

General Description

The Sanrise SRC60R078B 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 SRC60R078B break down voltage is 600V and it has a high rugged avalanche characteristics.

The SRC60R078B is available in TO-263-2 , TO-220F and TO-247 packages.

Features

- Ultra Low $R_{DS(ON)} = 78m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 90.3nC$ typ.
- Intrinsic Fast-Recovery Body Diode
- Fast switching capability
- Robust design with better EAS performance

Application

- AC/DC Power Supply
- EV Charger
- PC / Sever / Telecom
- Solar Inverter

Symbol

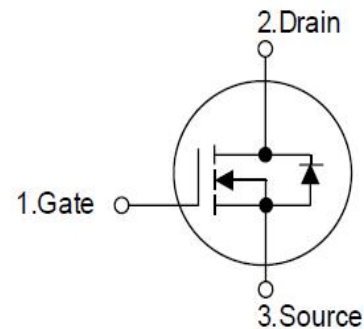


Figure 1 Symbol of SRC60R078B

Package Type

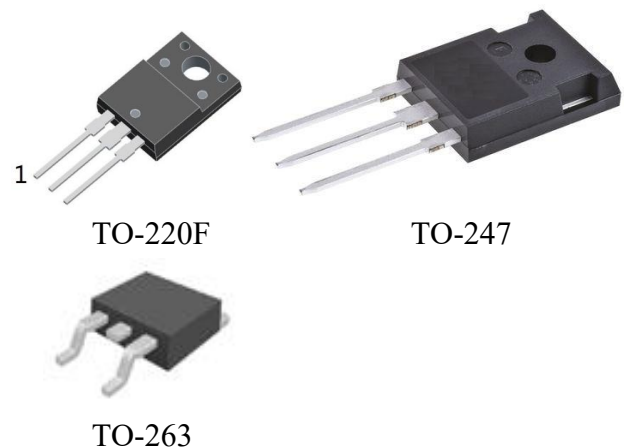
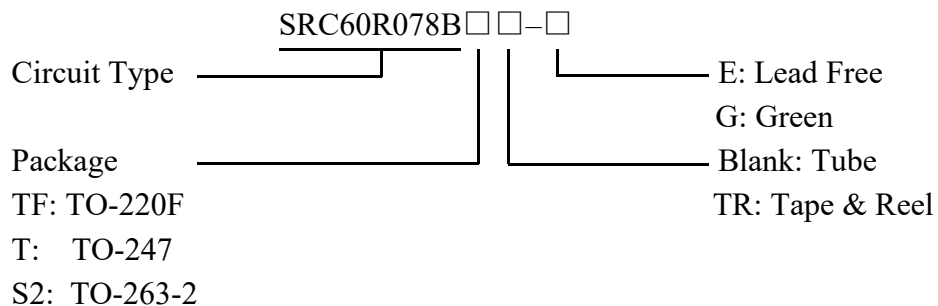


Figure 2 Package Types of SRC60R078B

Ordering Information



Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-220F	SRC60R078BTF-E	SRC60R078BTF-G	SRC60R078BTFE	SRC60R078BTFG	Tube
TO-247	SRC60R078BT-E	SRC60R078BT-G	SRC60R078BTE	SRC60R078BTG	Tube
TO-263-2	SRC60R078BS2TR-E	SRC60R078BS2TR-G	SRC60R078BS2E	SRC60R078BS2G	Tape & Reel

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±30	V
Gate-Source Voltage(dynamic),AC(f>1 Hz)		V_{GSS}	±30	V
Continuous Drain Current	$T_C=25^{\circ}C$	I_D	42	A
	$T_C=100^{\circ}C$		26	
	$T_C=125^{\circ}C$		18.7	
Pulsed Drain Current (Note 2)		I_{DM}	126	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	100	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	42	A
Diode Pulse Current		$I_{S,PULSE}$	126	A
MOSFET dv/dt Ruggedness, $V_{DS} \leq 480V$		dv/dt	50	V/ns
Reverse Diode dv/dt, $V_{DS} \leq 480V, I_{SD} \leq I_D$		dv/dt	50	V/ns
Power Dissipation (TO-220F)		P_{tot}	35.7	W
Power Dissipation (TO-247)		P_{tot}	291	W
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:

- 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.
- Repetitive Rating: Pulse width limited by maximum junction temperature
- $I_{AS} = 4.5A, V_{DD} = 60V, R_G = 25\Omega, \text{Starting } T_J = 25^{\circ}C$

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.5	°C /W
	TO-263-2				0.43	
	TO-247				0.43	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			70	°C /W
	TO-263-2				58	
	TO-247				58	

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}	$V_{GS}=0V, I_D=250\mu A$	600			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse	$I_{GSSR}, V_{GS}=-30V, V_{DS}=0V$			-100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=800\mu A$	3.0	4.0	5.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=21A$		70	78	mΩ
Gate Resistance	R_G	f=1MHz, Open Drain		0.7		Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{DS}=50V, V_{GS}=0V, f=1MHz$		3300		pF
Output Capacitance	C_{OSS}			136		
Reverse Transfer Capacitance	C_{RSS}			2.3		
Effective output capacitance, energy related ^{NOTE5}	$C_{O(er)}$	$V_{GS}=0V, V_{DS}=0\dots 400V$		98.2		pF
Effective output capacitance, time related ^{NOTE6}	$C_{O(tr)}$			601		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=21A, R_G=1.8\Omega, V_{GS}=10V$		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}	$V_{DD}=480V, I_D=21A, V_{GS}=0 \text{ to } 10V$		22.9		nC
Gate to Drain Charge	Q_{gd}			45.6		
Gate Charge Total	Q_g			90.3		
Gate Plateau Voltage	$V_{plateau}$			6.5		V
Reverse Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=21A$		0.9	1.1	V
Reverse Recovery Time	t_{rr}	$V_R=100V, I_F=21A, dI_F/dt=100A/\mu s$		158		ns
Reverse Recovery Charge	Q_{rr}			0.95		μC
Peak Reverse Recovery Current	I_{rrm}			12.0		A

