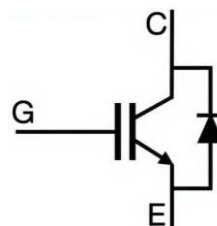


SMGW75H65FHB

650V 75A Field Stop Trench IGBT

Features:

- Low $V_{CE(sat)}$ Trench IGBT Technology
- Low Switching Loss
- Low Stray Inductance
- Maximum Junction Temperature $-40\sim+175^{\circ}\text{C}$
- Positive $V_{CE(sat)}$ Temperature Coefficient



Schematic diagram



G C E

Applications:

- High-power Converter
- Industrial UPS
- Motor Driver
- Welding Machine

Type	Package	Marking
SMGW75H65FHB	TO247-3	SMGW75H65FHB

Absolute Maximum Rated Values ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Values	Units
V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current, Limited by T_{Jmax}	$T_C=100^{\circ}\text{C}$	75	A
		$T_C=25^{\circ}\text{C}$	150	A
I_{CM}	Pulse Collector Current, T_p limited by T_{Jmax}		225	A
I_F	Continuous Forward Current, Limited by T_{Jmax}	$T_C=100^{\circ}\text{C}$	75	A
		$T_C=25^{\circ}\text{C}$	150	A
I_{FM}	Pulse Forward Current, T_p limited by T_{Jmax}		225	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	750	W
T_{JOP}	Maximum Operating Junction Temperature Range		$-40\sim 175$	$^{\circ}\text{C}$
T_{stg}	Storage temperature		$-40\sim 150$	$^{\circ}\text{C}$
T_{Solder}	Soldering Temperature, 0.063 in. (1.6mm) from case for 10 seconds		260	$^{\circ}\text{C}$



Electrical Characteristics of IGBT ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage		650			V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=3\text{mA}$, $V_{CE}=V_{GE}$		4.2		V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=75\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.38		V
			$T_J=125^{\circ}\text{C}$	1.54		V
			$T_J=175^{\circ}\text{C}$	1.62		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=650\text{V}$	$T_J=25^{\circ}\text{C}$	1	50	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			100	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$			8830	pF
C_{oes}	Output Capacitance				202	
C_{res}	Reverse Transfer Capacitance				40	

Switching Characteristics of IGBT ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V, I_C=75A,$ $R_{Gon}=10\Omega, V_{GE}=0/15V,$ Inductive Load	$T_J=25^{\circ}C$		62		ns
			$T_J=125^{\circ}C$		60		
			$T_J=175^{\circ}C$		61		
t_r	Rise Time		$T_J=25^{\circ}C$		82		ns
			$T_J=125^{\circ}C$		84		
			$T_J=175^{\circ}C$		82		
$t_{d(off)}$	Turn-off Delay Time	$T_J=25^{\circ}C$		372		ns	
		$T_J=125^{\circ}C$		391			
		$T_J=175^{\circ}C$		404			
t_f	Fall Time	$T_J=25^{\circ}C$		115		ns	
		$T_J=125^{\circ}C$		107			
		$T_J=175^{\circ}C$		109			

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E _{on}	Turn-on Switching Loss	V _{CC} =400V, I _C =75A, R _{Gon} =10Ω, V _{GE} =0/15V, di/dt=380A/μs(T _J =175°C), Inductive Load	T _J =25°C		2.69		mJ
			T _J =125°C		2.70		
			T _J =175°C		2.74		
E _{off}	Turn-off Switching Loss	V _{CC} =400V, I _C =75A, R _{Goff} =10Ω, V _{GE} =0/15V, du/dt=4250V/μs(T _J =175°C), Inductive Load	T _J =25°C		2.60		mJ
			T _J =125°C		2.68		
			T _J =175°C		2.80		
Q _g	Total Gate Charge	V _{CC} =520V, I _C =75A, V _{GE} =0V/15V			321		nC
Q _{ge}	Gate-emitter Charge				42		
Q _{gc}	Gate-collector Charge				110		

Electrical Characteristics of Diode (T_J=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =75A	T _J =25°C		1.62		V
			T _J =125°C		1.35		
			T _J =175°C		1.27		
I _{rr}	Peak Reverse Recovery Current	I _F =75A, di/dt=750A/μs(T _J =175°C), V _{rr} =400V, V _{GE} =0V	T _J =25°C		39		A
			T _J =125°C		47		
			T _J =175°C		51		
t _{rr}	Reverse Recovery Time		T _J =25°C		145		ns
			T _J =125°C		186		
			T _J =175°C		229		
dI _{rr} /dt	Peak Rate of Fall of Reverse Recovery Current		T _J =25°C		333		A/us
			T _J =125°C		252		
			T _J =175°C		222		

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Q _{rr}	Reverse Recovery Charge	I _F =75A, di/dt=750A/μs(T _J =175°C), V _{rr} =400V, V _{GE} =0V	T _J =25°C		2.1		μC
			T _J =125°C		5.4		
			T _J =175°C		7.1		
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.060		mJ
			T _J =125°C		0.114		
			T _J =175°C		0.148		

Thermal Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.20		K/W
R _{θJC} (Diode)	Thermal Resistance: Junction-to-Case		0.30		K/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	K/W



