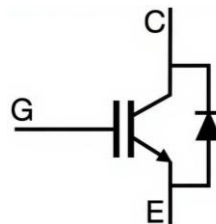


SMGW50H120ADB

1200V 50A 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
SMGW50H120ADB	TO247-3	SMGW50H120ADB

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}	$T_C=100^{\circ}\text{C}$	50	A
		$T_C=25^{\circ}\text{C}$	100	A
I_{CM}	Pulse Collector Current, T_p limited by T_{Jmax}		150	A
I_F	Continuous Forward Current, Limited by T_{Jmax}	$T_C=100^{\circ}\text{C}$	50	A
		$T_C=25^{\circ}\text{C}$	100	A
I_{FM}	Pulse Forward Current, T_p limited by T_{Jmax}		150	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	735	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	$I_C=1.7\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.5	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.69	2.00	V
			$T_J=125^{\circ}\text{C}$	2.13		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
			$T_J=175^{\circ}\text{C}$	6		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		5.25		nF
C_{oes}	Output Capacitance			0.25		
C_{res}	Reverse Transfer Capacitance			0.06		

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

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$, $I_C=50A$, $R_{Gon}=10\Omega$, $V_{GE}=0/15V$, Inductive Load	$T_J=25^{\circ}C$		76		ns
			$T_J=125^{\circ}C$		74		
			$T_J=175^{\circ}C$		72		
t_r	Rise Time		$T_J=25^{\circ}C$		99		ns
			$T_J=125^{\circ}C$		100		
			$T_J=175^{\circ}C$		99		
$t_{d(off)}$	Turn-off Delay Time	$T_J=25^{\circ}C$		264		ns	
		$T_J=125^{\circ}C$		295			
		$T_J=175^{\circ}C$		312			
t_f	Fall Time	$T_J=25^{\circ}C$		145		ns	
		$T_J=125^{\circ}C$		209			
		$T_J=175^{\circ}C$		240			

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E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =50A, R _{Gon} =10Ω, V _{GE} =0/15V, di/dt=400A/μs(T _J =175°C), Inductive Load	T _J =25°C		5.74		mJ
			T _J =125°C		6.19		
			T _J =175°C		6.32		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =50A, R _{Goff} =10Ω, V _{GE} =0/15V, du/dt=4750V/μs(T _J =175°C), Inductive Load	T _J =25°C		3.24		mJ
			T _J =125°C		4.24		
			T _J =175°C		4.76		
Q _g	Total Gate Charge	V _{CC} =960V, I _C =50A, V _{GE} =0V/15V			187		nC
Q _{ge}	Gate-emitter Charge				41		
Q _{gc}	Gate-collector Charge				93		
R _{g(int)}	Internal Gate Resistance				3		Ω
SCSOA	V _{CC} =600V, V _{GE} =0/15V, R _G =10Ω, R _{Goff} =10Ω, T _J =175°C			10			us

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =50A	T _J =25°C		1.71	2.00	V
			T _J =125°C		1.85		
			T _J =175°C		1.82		
I _{rr}	Peak Reverse Recovery Current	I _F =50A, di/dt=616A/μs(T _J =175°C), V _{rr} =600V, V _{GE} =0V	T _J =25°C		24		A
			T _J =125°C		27		
			T _J =175°C		31		
t _{rr}	Reverse Recovery Time		T _J =25°C		318		ns
			T _J =125°C		406		
			T _J =175°C		525		
dI _{rr} /dt	Peak Rate of Fall of Reverse Recovery Current		T _J =25°C		109		A/us
			T _J =125°C		81		
			T _J =175°C		96		

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IGBT Discrete Datasheet



Q _{rr}	Reverse Recovery Charge	I _F =50A, di/dt=616A/μs(T _J =175°C), V _{rr} =600V, V _{GE} =0V	T _J =25°C		4.05		μC
			T _J =125°C		5.88		
			T _J =175°C		8.57		
E _{rec}	Reverse Recovery Energy		T _J =25°C		1.14		mJ
			T _J =125°C		1.95		
			T _J =175°C		2.67		

Thermal Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC(IGBT)}	Thermal Resistance: Junction-to-Case		0.17		K/W
R _{θJC(Diode)}	Thermal Resistance: Junction-to-Case		0.27		K/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	K/W



