

General Description

The Sanrise SRC60R042B 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 SRC60R042B break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R042B is available in TO-247 package.

Features

- Ultra Low $R_{DS(ON)} = 42m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 182nC$ typ.
- Intrinsic Fast-Recovery Body Diode
- Fast switching capability
- Qualified according to AEC Q101
- Green Product (RoHS compliant)
- Ultra-fast body diode

Application

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

Ordering Information

Circuit Type		SRC60R042B	□	□	—	□
Package						
T: TO-247						
					E: Lead Free	
					G: Green	
					Blank: Tube	

Symbol

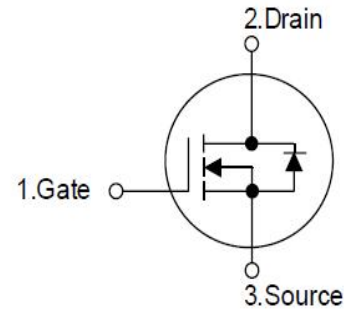


Figure 1 Symbol of SRC60R042B

Package Type

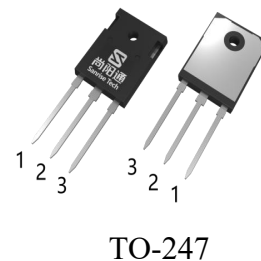


Figure 2 Package Type of SRC60R042B

Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R042BT-GA	SRC60R042BTGA	Tube

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>1Hz)		V_{GSS}	±30	V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	78	A
	$T_C=125^{\circ}\text{C}$		34.8	
Pulsed Drain Current (Note 2)		I_{DM}	234	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	871	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	2880	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.9	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	4.5	A
Continuous Diode Forward Current		I_S	78	A
Diode Pulse Current		$I_{S,PULSE}$	234	A
MOSFET dv/dt Ruggedness, $V_{DS}\leq 480\text{V}$		dv/dt	80	V/ns
Reverse Diode dv/dt, $V_{DS}\leq 480\text{V}$, $I_{SD}\leq I_D$		dv/dt	50	V/ns
Operating Junction Temperature		T_J	150	°C
Storage Temperature		T_{STG}	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	°C

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. $I_{AS} = 6.6\text{A}$, $V_{DD} = 120\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$. Finish goods test condition.
4. $I_{AS} = 12\text{A}$, $V_{DD} = 120\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$. Typical Eas.

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.24	°C /W
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			54	°C /W

Electrical Characteristics

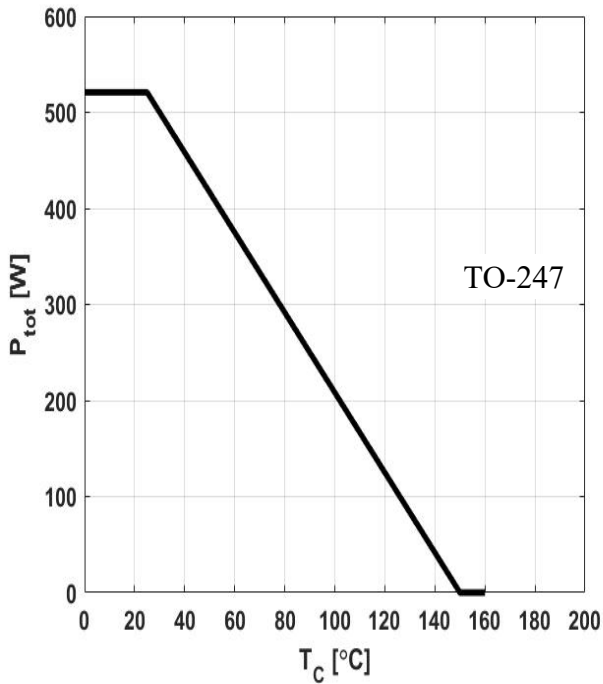
$T_J = 25^\circ\text{C}$, unless otherwise specified.

