



SMGI15H120ADB

1200V 15A Field Stop Trench IGBT

Features:

- Low $V_{CE(sat)}$ Trench IGBT Technology
- Low Switching Loss
- Low Stray Inductance
- Maximum Junction Temperature 175°C
- Positive $V_{CE(sat)}$ Temperature Coefficient

Applications:

- UPS
- Motor Driver

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	$T_C=100^{\circ}\text{C}$	15	A
		$T_C=25^{\circ}\text{C}$	30	A
I_{CM}	Pulse Collector Current		60	A
I_F	Continuous Forward Current	$T_C=100^{\circ}\text{C}$	15	A
		$T_C=25^{\circ}\text{C}$	30	A
I_{FM}	Pulse Forward Current		60	A
t_{sc}	Short Circuit Withstand Time	$V_{CC}=600\text{V}$, $V_{GE}=15\text{V}$ $T_J=150^{\circ}\text{C}$	>10	μs
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	405	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)	$^{\circ}\text{C}$



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	$V_{GE}=0\text{V}$, $I_C=250\mu\text{A}$		1200			V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$		1.75	2.10	V
			$T_J=125^{\circ}\text{C}$		2.10		V
			$T_J=150^{\circ}\text{C}$		2.20		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=V_{CES}$,				25	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 25\text{V}$, $V_{CE}=0\text{V}$,				± 200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$			0.98		nF
C_{oes}	Output Capacitance				0.07		
C_{res}	Reverse Transfer Capacitance				0.02		

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

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =0/15V, Inductive Load	T _J =25℃		37		ns
			T _J =125℃		39		
			T _J =150℃		43		
t _r	Rise Time		T _J =25℃		41		ns
			T _J =125℃		45		
			T _J =150℃		59		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =0/15V, Inductive Load	T _J =25℃		152		ns
			T _J =125℃		156		
			T _J =150℃		163		



t _f	Fall Time	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =0/15V, Inductive Load	T _J =25℃		188		ns
			T _J =125℃		196		
			T _J =150℃		207		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =0/15V, di/dt=287A/μs(T _J =150℃), Inductive Load	T _J =25℃		1.47		mJ
			T _J =125℃		1.98		
			T _J =150℃		2.12		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =0/15V, du/dt=1300V/μs(T _J =150℃), Inductive Load	T _J =25℃		0.60		mJ
			T _J =125℃		0.79		
			T _J =150℃		0.85		
Q _g	Total Gate Charge	V _{CC} =960V, I _C =15A, V _{GE} =0/15V			55		nC
Q _{ge}	Gate-emitter Charge				11		
Q _{gc}	Gate-collector Charge				31		
I _{sc}	V _{CC} =600V, V _{GE} =0/15V, t _p =10μs, T _J =150℃				69		A

Electrical Characteristics of Diode ($T_C=25^\circ C$ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =15A	T _J =25℃		1.75		V
			T _J =125℃		1.85		
			T _J =150℃		1.90		
I _{rr}	Peak Reverse Recovery Current	I _F =15A, -di/dt=385A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =0V	T _J =25℃		9.1		A
			T _J =125℃		10.3		
			T _J =150℃		10.3		
t _{rr}	Reverse Recovery Time		T _J =25℃		243		ns
			T _J =125℃		301		
			T _J =150℃		311		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		1.37		μC
			T _J =125℃		1.61		
			T _J =150℃		1.65		



E _{rec}	Reverse Recovery Energy	I _F =15A, di/dt=385A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =0V	T _J =25°C		0.57		mJ
			T _J =125°C		0.70		
			T _J =150°C		0.73		

Thermal Characteristics (T_C=25°C unless otherwise specified)

Symbol	Description	Min.	Typ.	Max.	Units
R _{ΘJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.37		°C/W
R _{ΘJC} (Diode)	Thermal Resistance: Junction-to-Case		0.81		°C/W
R _{ΘJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	°C/W