Characteristics diagrams

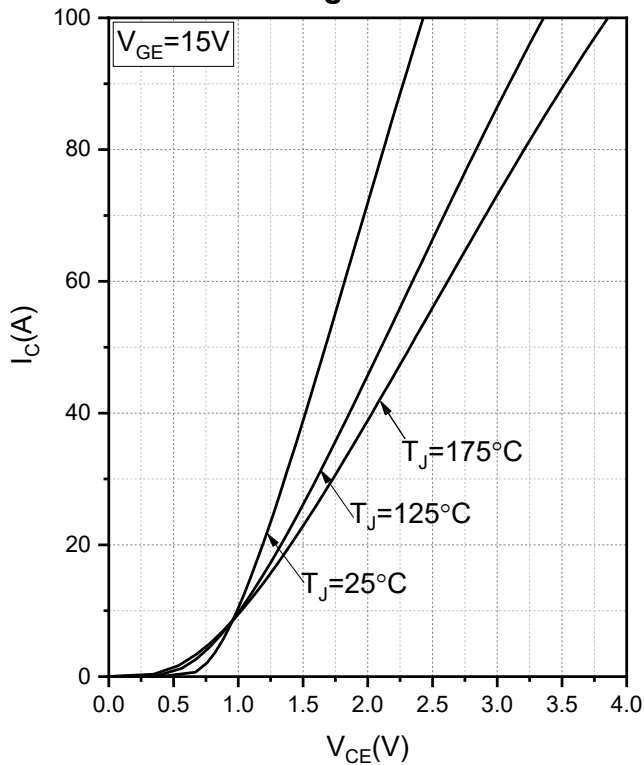


Fig.1 Typical Saturation Voltage Characteristics

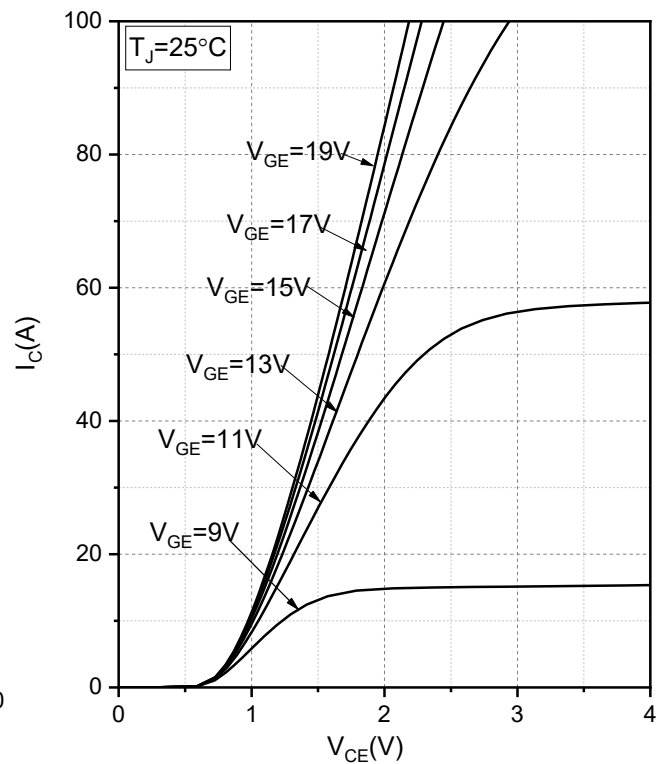


Fig.2 Typical Output Characteristics, $T_J=25^{\circ}\text{C}$

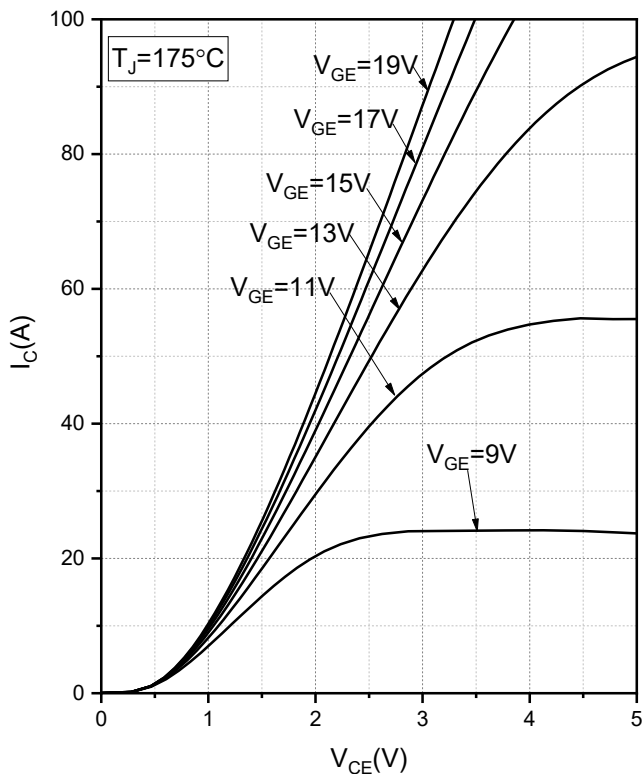


Fig.3 Typical Output Characteristics, $T_J=175^{\circ}\text{C}$

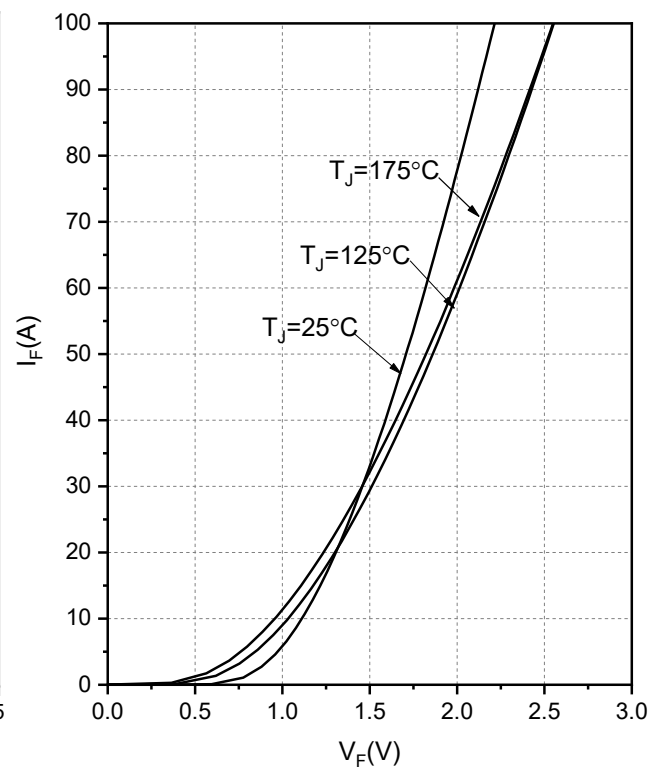


Fig.4 Forward Characteristics of Diode

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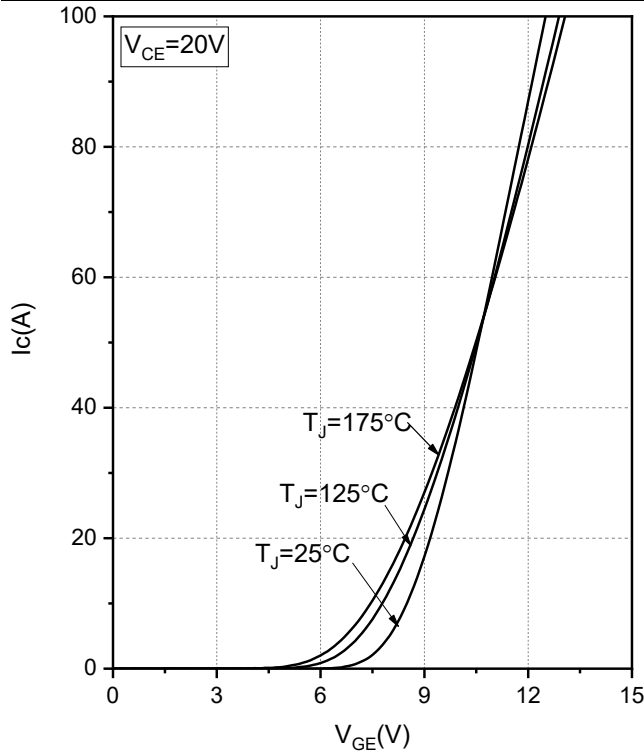


