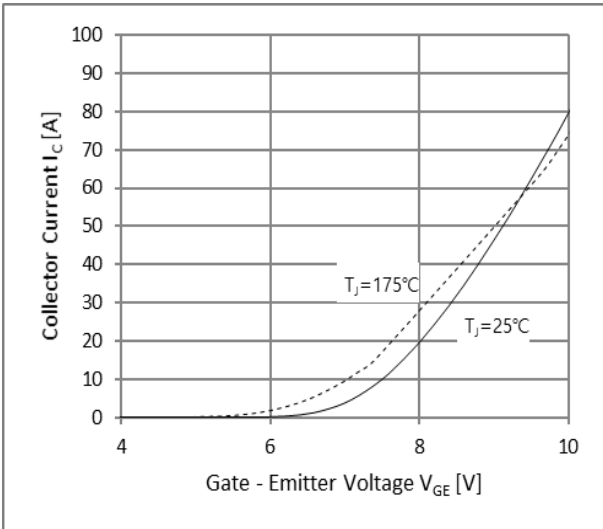
Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
<b>Static Characteristics</b>							
Collector-emitter breakdown voltage	BV <sub>CES</sub>	I <sub>C</sub> = 2mA, V <sub>GE</sub> = 0V	650	-	-	V	
Collector-emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 75A, V <sub>GE</sub> = 15V	T <sub>vj</sub> = 25°C	-	1.7	2	V
			T <sub>vj</sub> = 175°C	-	2.2	-	
Diode forward voltage	V <sub>F</sub>	V <sub>GE</sub> = 0V, I <sub>F</sub> = 50A	T <sub>vj</sub> = 25°C	-	1.55	1.8	V
			T <sub>vj</sub> = 175°C	-	1.6	-	
Gate-emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 1.2mA	4.5	5.5	6.5	V	
Zero gate voltage collector current	I <sub>CES</sub>	V <sub>CE</sub> = 650V, V <sub>GE</sub> = 0V, T <sub>vj</sub> = 25°C	-	-	20	μA	
Gate-emitter leakage current	I <sub>GES</sub>	V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V	-	-	±100	nA	
<b>Dynamic Characteristics</b>							
Total gate charge	Q <sub>G</sub>	V <sub>CE</sub> = 520V, I <sub>C</sub> = 75A, V <sub>GE</sub> = 15V	-	280	-	nC	
Gate-emitter charge	Q <sub>GE</sub>		-	42	-		
Gate-collector charge	Q <sub>GC</sub>		-	114	-		
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz	-	6900	-	pF	
Output capacitance	C <sub>oes</sub>		-	230	-		
Reverse transfer capacitance	C <sub>res</sub>		-	158	-		
<b>Switching Characteristics</b>							
Turn-on delay time	t <sub>d(on)</sub>	V <sub>GE</sub> = -5/15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>vj</sub> = 25°C	-	38	-	ns	
Rise time	t <sub>r</sub>		-	192	-		
Turn-off delay time	t <sub>d(off)</sub>		-	156	-		
Fall time	t <sub>f</sub>		-	103	-		
Turn-on switching energy	E <sub>on</sub>		V <sub>GE</sub> = -5/15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>vj</sub> = 175°C	-	4.69	-	mJ
Turn-off switching energy	E <sub>off</sub>			-	1.75	-	
Total switching energy	E <sub>ts</sub>	-		6.44	-		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>GE</sub> = -5/15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>vj</sub> = 175°C	-	37	-	ns	
Rise time	t <sub>r</sub>		-	194	-		
Turn-off delay time	t <sub>d(off)</sub>		-	168	-		
Fall time	t <sub>f</sub>		-	106	-		
Turn-on switching energy	E <sub>on</sub>		V <sub>GE</sub> = -5/15V, V <sub>CC</sub> = 400V, I <sub>C</sub> = 75A, R <sub>G</sub> = 10Ω, Inductive Load, T <sub>vj</sub> = 175°C	-	5.62	-	mJ
Turn-off switching energy	E <sub>off</sub>			-	2.04	-	
Total switching energy	E <sub>ts</sub>	-		7.66	-		
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50A, di <sub>F</sub> /dt = 200A/μs, T <sub>vj</sub> = 25°C	-	181	-	ns	
Reverse recovery current	I <sub>rr</sub>		-	10.4	-	A	
Reverse recovery charge	Q <sub>rr</sub>		-	1.12	-	μC	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50A, di <sub>F</sub> /dt = 200A/μs, T <sub>vj</sub> = 175°C	-	384	-	ns	
Reverse recovery current	I <sub>rr</sub>		-	13.3	-	A	
Reverse recovery charge	Q <sub>rr</sub>		-	3.07	-	μC	



