



SMGQ75H120FHB

1200V 75A Field Stop Trench IGBT

Features:

- Low $V_{CE(sat)}$ Trench IGBT Technology
- High Speed Switching Series
- Safe Paralleling
- Square RBSOA
- Very Fast Recovery Antiparallel Diode
- Low Thermal Resistance
- Lead Free, Compliant with RoHS Requirement

Applications:

- Uninterruptible Power Supply
- Welding Machines
- Photovoltaic Inverters
- Power Factor Correction
- High Frequency Converters

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

Symbol	Description	Conditions	Values	Units
V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^{\circ}\text{C}$	75	A
		$T_C=25^{\circ}\text{C}$	150	A
I_{CP}	Pulse Collector Current		300	A
I_F	Continuous Forward Current	$T_C=100^{\circ}\text{C}$	75	A
		$T_C=25^{\circ}\text{C}$	150	A
I_{FP}	Pulse Forward Current		300	A



P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	600	W
T_J	Maximum Junction Temperature		-40~175	$^{\circ}\text{C}$
T_{JOP}	Maximum Operating Junction Temperature Range		-40~175	$^{\circ}\text{C}$
	Soldering Temperature, for 10 sec.		260 (0.063 in. (1.6mm) from case)	

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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=1mA$	1200			V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.5mA, V_{CE}=V_{GE}$	4.3	5.1	5.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=75A, V_{GE}=15V$	$T_J=25^{\circ}\text{C}$	1.70	2.10	V
			$T_J=125^{\circ}\text{C}$	2.20		
			$T_J=150^{\circ}\text{C}$	2.28		
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=1200V$			25	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V$			± 200	nA
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V, f=100kHz$		12.2		nF
C_{oes}	Output Capacitance			0.41		
C_{res}	Reverse Transfer Capacitance			0.13		

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =75A, R _G =10Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		265		ns
			T _J =125°C		268		
			T _J =150°C		268		
t _r	Rise Time		T _J =25°C		68		ns
			T _J =125°C		70		
			T _J =150°C		70		
t _{d(off)}	Turn-off Delay Time	T _J =25°C		248		ns	
		T _J =125°C		256			
		T _J =150°C		260			



t_f	Fall Time	$V_{CC}=600V, I_C=75A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$		135		ns
			$T_J=125^\circ C$		146		
			$T_J=150^\circ C$		150		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=75A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $di/dt=915A/\mu s(T_J=150^\circ C),$ Inductive Load	$T_J=25^\circ C$		3.8		mJ
			$T_J=125^\circ C$		4.6		
			$T_J=150^\circ C$		5.0		
E_{off}	Turn-off Switching Loss	$V_{CC}=600V, I_C=75A,$ $R_G=10\Omega, V_{GE}=\pm 15V,$ $du/dt=6870V/\mu s(T_J=150^\circ C),$ Inductive Load	$T_J=25^\circ C$		1.5		mJ
			$T_J=125^\circ C$		2.1		
			$T_J=150^\circ C$		2.3		
Q_G	Total Gate Charge	$V_{CC}=960V, V_{GE}=0 \text{ to } 15V,$ $I_C=75A$			417		nC
Q_{GE}	Gate-Emitter Charge				83		
Q_{GC}	Gate-Collector Charge				175		

Diode Switching Characteristics ($T_J=25^\circ C$ unless otherwise specified)