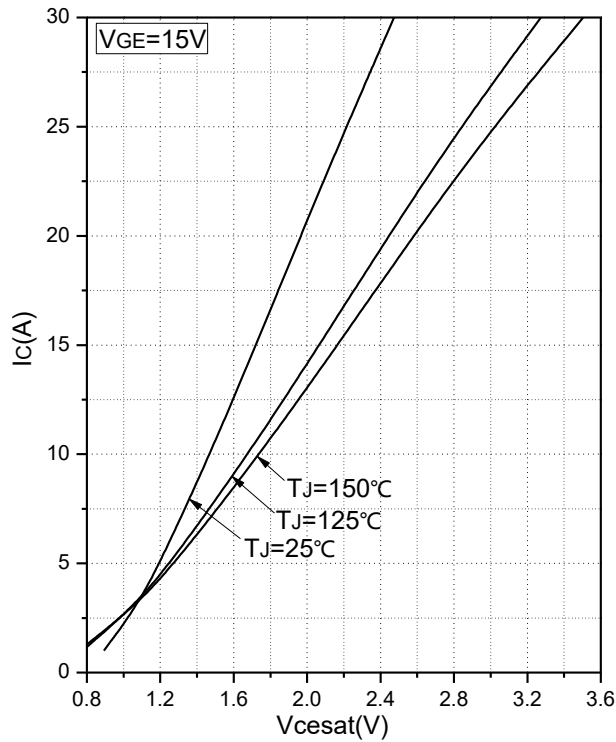


Fig.1 Typical Saturation Voltage Characteristics

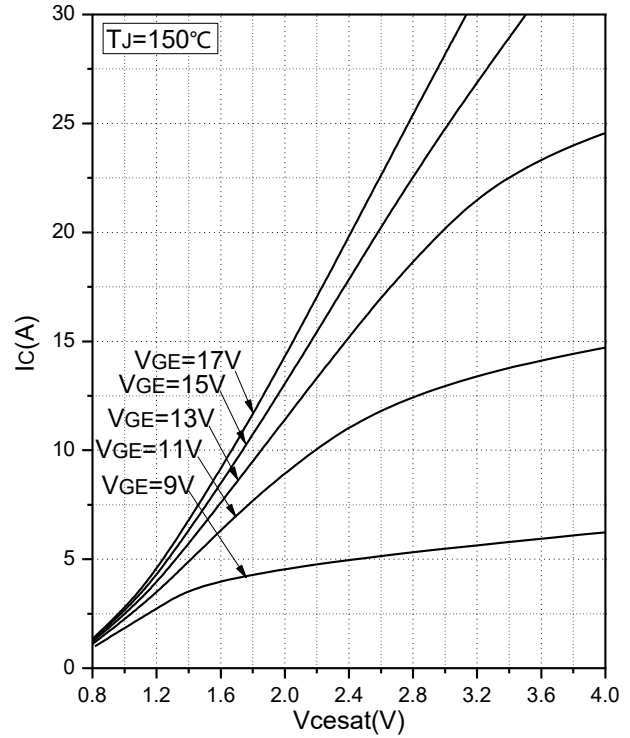


Fig.2 Typical Output Characteristics

