78mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R078B

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 $R_{DS(ON)}$ = 78mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=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

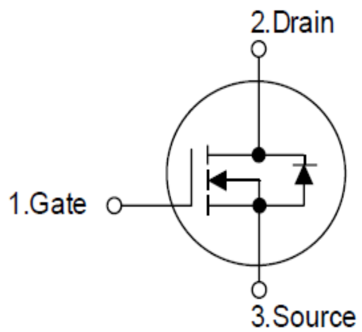
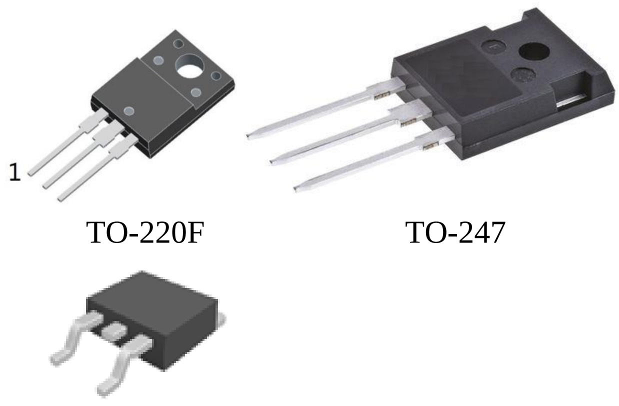


Figure 1 Symbol of SRC60R078B

Package Type



TO-220F TO-247

TO-263

Figure 2 Package Types of SRC60R078B

Ordering Information

SRC60R078B□□–□

Circuit Type

Package
TF: TO-220F
T: TO-247
S2: TO-263-2

E: Lead Free
G: Green
Blank: Tube
TR: Tape & Reel

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
Continuous Drain Current	T_C=25ºC	I_D	42	A
	T_C=125ºC		18.7	
Pulsed Drain Current (Note 2)		I_{DM}	126	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	550	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}<=480V		dv/dt	50	V/ns
Reverse Diode dv/dt, V_{DS}<=480V, I_{SD}<=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	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} = 4.5A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.5	ºC /W
	TO-263-2				0.43	
	TO-247				0.43	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			70	ºC /W
	TO-263-2				58	
	TO-247				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}=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=800uA	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…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=1.8Ω, 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=21A V_{GS}=0 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/us		158		ns
Reverse Recovery Charge		Q_{rr}			0.95		uC
Peak Reverse Recovery Current		I_{rrm}			12.0		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

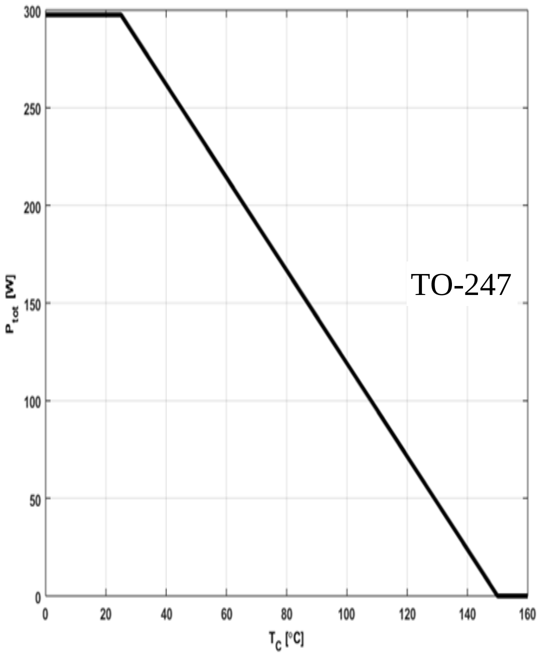
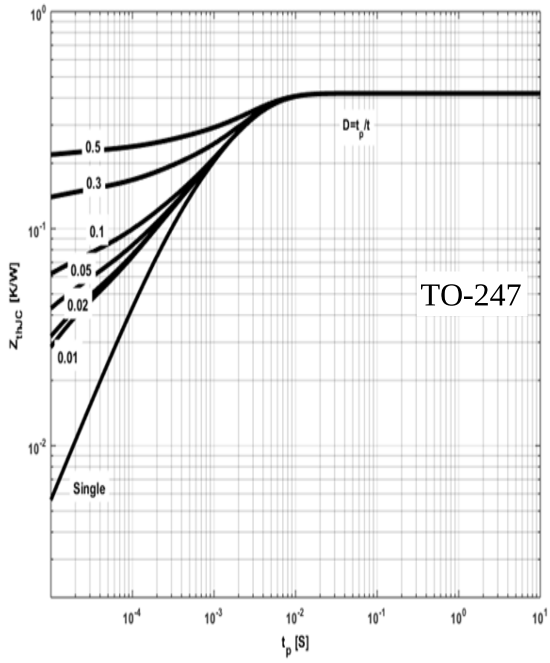
Figure 3: Power Dissipation	Figure 4: Max. Transient Thermal Impedance
	