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 =1.6mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =30A		35	42	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		7200		pF
Output Capacitance		C _{OSS}			4300		
Reverse Transfer Capacitance		C _{RSS}			57.1		
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...480V		155.1		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			905.9		
Turn-on Delay Time		t _{d(on)}	V _{DD} =400V, I _D =38A R _G =3.3Ω, V _{GS} =10V		17		ns
Rise Time		t _r			6.6		
Turn-off Delay Time		t _{d(off)}			112		
Fall Time		t _f			4.3		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =480V, I _D =38A V _{GS} =0 to 10V		46.3		nC
Gate to Drain Charge		Q _{gd}			92.2		
Gate Charge Total		Q _g			182		
Gate Plateau Voltage		V _{plateau}			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =30A		0.9	1.1	V
Reverse Recovery Time		t _{rr}	V _R =100V, I _F =38A dI _F /dt=100A/us		168		ns
Reverse Recovery Charge		Q _{rr}			1.17		uC
Peak Reverse Recovery Current		I _{rrm}			14.0		A

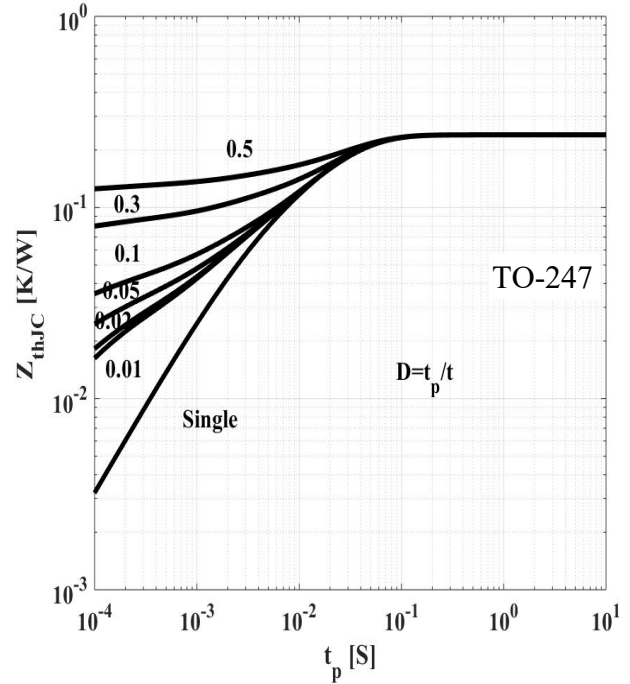
Note:

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

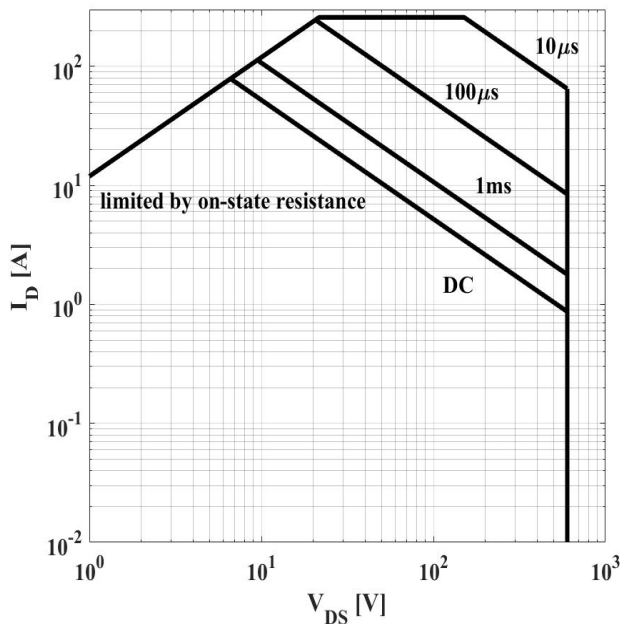
6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480 V

Typical Performance Characteristics
Figure 3: Power Dissipation


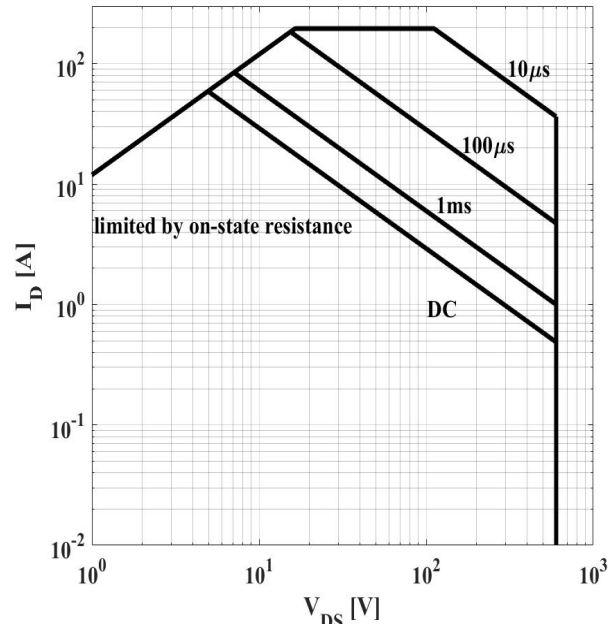
$$P_{\text{tot}} = f(T_c)$$

Figure 4: Max. Transient Thermal Impedance


$$Z_{\text{thJC}} = f(t_p); \text{ parameter: } D = t_p / T$$

Figure 5: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

Figure 6: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 80^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