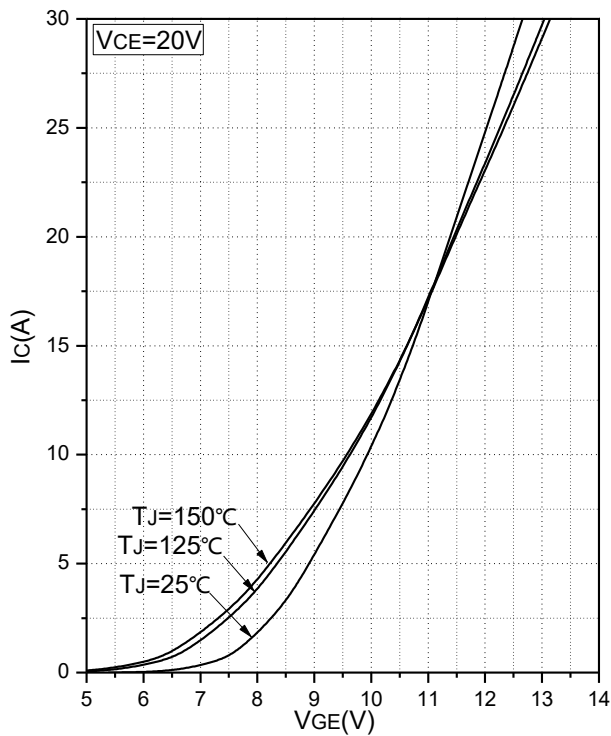


Fig.3 Transfer Characteristics

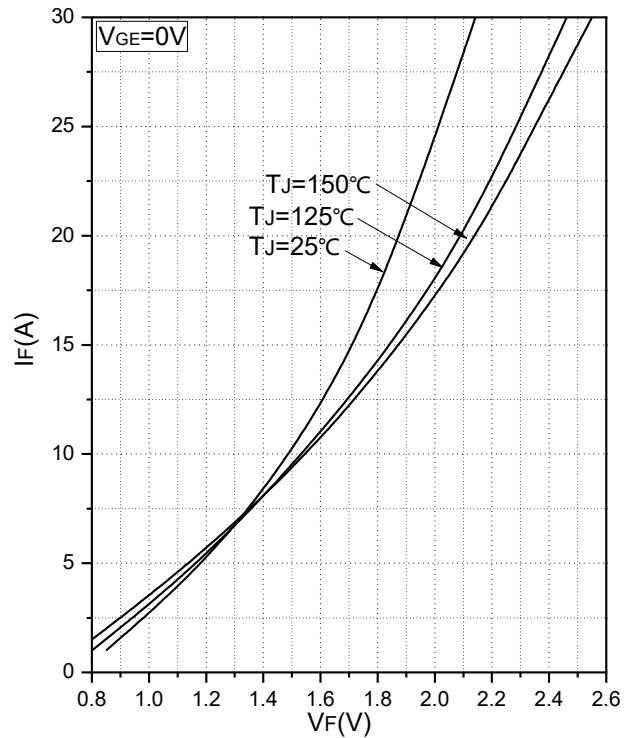


Fig.4 Forward Characteristics of Diode