$P_{tot} = f(T_c)$	$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

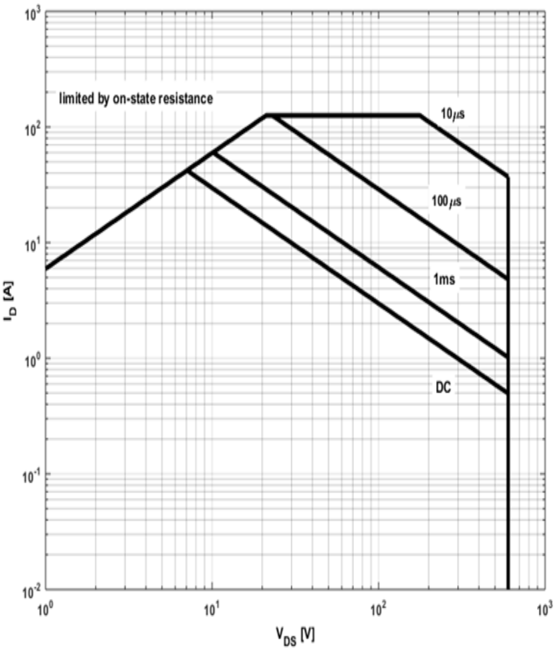
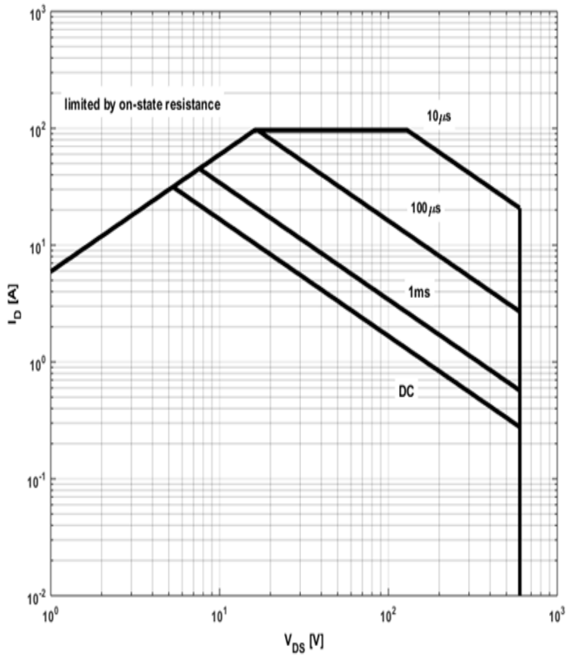
Figure 5: Safe Operating Area	Figure 6: Safe Operating Area
	
$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p	$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