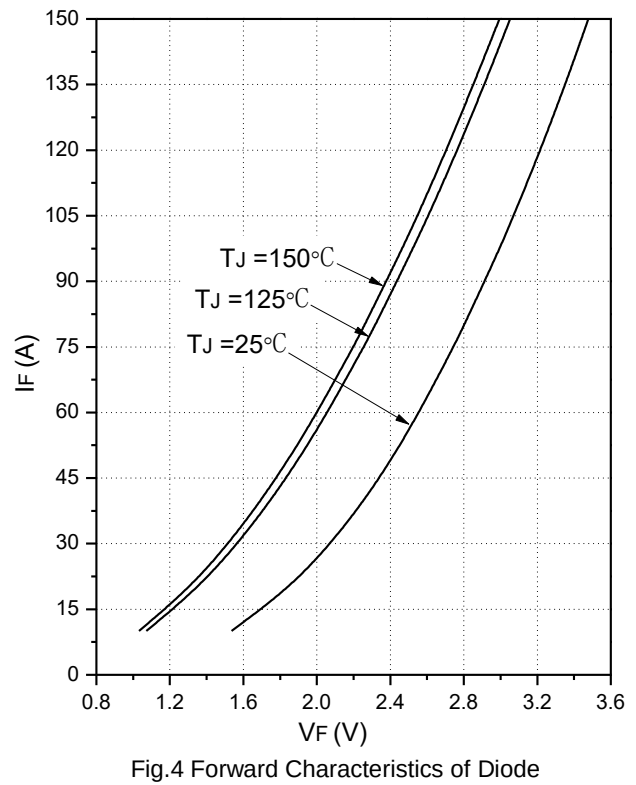
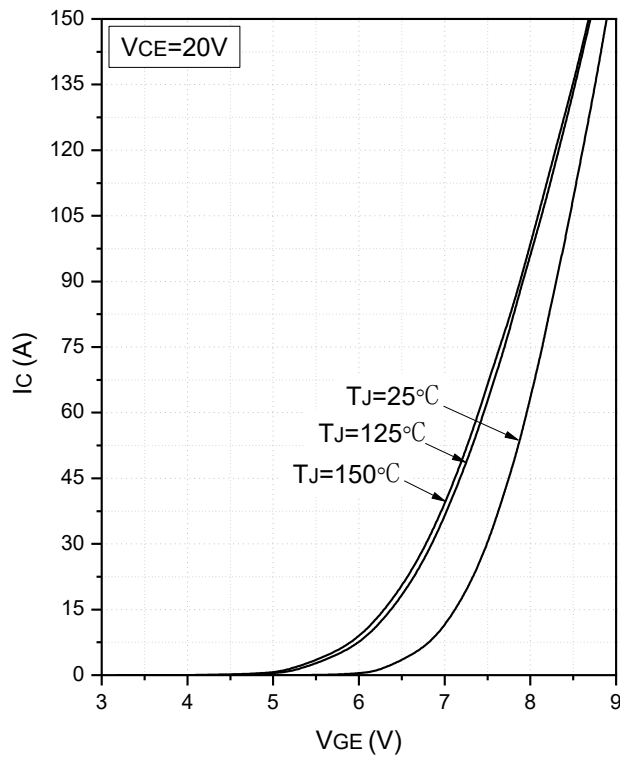
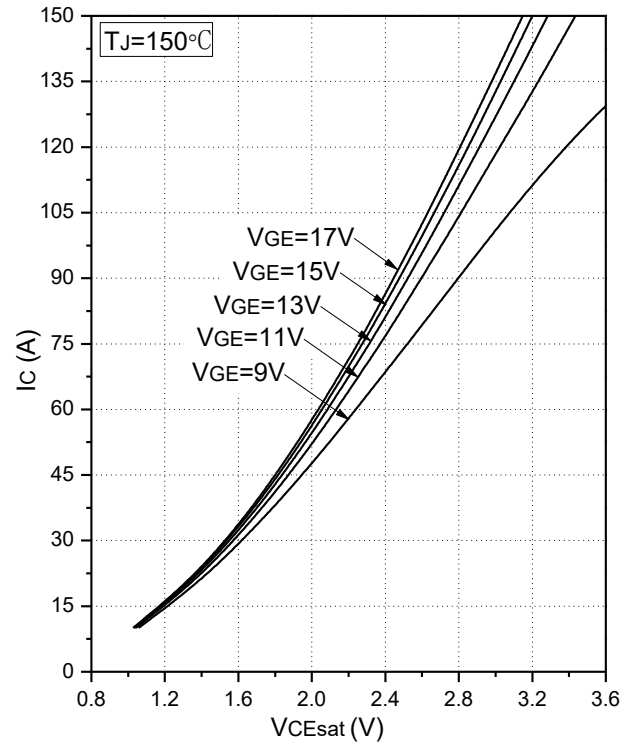
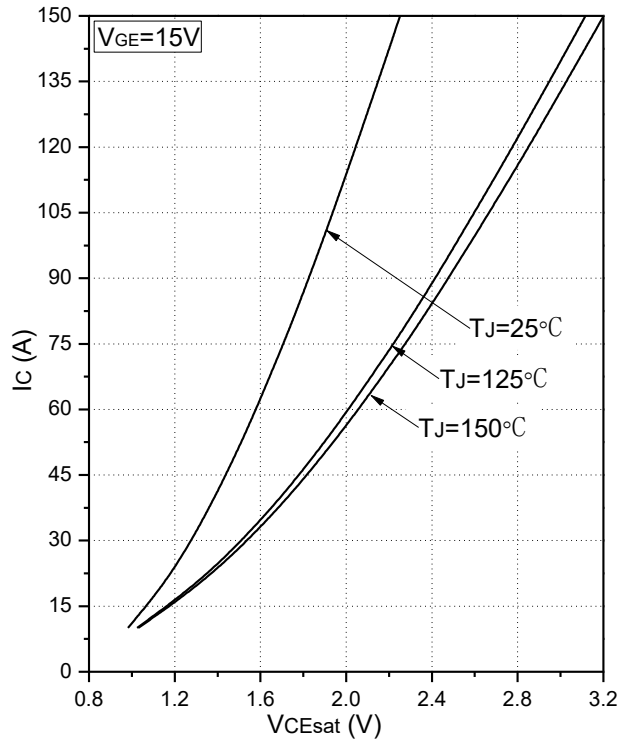
Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward On-voltage	I _F =75A	T _J =25℃		2.75		V
			T _J =125℃		2.25		
			T _J =150℃		2.20		
t _{rr}	Reverse Recovery Time	V _R =600V, I _F =75A, R _G =10Ω, V _{GE} =±15V, di/dt=1170A/μs(T _J =150℃), Inductive Load	T _J =25℃		188		ns
			T _J =125℃		194		
			T _J =150℃		194		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		2.2		uC
			T _J =125℃		3.2		
			T _J =150℃		3.5		
I _{rrm}	Reverse Recovery Current		T _J =25℃		24.4		A
			T _J =125℃		28.7		
			T _J =150℃		30.0		



