Sanrise Tech 尚阳通

Datasheet

100mΩ, 600V, Super Junction N-Channel Power MOSFET **SRC60R100B**

General Description

The Sanrise SRC60R100B is a high voltage power MOSFET, fabricated using advanced super junction technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and outstanding efficiency.

The SRC60R100B break down voltage is 600V and it has a high rugged avalanche characteristics.

The SRC60R100B is available in TO-263-2, TO-247 packages.

Symbol

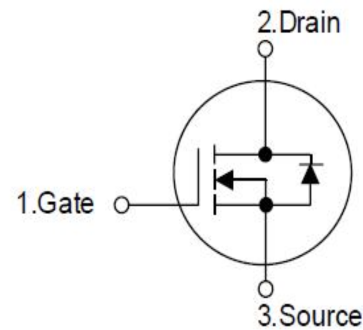


Figure 1 Symbol of SRC60R100B

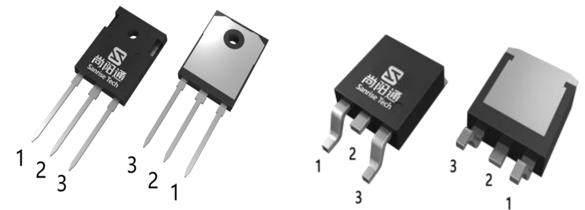
Features

- Ultra Low $R_{DS(ON)}$ = 100mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=86nC typ.
- Fast switching capability
- Robust design with better EAS performance
- Qualified according to AEC Q101
- Green Product (RoHS compliant)
- Ultra-fast body diode

Application

- On-Board Charger
- DC/DC Converter
- Auxiliary Inverter

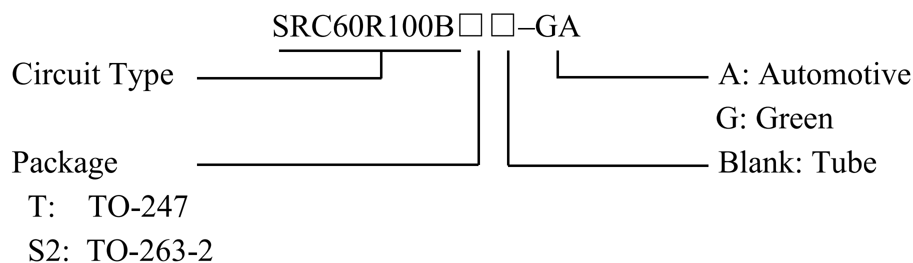
Package Type



TO-247 TO-263-2

Figure 2 Package Types of SRC60R100B

Ordering Information



Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R100BT-GA	SRC60R100BTGA	Tube
TO-263-2	SRC60R100BS2TR-GA	SRC60R100BS2GA	Tape & Reel

Absolute Maximum Ratings[Note 1]

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage (static)		V_{GSS}	±20	V
Gate-Source Voltage (dynamic), AC (f>1 Hz)			±30	V
Continuous Drain Current	T_C=25ºC	I_D	36.9	A
	T_C=100ºC		23.3	
	T_C=125ºC		16.5	
Pulsed Drain Current (Note 2)		I_{DM}	110.7	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	135	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	1020	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	4.5	A
Continuous Diode Forward Current		I_S	36.9	A
Diode Pulse Current		$I_{S.PULSE}$	110.7	A
MOSFET dv/dt Ruggedness, V_{DS}<=480V		dv/dt	80	V/ns
Reverse Diode dv/dt, V_{DS}<=480V, I_{SD}<=I_D		dv/dt	50	V/ns
Power Dissipation（TO-263-2,TO-247）		P_{tot}	291	W
Operating Junction Temperature		T_J	150	ºC
Storage Temperature		T_{STG}	-55 to 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	ºC

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. I_{AS} = 2.0A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Finish goods test condition.
4. I_{AS} =5.5A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Typical Eas.

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.43	ºC /W
	TO-263-2				0.43	
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			58	ºC /W
	TO-263-2				58	

Electrical Characteristics

T_J = 25℃, unless otherwise specified.

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	600			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			10	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			100	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-100	nA
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=800uA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=18A		82	100	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		0.7		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz		3333		pF
Output Capacitance		C_{OSS}			3466		
Reverse Transfer Capacitance		C_{RSS}			46.9		
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		98.2		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			601		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=18A R_G=1.8Ω, V_{GS}=10V		24		ns
Rise Time		t_r			38		
Turn-off Delay Time		$t_{d(off)}$			48		
Fall Time		t_f			10		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=18A V_{GS}=0 to 10V		22.9		nC
Gate to Drain Charge		Q_{gd}			42.6		
Gate Charge Total		Q_g			86		
Gate Plateau Voltage		$V_{plateau}$			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=18A		0.9	1.1	V
Reverse Recovery Time		t_{rr}	V_R=100V, I_F=18A dI_F/dt=100A/us		152		ns
Reverse Recovery Charge		Q_{rr}			0.89		uC
Peak Reverse Recovery Current		I_{rrm}			11.6		A