Fig.5 Transfer Characteristic

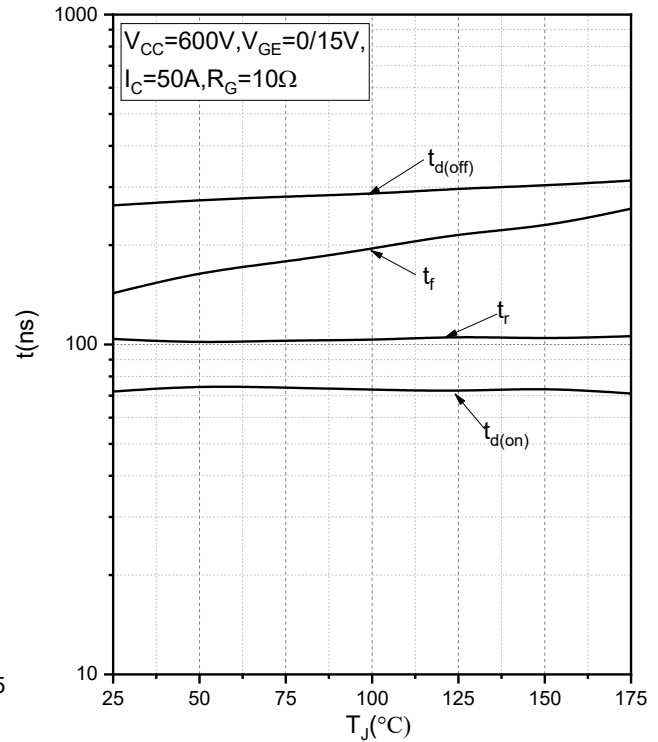


Fig.6 Typical Switching Times as a Function of Junction Temperature

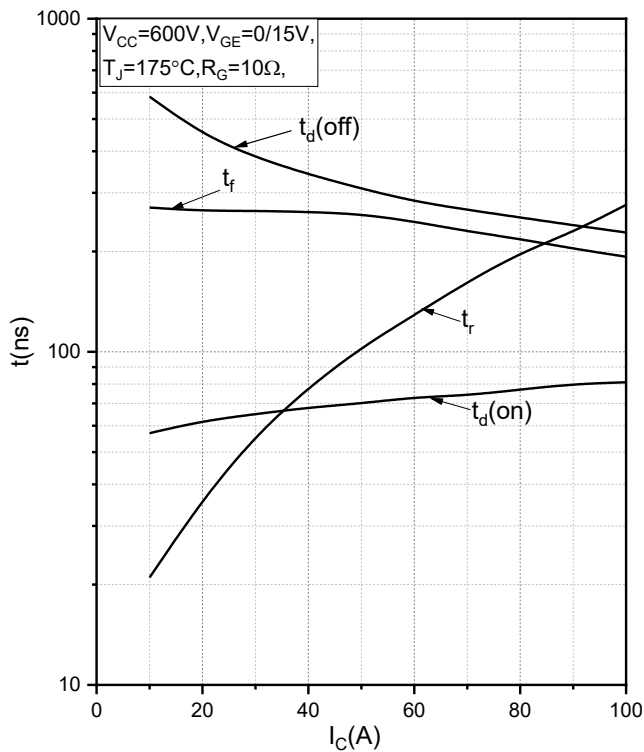


Fig.7 Typical Switching Times as a Function of Collector current, $T_J=175^{\circ}\text{C}$

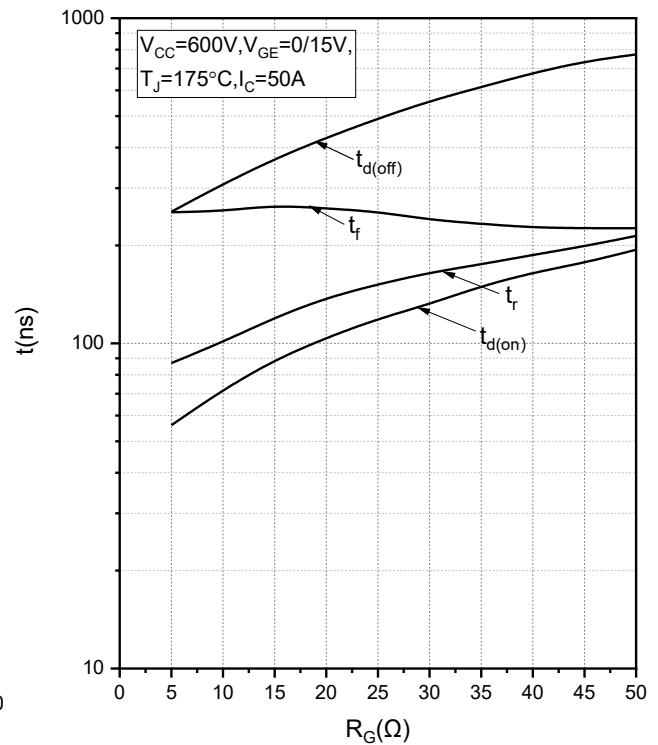


Fig.8 Typical Switching Times as a Function of Gate Resistor, $T_J=175^{\circ}\text{C}$