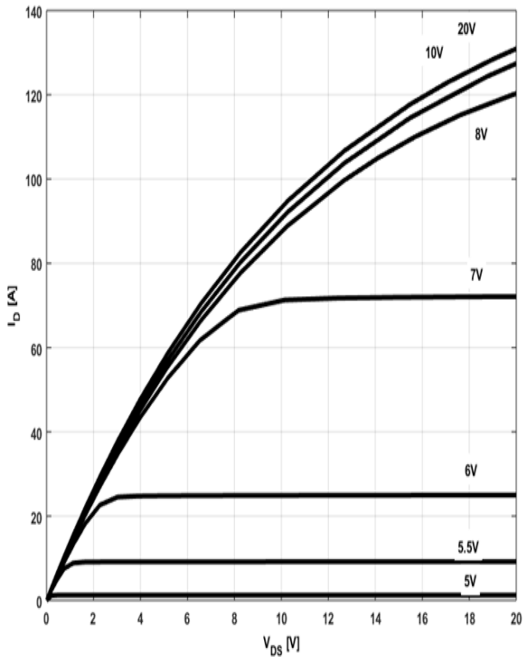
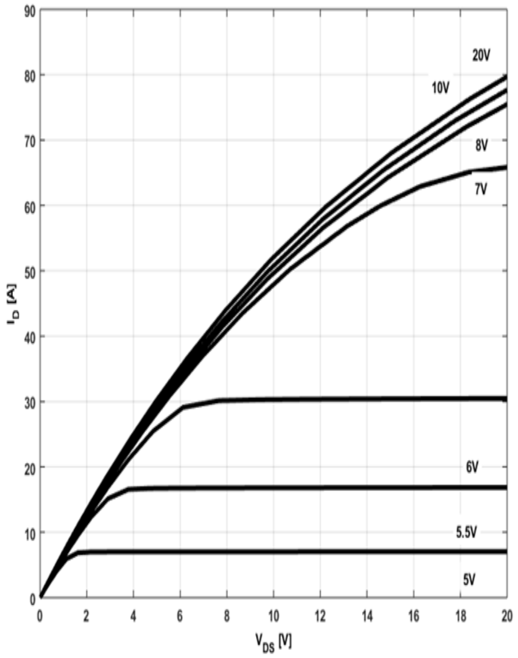
Figure 7: Typ. Output Characteristics	Figure 8: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