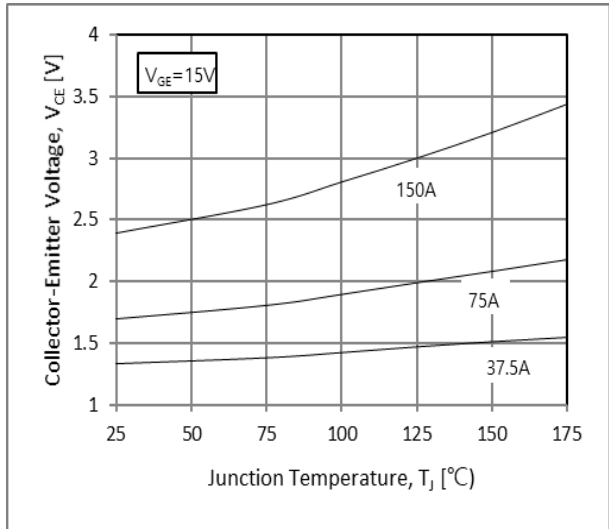
**Fig.1 Typical Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



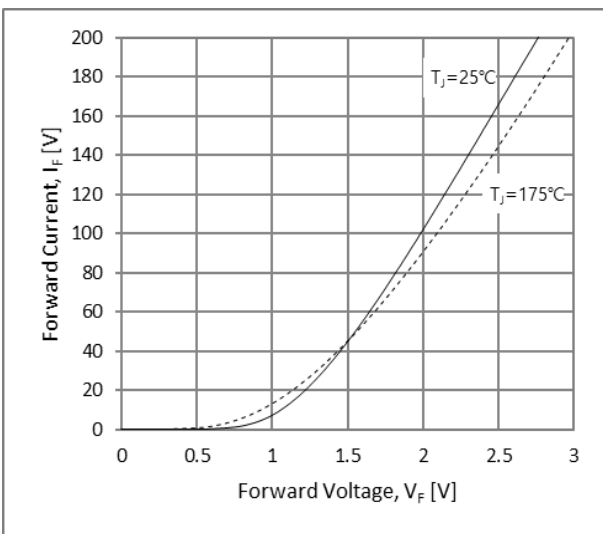
**Fig.2 Typical Output Characteristics ( $T_J = 175^\circ\text{C}$ )**



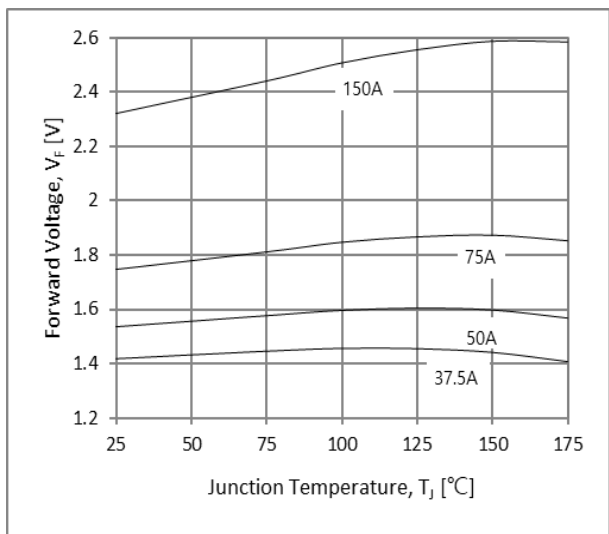
**Fig.3 Typical Transfer Characteristics**