Note:

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

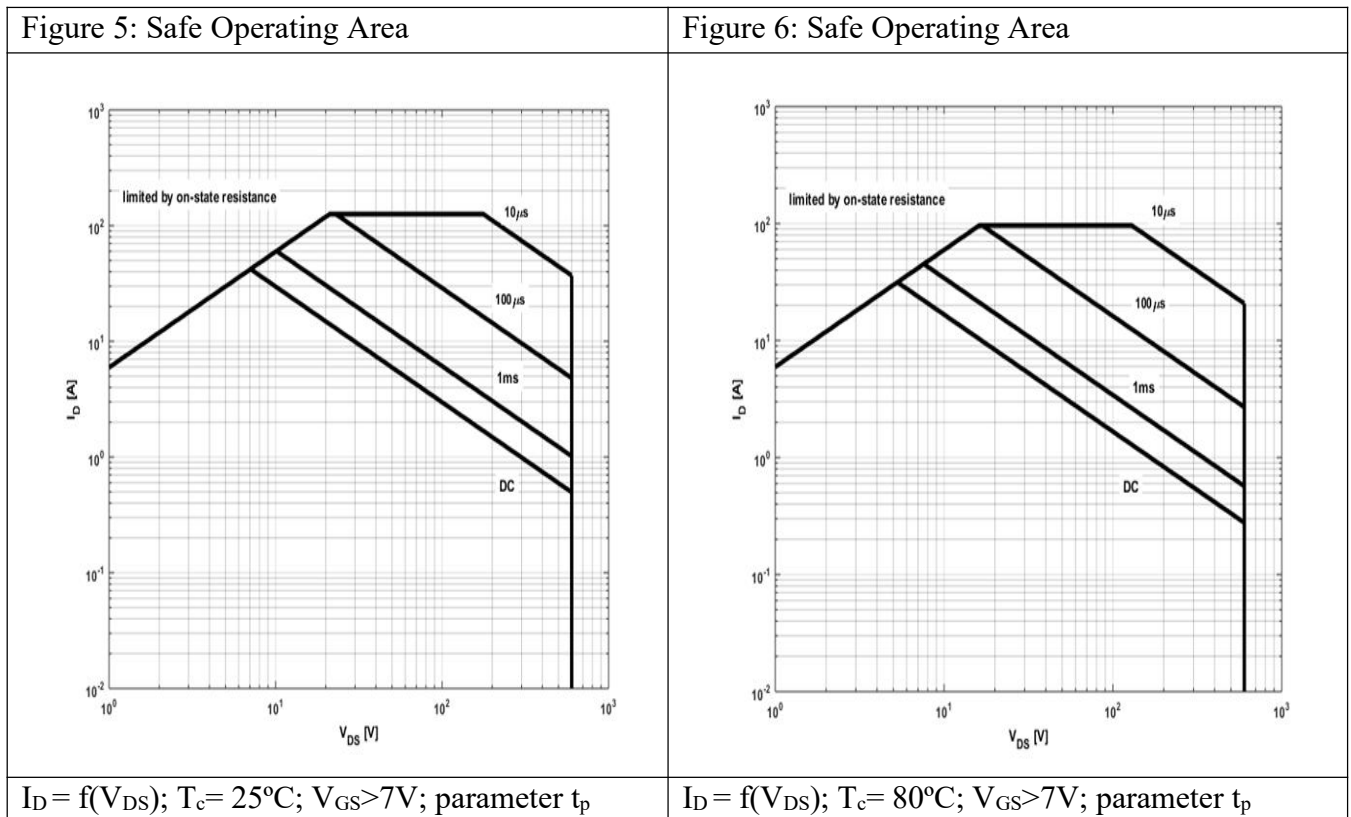
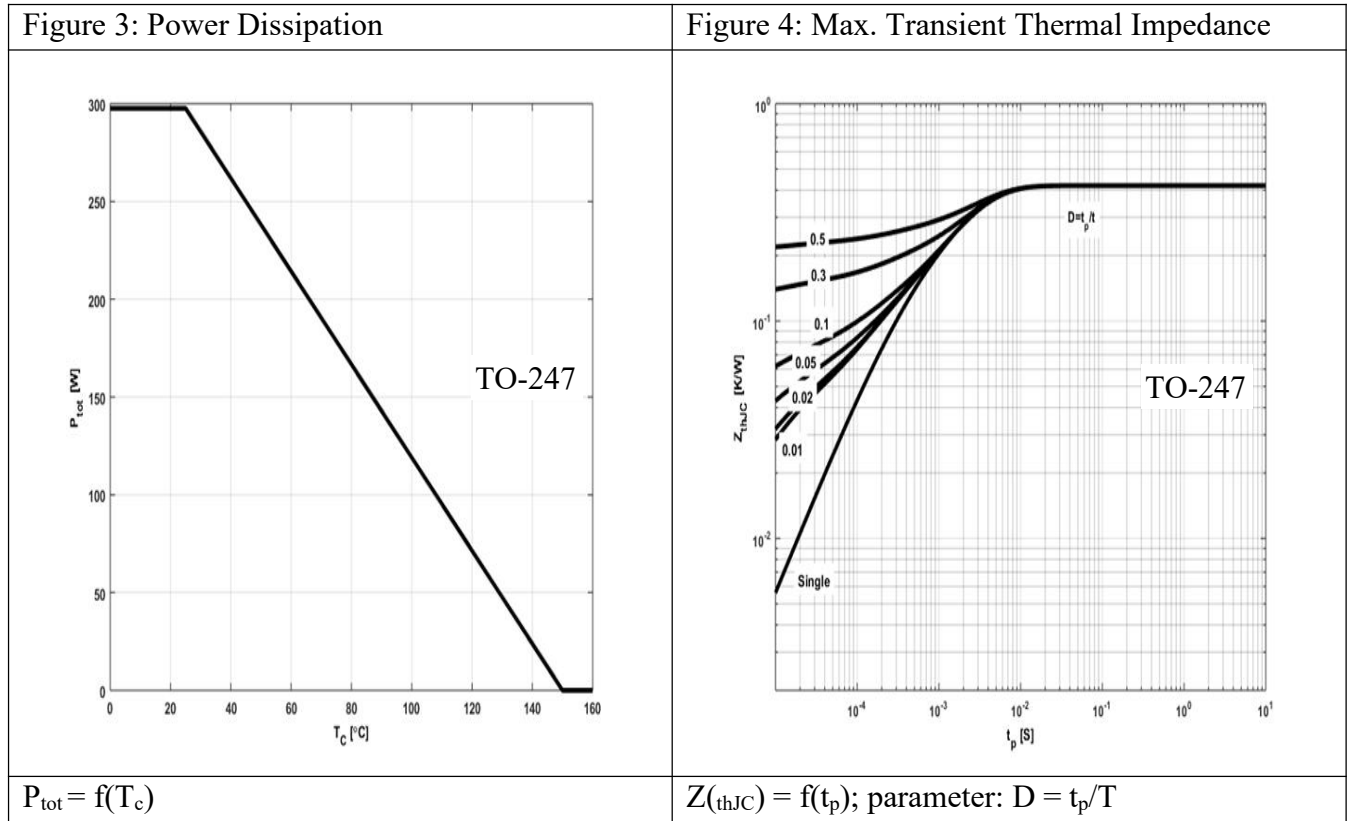
Typical Performance Characteristics