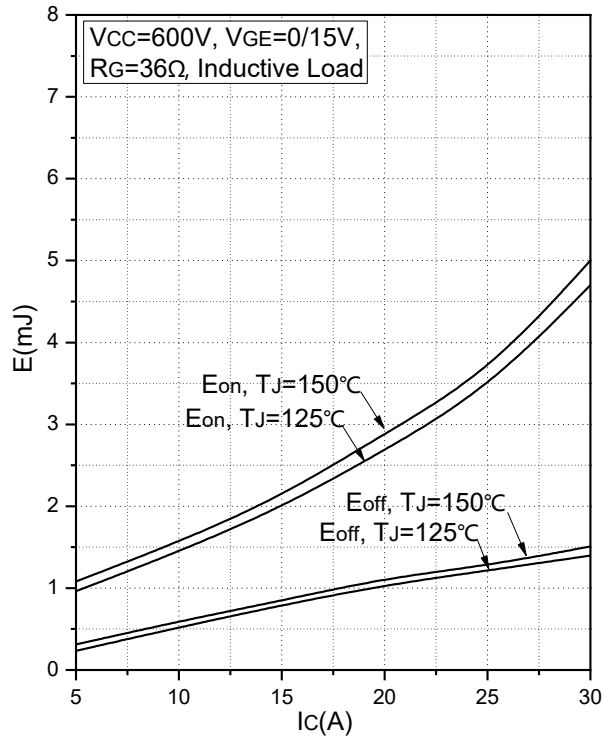


Fig.5 Typical Switching Loss vs. Collector Current

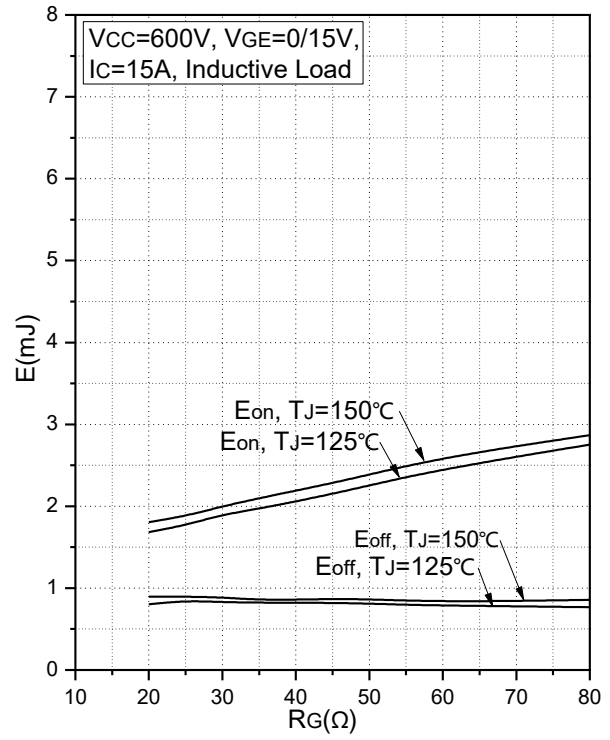