Note:

5. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V
6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480 V

Typical Performance Characteristics

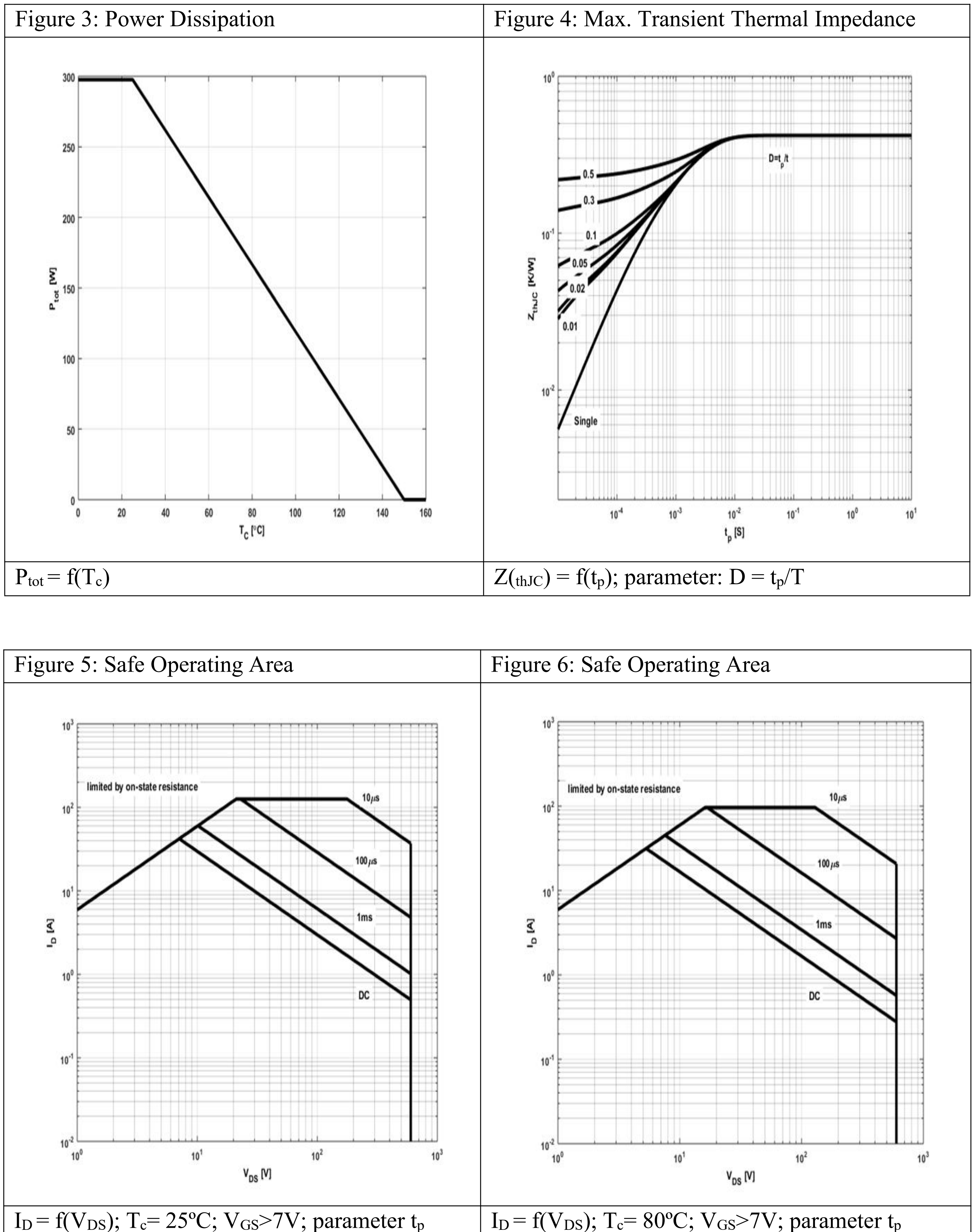


Figure 3: Power Dissipation	Figure 4: Max. Transient Thermal Impedance
$P_{tot} = f(T_c)$	$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

Figure 5: Safe Operating Area	Figure 6: Safe Operating Area
$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p	$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