Characteristics diagrams

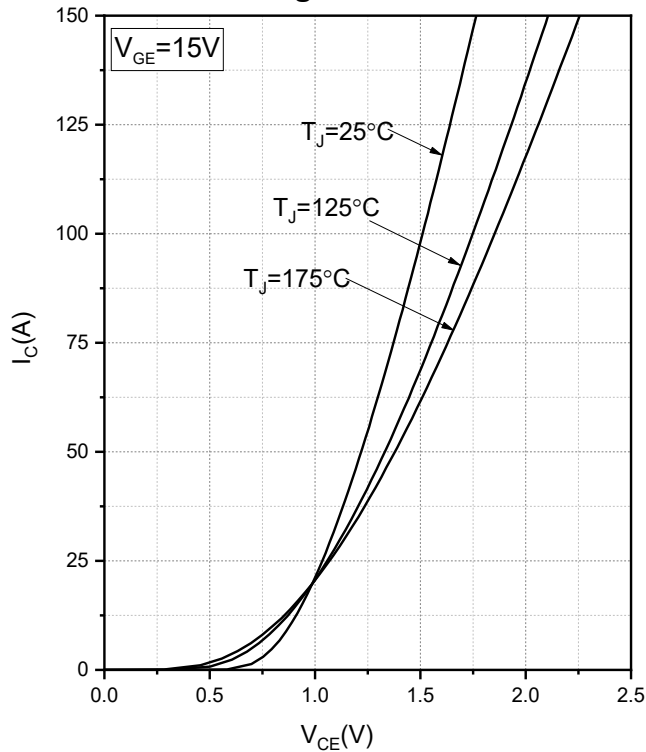


Fig.1 Typical Saturation Voltage Characteristics

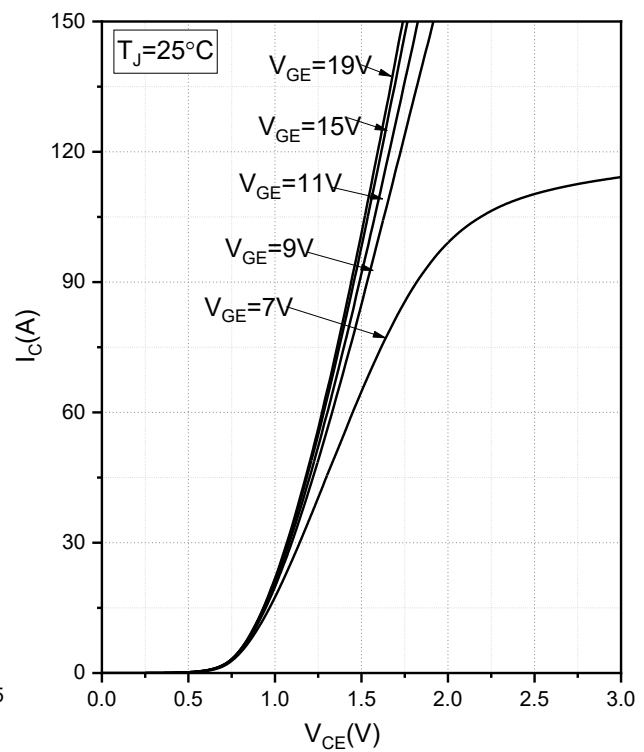


Fig.2 Typical Output Characteristics, $T_J=25^{\circ}\text{C}$

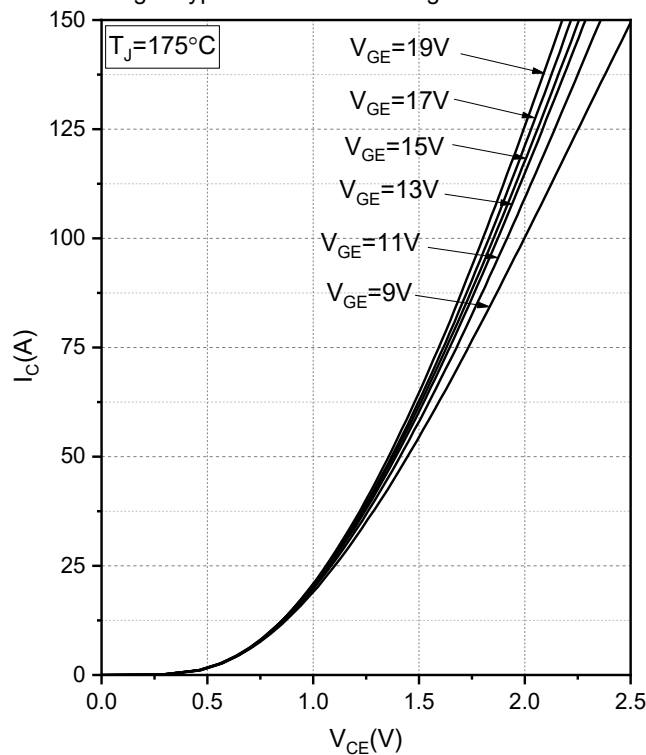