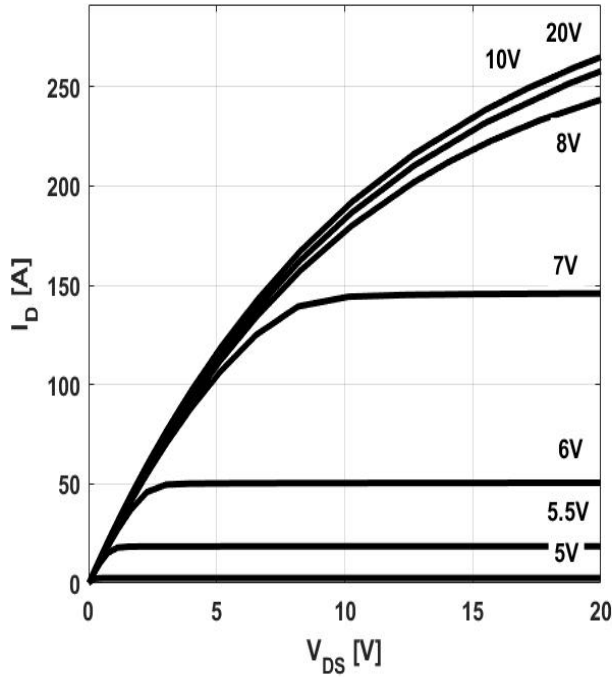
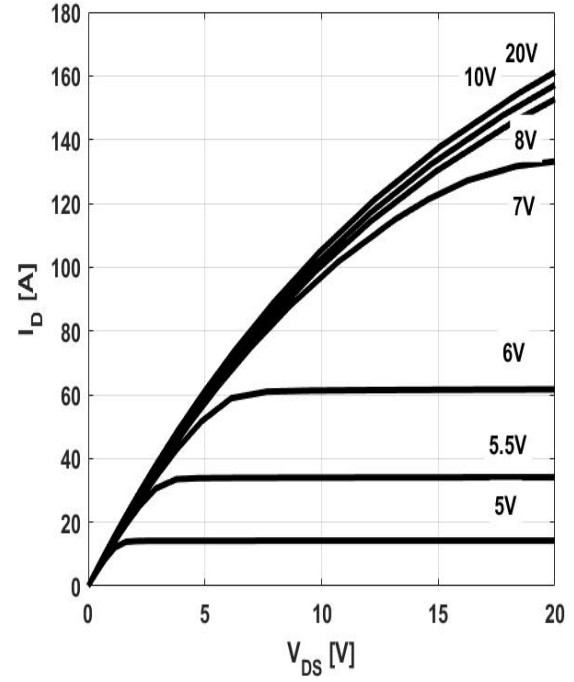
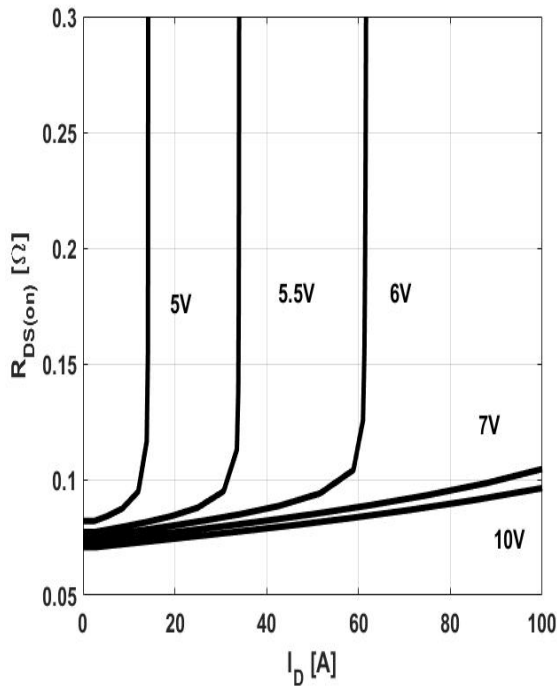
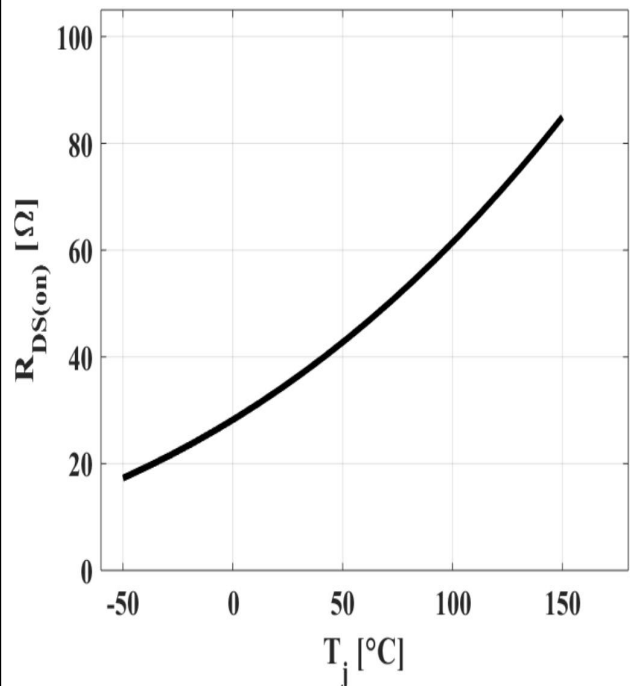
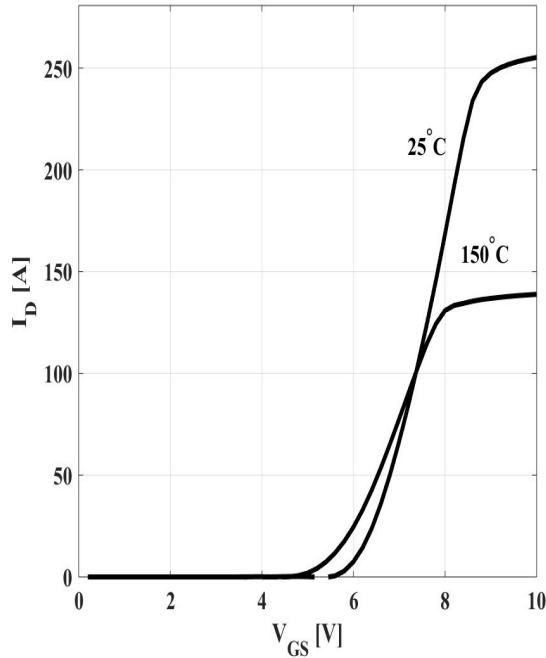
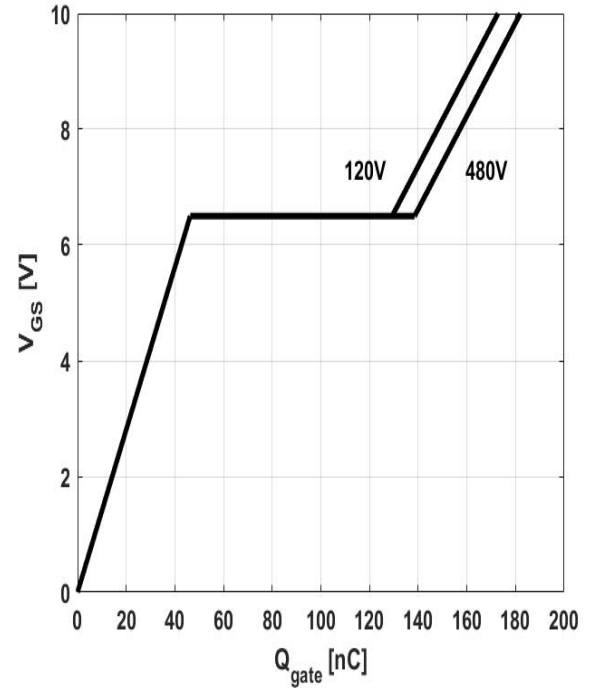
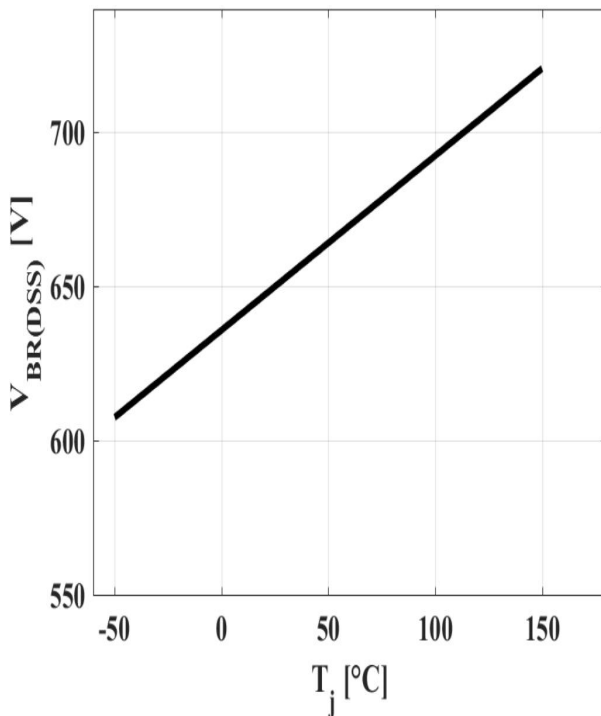
Figure 7: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 8: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 9: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(I_D); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 10: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(T_j); I_D = 30\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