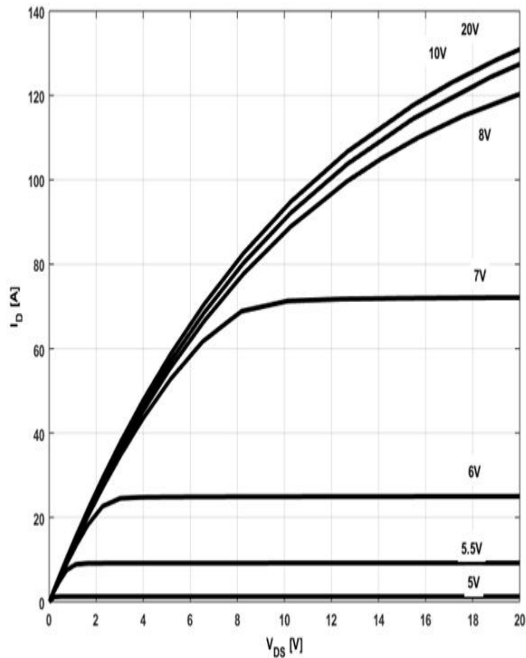
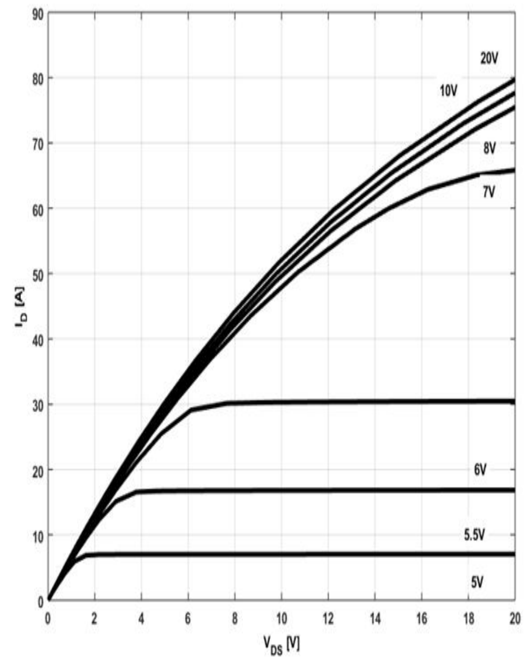
Figure 7: Typ. Output Characteristics	Figure 8: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25°C; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125°C; parameter: V_{GS}

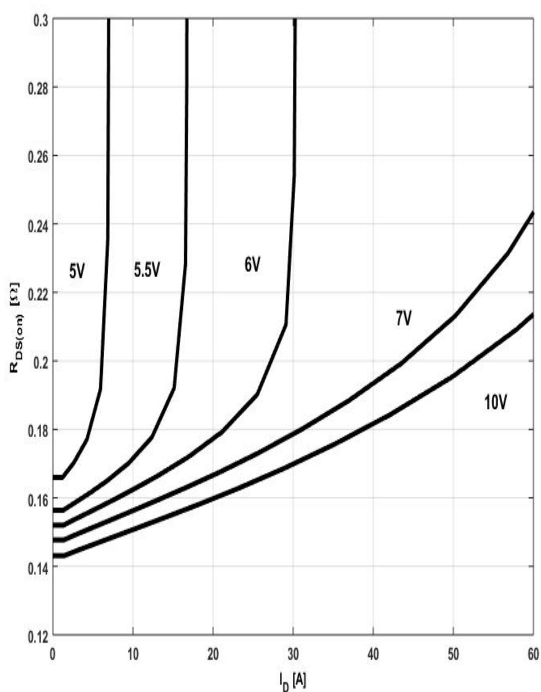
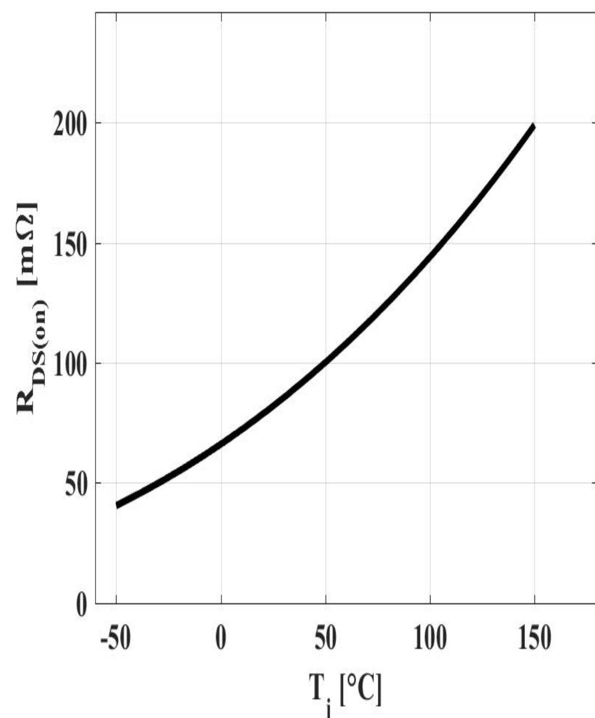
Figure 9: Typ. Drain-Source On-State Resistance	Figure 10: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)} = f(I_D)$; T_j=125°C; parameter: V_{GS}	$R_{DS(ON)} = f(T_j)$; I_D=18A; V_{GS}=10V