Fig.3 Typical Output Characteristics, $T_J=175^{\circ}\text{C}$

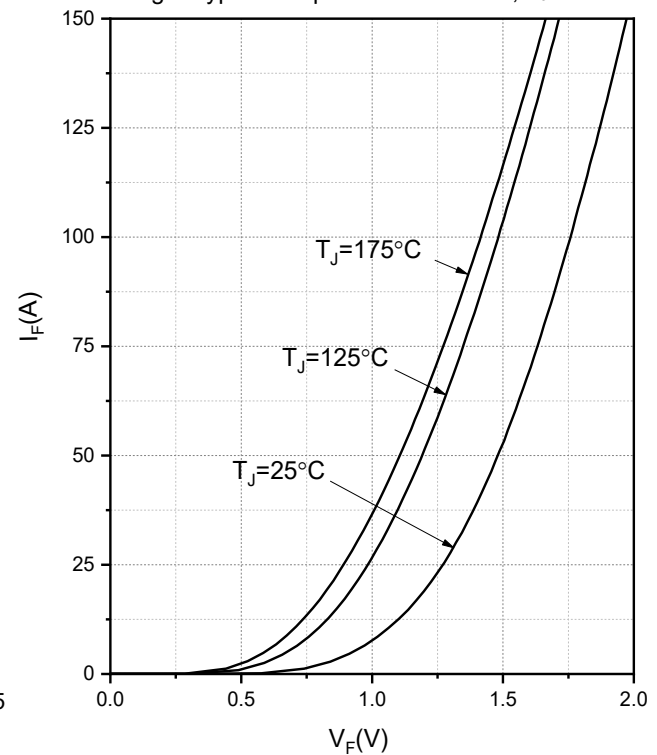
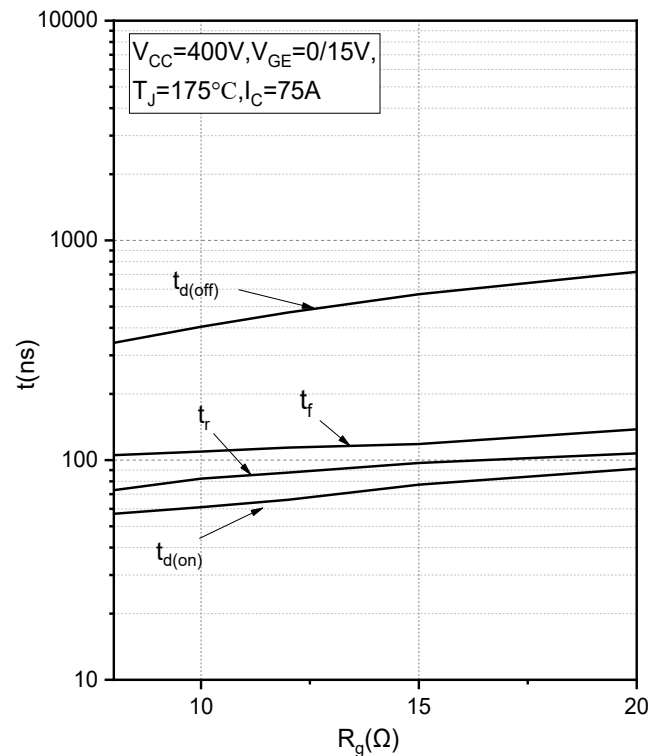
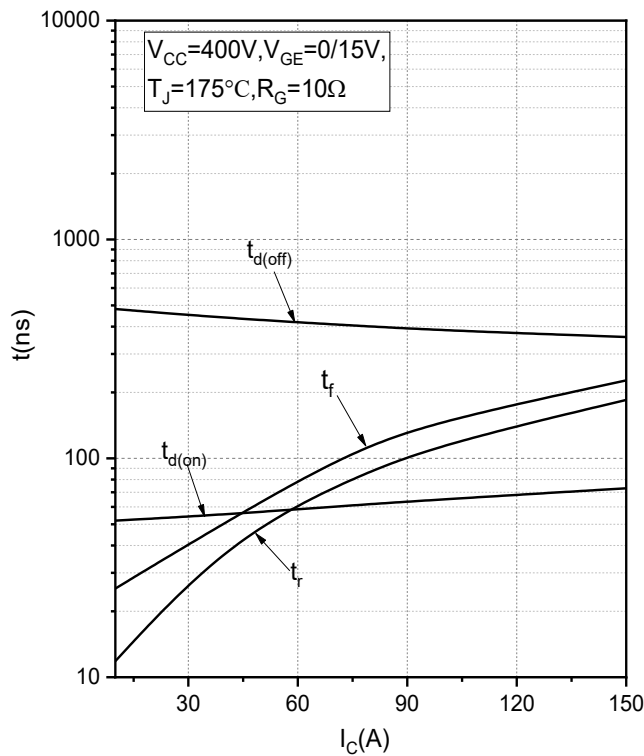
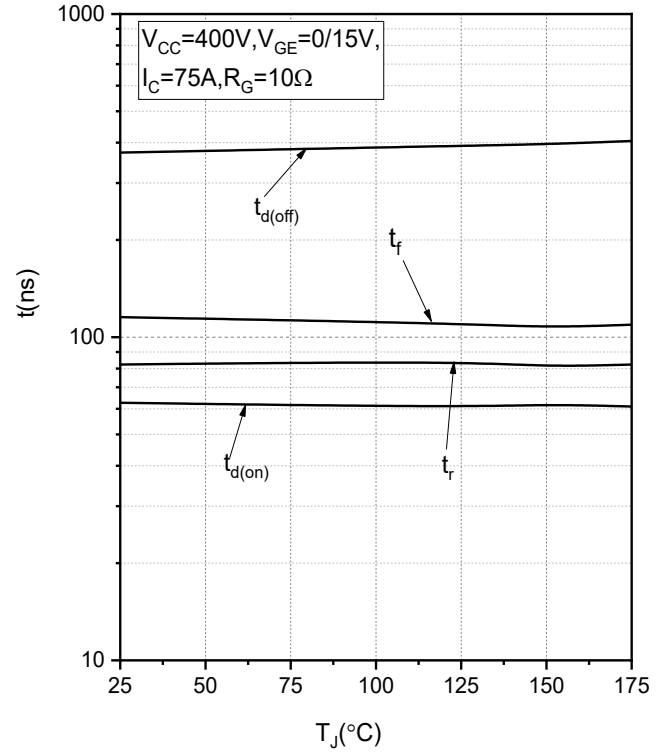
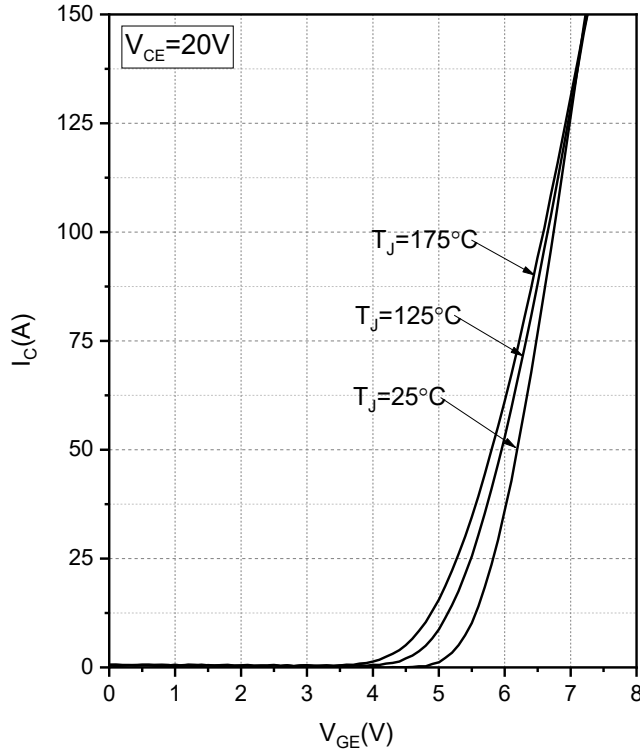