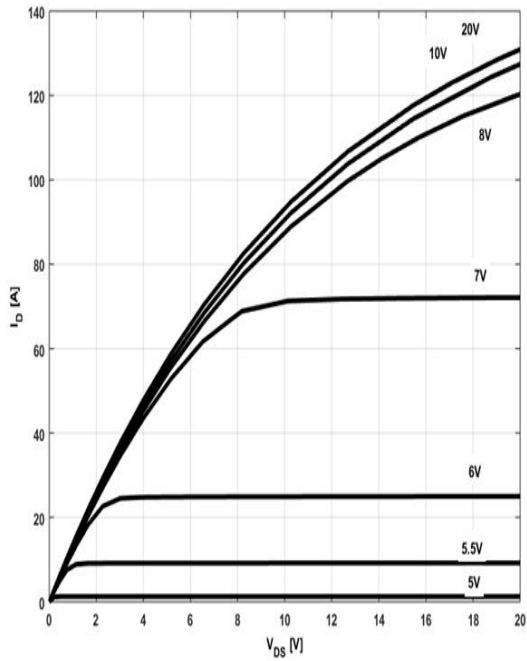
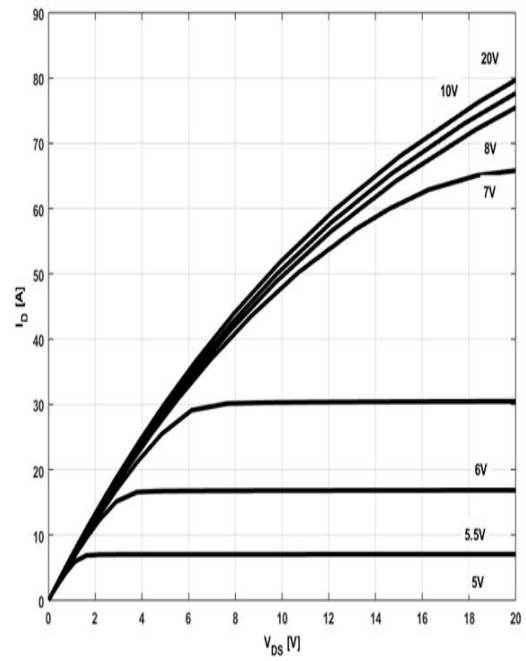
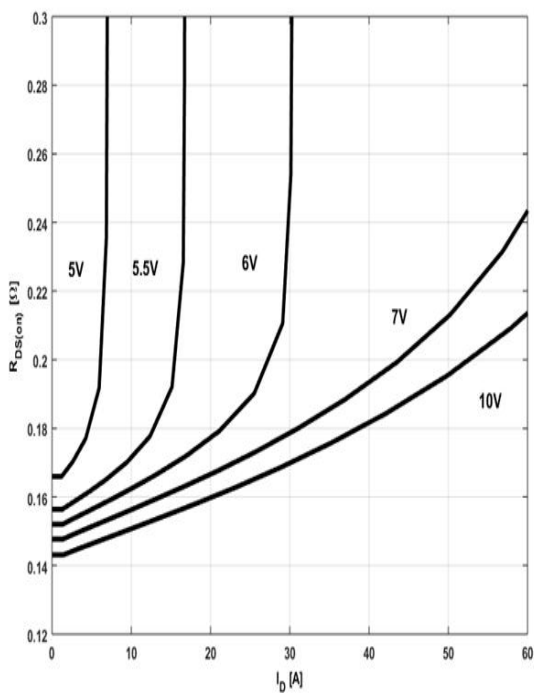
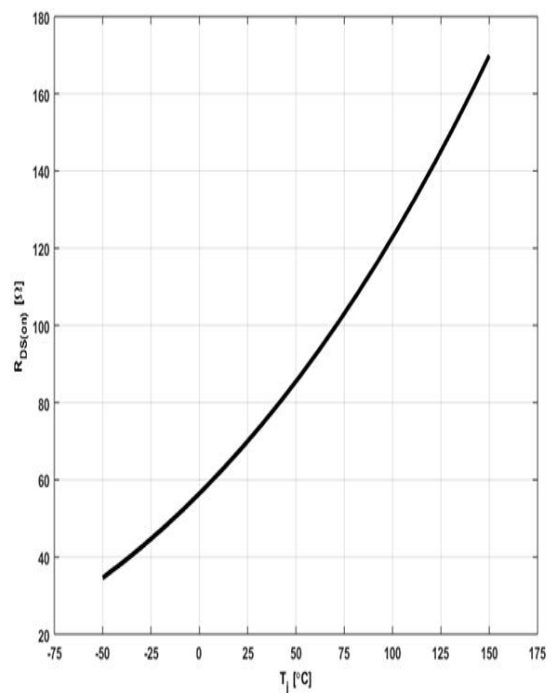
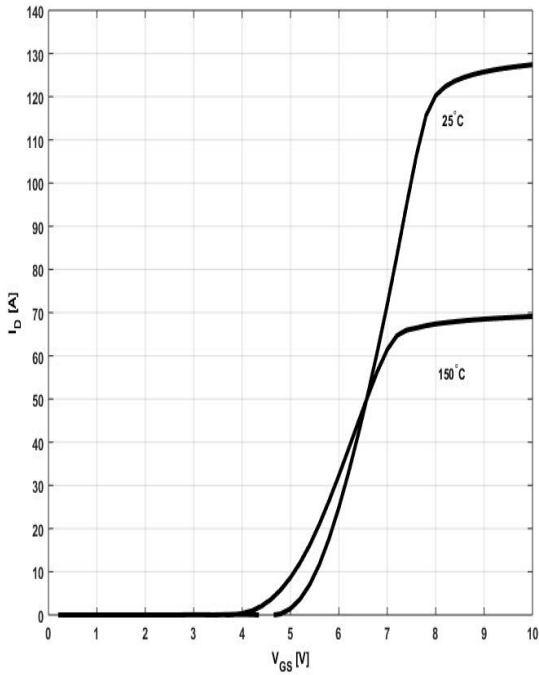