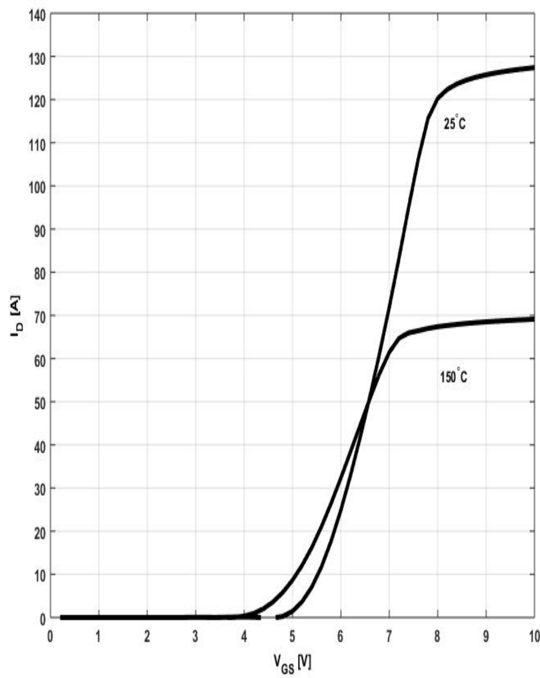
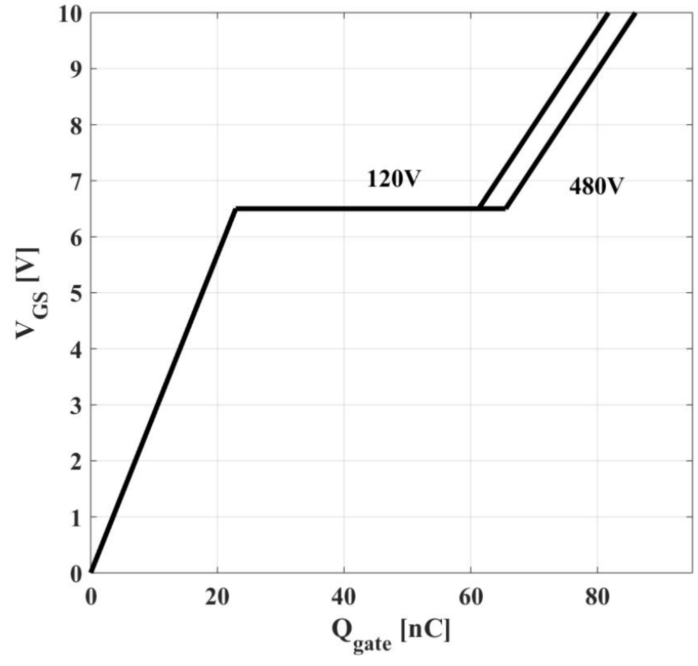
Figure 11: Typ. Transfer Characteristics	Figure 12: Typ. Gate Charge
	
$I_D = f(V_{GS})$; $V_{DS} = 20V$	$V_{GS}= f(Q_{gate})$, $I_D= 18A$ pulsed

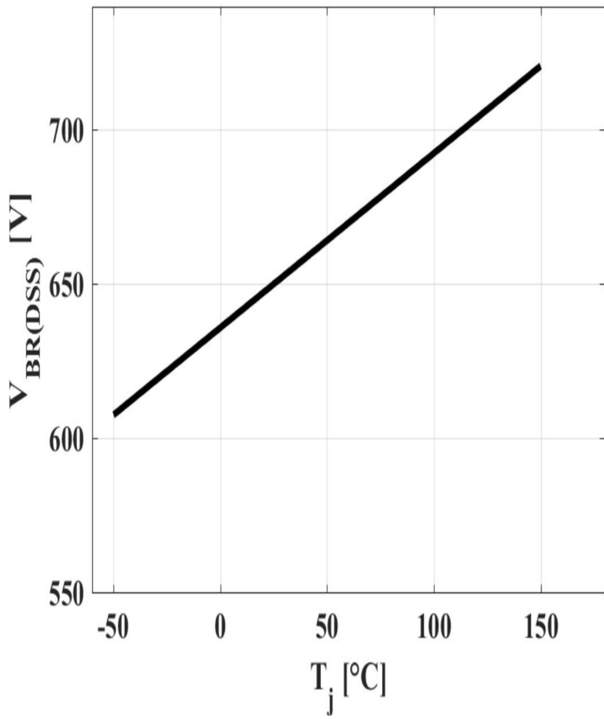
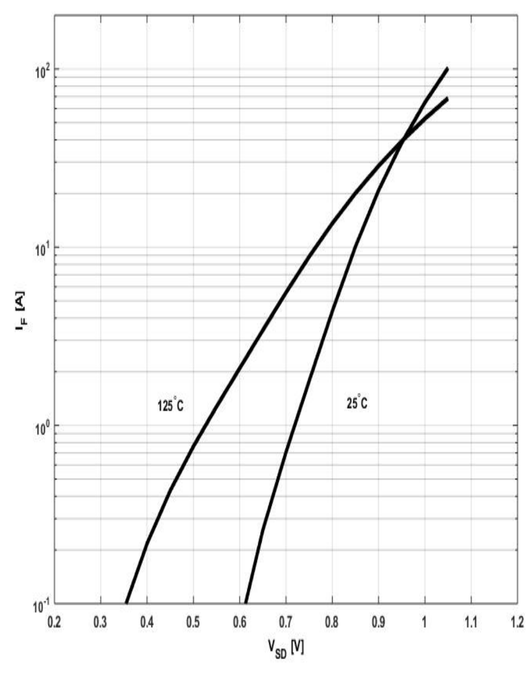
Figure 13: Drain-Source Breakdown Voltage	Figure 14: Forward Characteristics of Reverse Diode
	