E _{rr}	Reverse Recovery Energy	V _R =600V, I _F =75A, R _G =10Ω, V _{GE} =±15V, di/dt=1170A/μs(T _J =150°C), Inductive Load	T _J =25°C		0.7		mJ
			T _J =125°C		1.1		
			T _J =150°C		1.2		

Thermal Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.25		°C/W
R _{θJC} (Diode)	Thermal Resistance: Junction-to-Case		0.20		°C/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			50	°C/W



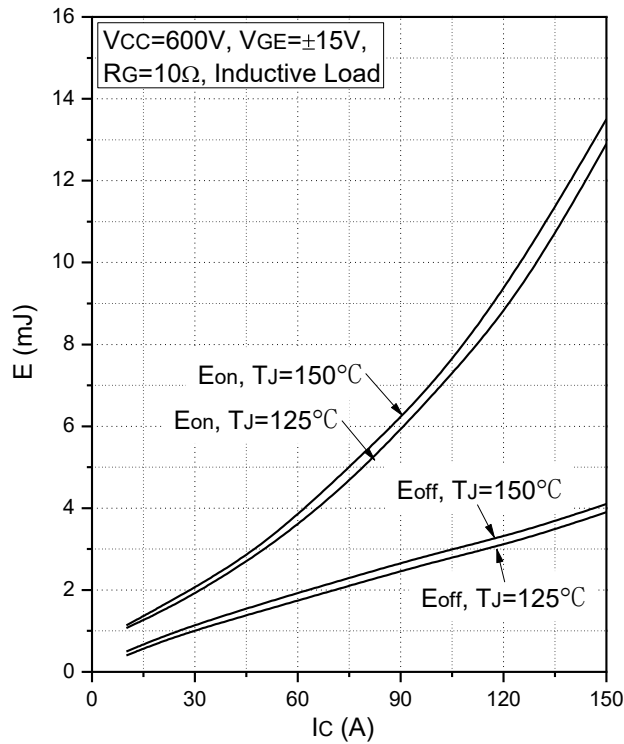


Fig.5 Typical Switching Loss vs. Collector Current

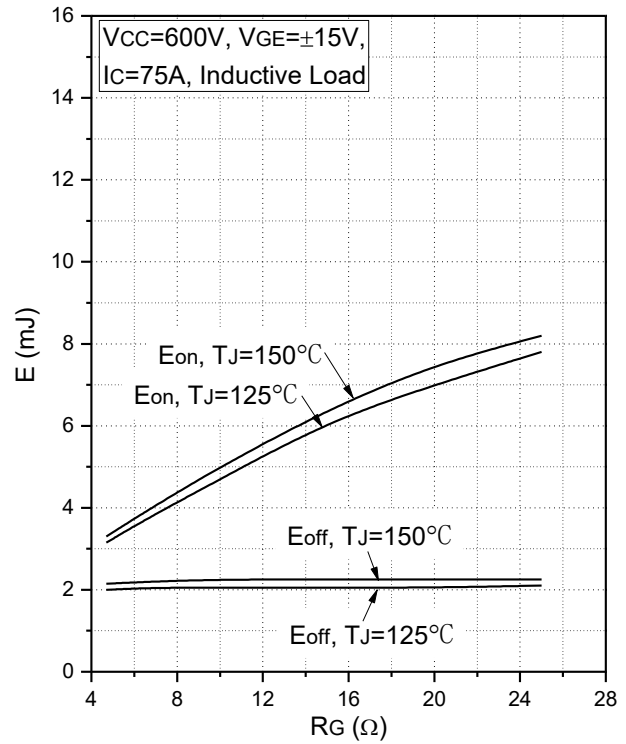


Fig.6 Typical Switching Loss vs. Gate Resistance