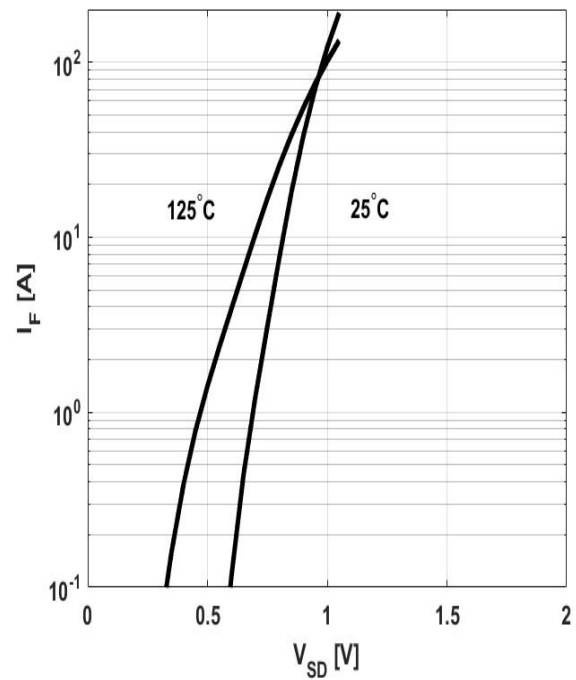
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