Fig.6 Typical Switching Loss vs. Gate Resistance

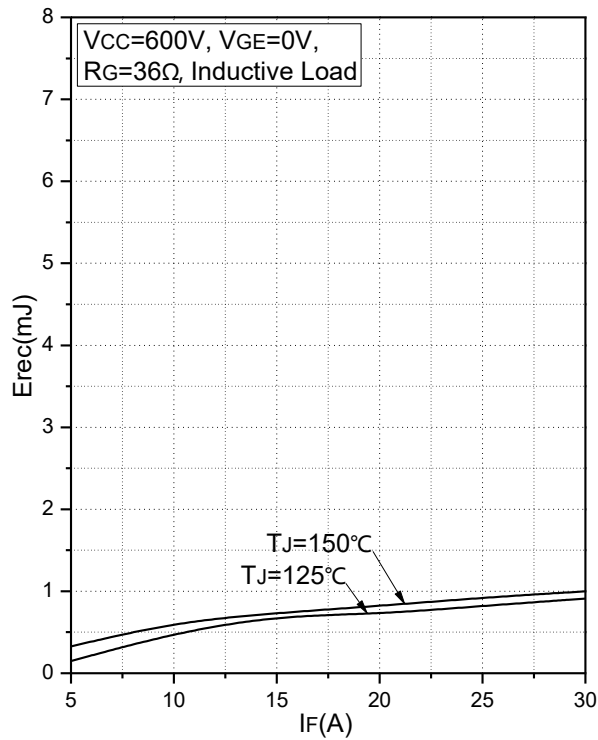


Fig.7 Typical Switching Loss vs. Forward Current

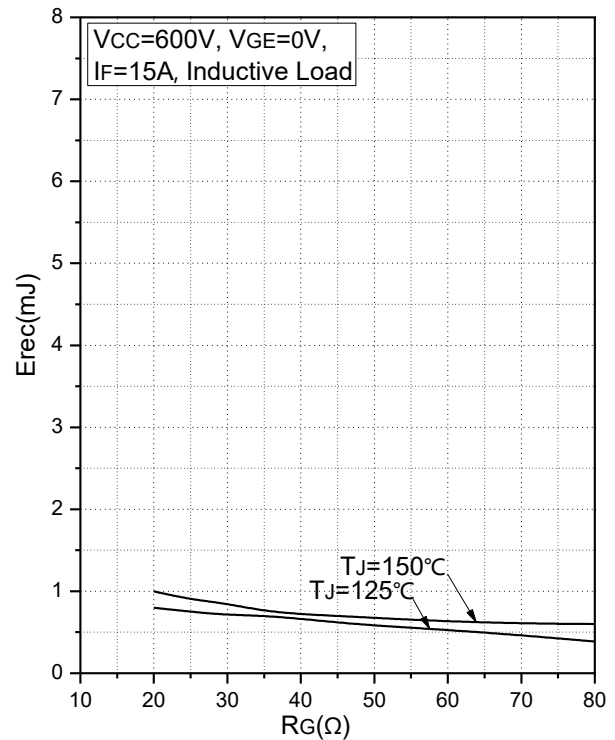