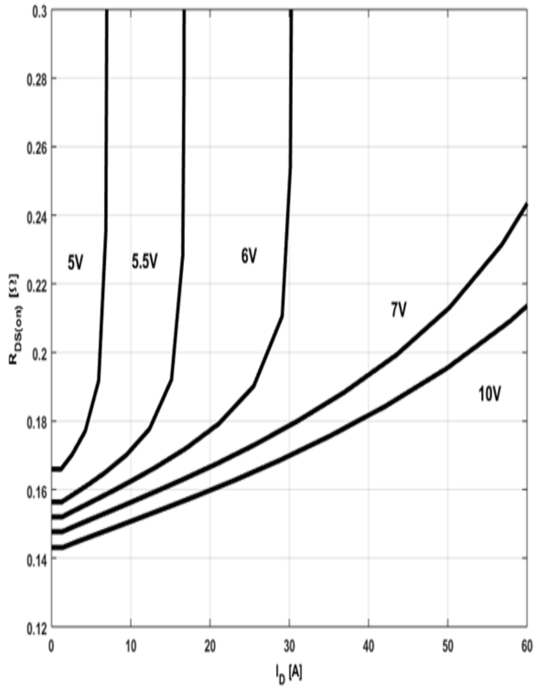
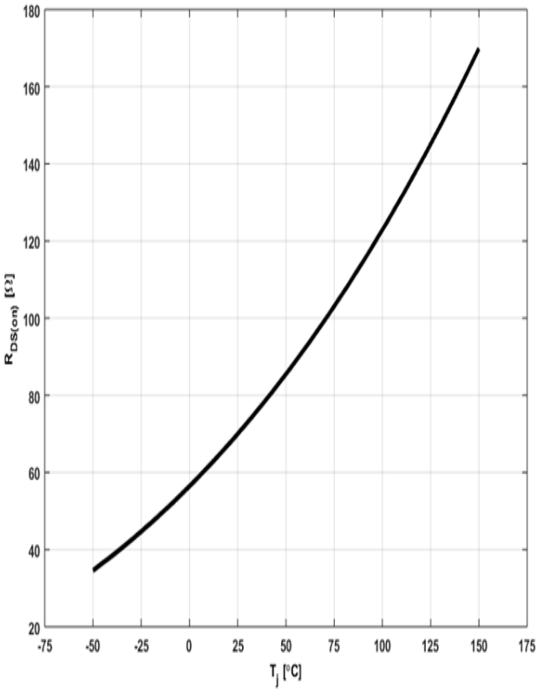
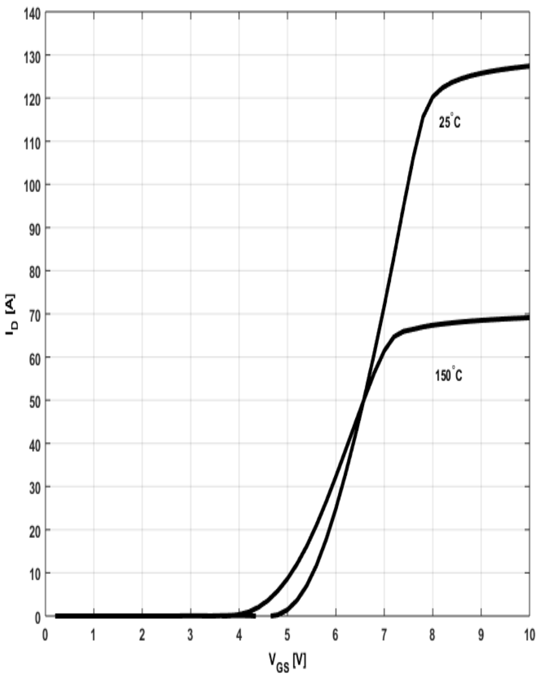
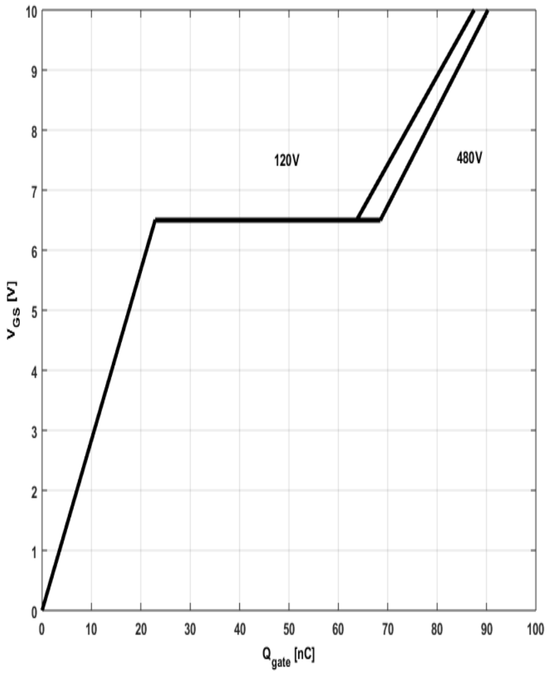
Figure 9: Typ. Drain-Source On-State Resistance	Figure 10: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)} = f(I_D)$; T_j=125ºC; parameter: V_{GS}	$R_{DS(ON)} = f(T_j)$; I_D=21A; V_{GS}=10V