$V_{BR(DSS)}=f(T_j)$; $I_D=10mA$	$I_F=f(V_{SD})$; parameter: T_j

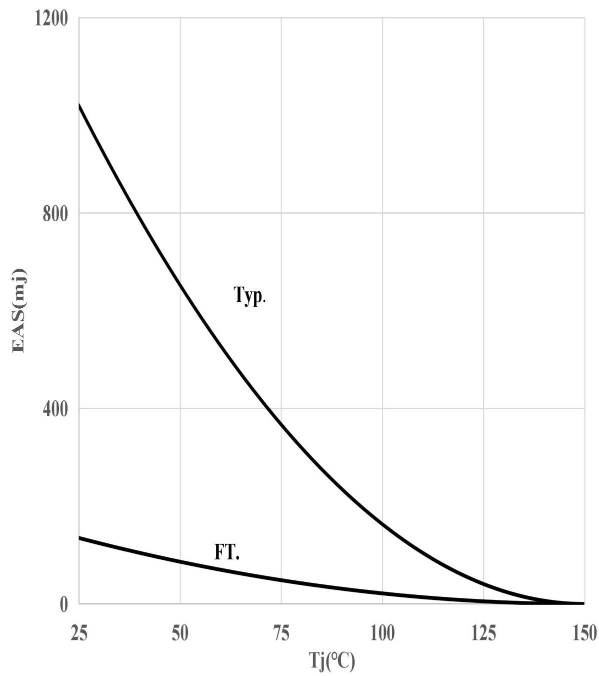
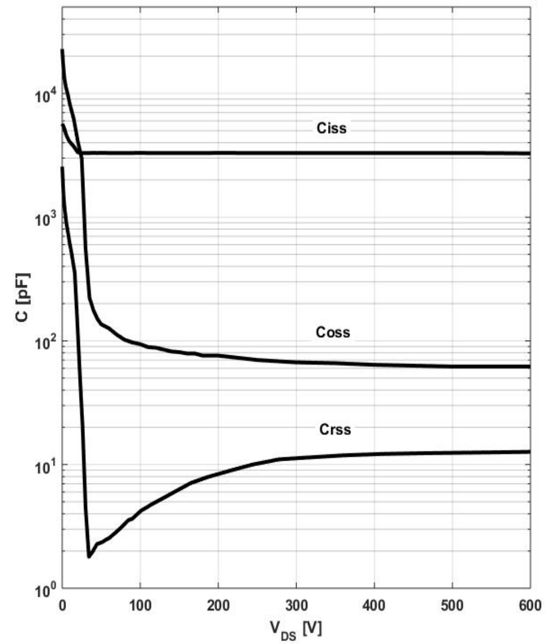
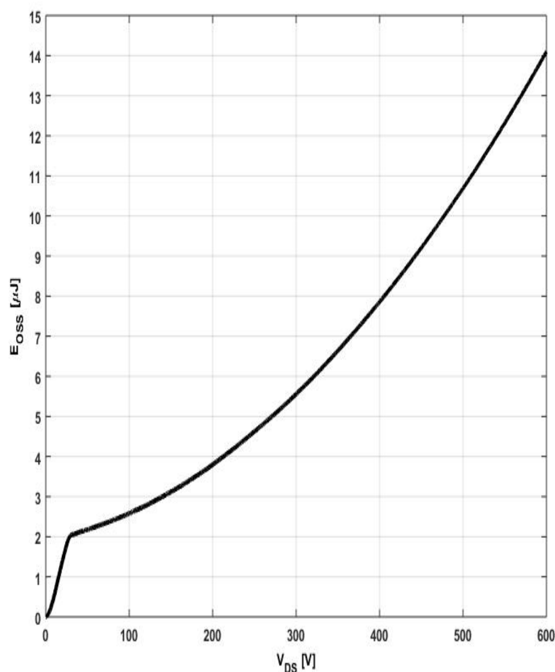
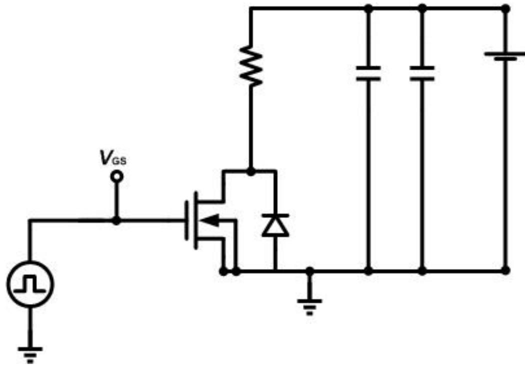
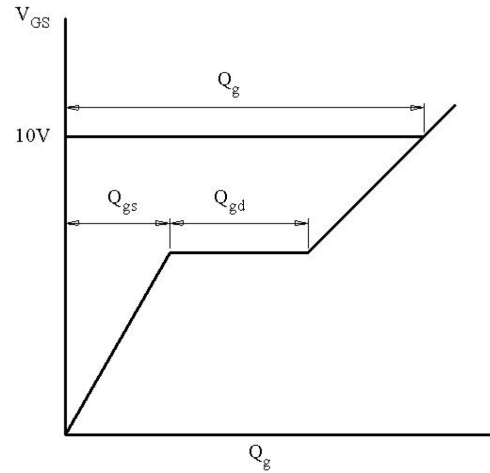
Figure 15: Avalanche Energy	Figure 16: Typ. Capacitances
	