Fig.4 Forward Characteristics of Diode



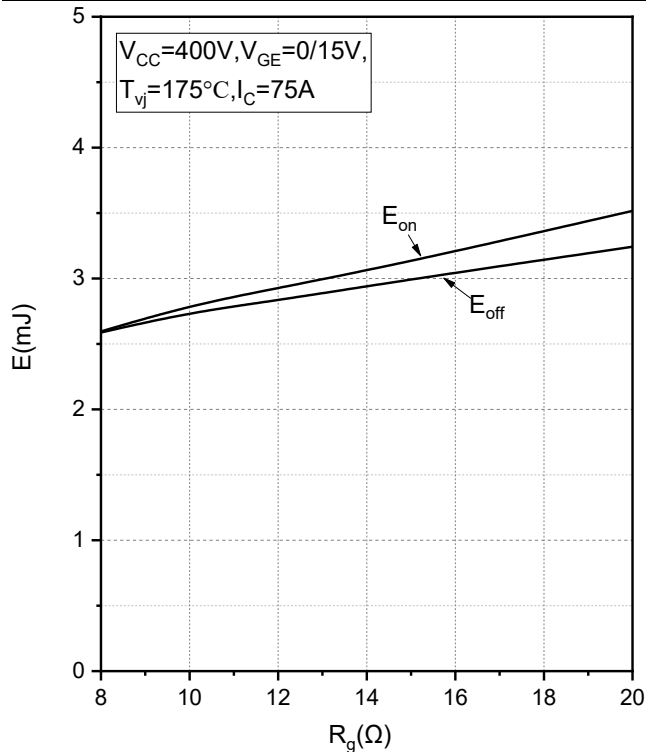


Fig.9 Typical Switching Energy Losses as a Function of Gate Resistor, $T_j=175^\circ C$

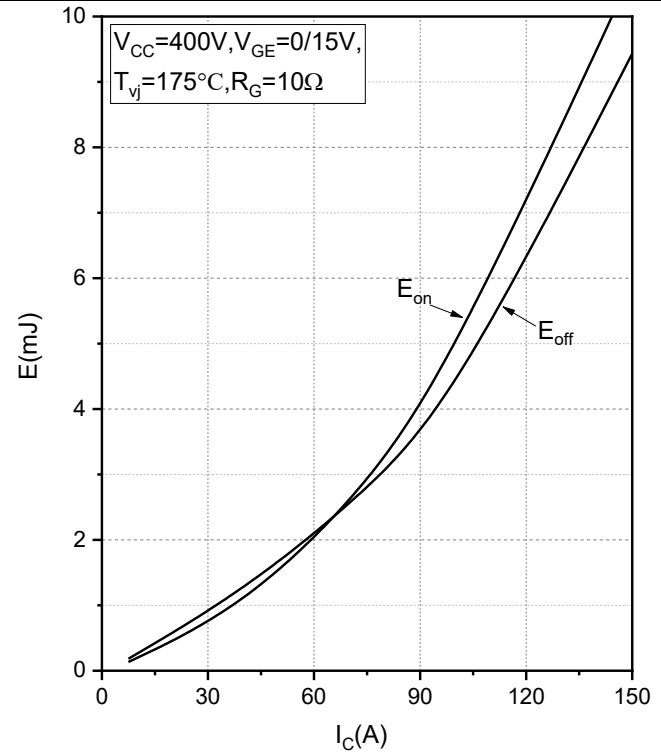


Fig.10 Typical Switching Energy Losses as a Function of Collector Current, $T_j=175^\circ C$