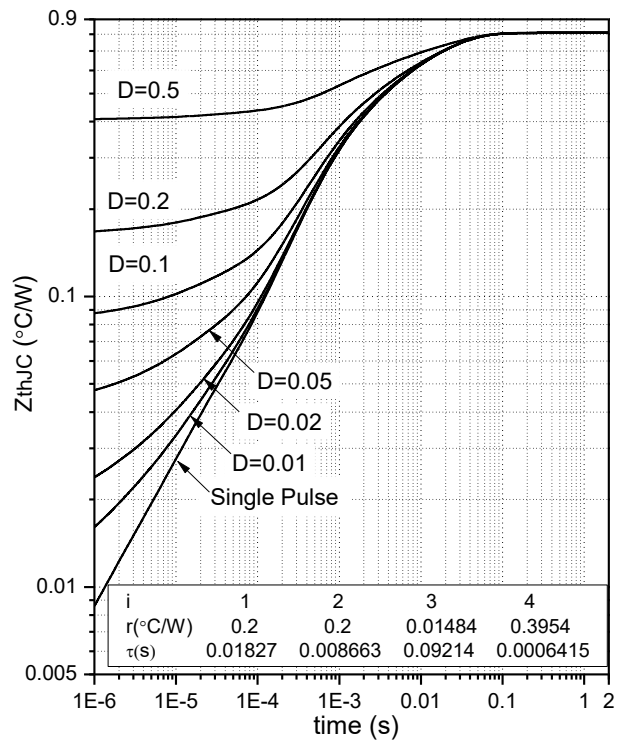
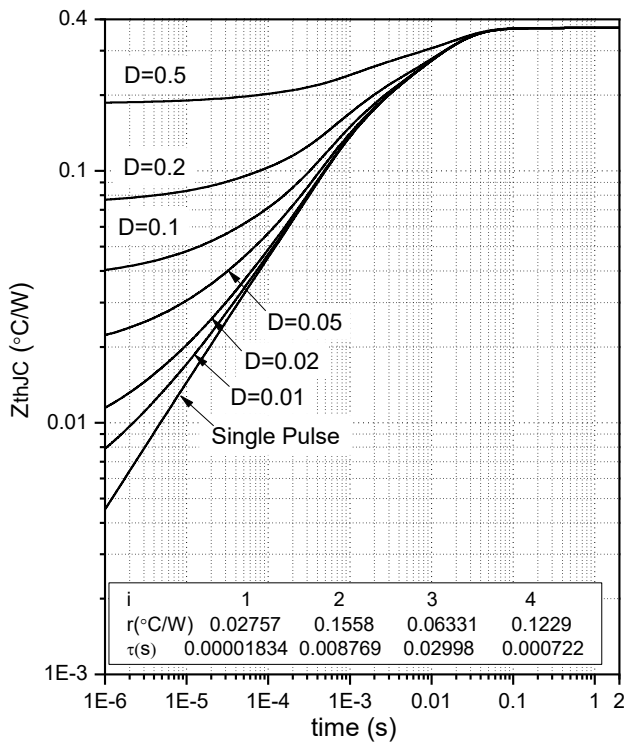
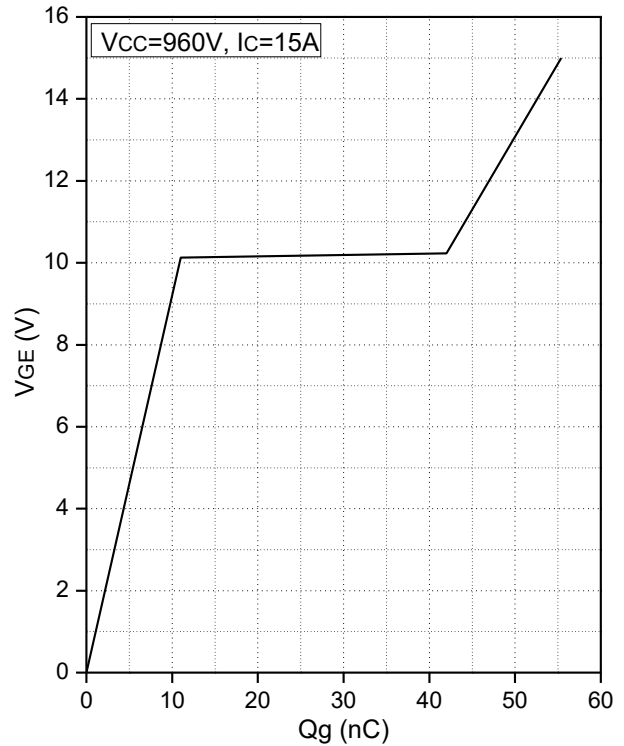
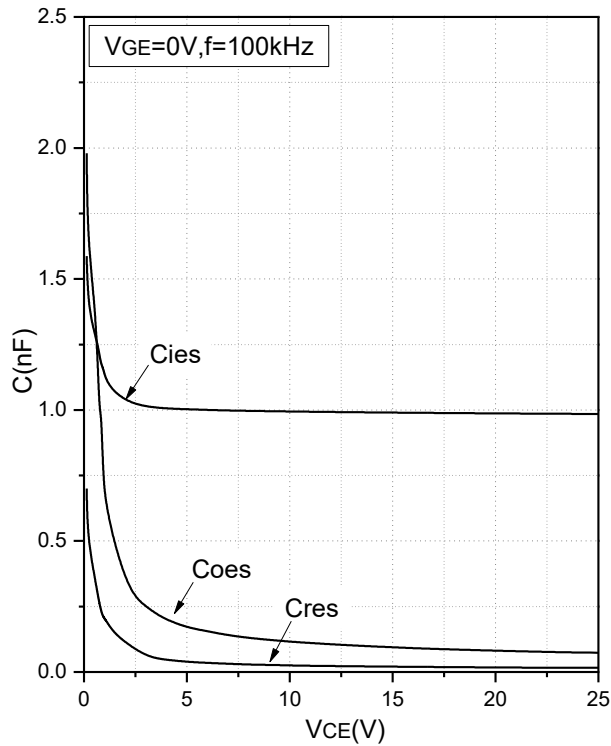