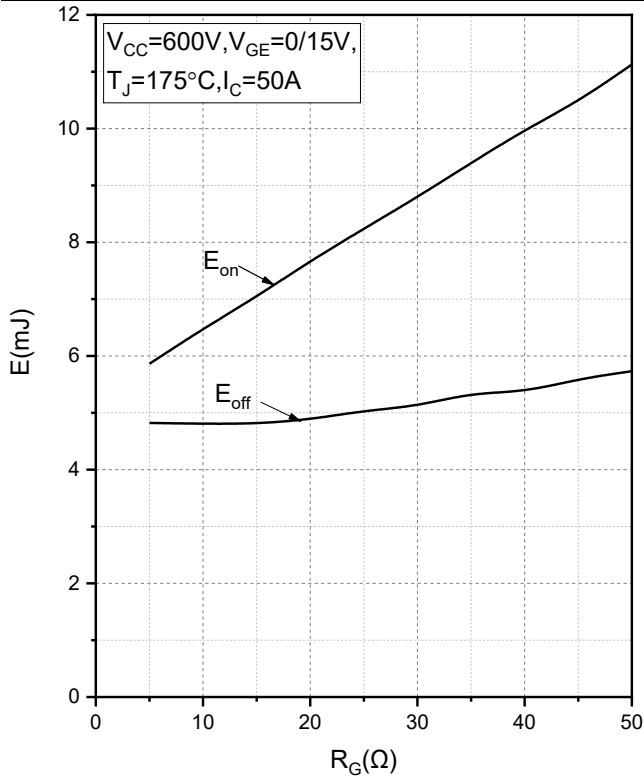


Fig.9 Typical Switching Energy Losses as a Function of Gate Resistor, $T_J=175^\circ C$

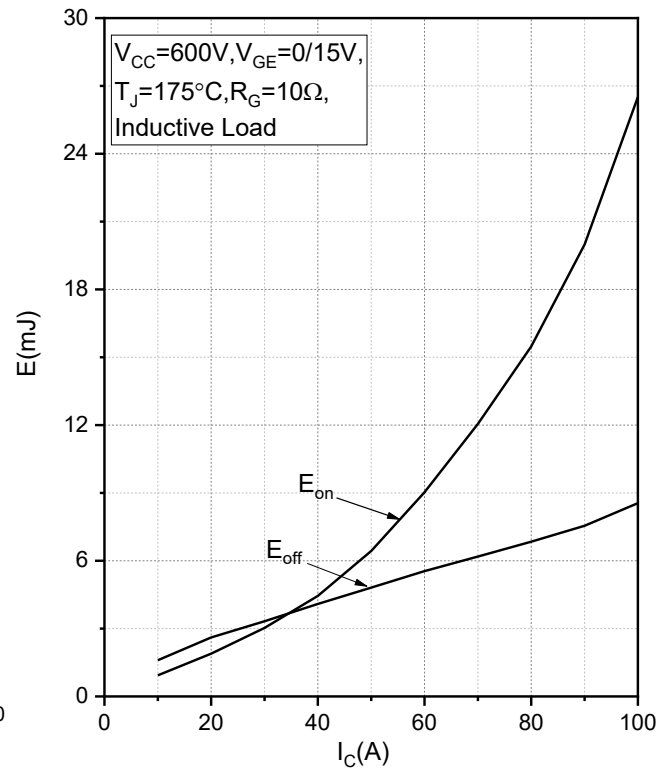


Fig.10 Typical Switching Energy Losses as a Function of Collector Current, $T_J=175^\circ C$