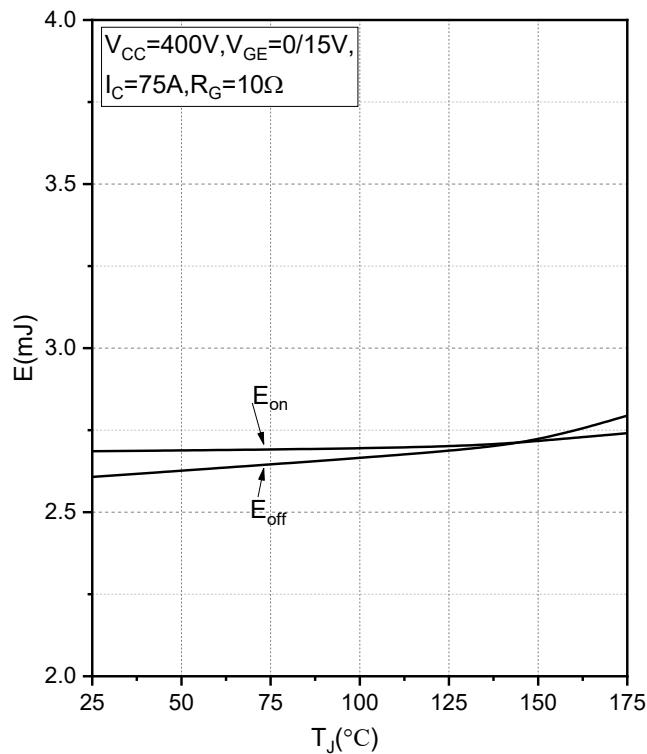


Fig.11 Typical Switching Energy Losses as a Function of Junction Temperature

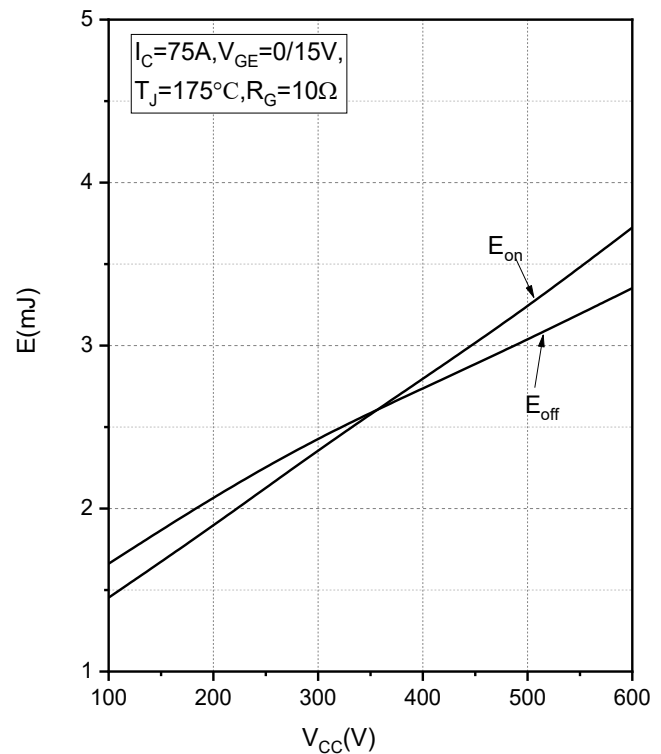


Fig.12 Typical Switching Energy Losses as a Function of Collector Emitter Voltage

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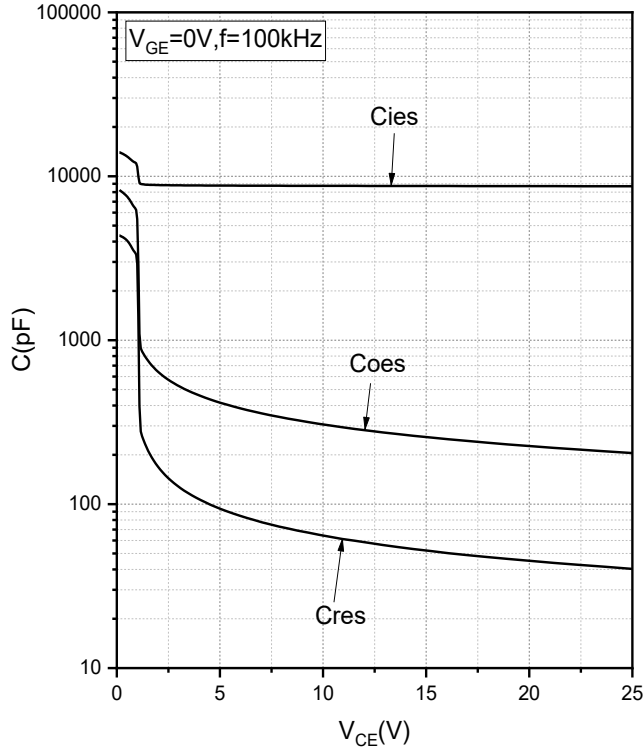