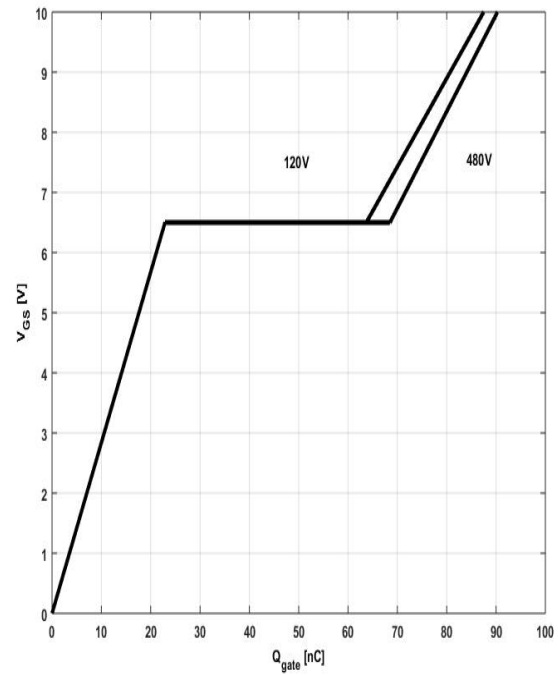
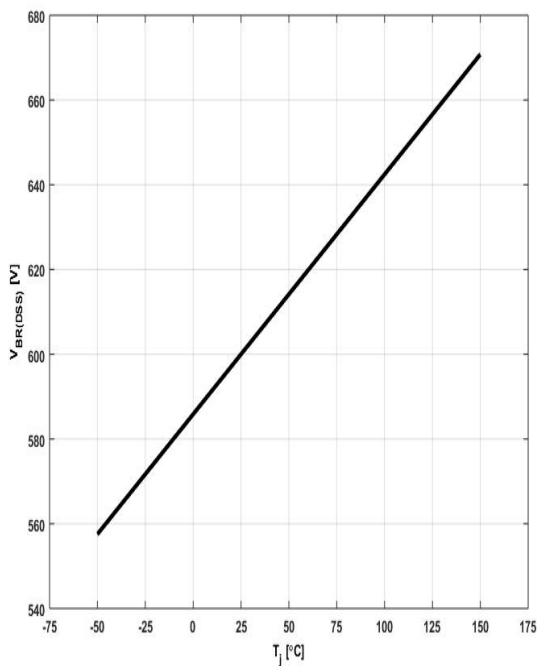
Figure 7: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$
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

