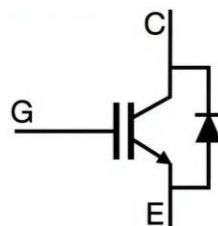


SMGW15H120ADB

1200V 15A 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
SMGW15H120ADB	TO247-3	SMGW15H120ADB

Absolute Maximum Rated Values ($T_C=25^{\circ}\text{C}$ 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, Limited by T_{Jmax}	$T_C=100^{\circ}\text{C}$	15	A
		$T_C=25^{\circ}\text{C}$	30	A
I_{CM}	Pulse Collector Current, T_p limited by T_{Jmax}		45	A
I_F	Continuous Forward Current Limited by T_{Jmax}	$T_C=100^{\circ}\text{C}$	15	A
		$T_C=25^{\circ}\text{C}$	30	A
I_{FM}	Pulse Forward Current, T_p limited by T_{Jmax}		45	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	250	W
T_{JOP}	Maximum Operating Junction Temperature Range		$-40\sim 175$	$^{\circ}\text{C}$
$T_{Storage}$	Storage Temperature		$-40\sim 150$	$^{\circ}\text{C}$
T_{Solder}	Soldering Temperature, 0.063 in. (1.6mm) from case for 10 seconds		235	$^{\circ}\text{C}$



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		1200			V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.5\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.68	2.10	V
			$T_J=125^{\circ}\text{C}$	2.12		V
			$T_J=175^{\circ}\text{C}$	2.32		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200\text{V}$	$T_J=25^{\circ}\text{C}$	1	50	μA
			$T_J=175^{\circ}\text{C}$	2		mA
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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		958		pF
C_{oes}	Output Capacitance			76		
C_{res}	Reverse Transfer Capacitance			17		

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

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=36\Omega, V_{GE}=0/15V,$ Inductive Load	$T_J=25^{\circ}C$		41		ns
			$T_J=125^{\circ}C$		40		
			$T_J=175^{\circ}C$		38		
t_r	Rise Time		$T_J=25^{\circ}C$		50		ns
			$T_J=125^{\circ}C$		56		
			$T_J=175^{\circ}C$		59		
$t_{d(off)}$	Turn-off Delay Time	$T_J=25^{\circ}C$		232		ns	
		$T_J=125^{\circ}C$		255			
		$T_J=175^{\circ}C$		267			
t_f	Fall Time	$T_J=25^{\circ}C$		133		ns	
		$T_J=125^{\circ}C$		190			
		$T_J=175^{\circ}C$		226			

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E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =0/15V, di/dt=200A/μs(T _J =175°C), Inductive Load	T _J =25°C		1.42		mJ
			T _J =125°C		1.50		
			T _J =175°C		1.54		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =0/15V, du/dt=4300V/μs(T _J =175°C), Inductive Load	T _J =25°C		0.83		mJ
			T _J =125°C		1.04		
			T _J =175°C		1.17		
Q _g	Total Gate Charge	V _{CC} =960V, I _C =15A, V _{GE} =0V/15V			57		nC
Q _{ge}	Gate-emitter Charge				9		
Q _{gc}	Gate-collector Charge				39		
SCSOA	V _{CC} =600V, V _{GE} =0/15V, R _G =36Ω, R _{Goff} =36Ω, T _J =175°C			10			us

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =15A	T _J =25°C		1.79	2.15	V
			T _J =125°C		1.99		
			T _J =175°C		1.96		
I _{rr}	Peak Reverse Recovery Current	I _F =15A, di/dt=300A/μs(T _J =175°C), V _{rr} =600V, V _{GE} =0V	T _J =25°C		9		A
			T _J =125°C		10		
			T _J =175°C		11		
t _{rr}	Reverse Recovery Time		T _J =25°C		240		ns
			T _J =125°C		415		
			T _J =175°C		430		
dI _{rr} /dt	Peak Rate of Fall of Reverse Recovery Current		T _J =25°C		41		A/us
			T _J =125°C		21		
			T _J =175°C		25		

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IGBT Discrete Datasheet



Q _{rr}	Reverse Recovery Charge	I _F =15A, di/dt=300A/μs(T _J =175°C), V _{rr} =600V, V _{GE} =0V	T _J =25°C		1.16		μC
			T _J =125°C		1.91		
			T _J =175°C		2.27		
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.45		mJ
			T _J =125°C		0.77		
			T _J =175°C		1.01		

Thermal Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.50		K/W
R _{θJC} (Diode)	Thermal Resistance: Junction-to-Case		1.29		K/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	K/W