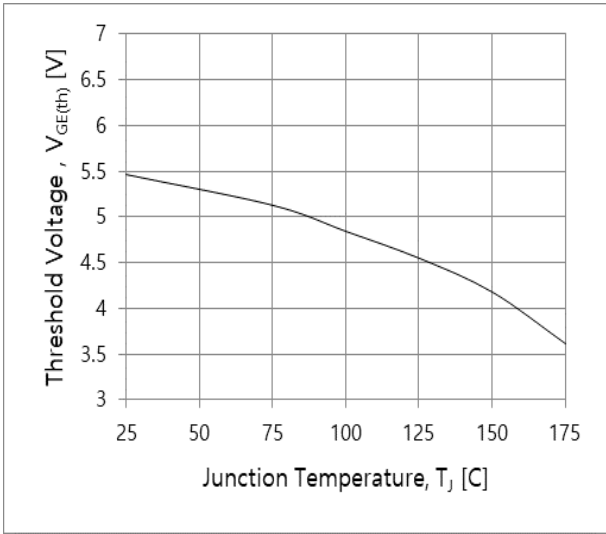
**Fig.4 Typical Collector-Emmitter Saturation Voltage - Junction Temperature**



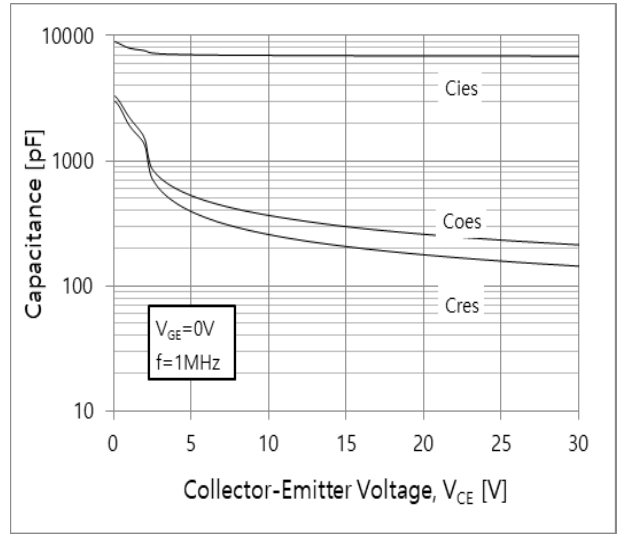
**Fig.5 Diode Forward Characteristics**



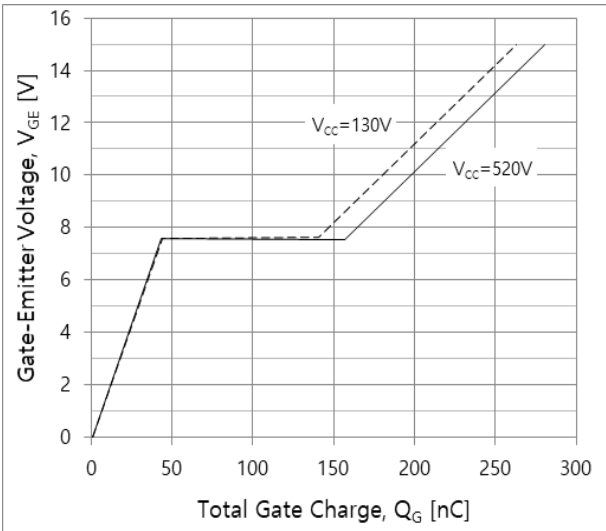
**Fig.6 Diode Forward-Junction Temperature**