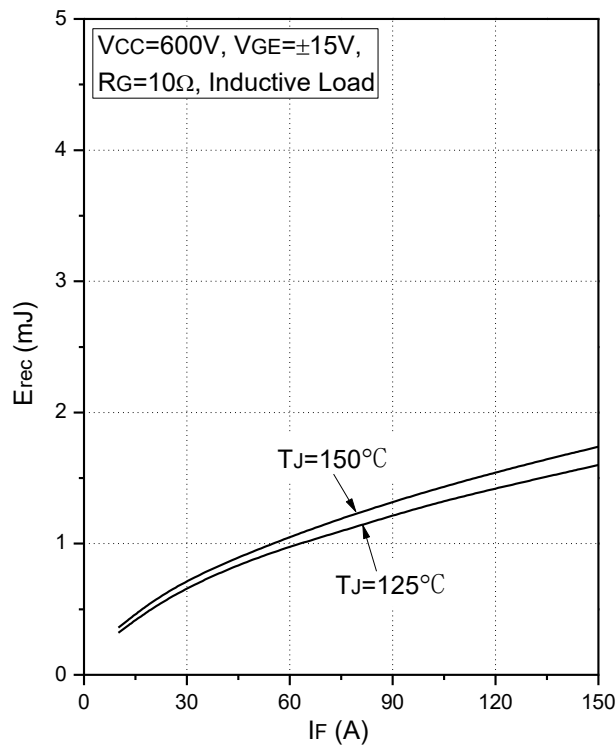


Fig.7 Typical Switching Loss vs. Forward Current

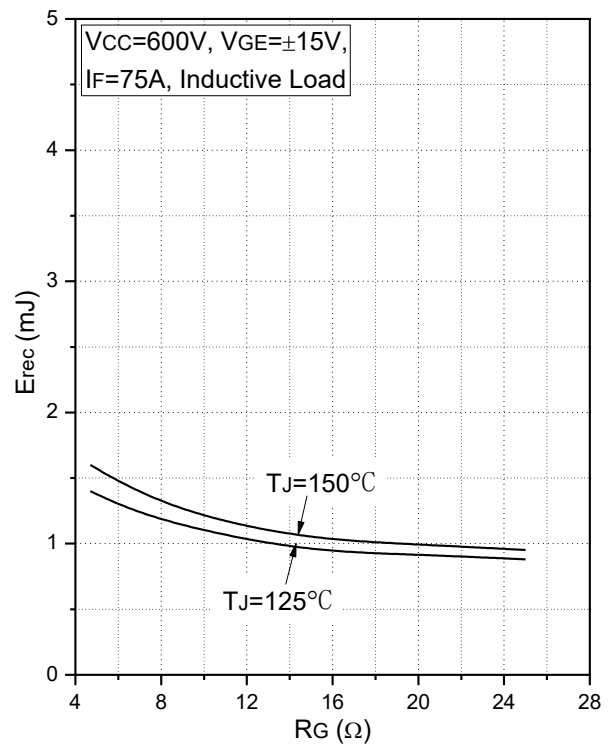
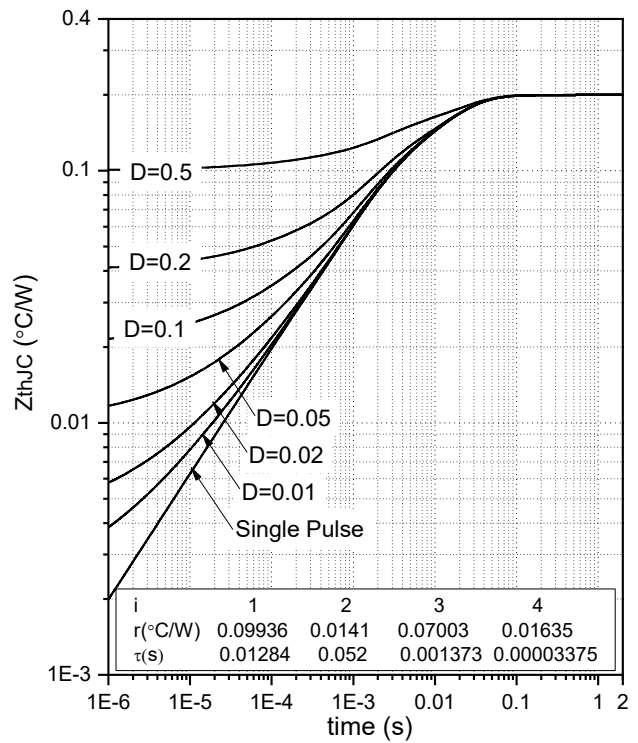
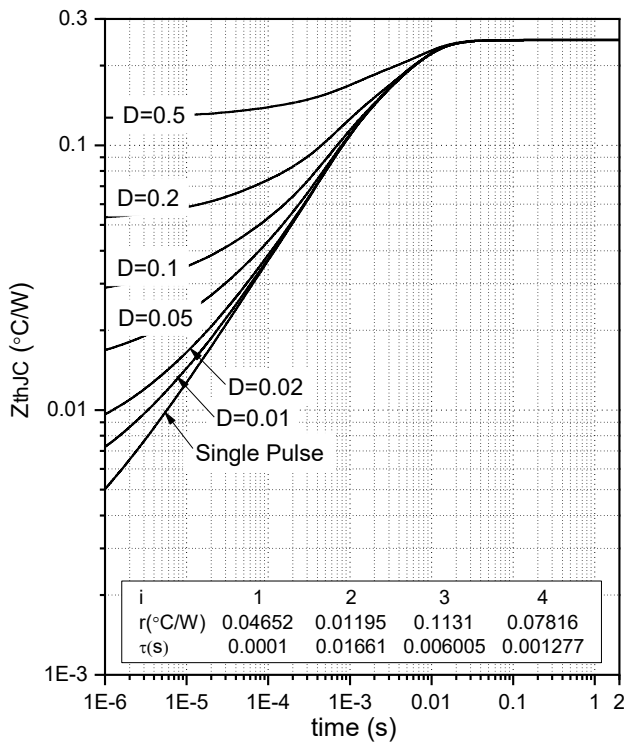
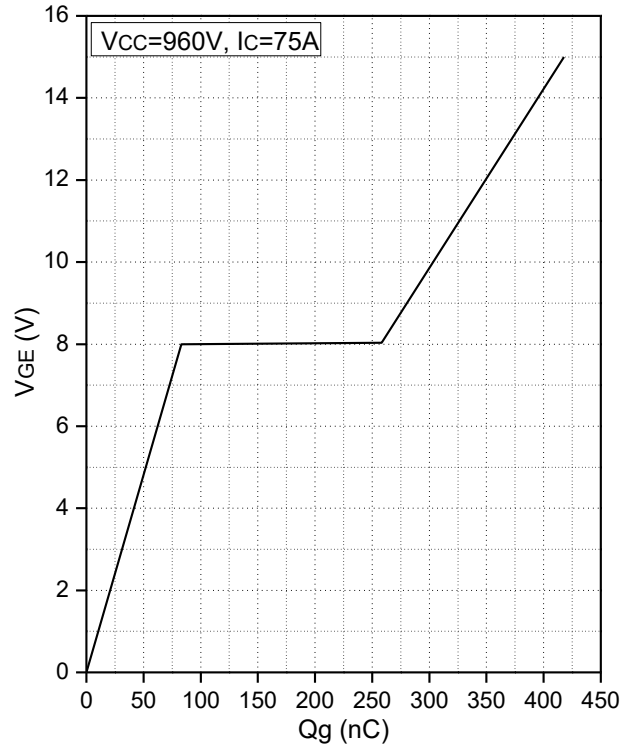
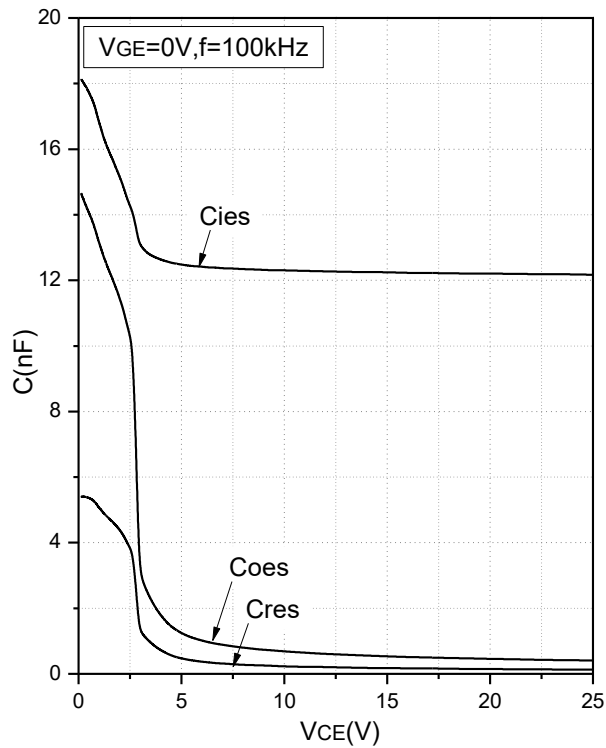