Figure 11: Typ. Transfer Characteristics



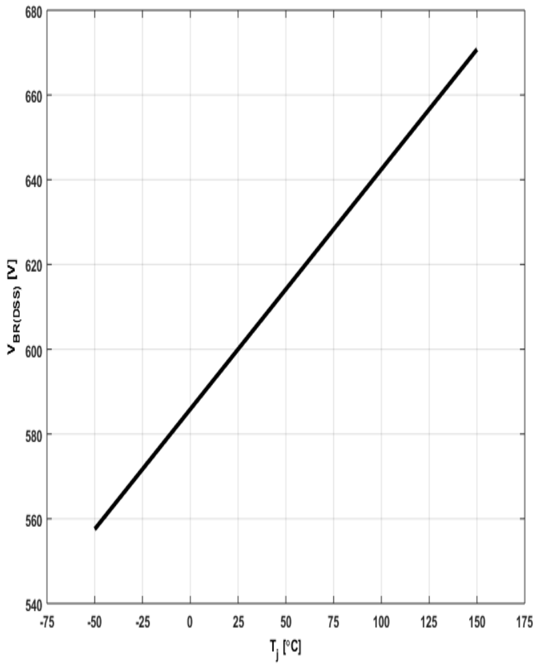
$I_D = f(V_{GS})$; $V_{DS} = 20V$

Figure 12: Typ. Gate Charge



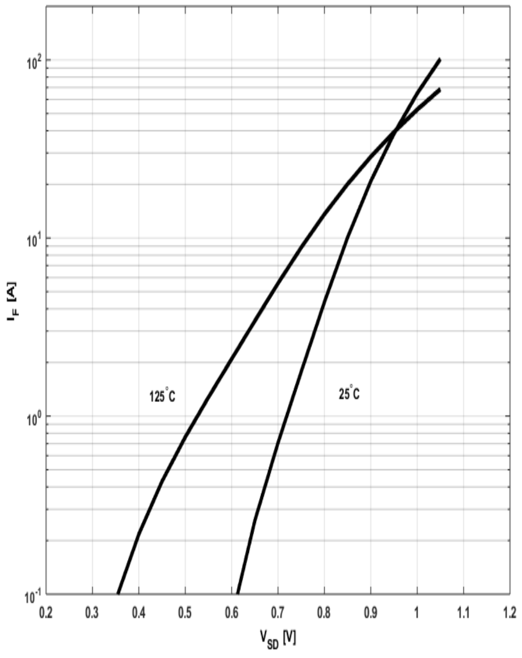
$V_{GS}= f(Q_{gate})$, $I_D= 21A$ pulsed

Figure 13: Drain-Source Breakdown Voltage



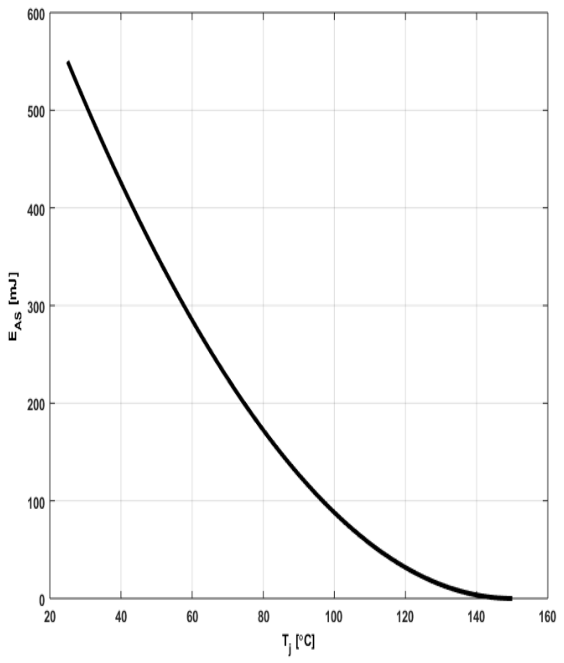
$V_{BR(DSS)}=f(T_j)$; $I_D=10mA$

Figure 14: Forward Characteristics of Reverse Diode



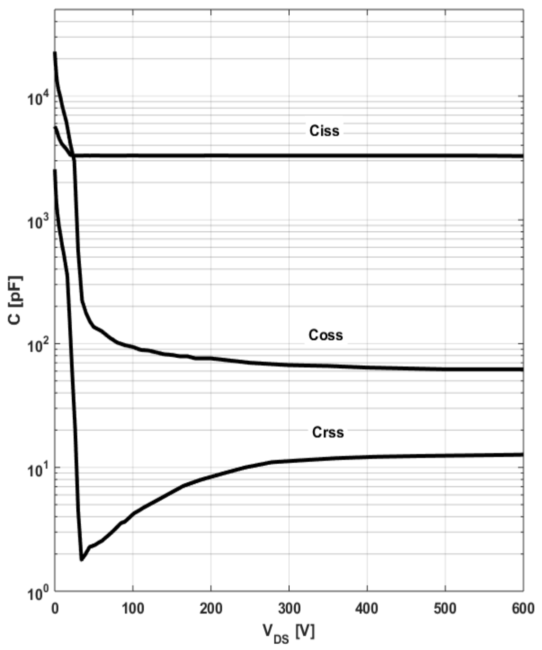
$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