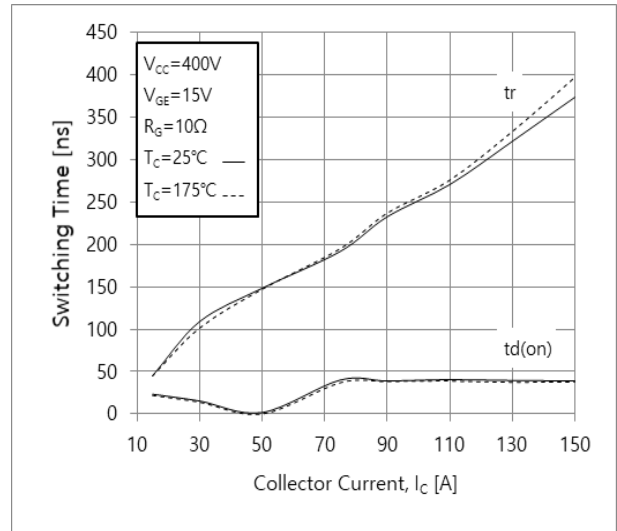
**Fig.7 Threshold Voltage-Junction Temperature**



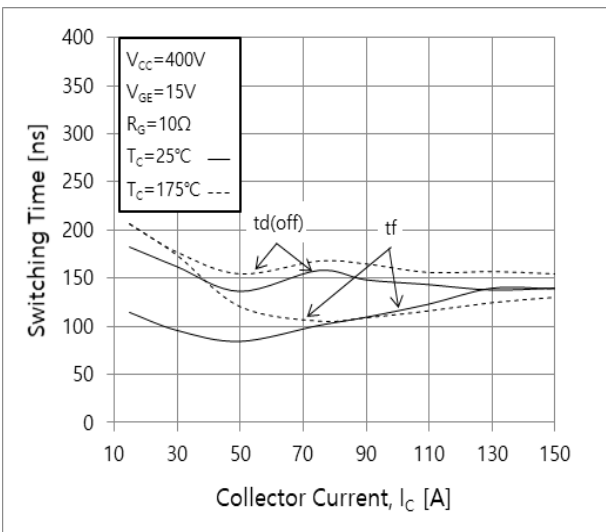
**Fig.8 Typical Capacitance**



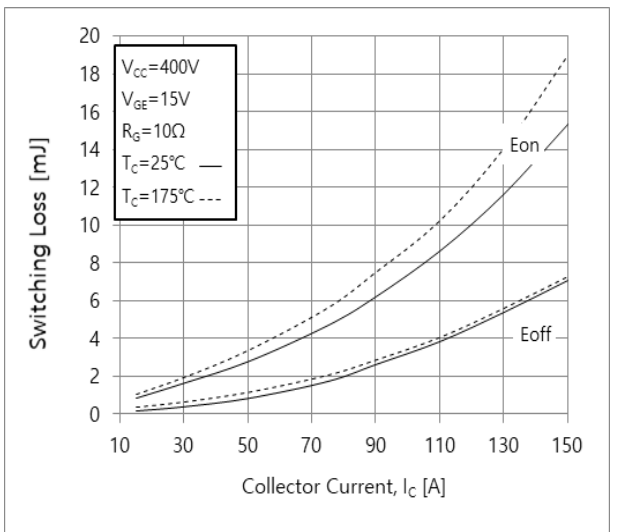
**Fig.9 Typical Gate Charge**



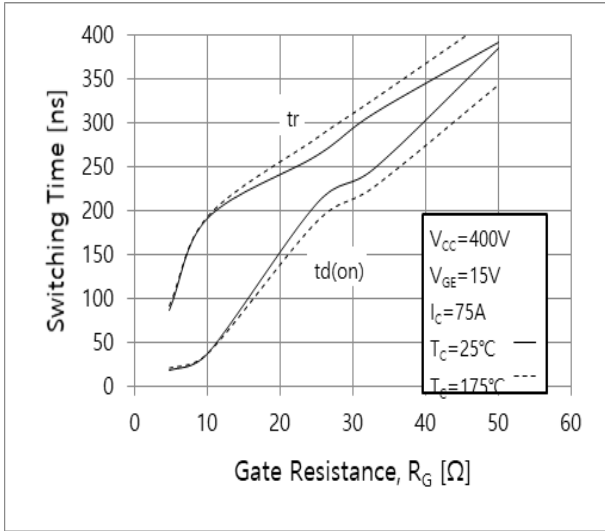
**Fig.10 Typical Turn on-Collector Current**