Fig.8 Typical Switching Loss vs. Gate Resistance





Test Circuit:

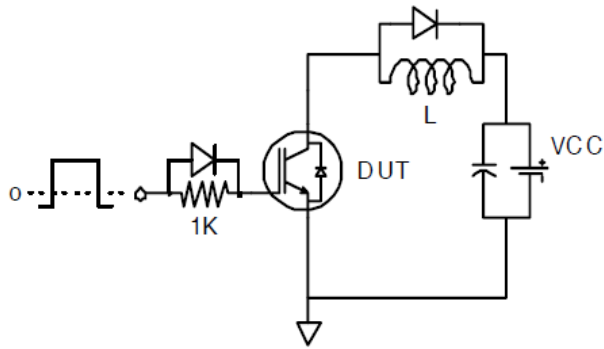


Fig.13 Gate Charge Circuit (turn-off)

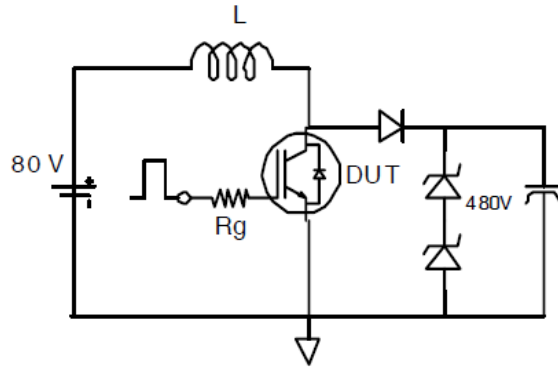


Fig.14 RBSOA Circuit

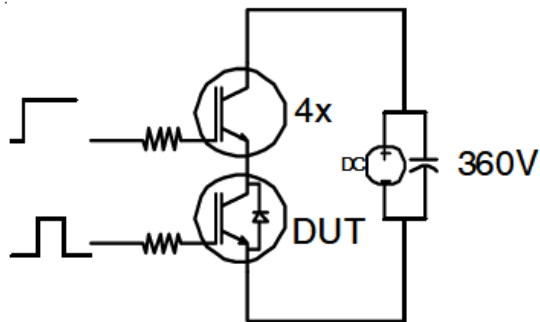


Fig.15 S.C. SOA Circuit

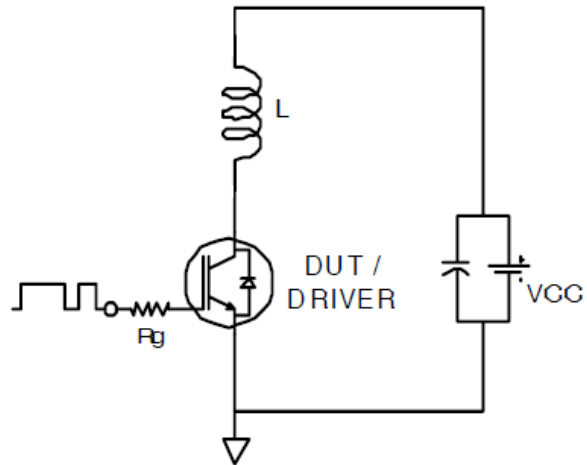


Fig.16 Switching Loss Circuit

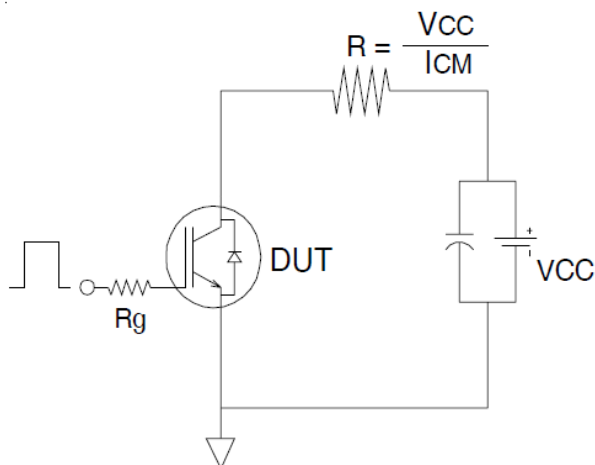


Fig.17 Resistive Load Circuit

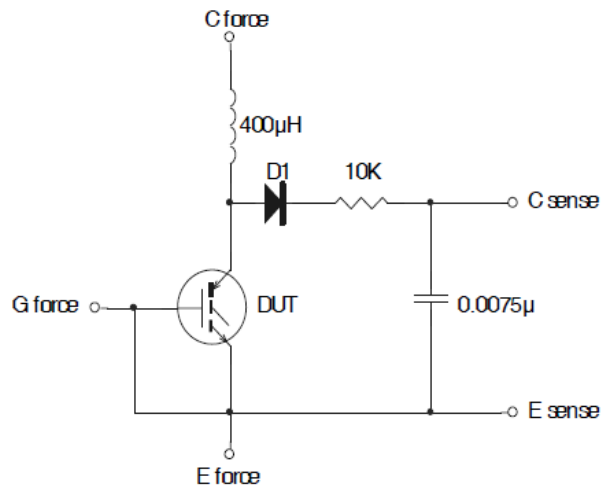
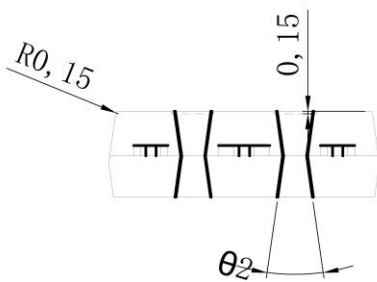
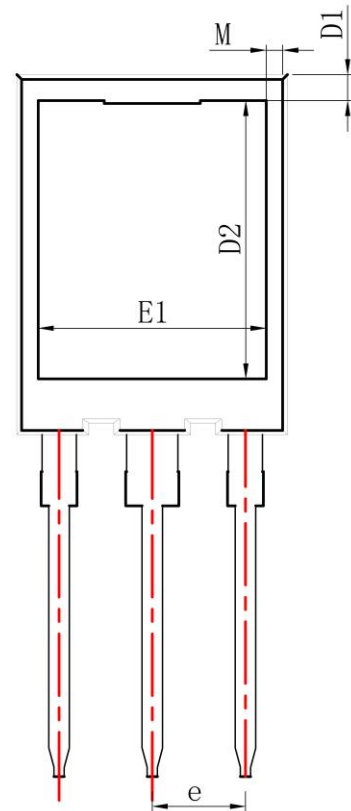