Fig.13 Capacitance Characteristics

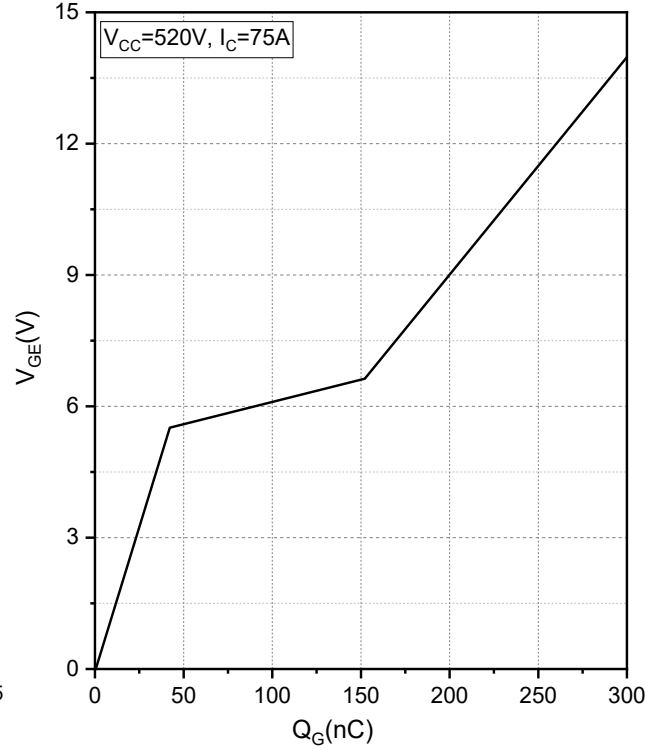


Fig.14 Typical Gate Charge Characteristics

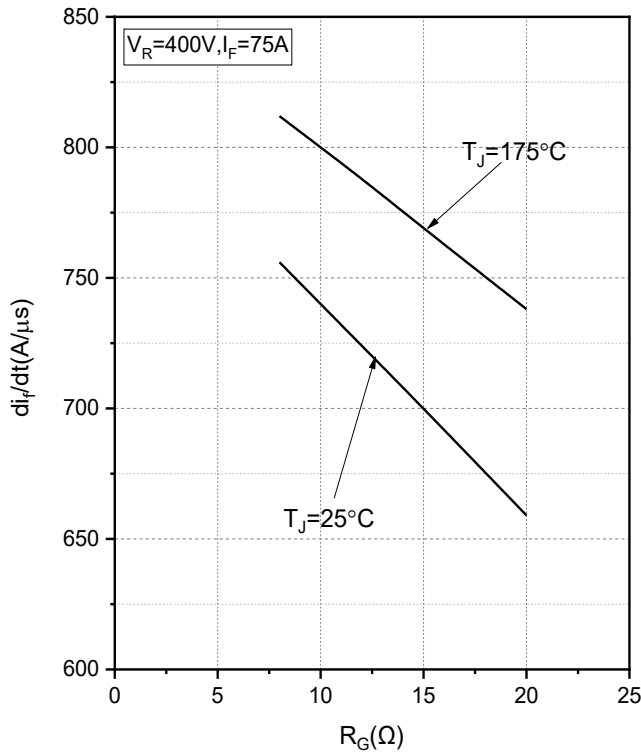


Fig.15 Typical Diode Current Slope as a Function of Gate Resistor

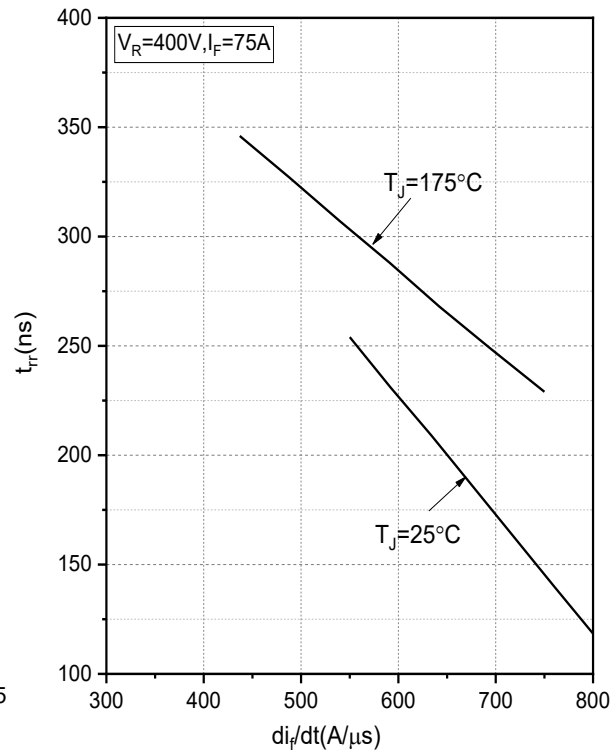


Fig.16 Typical Reverse Recovery Time as a Function of Diode Current Slope

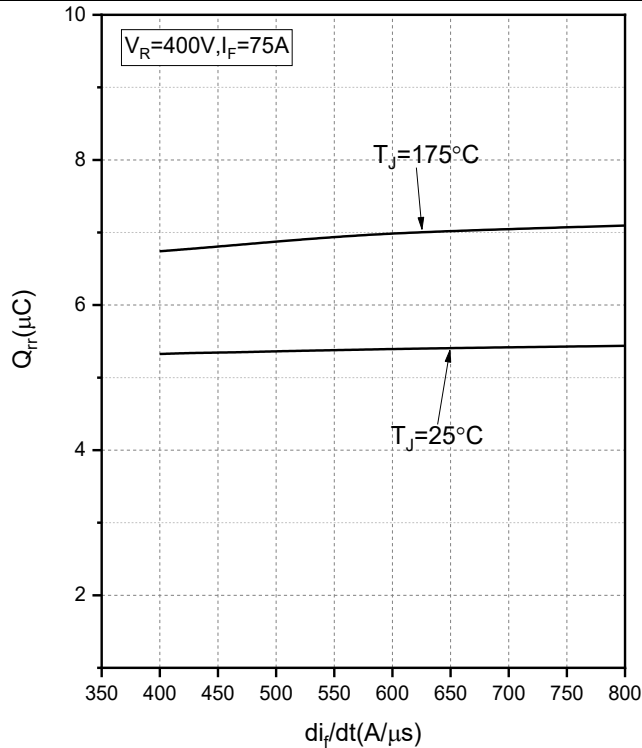


Fig.17 Typical Reverse Recovery Charge as a Function of Diode Current Slope