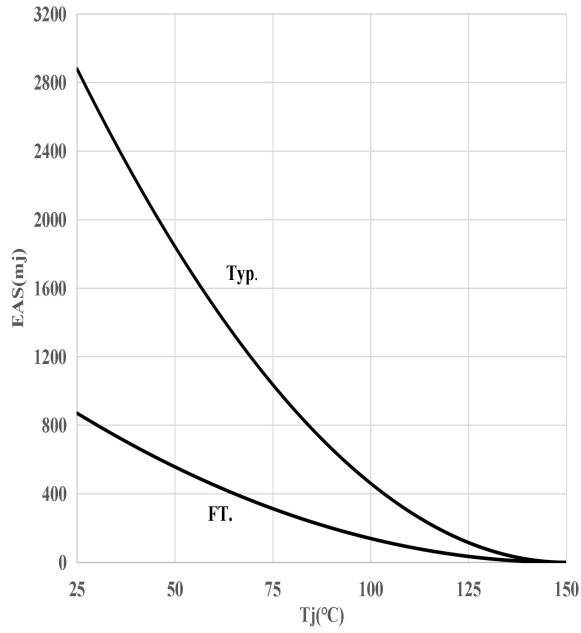
$$V_{GS} = f(Q_{gate}), I_D = 30A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