E_{AS}=f(T_j); V_{DD}=60V	C=f(V_{DS}); V_{GS}=0; f=1MHz

Figure 17: C_{OSS} Stored Energy

E_{OSS}=f(V_{DS})

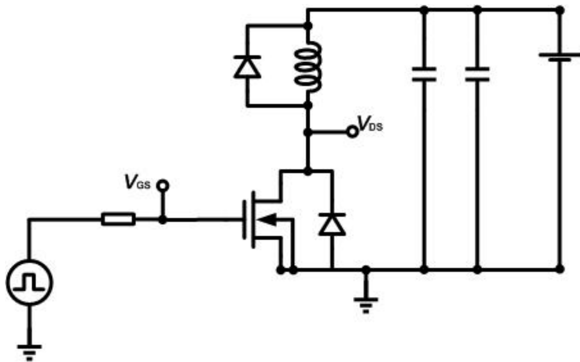
Test Circuits

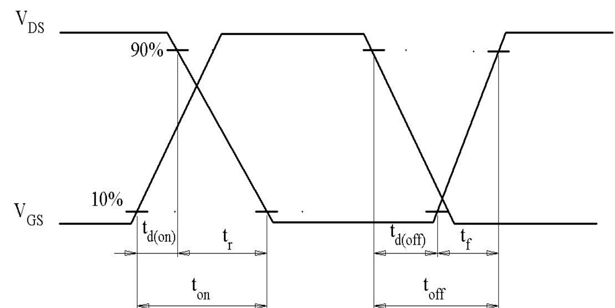
1. Gate Charge Test Circuit & Waveform



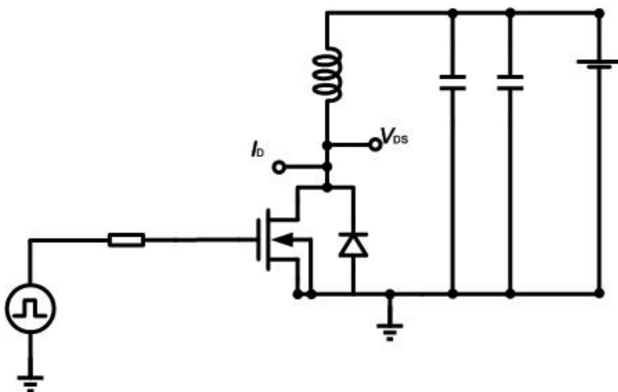