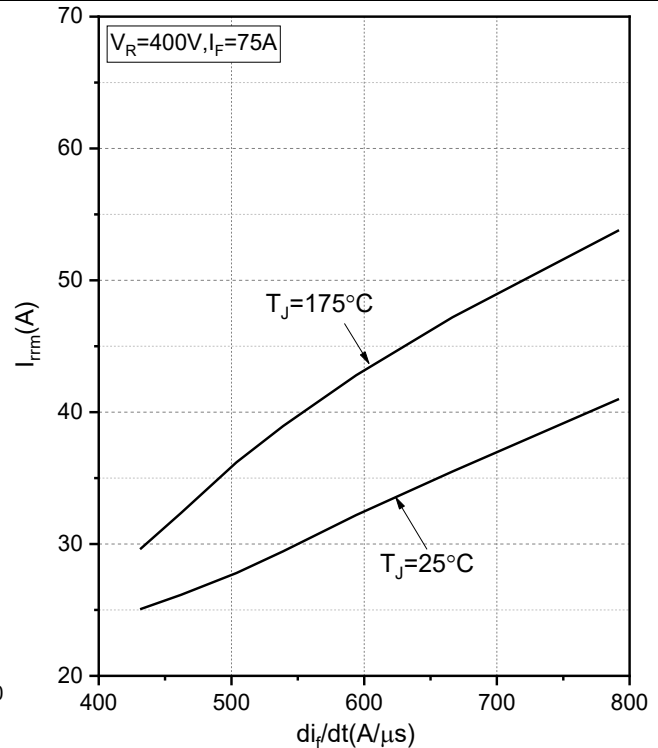


Fig.18 Typical Reverse Recovery Current as a Function of Diode Current Slope

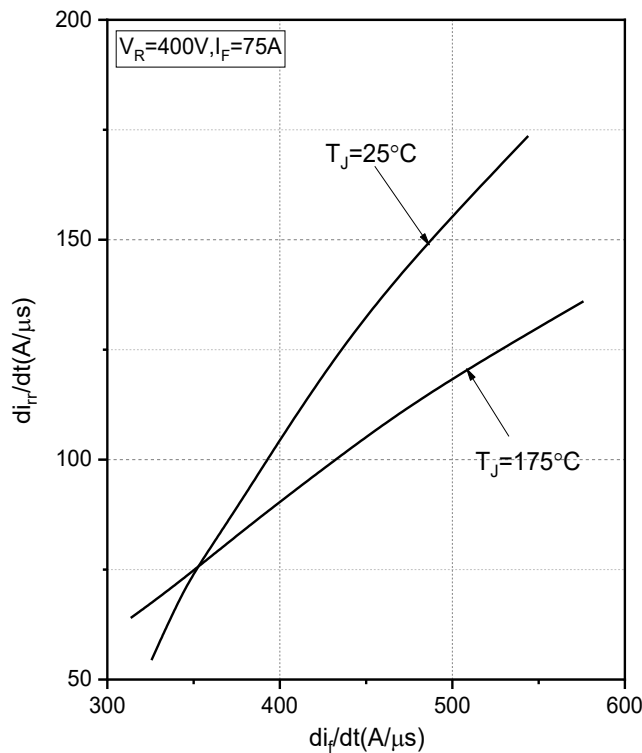


Fig.19 Typical Diode Peak Rate of Fall of Reverse Recovery Current as a Function of Diode Current Slope

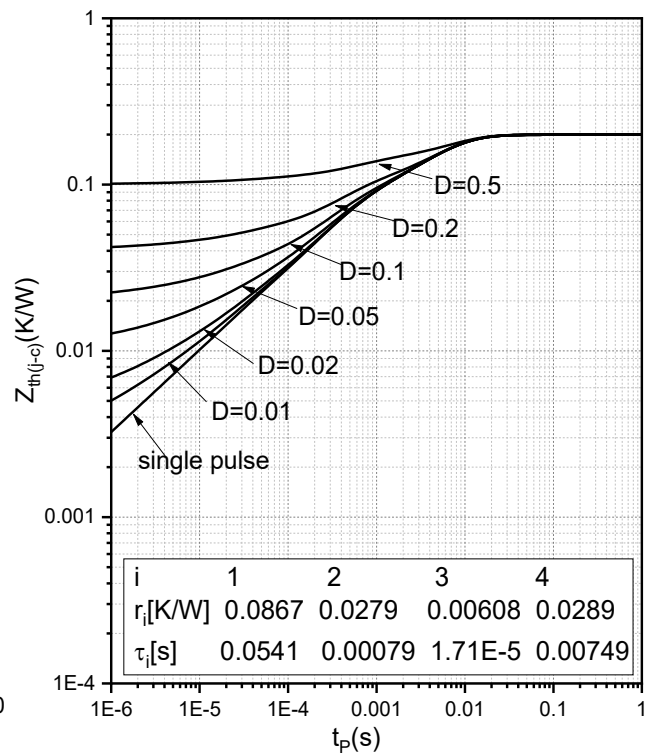


Fig.20 Transient Thermal Impedance (IGBT)

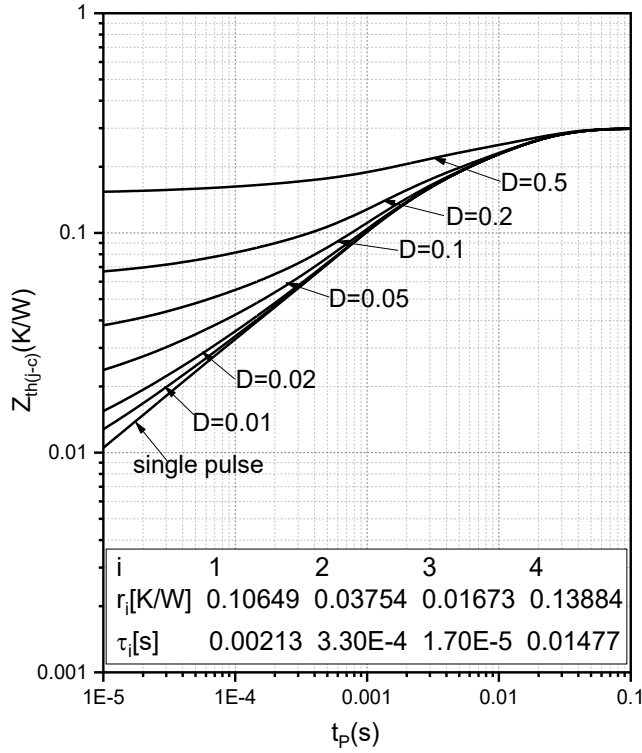


Fig.21 Transient Thermal Impedance (Diode)