Characteristics diagrams

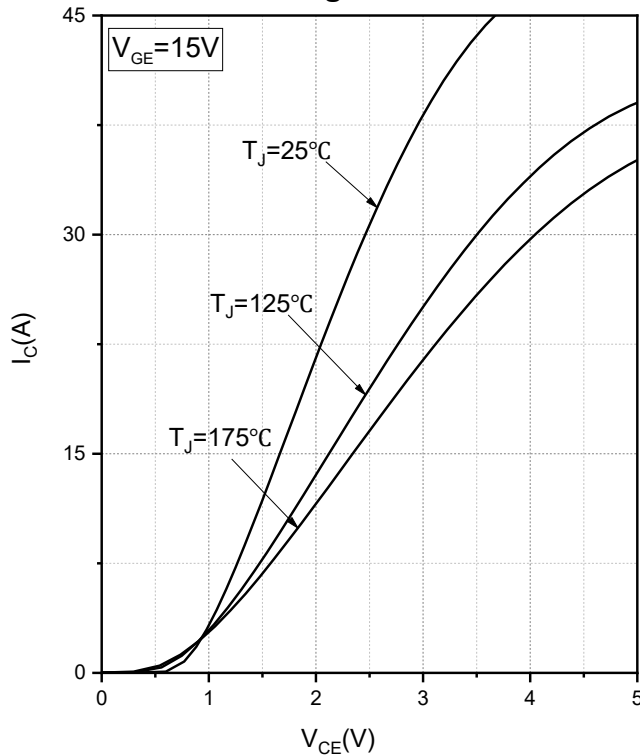


Fig.1 Typical Saturation Voltage Characteristics

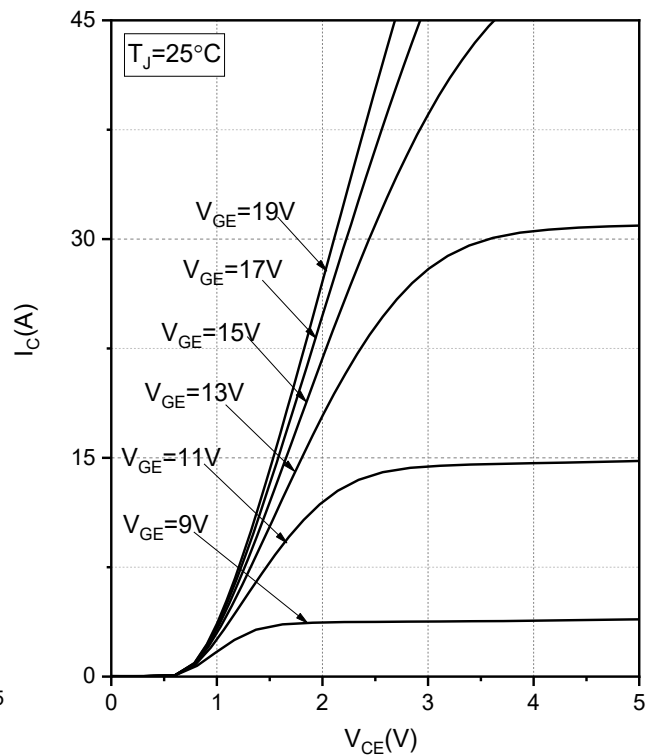


Fig.2 Typical Output Characteristics, $T_J=25^{\circ}\text{C}$

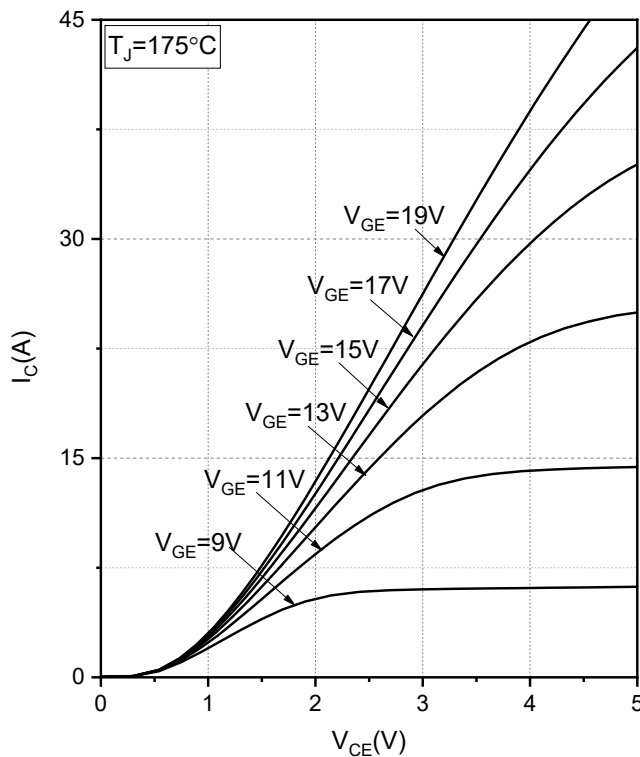


Fig.3 Typical Output Characteristics, $T_J=175^{\circ}\text{C}$