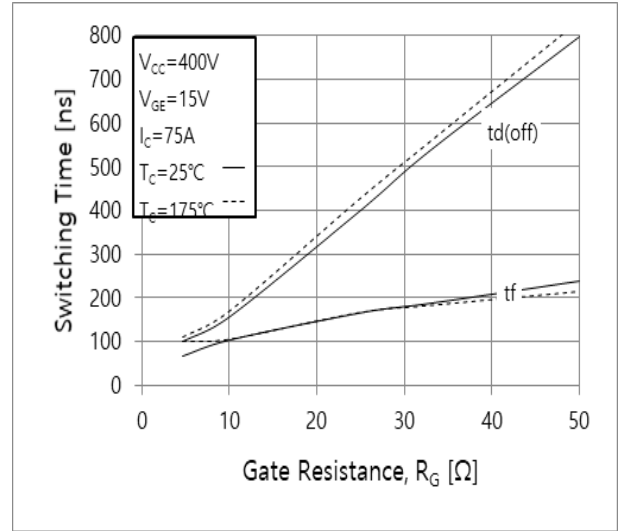
**Fig.11 Typical Turn off-Collector Current**



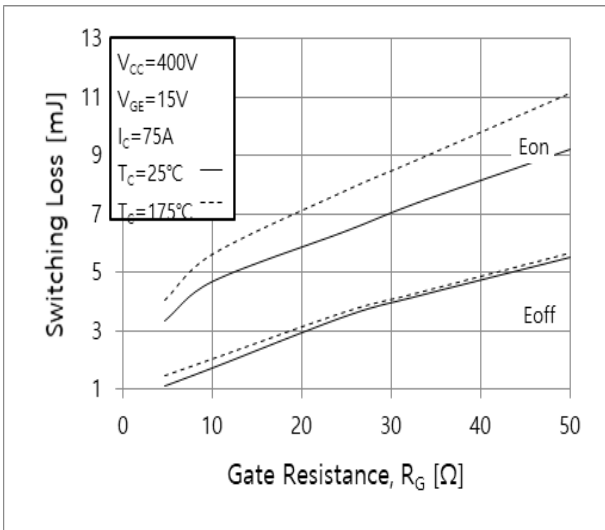
**Fig.12 Switching Loss-Collector Current**



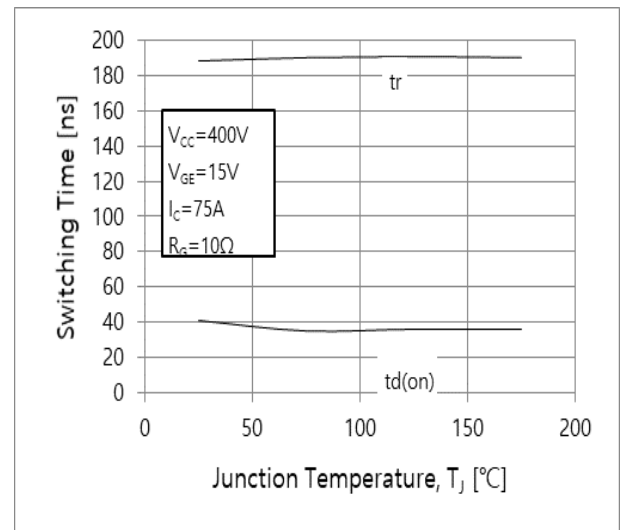
**Fig.13 Turn on Characteristics-Gate Resistance**



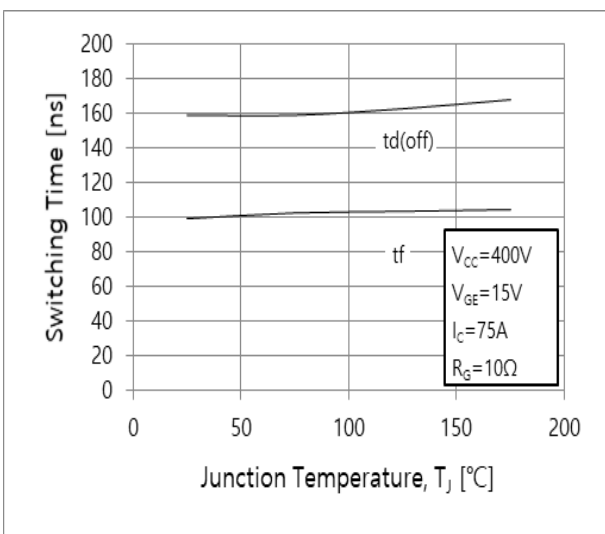
**Fig.14 Turn off Characteristics-Gate Resistance**