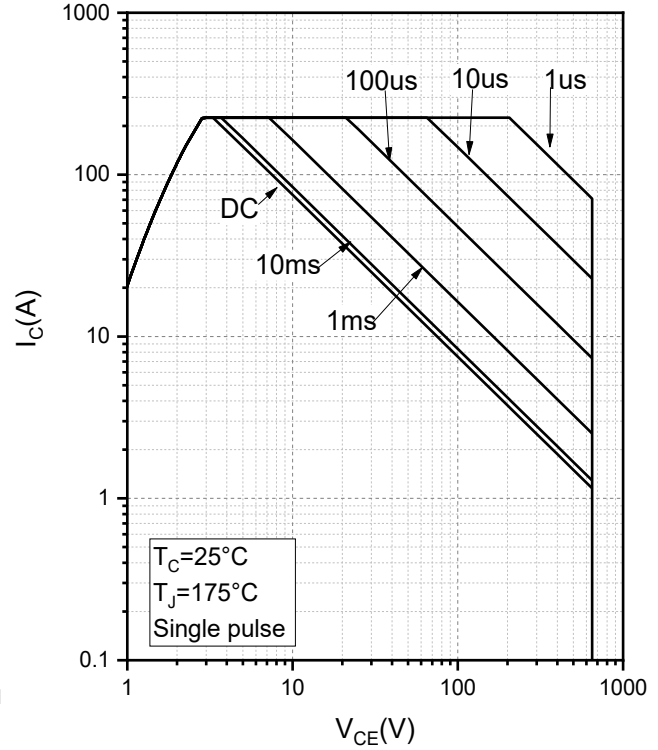


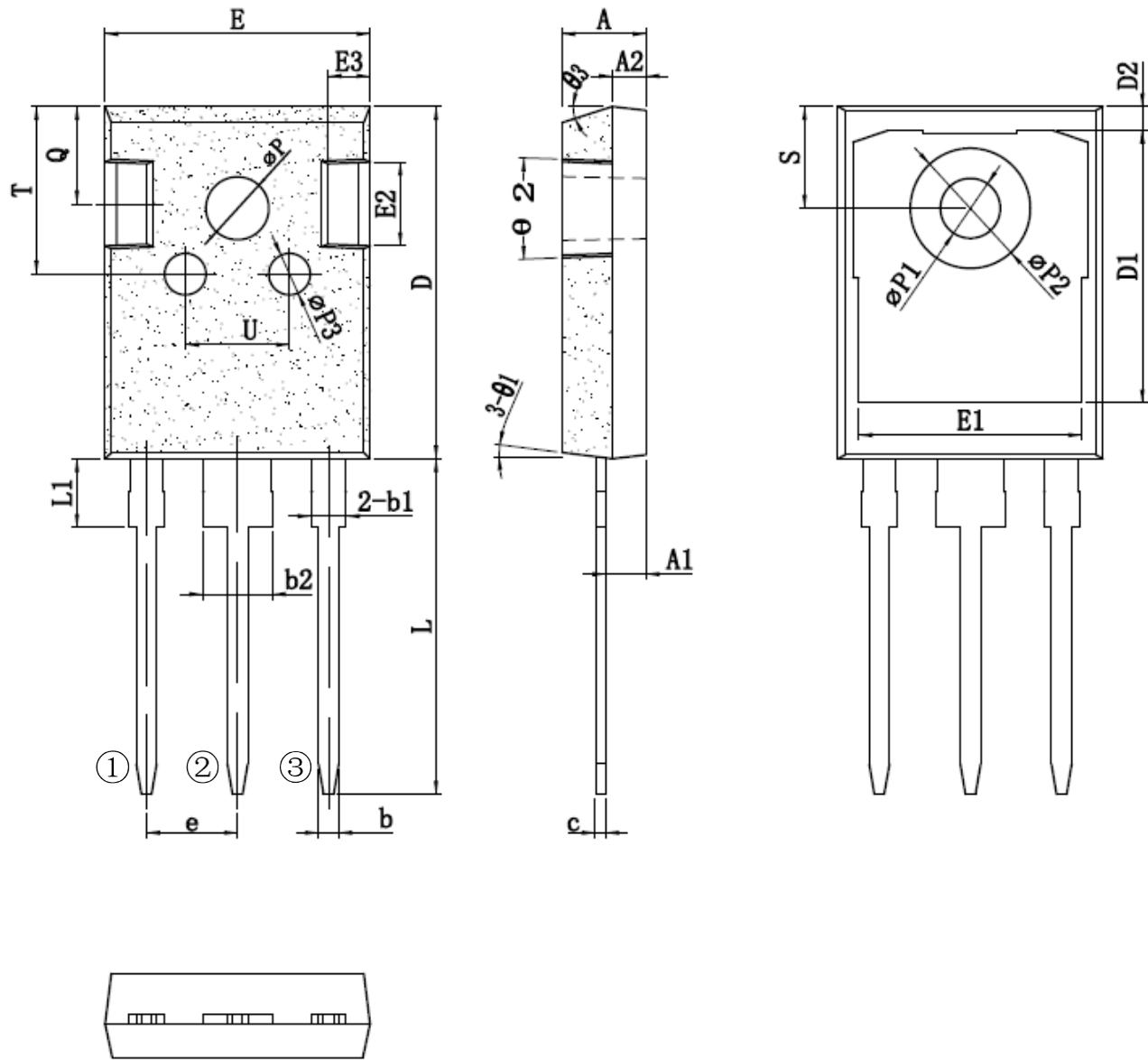
Fig.22 Forward Bias Safe Operating Area, IGBT

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TO-247 Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER



TO-247 Package Mechanical Data:

SYMBOL	mm		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
*A1	2.30	2.40	2.50
A2	1.90	2.00	2.10
*b	1.15	1.20	1.25
*b1	1.95	2.10	2.25
*b2	2.95	3.10	3.25
b3	0.45	0.60	0.75
*C	0.55	0.60	0.68
*D	20.90	21.00	21.10
D1	1.00	1.20	1.40
D2	16.05	16.35	16.65
*E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	1.25	1.45	1.65
E3	1.80	2.00	2.20
*e	5.40	5.44	5.48
*L	19.80	19.95	20.10
*L1	—	—	4.30
M	0.50	0.70	0.90
ΦP	2.30	2.50	2.70
Q	1.80	2.00	2.20
Q1	0.50	0.68	0.80
T	9.80	10.00	10.20
U	5.80	6.00	6.20
θ1	5°	7°	9°
θ2	13°	16°	19°
θ3	13°	15°	17°

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Revision	Notes
01	Engineering Sample Datasheet

Announcement

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