Fig.8 Typical Switching Loss vs. Gate Resistance





Test Circuit:

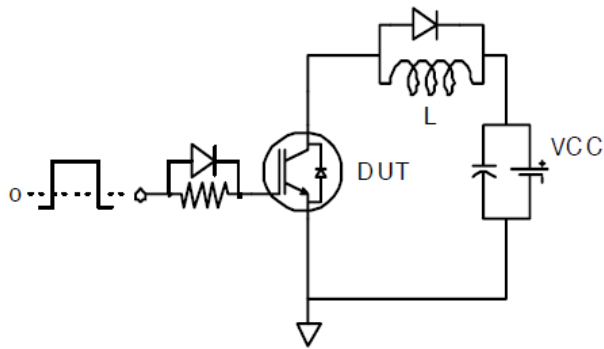


Fig.13 Gate Charge Circuit (turn-off)

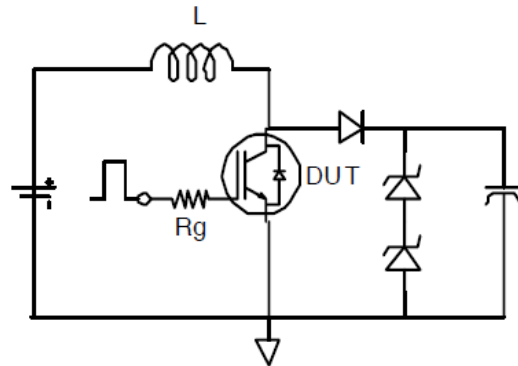


Fig.14 RBSOA Circuit

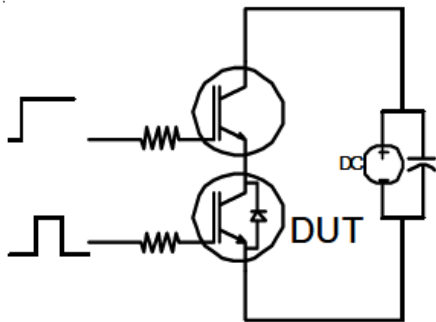


Fig.15 S.C. SOA Circuit

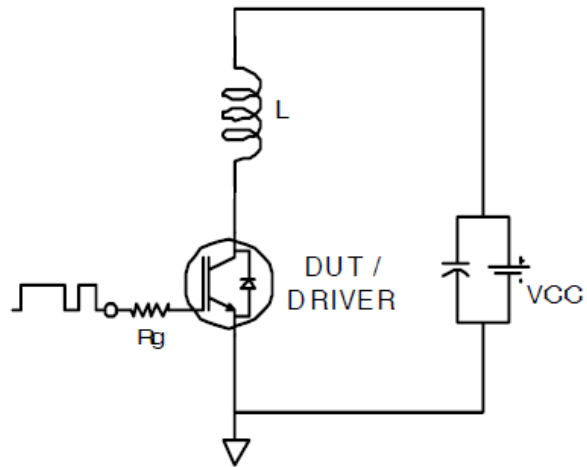


Fig.16 Switching Loss Circuit

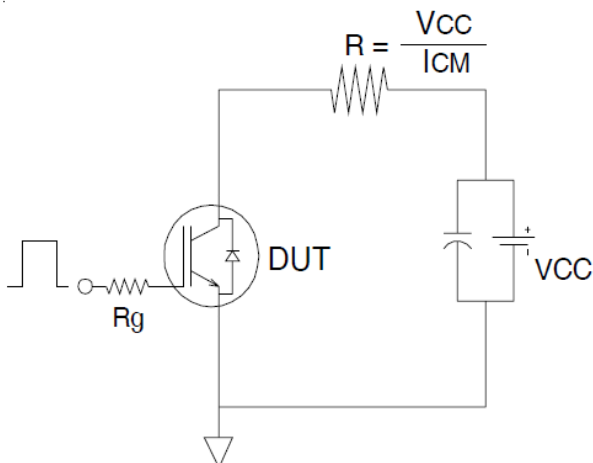


Fig.17 Resistive Load Circuit