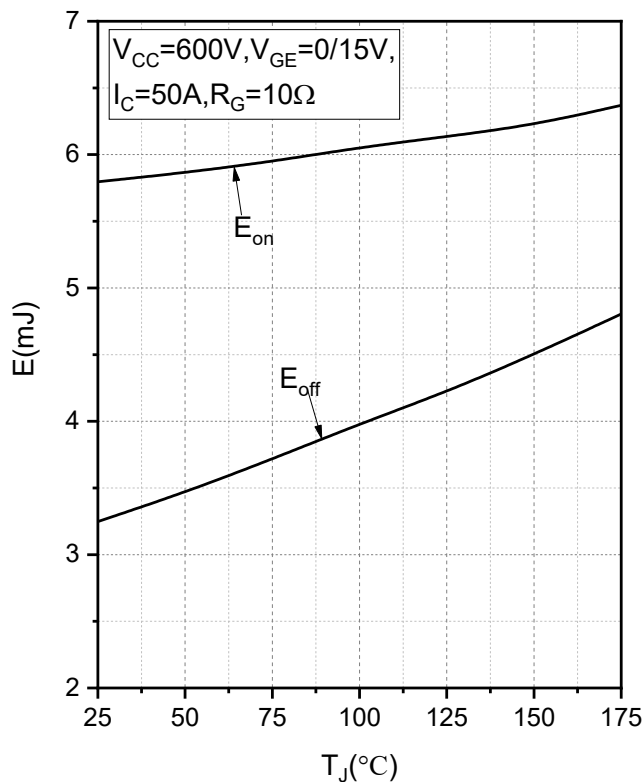


Fig.11 Typical Switching Energy Losses as a Function of Junction Temperature

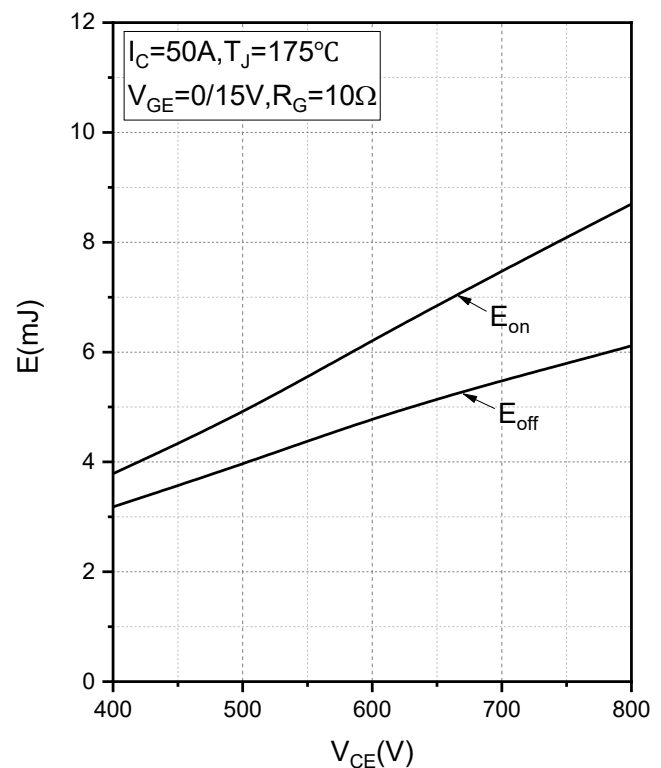
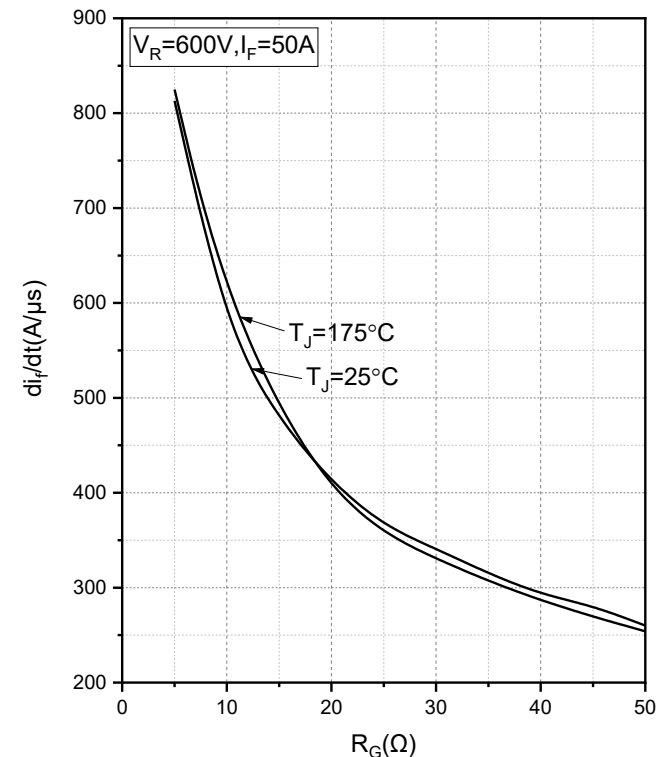
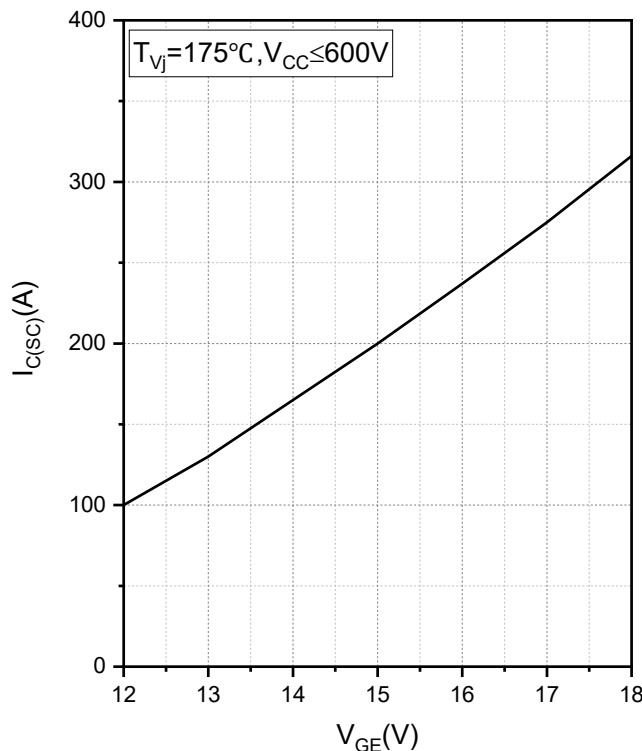