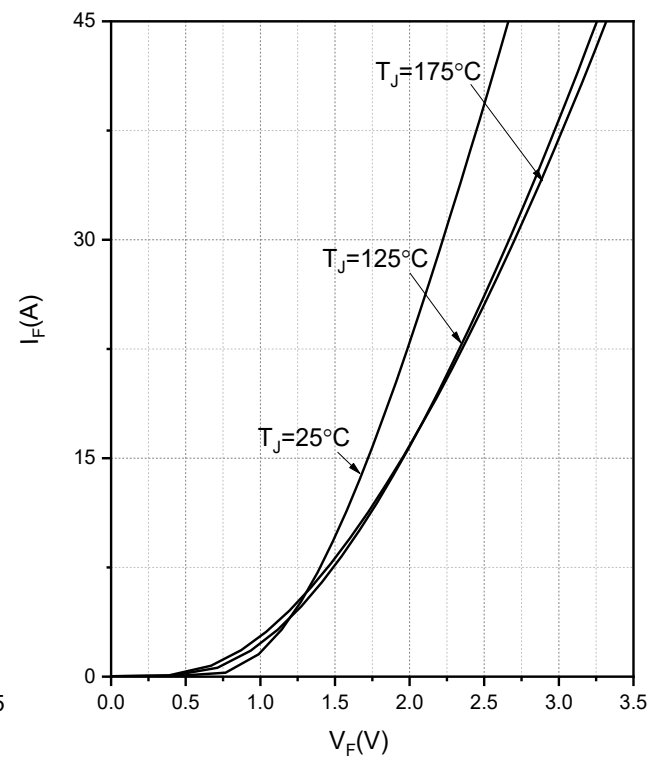
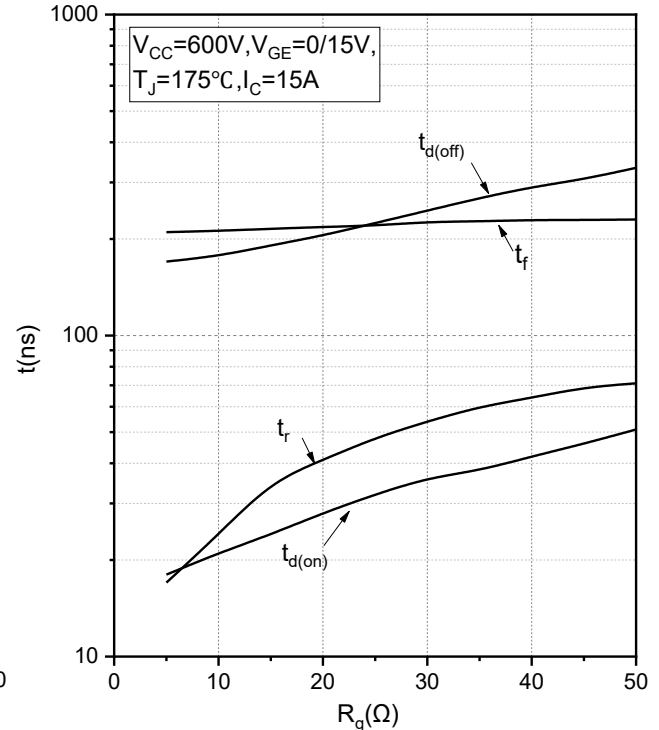
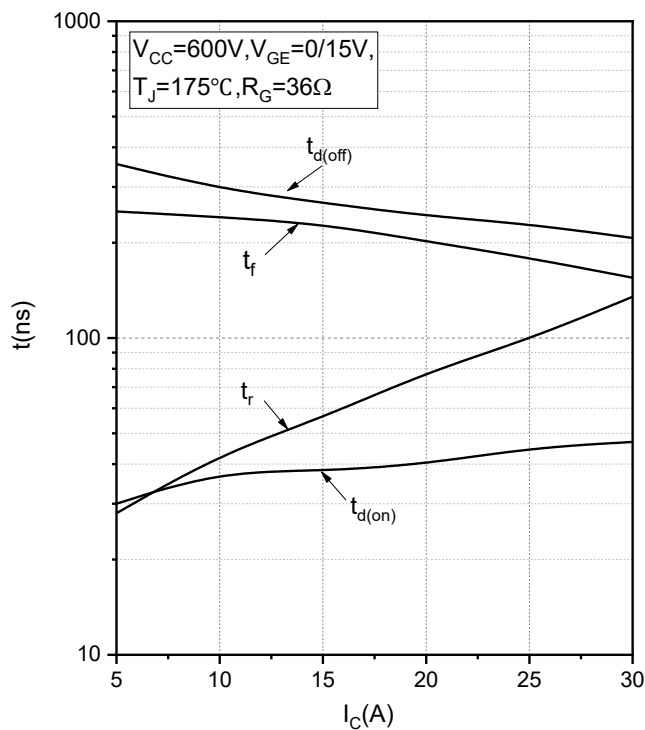
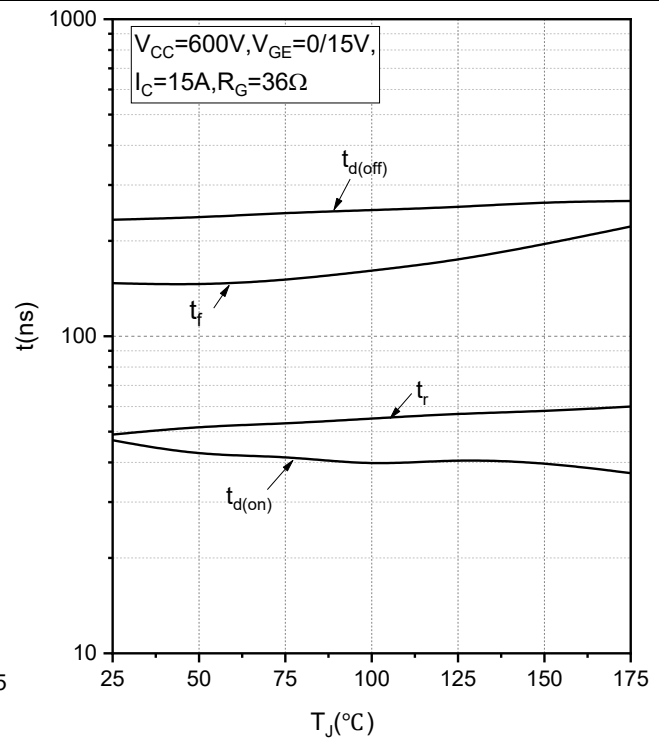
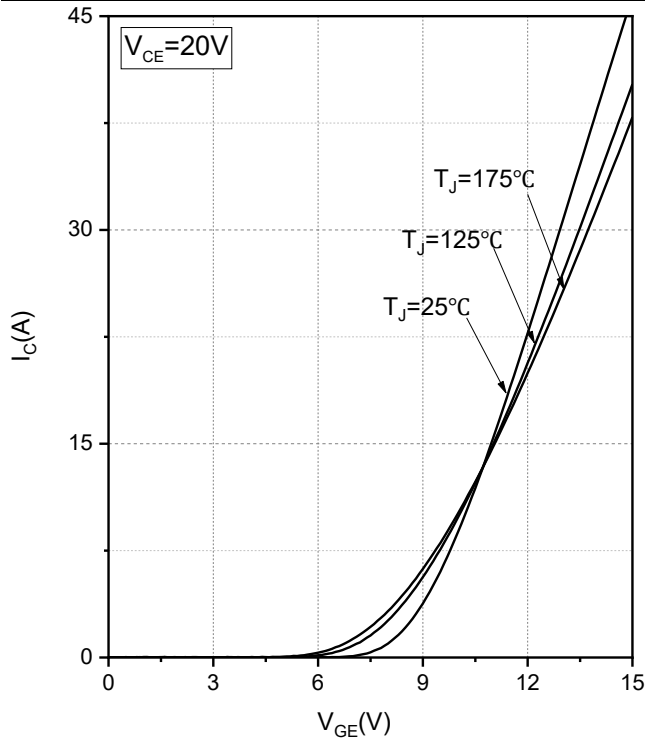
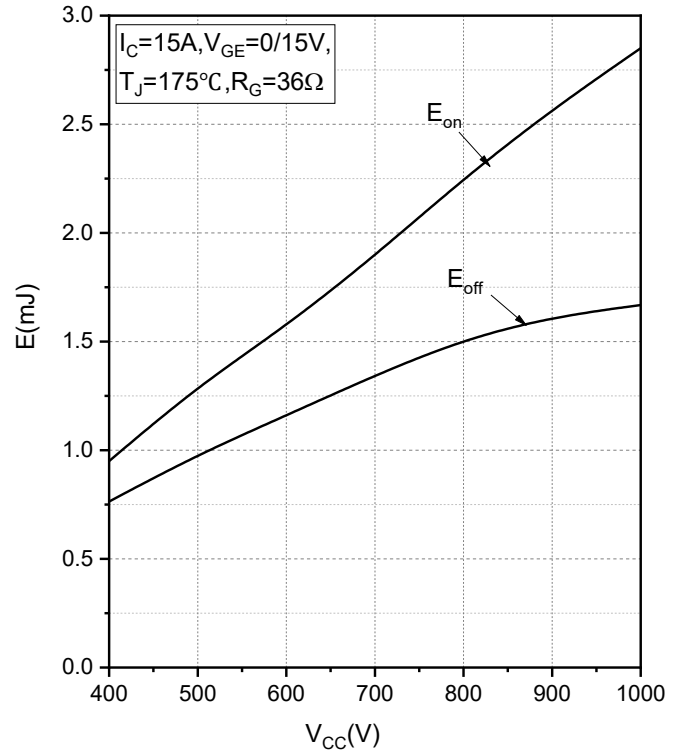
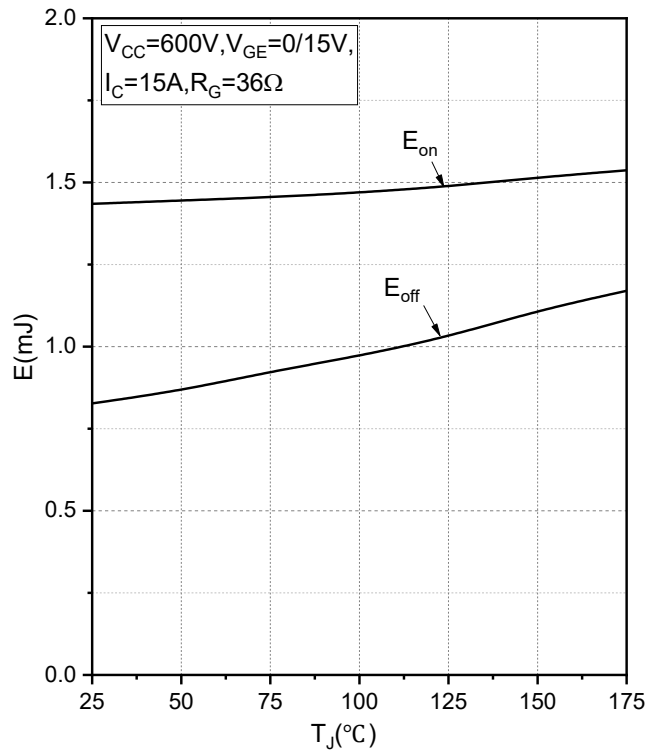
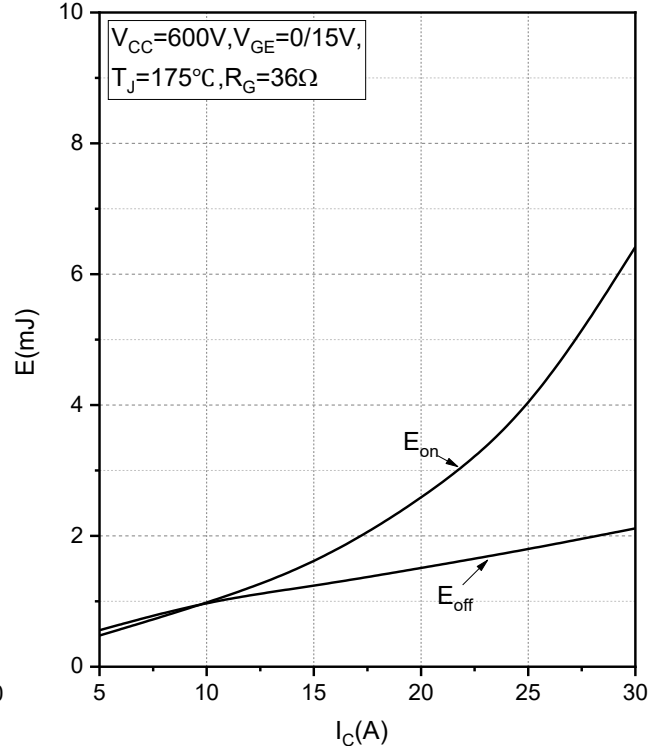
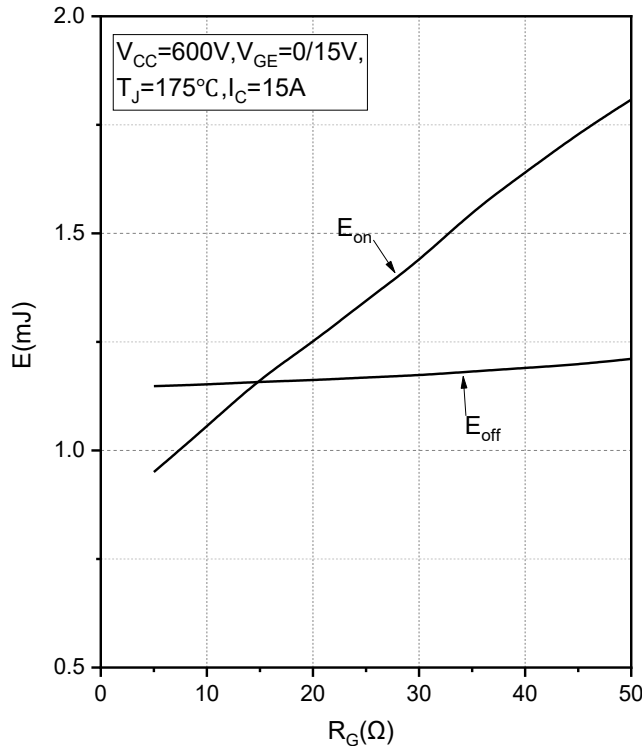