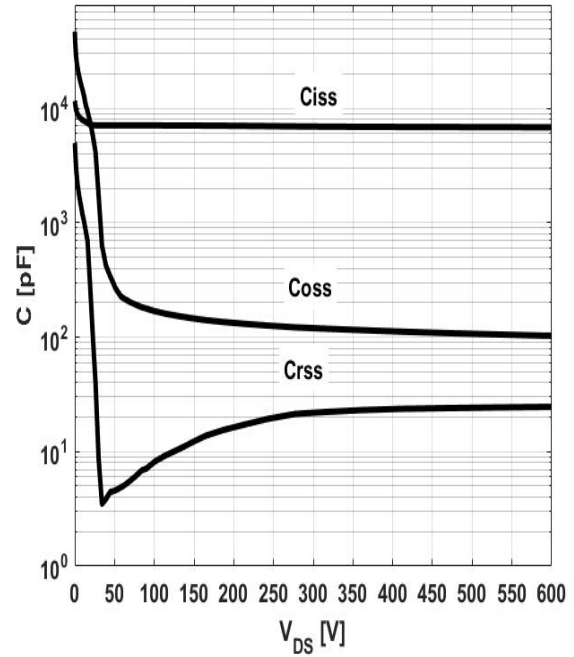
$$V_{BR(DSS)} = f(T_j); I_D = 10mA$$

Figure 14: Forward Characteristics of Reverse Diode


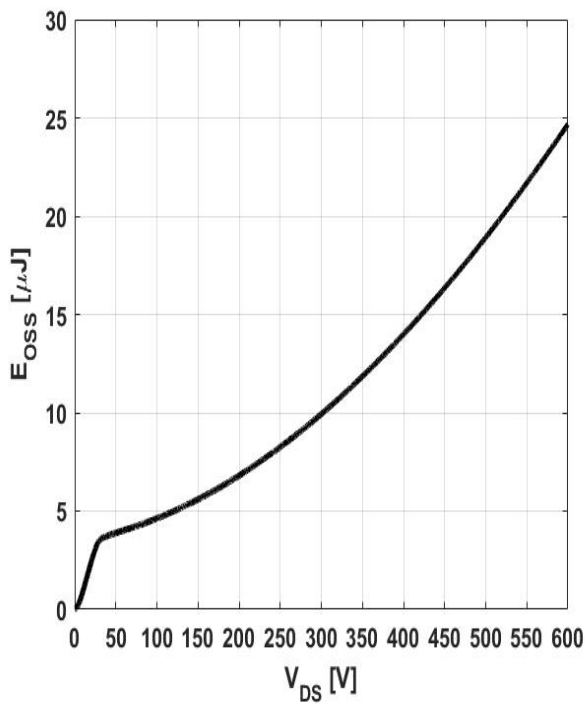
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy


$$E_{AS}=f(T_j); V_{DD}=120V$$

Figure 16: Typ. Capacitances


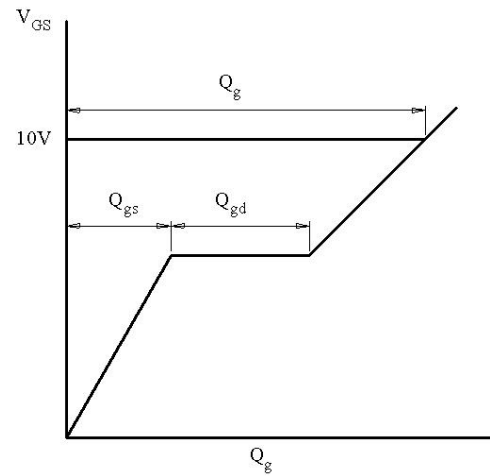
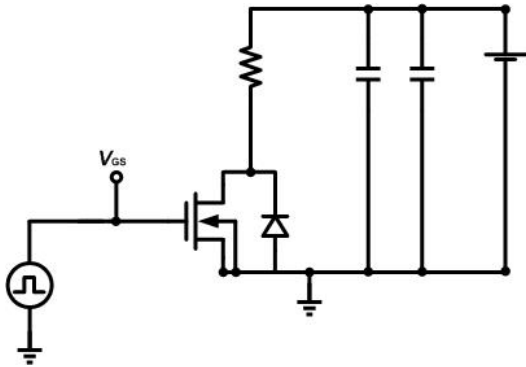
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

Figure 17: Coss Stored Energy


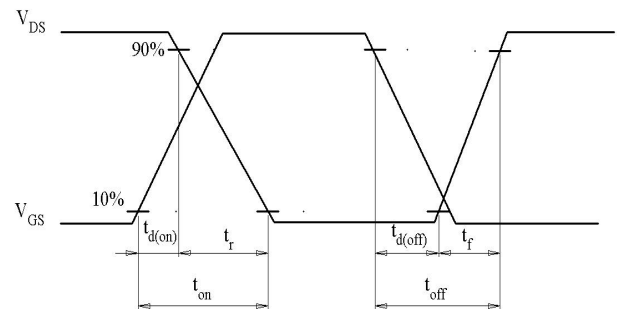
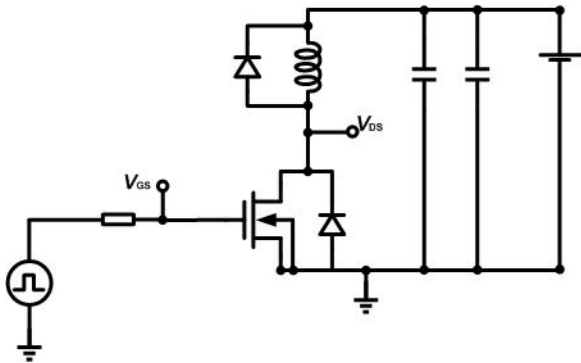
$$E_{OSS}=f(V_{DS})$$