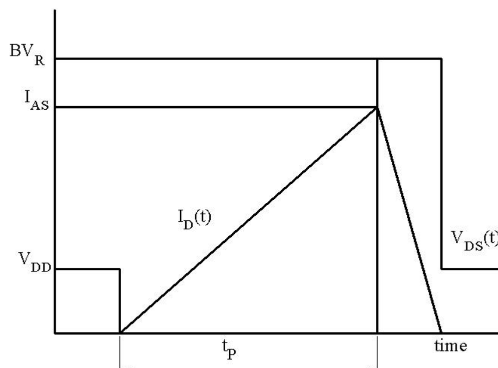
2. Switch Time Test Circuit



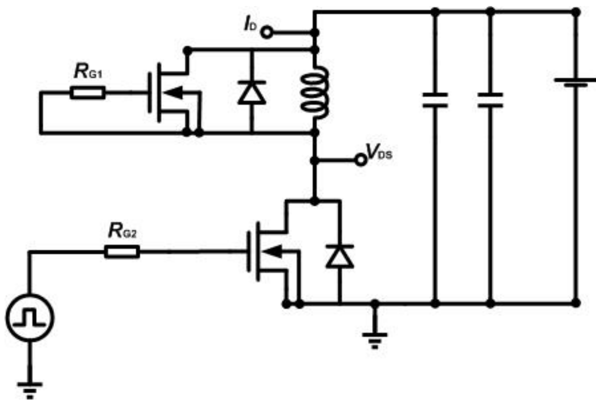


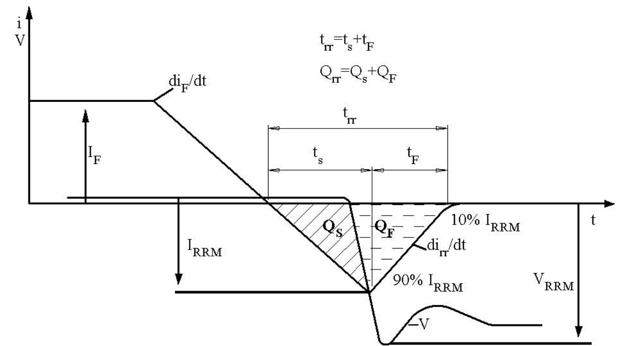
3. Unclaimed Inductive Switching Test Circuit & Waveforms





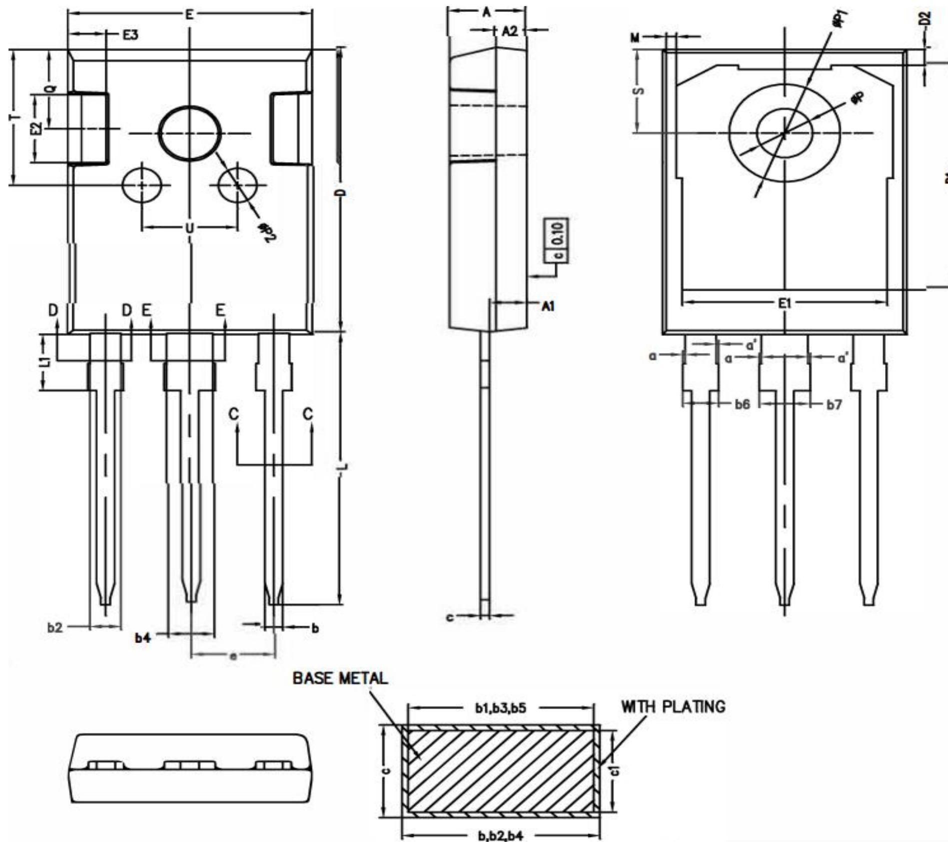
4. Test Circuit and Waveform for Diode Characteristics