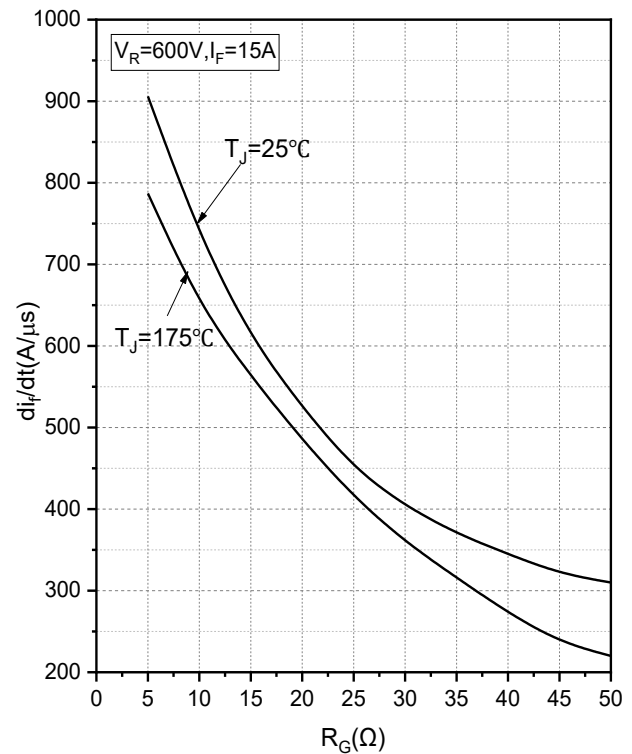
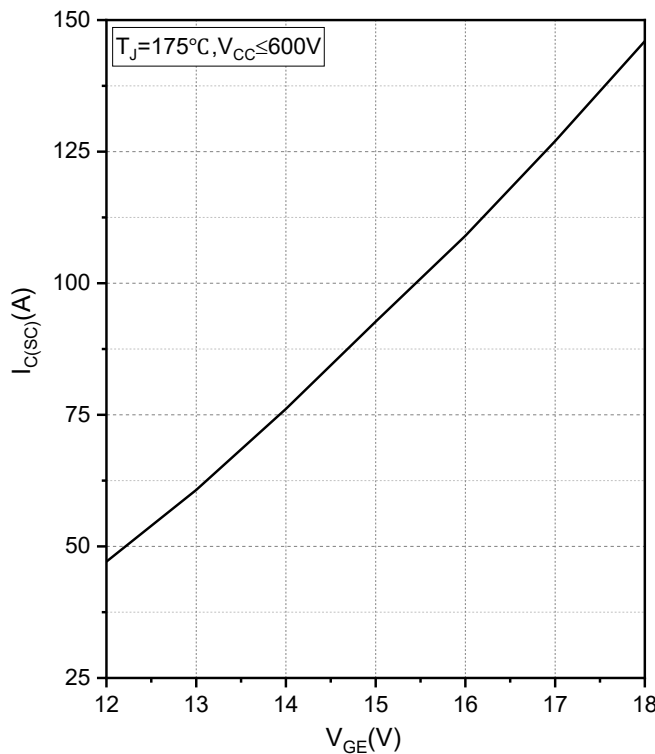
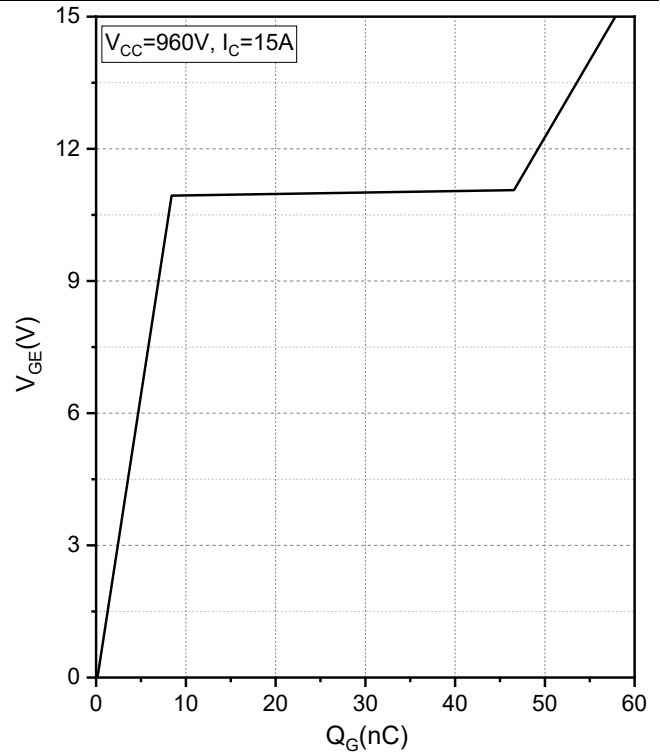
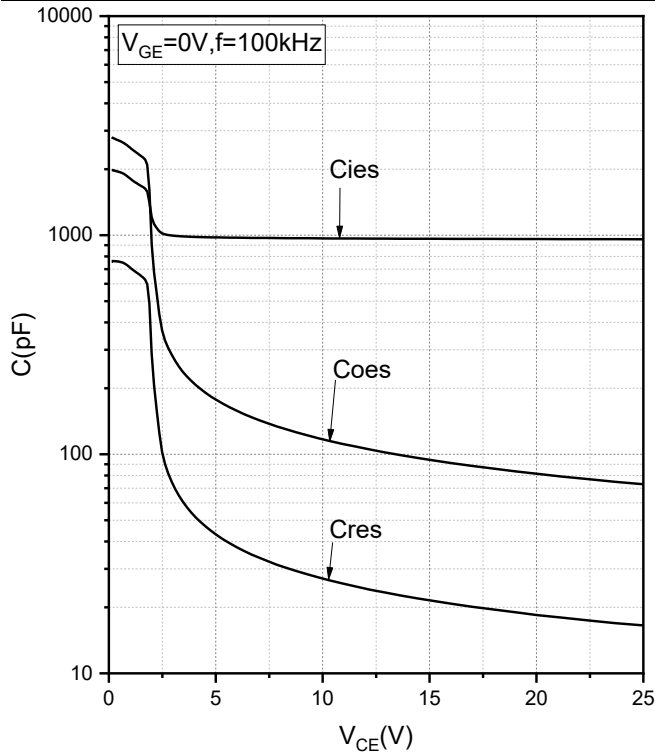
Fig.4 Forward Characteristics of Diode