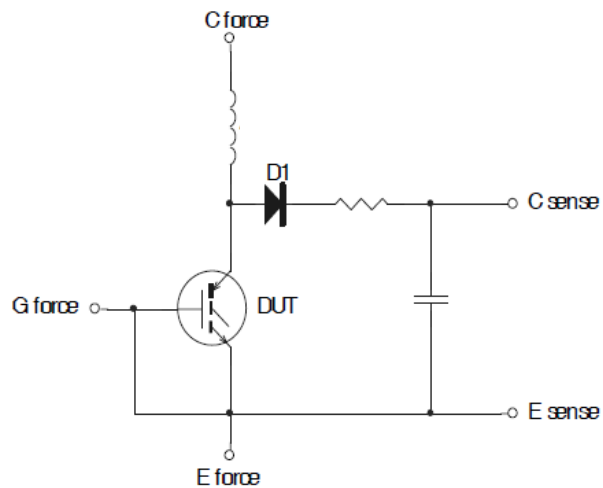
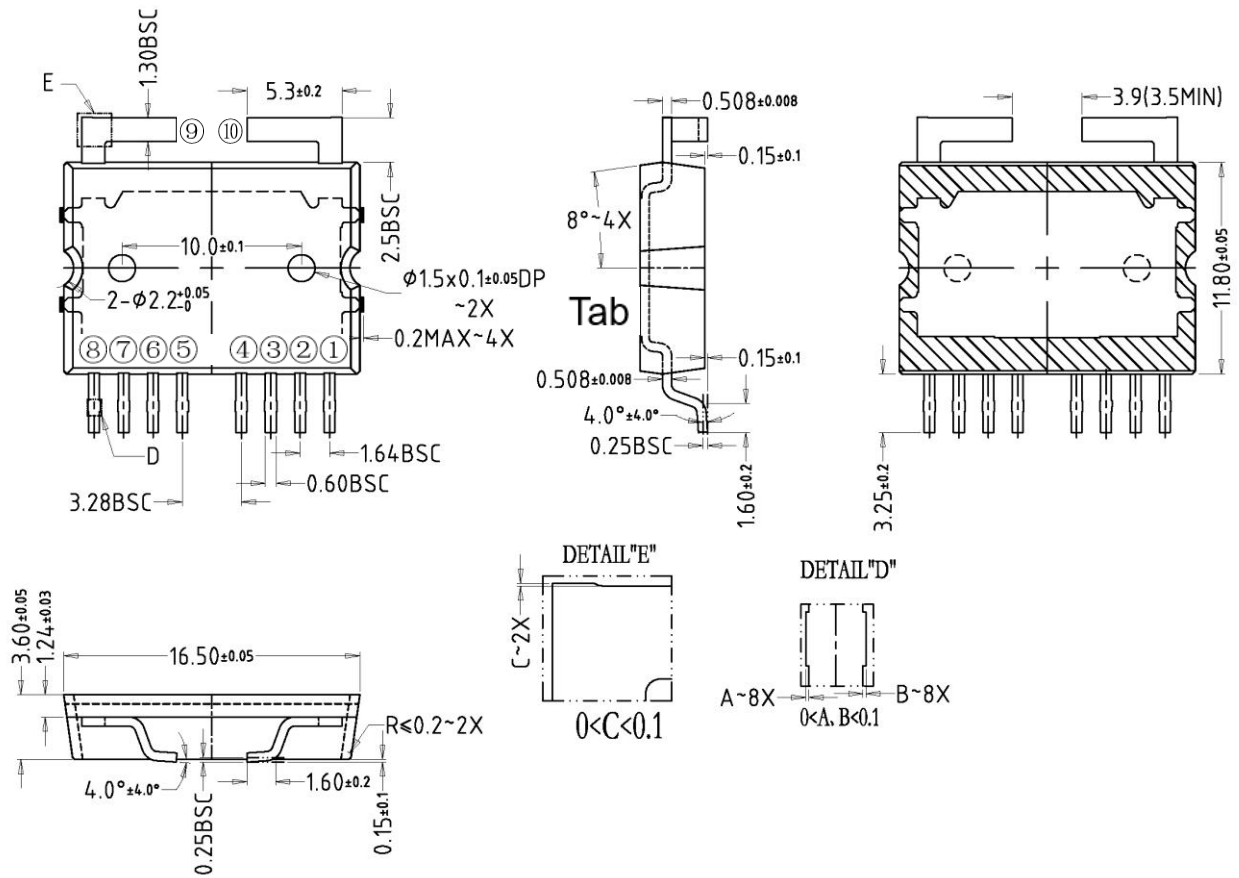


Fig.18 BVCEs Filter Circuit



IP-8L Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② KELVIN EMITTER
- ③ ... ⑧ EMITTER
- ⑨/⑩/Tab COLLECTOR



Revision	Notes
01	Initial Release
02	Updated Outline
03	Update Electrical Characteristics and Curves
A	Final Version

Announcement

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