Mechanical Dimensions

TO-247(Package 1) **Unit: mm**

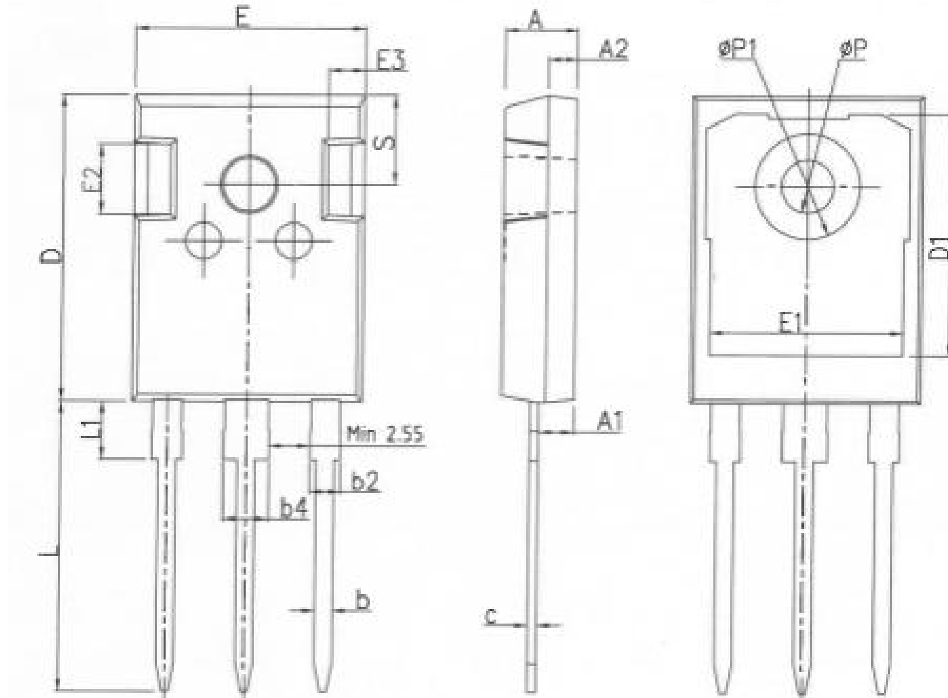


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E2	4.90	5.00	5.10
A1	2.31	2.41	2.51	E3	2.40	2.50	2.60
A2	1.90	2.00	2.10	e	5.34	5.44	5.54
b	1.12	-	1.22	L	19.80	19.92	20.10
b1	1.11	1.16	1.18	L1	3.95	4.13	4.30
b2	1.96	-	2.06	P	3.50	3.60	3.70
c	0.59	-	0.66	P1	7.00	-	7.40
D	20.90	21.00	21.10	P2	2.40	2.50	2.60
D1	16.25	16.55	16.85	Q	5.60	-	6.00
D2	1.05	1.20	1.35	S	6.05	6.15	6.25
E	15.70	15.80	15.90	T	9.80	-	10.20
E1	13.10	13.30	13.50	U	6.00	-	6.40
b3	1.95	2.00	2.02	b6	-	-	2.25
b4	2.96	-	3.06	b7	-	-	3.25
b5	2.95	3.00	3.02	c1	0.58	0.60	0.62
M	0.35	-	0.95	a	0	-	0.15
a'	0	-	0.15				

Mechanical Dimensions

TO-247(Package 2)

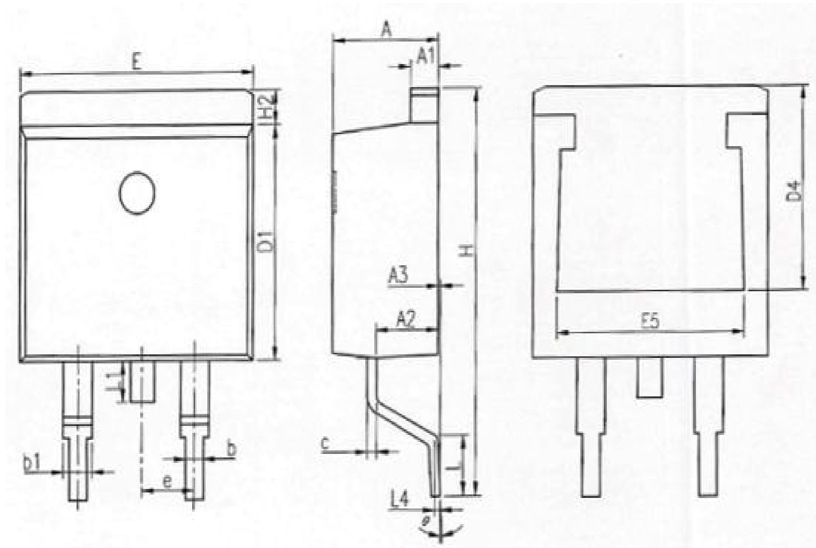
Unit: mm



Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E	15.50	15.80	16.10
A1	2.21	2.41	2.59	E1	13.00	13.30	13.60
A2	1.85	2.00	2.15	E2	4.80	5.00	5.20
b	1.11	1.21	1.36	E3	2.30	2.50	2.70
b2	1.91	2.01	2.21	e	5.44BSC		
b4	2.91	3.01	3.21	M	0.35	-	0.95
c	0.51	0.61	0.75	a'	0	-	0.15
D	20.70	21.00	21.30	L	19.62	19.92	20.22
D1	16.25	16.55	16.85	L1	-	-	4.30
ϕP	3.40	3.60	3.80	S	6.15BSC		
ϕP1	-	-	7.30				

Mechanical Dimension

TO-263-2 **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0.00	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54(BSC)		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25(BSC)		
θ	0°	5°	8°

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