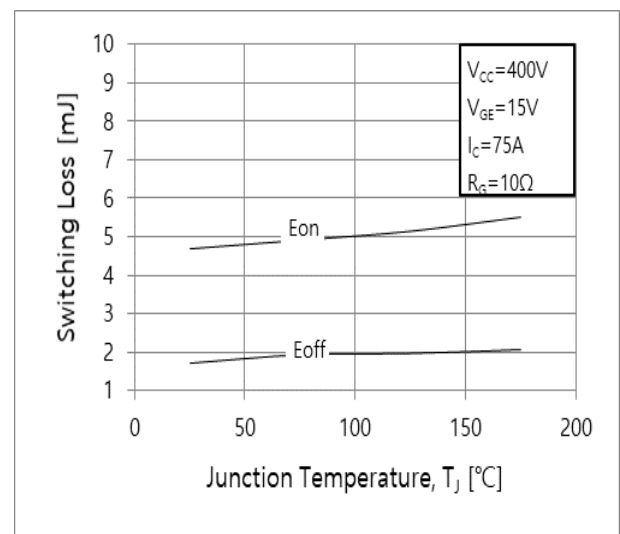
**Fig.15 Switching Loss-Gate Resistance**



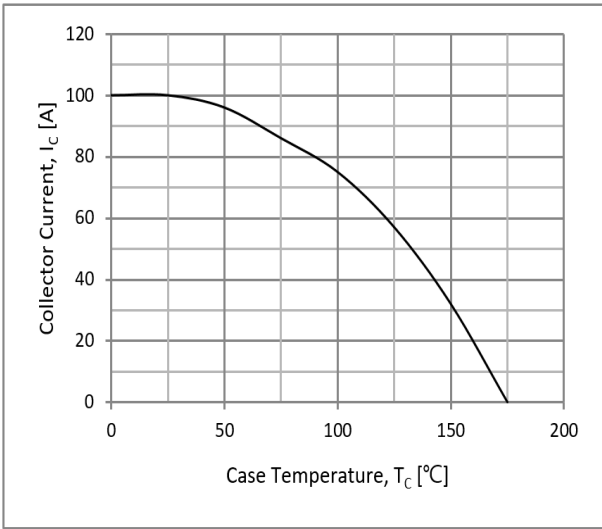
**Fig.16 Turn on Characteristics-Junction Temperature**