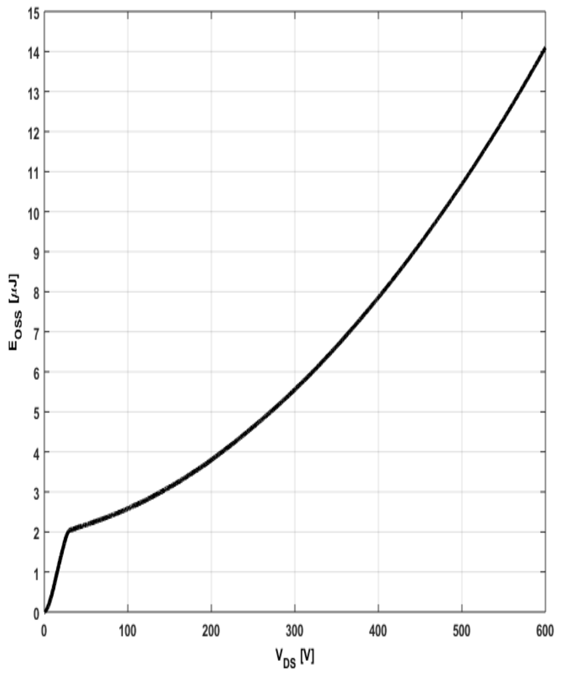
E_{AS}=f(T_j); I_D=4.5A; V_{DD}=60V

Figure 16: Typ. Capacitances



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

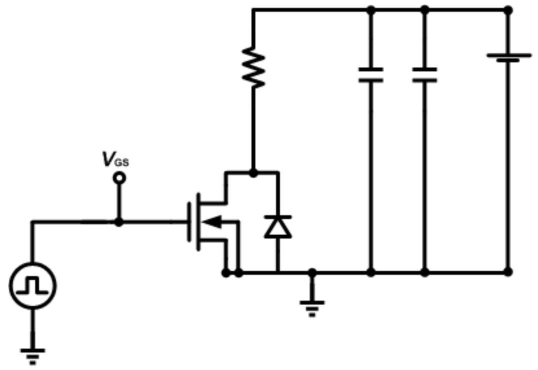
Figure 17: C_{OSS} Stored Energy

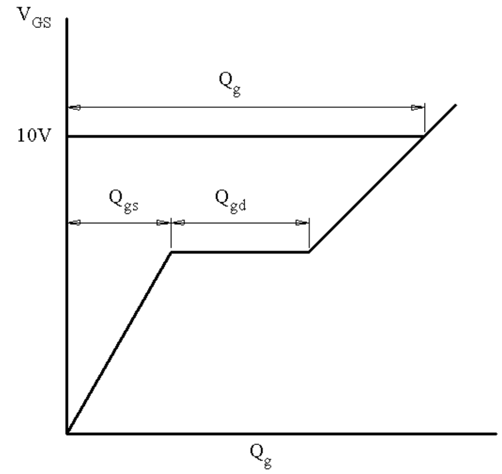


E_{OSS}=f(V_{DS})