 $R_{DS(ON)} = f(T_j); I_D = 21\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


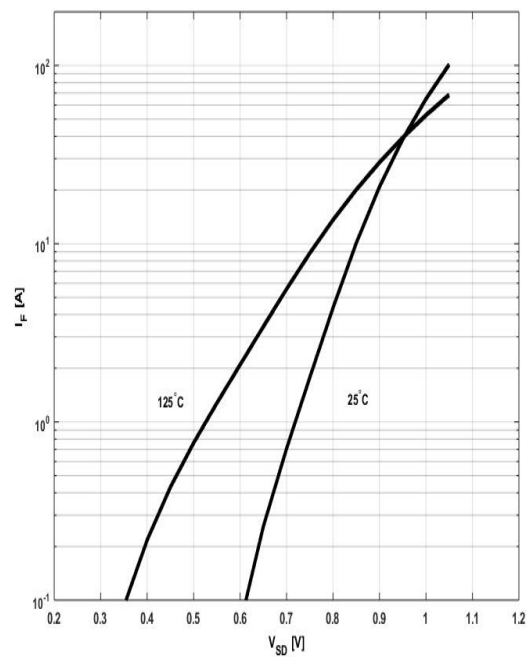
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


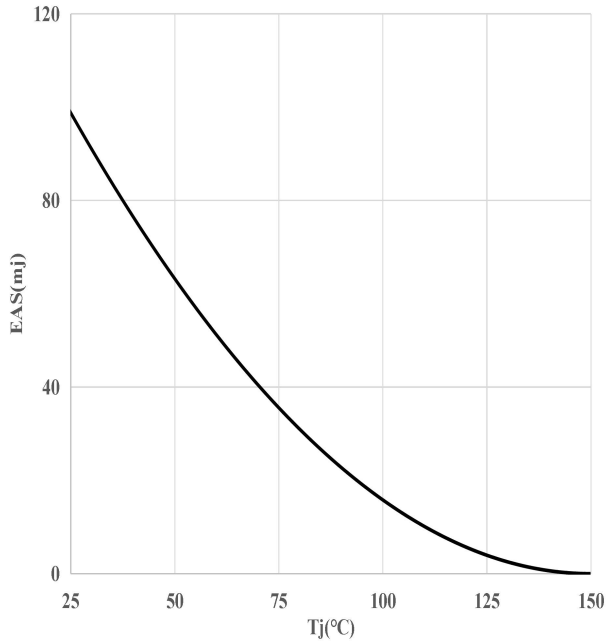
$$V_{GS} = f(Q_{gate}), I_D = 21A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


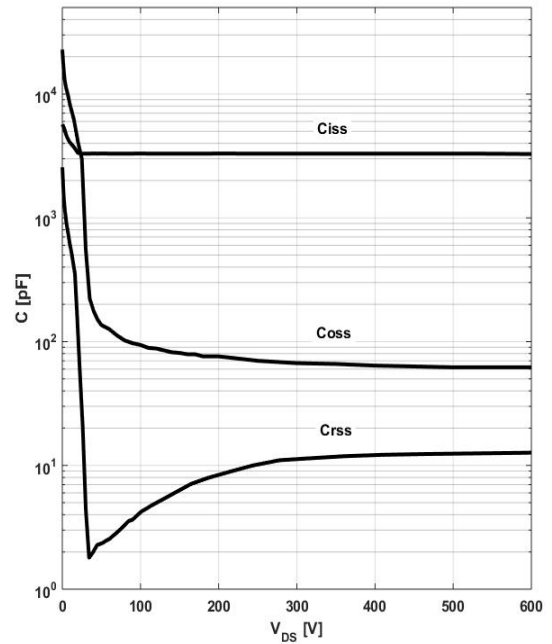
$$V_{BR(DSS)} = f(T_j); I_D = 10mA$$

Figure 14: Forward Characteristics of Reverse Diode


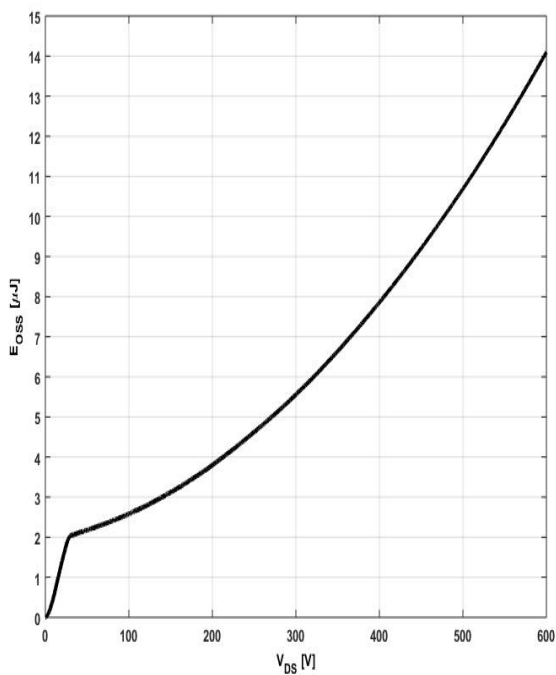
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy


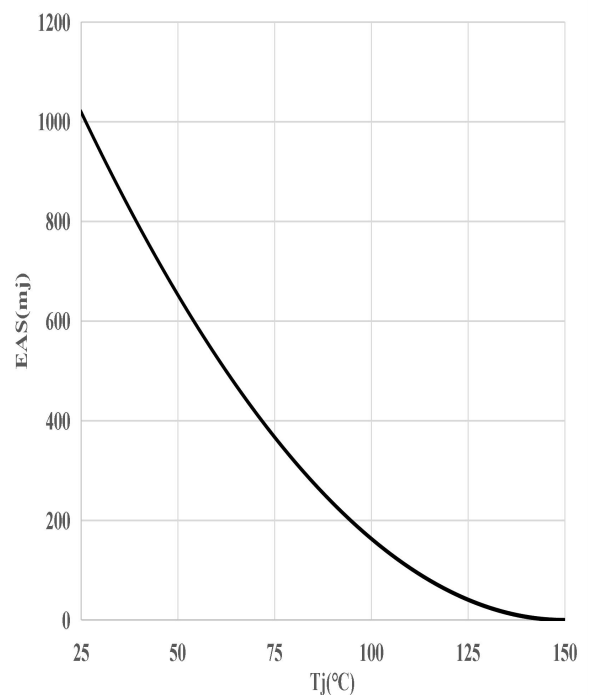
$$E_{AS}=f(T_j); I_D=4.5A; V_{DD}=60V$$

Figure 16: Typ. Capacitances


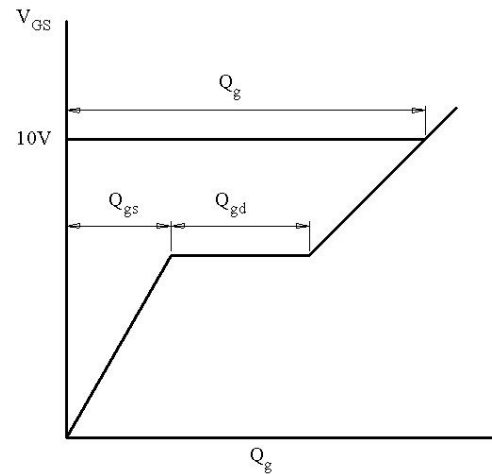
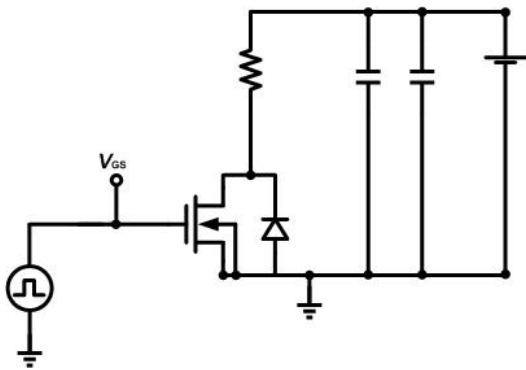
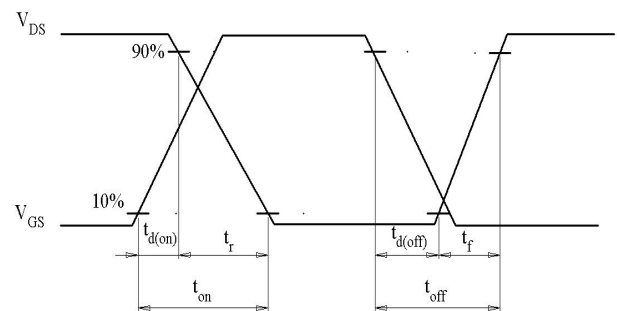
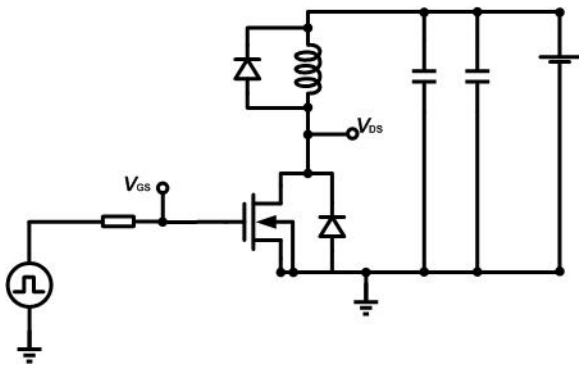
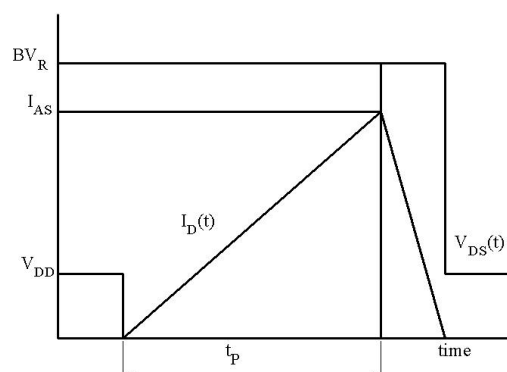
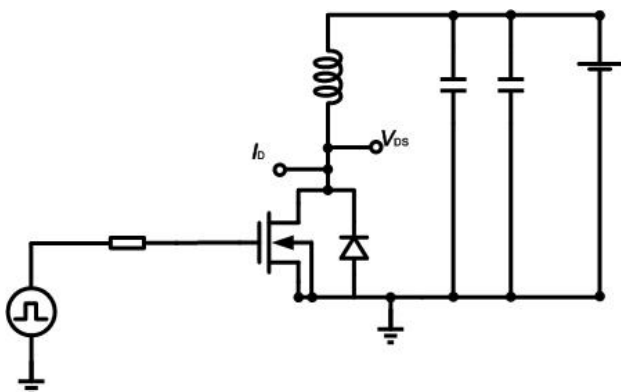
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