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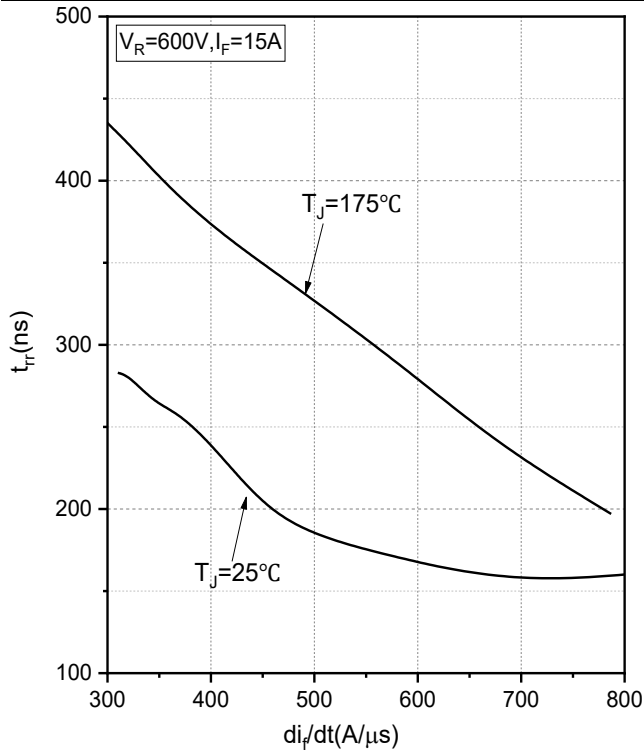