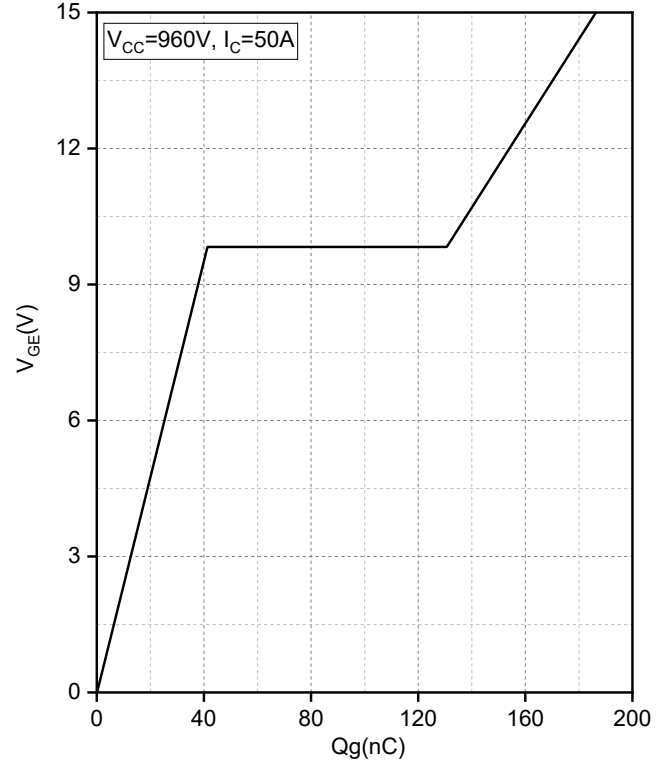
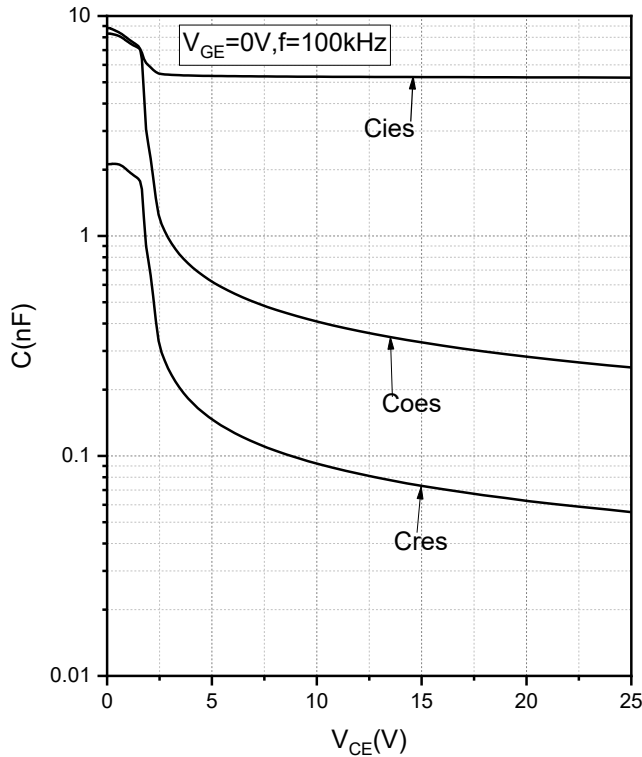
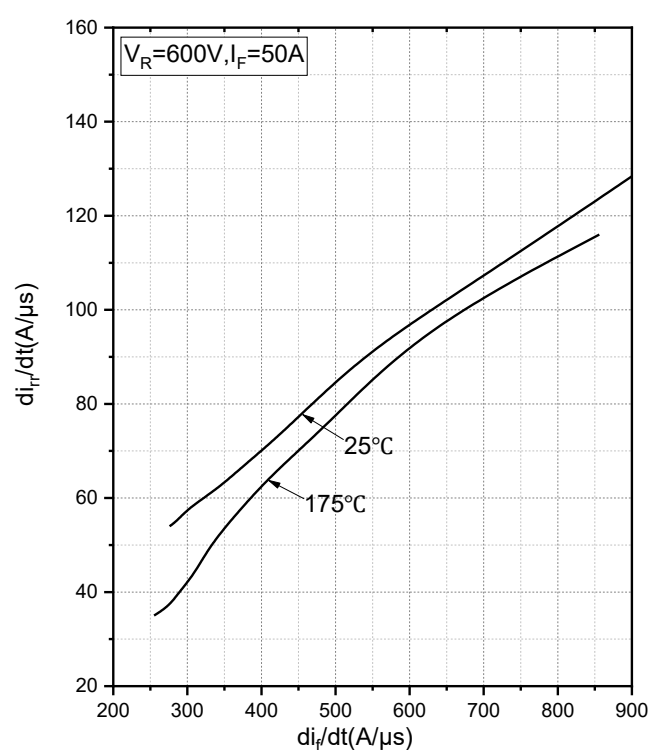
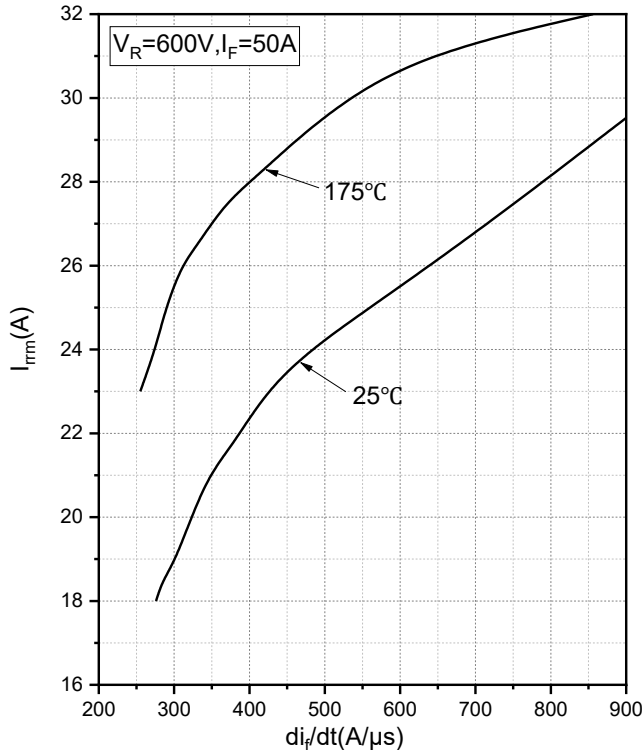
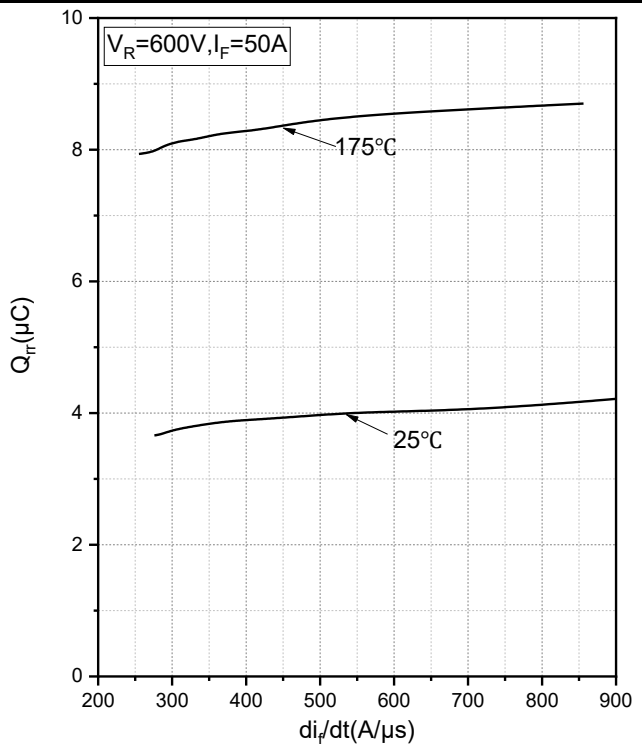
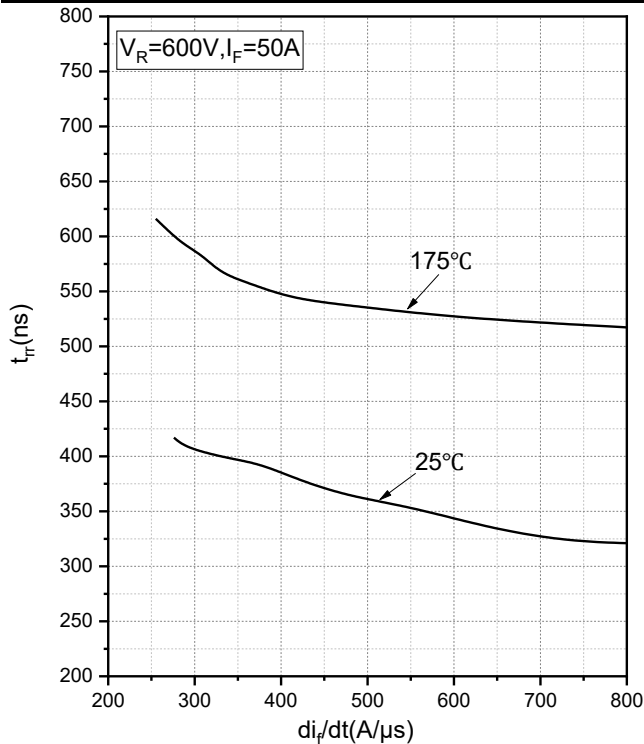