Figure 17: Coss Stored Energy


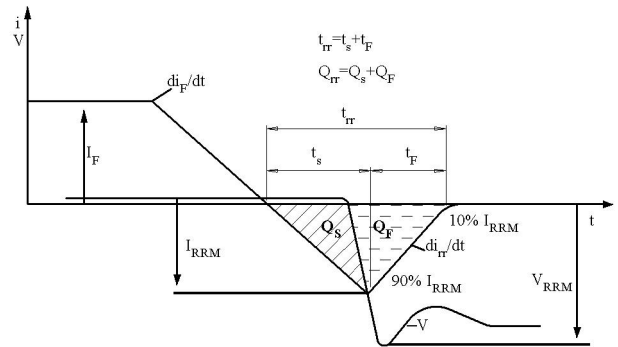
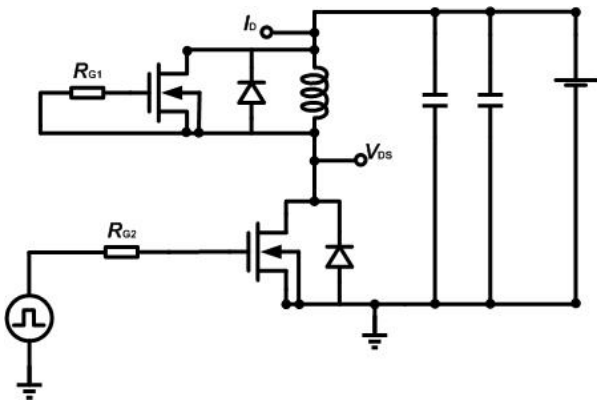
$$E_{OSS}=f(V_{DS})$$

Figure 15: Avalanche Energy


$$E_{AS}=f(T_j); I_D=5.5A; V_{DD}=60V$$

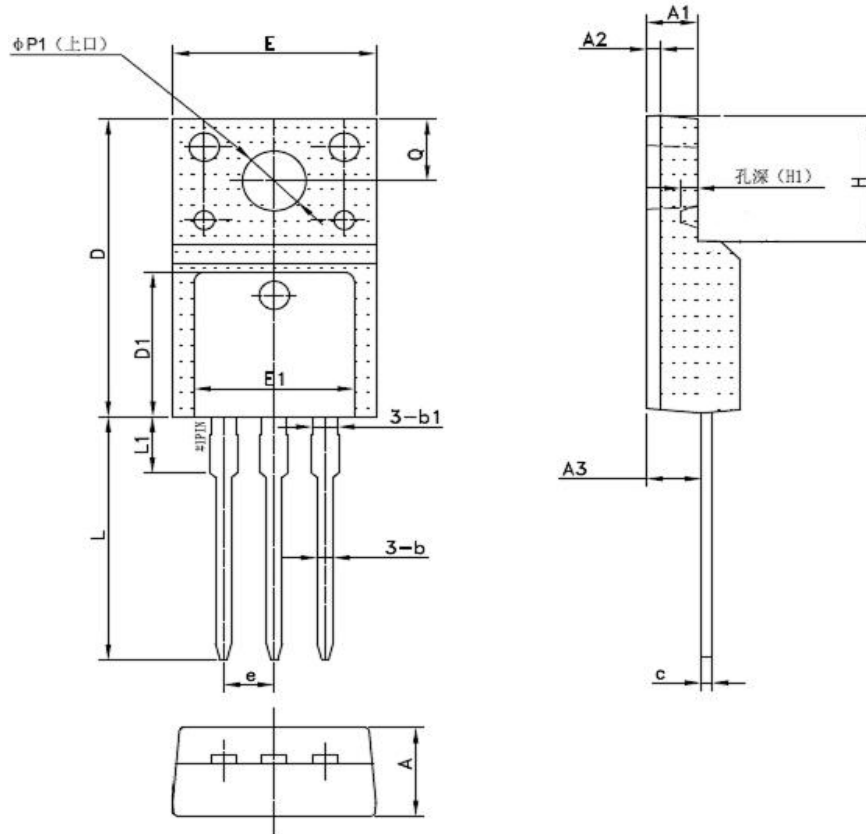
Test Circuits
1. Gate Charge Test Circuit & Waveform