Fig.17 Typical Reverse Recovery Time as a Function of Diode Current Slope

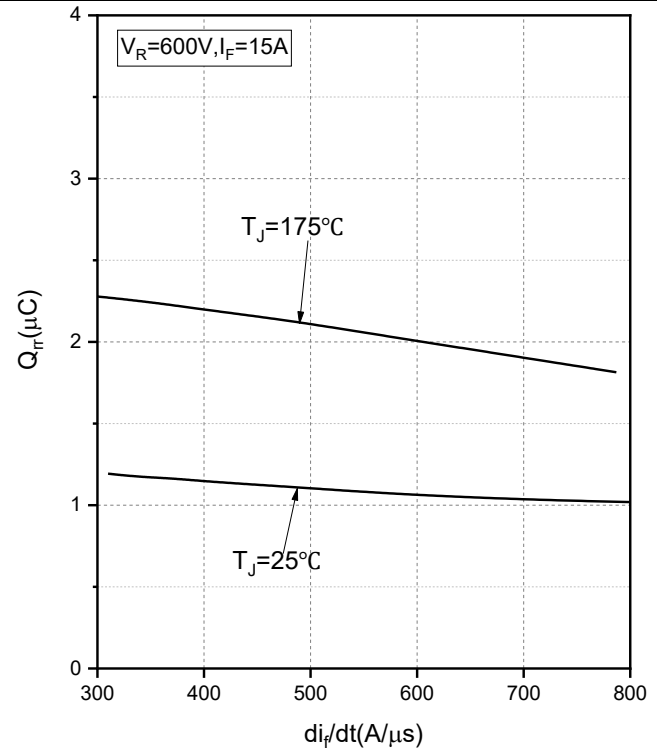


Fig.18 Typical Reverse Recovery Charge as a Function of Diode Current Slope

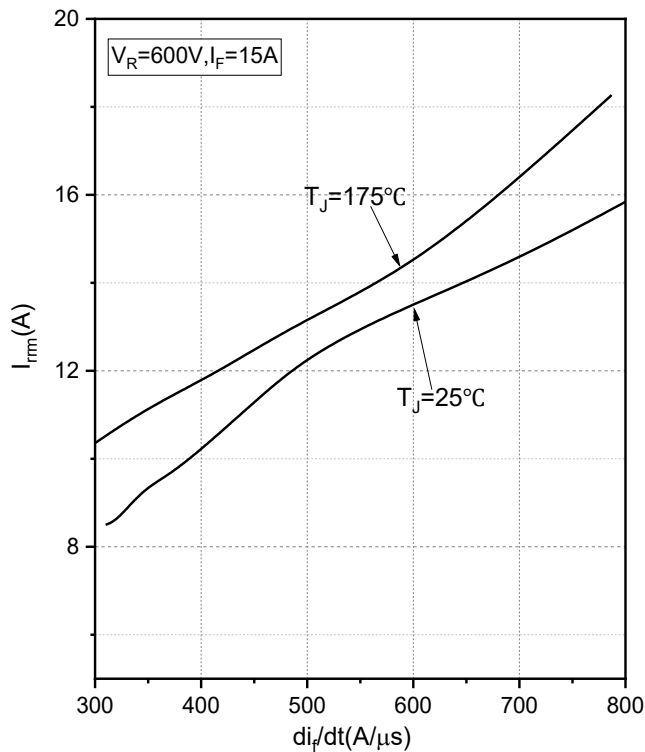


Fig.19 Typical Reverse Recovery Current as a Function of Diode Current Slope

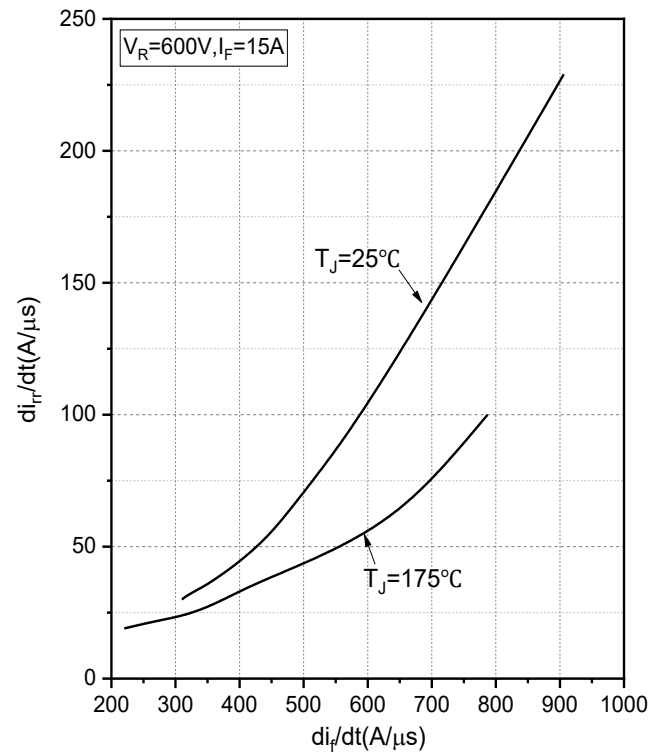


Fig.20 Typical Diode Peak Rate of Fall Of Reverse Recovery Current as a Function of Diode Current Slope