Fig.12 Typical Switching Energy Losses as a Function of Collector Emitter Voltage





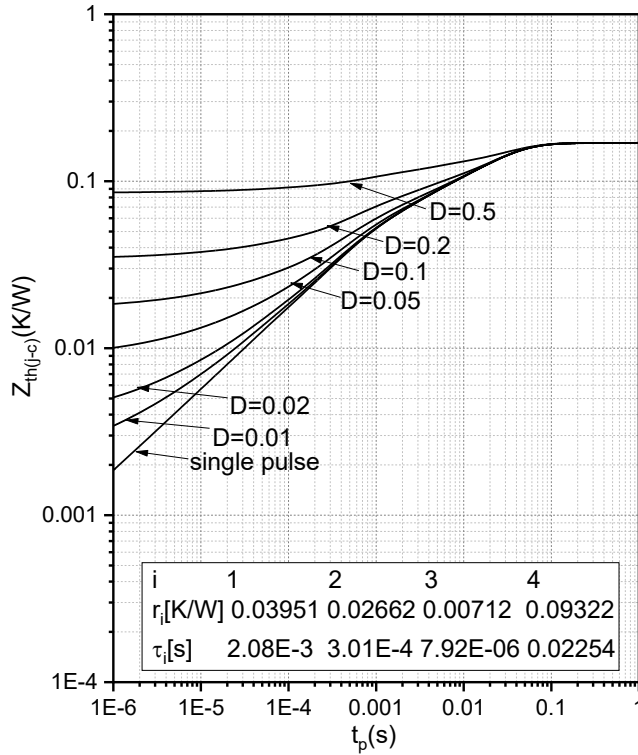


Fig.21 Transient Thermal Impedance (IGBT)

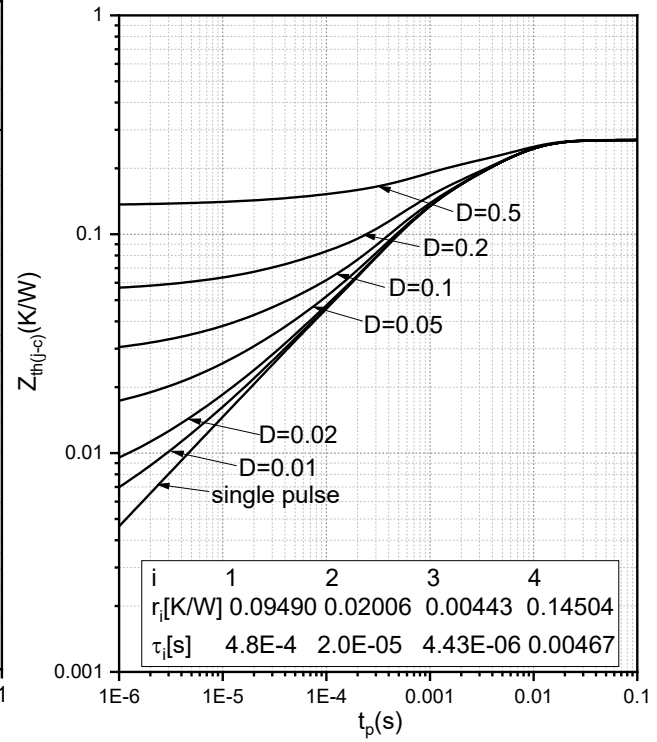


Fig.22 Transient Thermal Impedance (Diode)

Test Circuit:

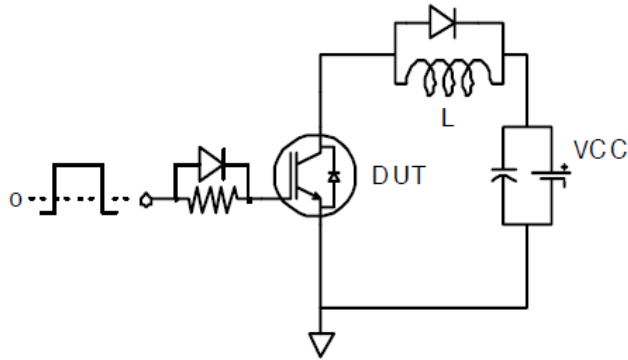


Fig.23 Gate Charge Circuit (turn-off)