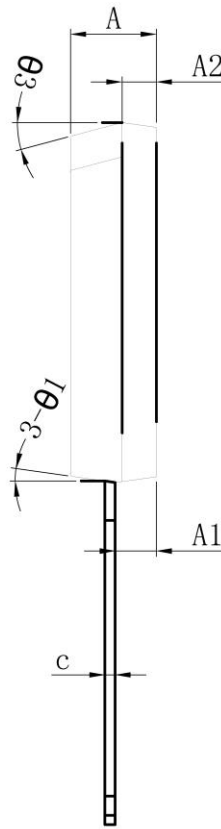
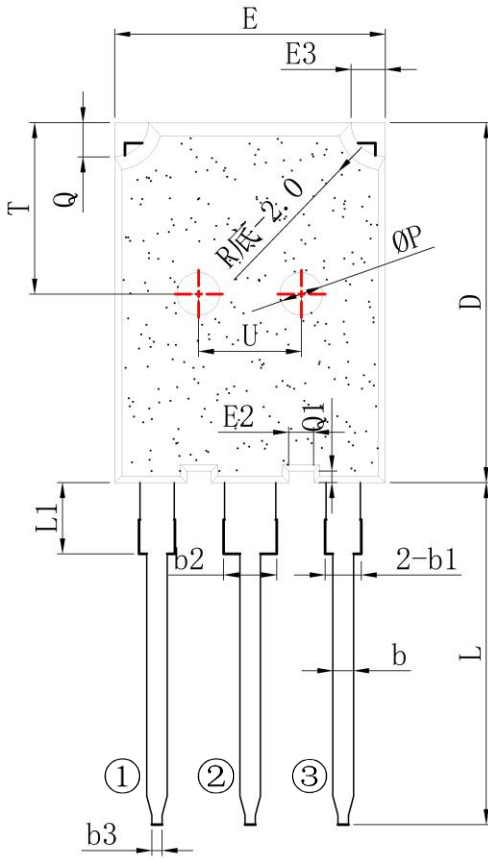


Fig.18 BVCES Filter Circuit



Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER



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°



Revision	Notes
A	Final Version
B	Update Package Outline Drawing
C	Update Capacitance and Gate Charge
D	Optimized Switching Characteristics
E	Updated Switching Loss Curve for Smaller R_G

Announcement

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

The released datasheet would be issued with “REV.” + “alphabet characters”.