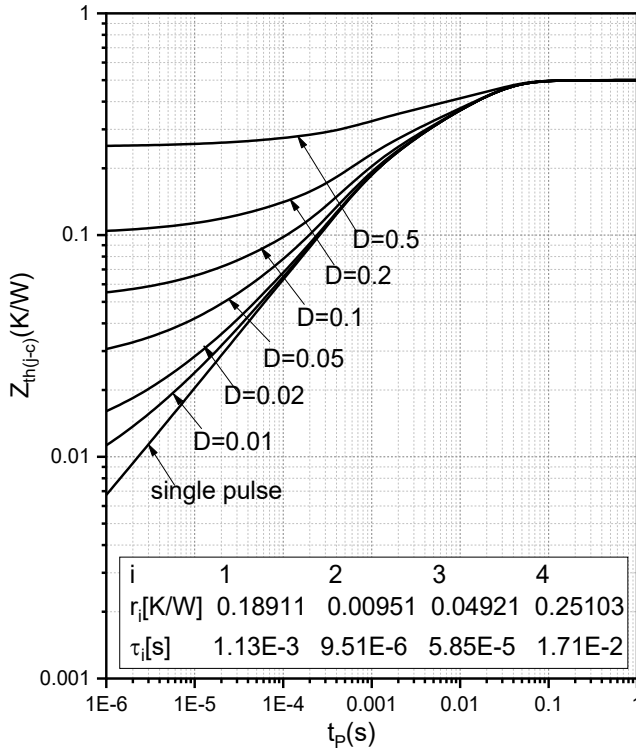


Fig.21 Transient Thermal Impedance (IGBT)

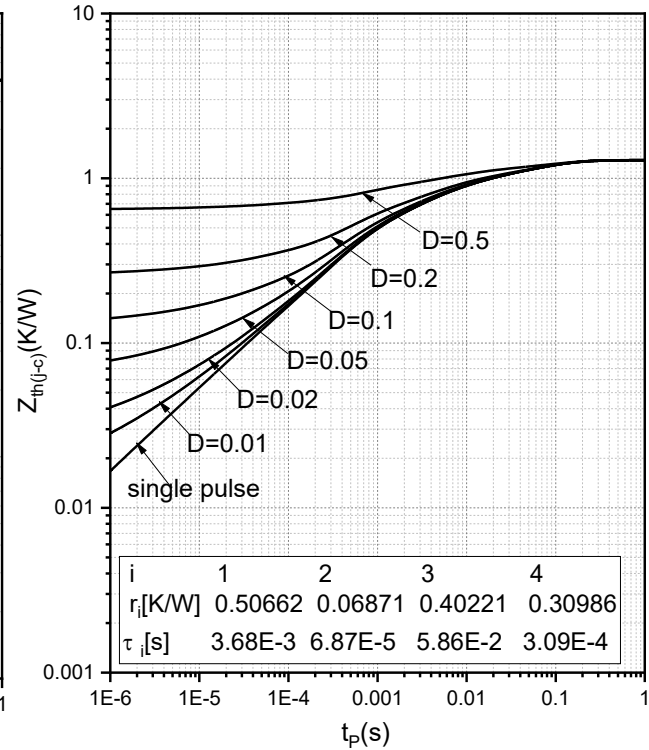


Fig.22 Transient Thermal Impedance (Diode)

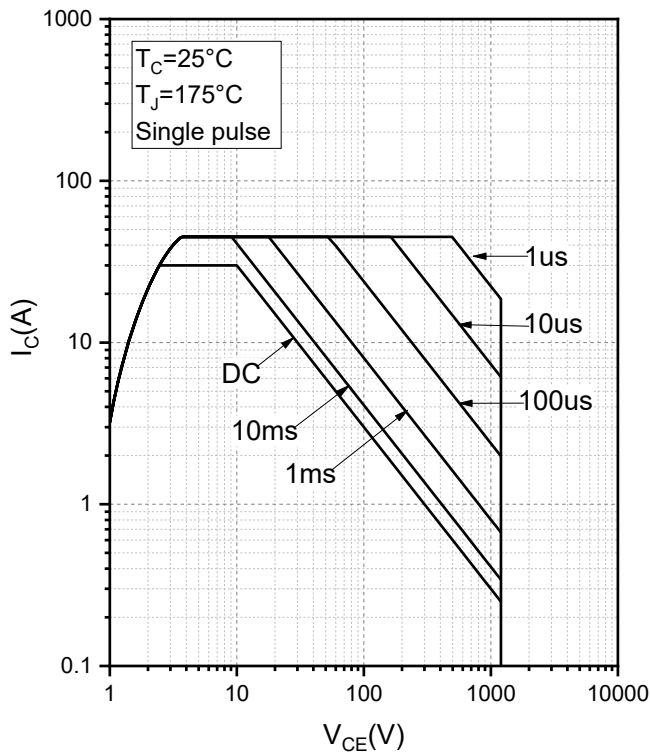


Fig.23 Forward Bias Safe Operating Area, IGBT



Test Circuit:

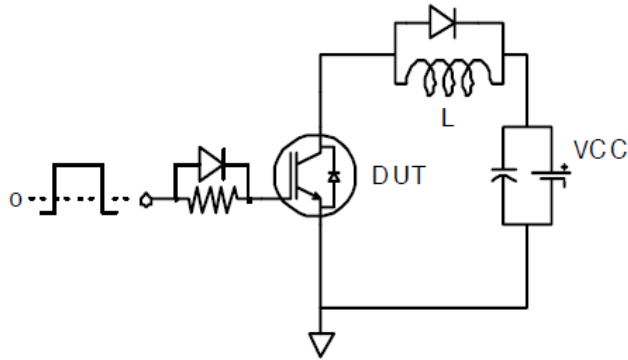


Fig.23 Gate Charge Circuit (turn-off)