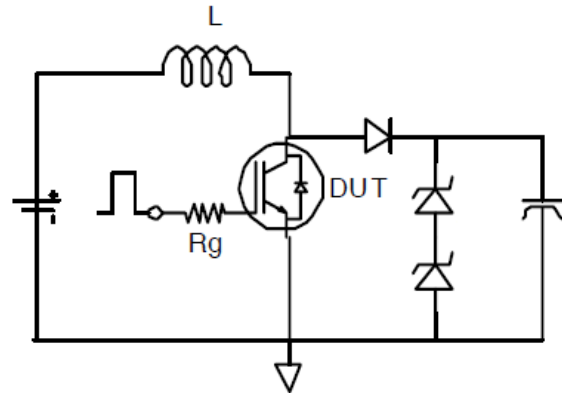


Fig.24 RBSOA Circuit

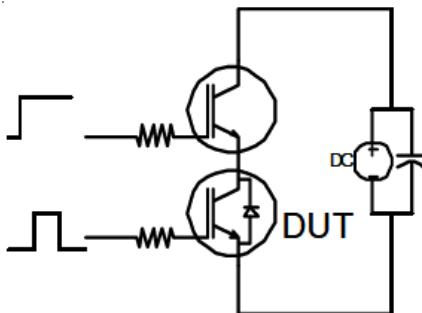


Fig.25 S.C. SOA Circuit

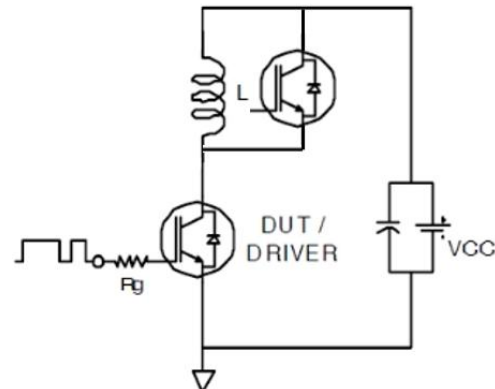


Fig.26 Switching Loss Circuit

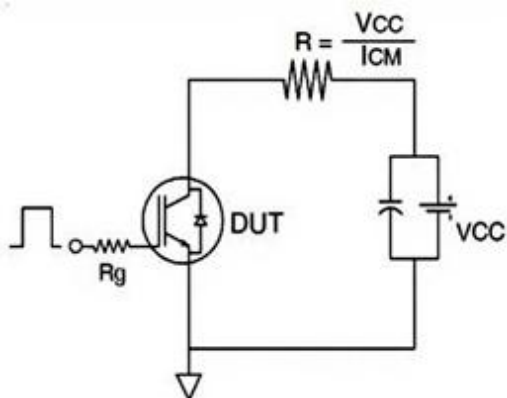


Fig.27 Resistive Load Circuit

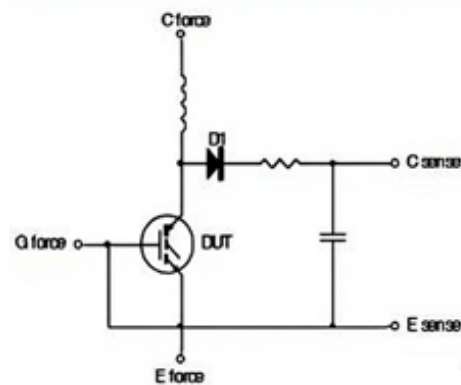


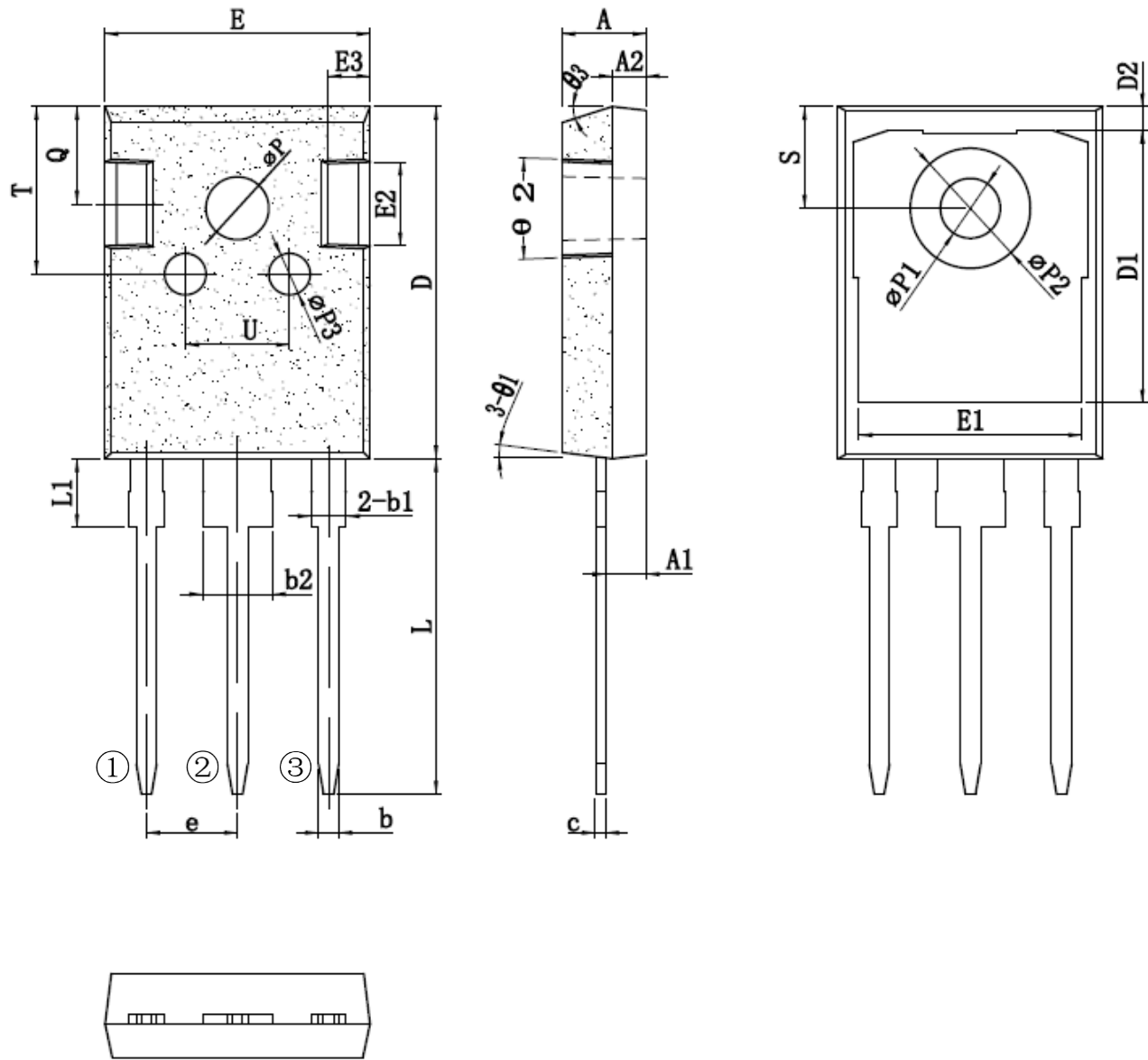
Fig.28 BV CES Filter Circuit

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TO-247 Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER

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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".