Test Circuits

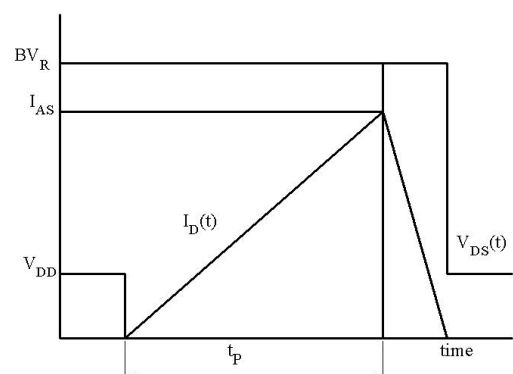
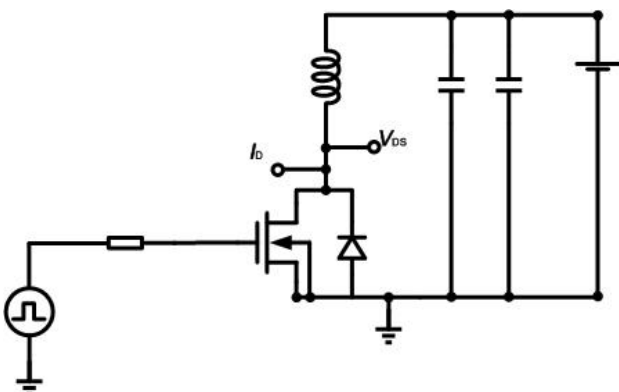
1. Gate Charge Test Circuit & Waveform



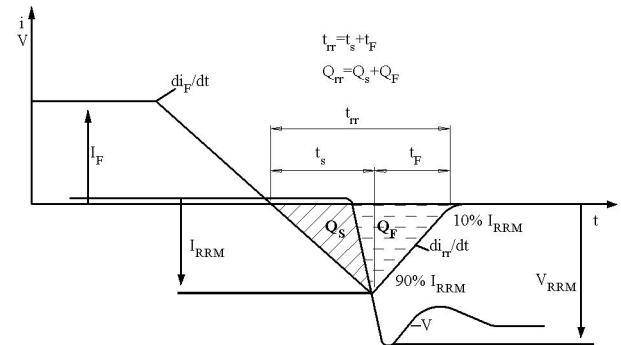
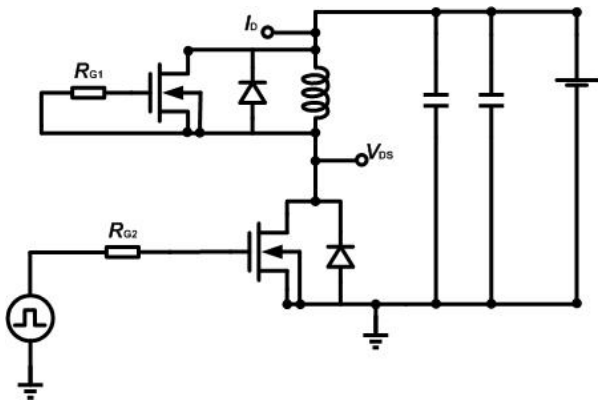
2. Switch Time Test Circuit