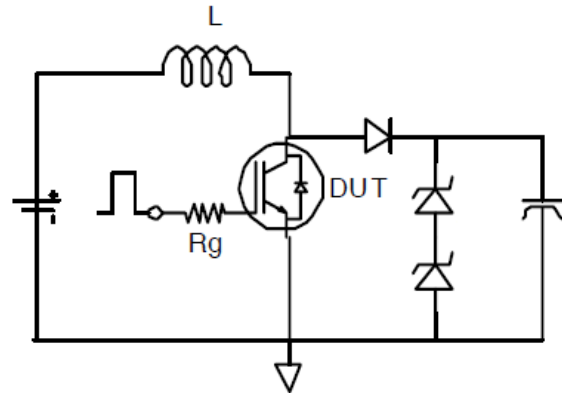


Fig.24 RBSOA Circuit

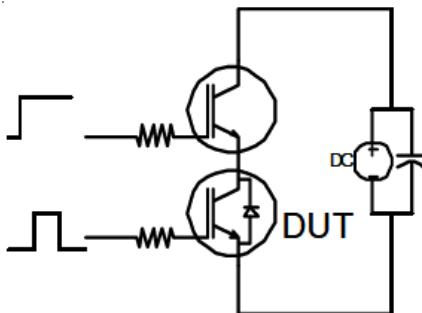


Fig.25 S.C. SOA Circuit

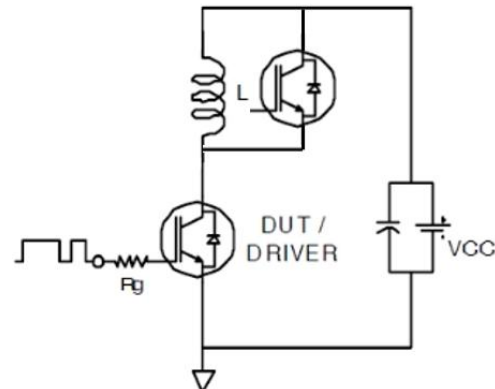


Fig.26 Switching Loss Circuit

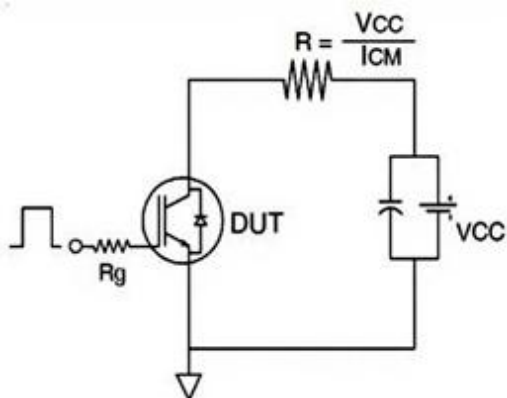


Fig.27 Resistive Load Circuit

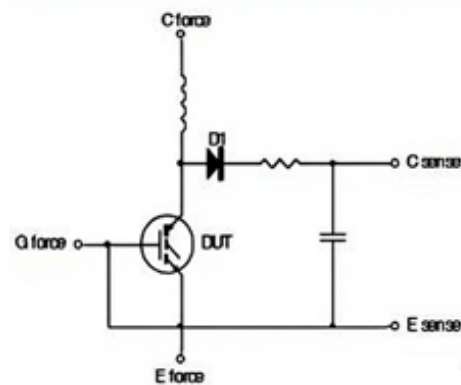


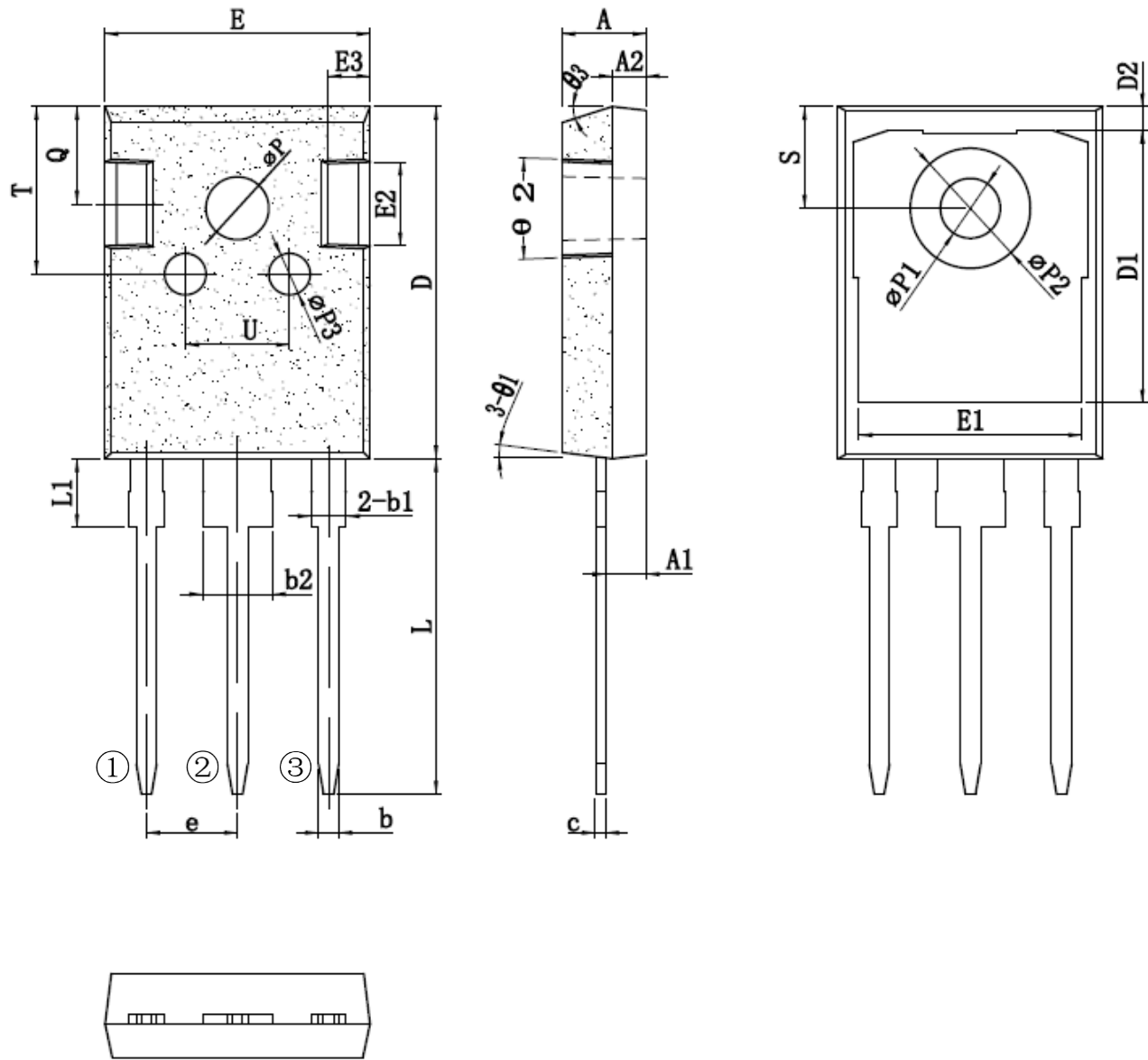
Fig.28 BVCES Filter Circuit

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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	2.31	2.41	2.51
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
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.98	20.15
*L1	-	-	4.30
*ΦP	3.60	3.70	3.80
*ΦP1	3.45	3.55	3.65
ΦP2	7.03	7.18	7.33
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°



Revision	Notes
A	Final datasheet initial release

Announcement

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