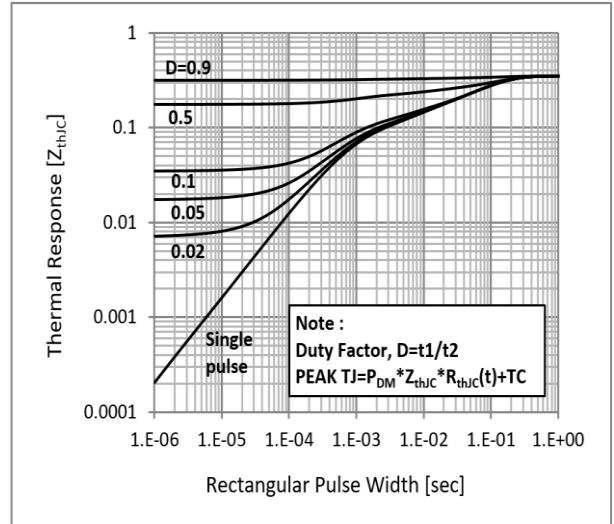
**Fig.17 Turn off Characteristics**



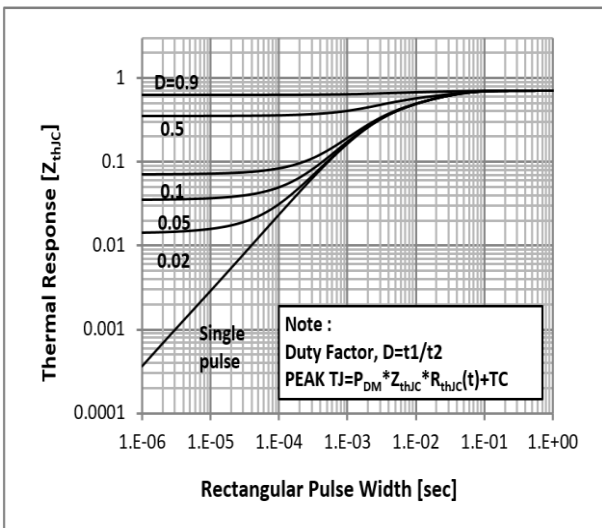
**Fig.18 Switching Loss-Junction Temperature**



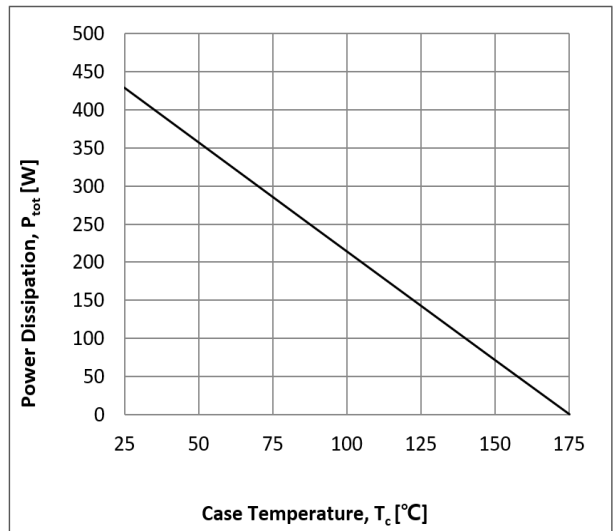
**Fig.19 Case Temperature-Collector Current**



**Fig.20 IGBT Transient Thermal Impedance**



**Fig.21 FRD Transient Thermal Impedance**

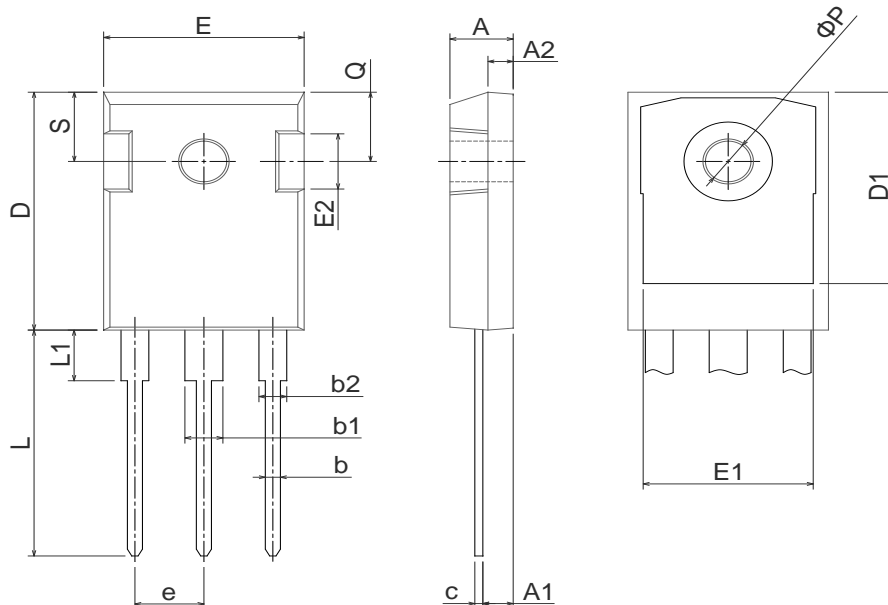


**Fig.22 Power Dissipation-Case Temperature**

**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.

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