2. Switch Time Test Circuit

3. Unclaimed Inductive Switching Test Circuit & Waveforms


4. Test Circuit and Waveform for Diode Characteristics

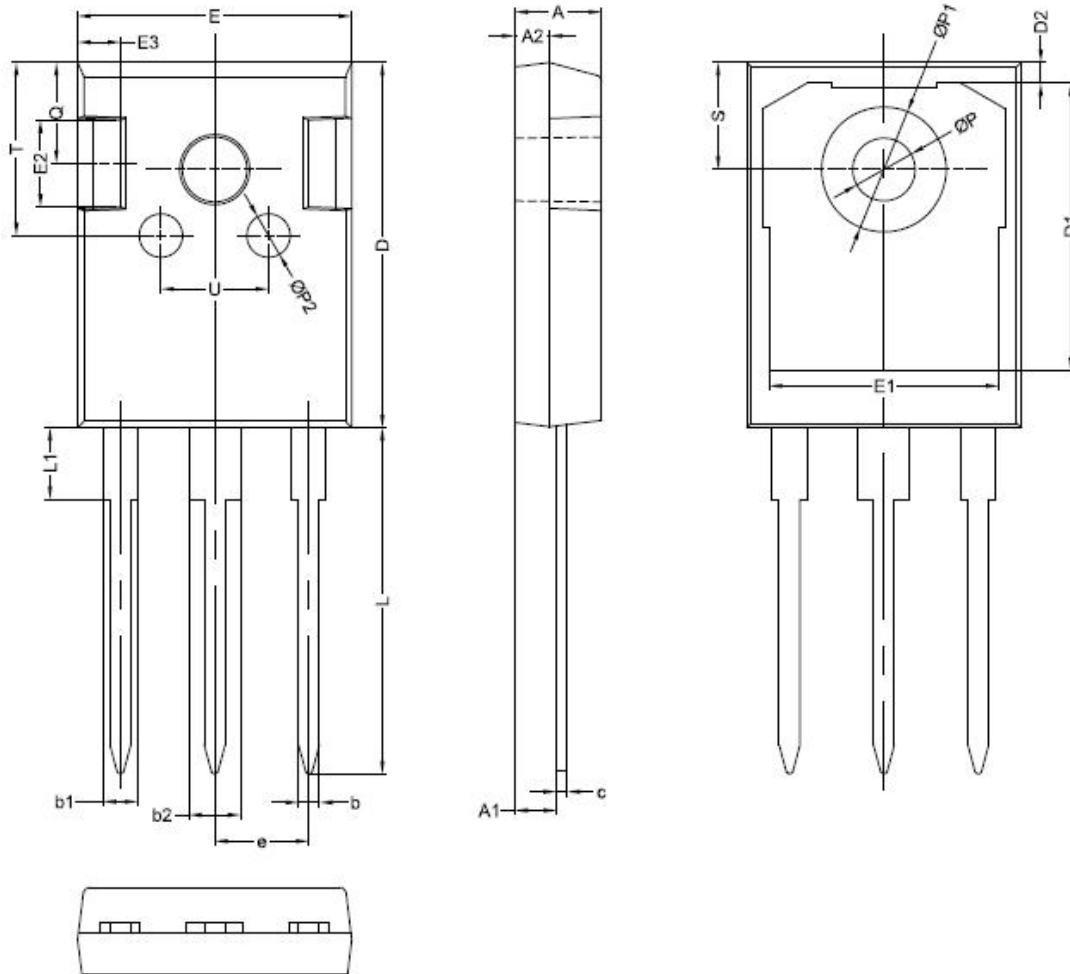


Mechanical Dimensions
TO-220F

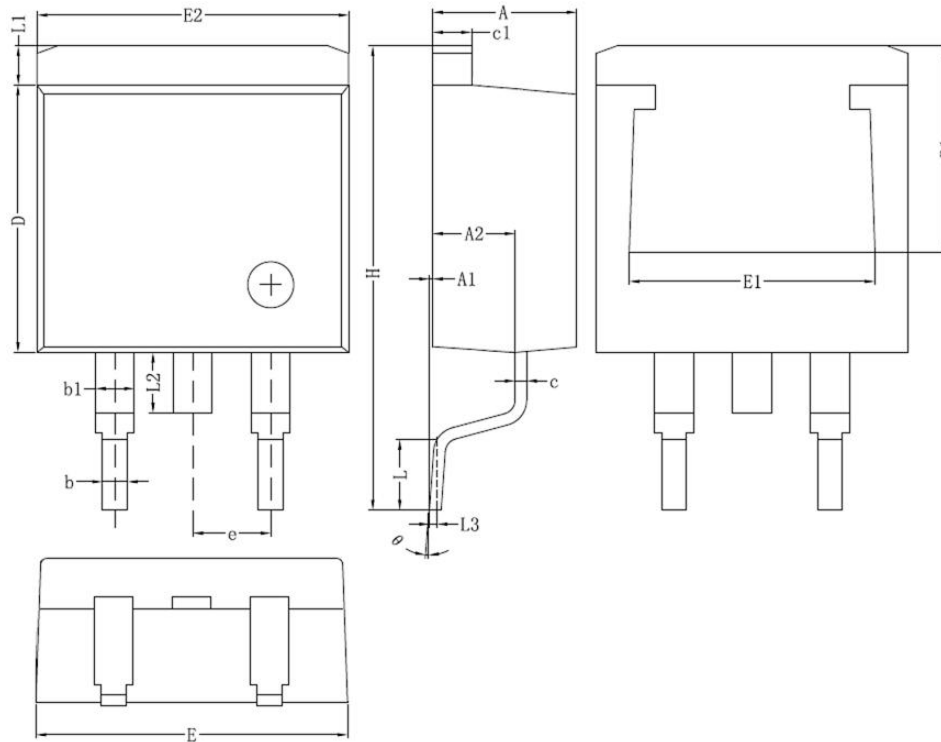
Unit: mm



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
ΦP1	-	3.18	-
Q	2.90	3.30	3.50

Mechanical Dimensions (Continued)
TO-247
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	-	5.00	-
A1	2.21	2.41	2.61	E3	-	2.50	-
A2	1.90	2.00	2.10	e	5.44(BSC)		
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	-	7.40
D	20.80	21.00	21.20	P2	-	2.50	-
D1	-	16.55	-	Q	-	5.80	-
D2	-	1.20	-	S	6.05	6.15	6.25
E	15.60	15.80	16.00	T	-	10.00	-
E1	-	13.30	-	U	-	6.20	-

Mechanical Dimensions
TO-263-2
Unit: mm


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.60	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
c1	1.15	1.27	1.40
D	8.55	-	9.40
D1	6.40	-	-
E	9.80	10.10	10.31
E1	7.60	-	-
E2	9.80	10.00	10.20
e	2.54(BSC)		
H	14.70	15.20	16.00
L	2.00	2.30	2.84
L1	1.00	1.27	1.40
L2	-	-	2.20
L3	-	0.25	-
θ	0°	-	8°



Shenzhen Sanrise Technology Co., LTD

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Main Site:

- Headquarter

Shenzhen Sanrise Technology Co., LTD.
A1206, Skyworth building, No. 008, gaoxinnan 1st Road,
Gaoxin District, Yuehai street,, Nanshan District, ShenZhen,
P.R.China

Tel: +86-755-22953335

Fax: +86-755-22916878

- Shanghai Office

Shenzhen Sanrise Technology Co., LTD
Rm.401, Building B, No. 666, Zhangheng Road,
Zhangjiang Hi-Tech Park, Shanghai, P.R.China

Tel: +86-21-68825918