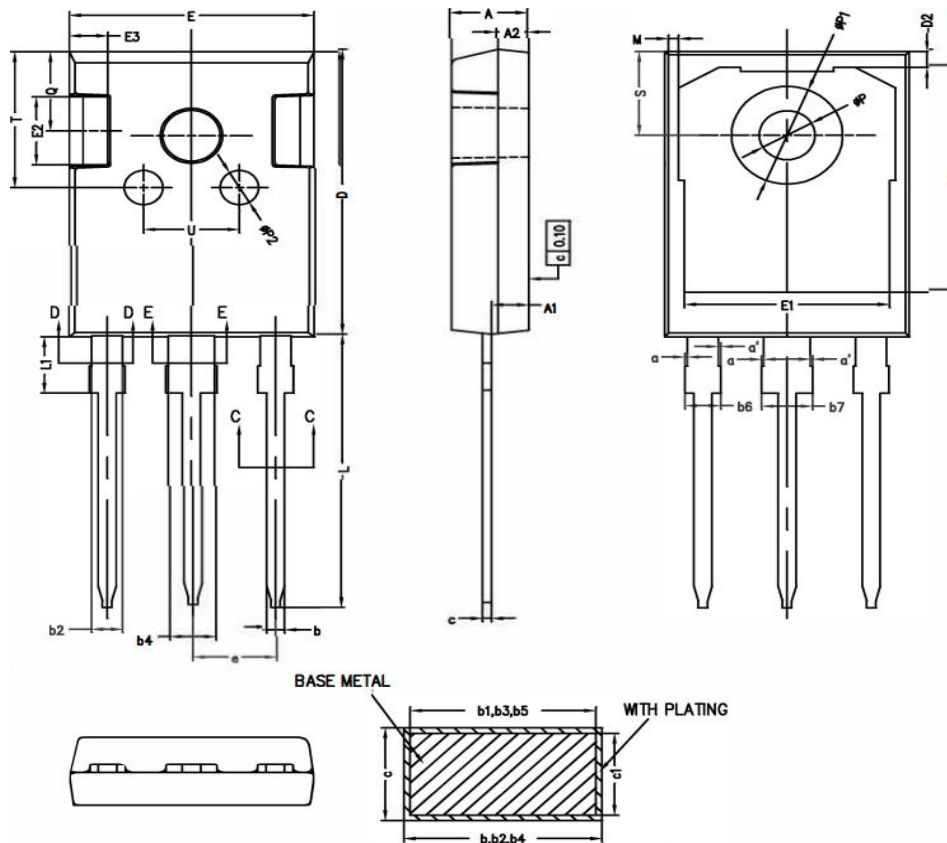


3. Unclaimed Inductive Switching Test Circuit & Waveforms

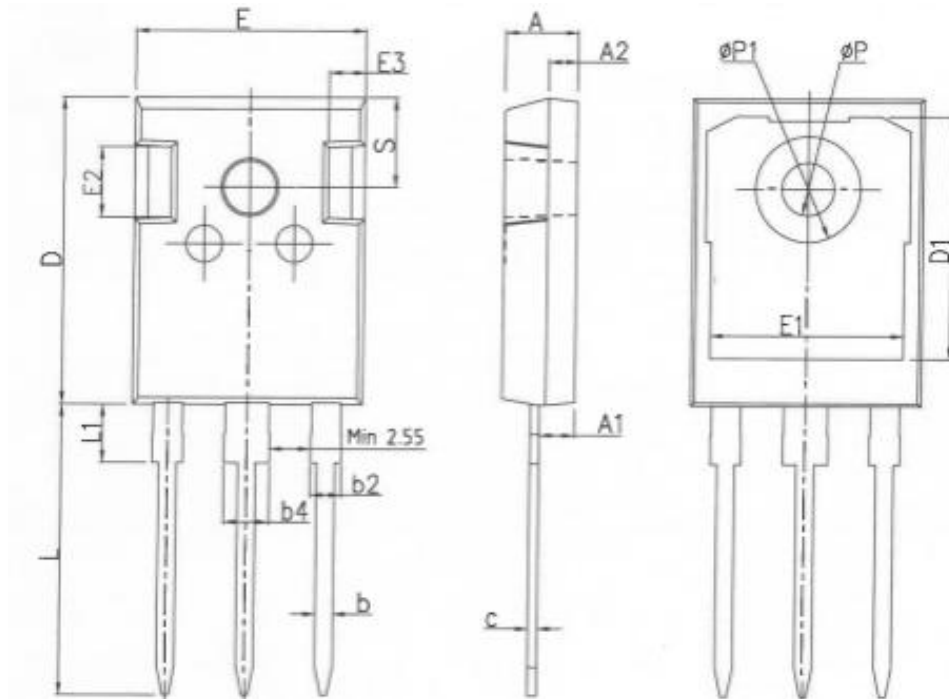


4. Test Circuit and Waveform for Diode Characteristics



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)		
	Min.	Typ.	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
φ P	3.40	3.60	3.80
φ P1	-	-	7.30

Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
M	0.35	-	0.95
a'	0	-	0.15
L	19.62	19.92	20.22
L1	-	-	4.30
S	6.15BSC		



Shenzhen Sanrise Technology Co., LTD

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