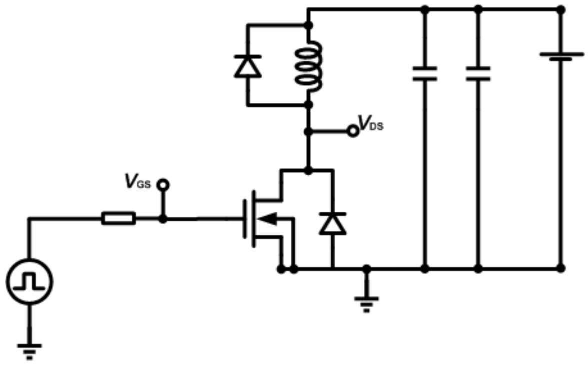
Test Circuits

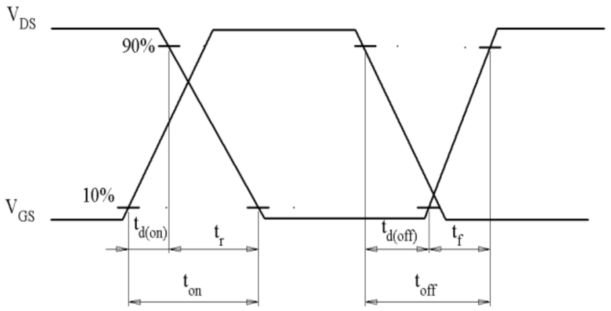
1. Gate Charge Test Circuit & Waveform



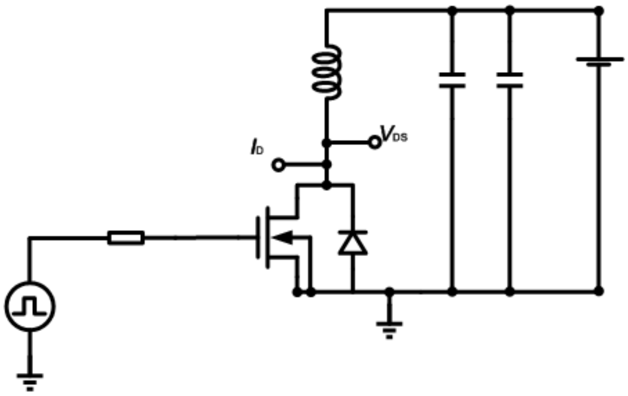


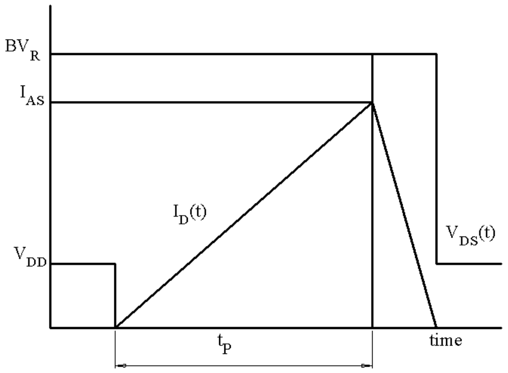
2. Switch Time Test Circuit



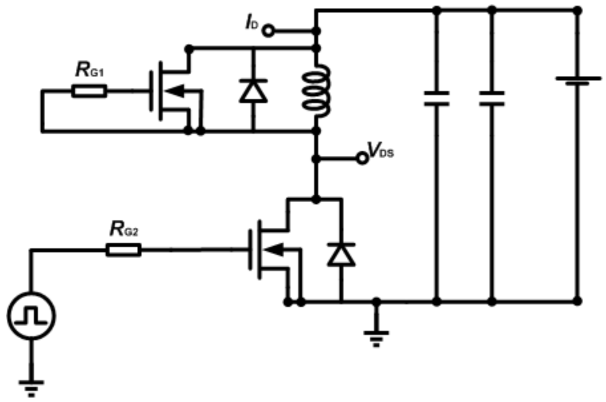


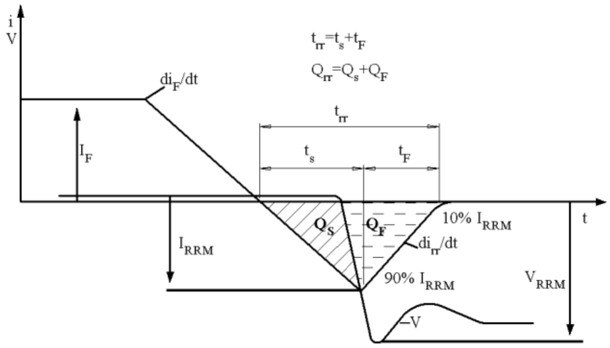
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

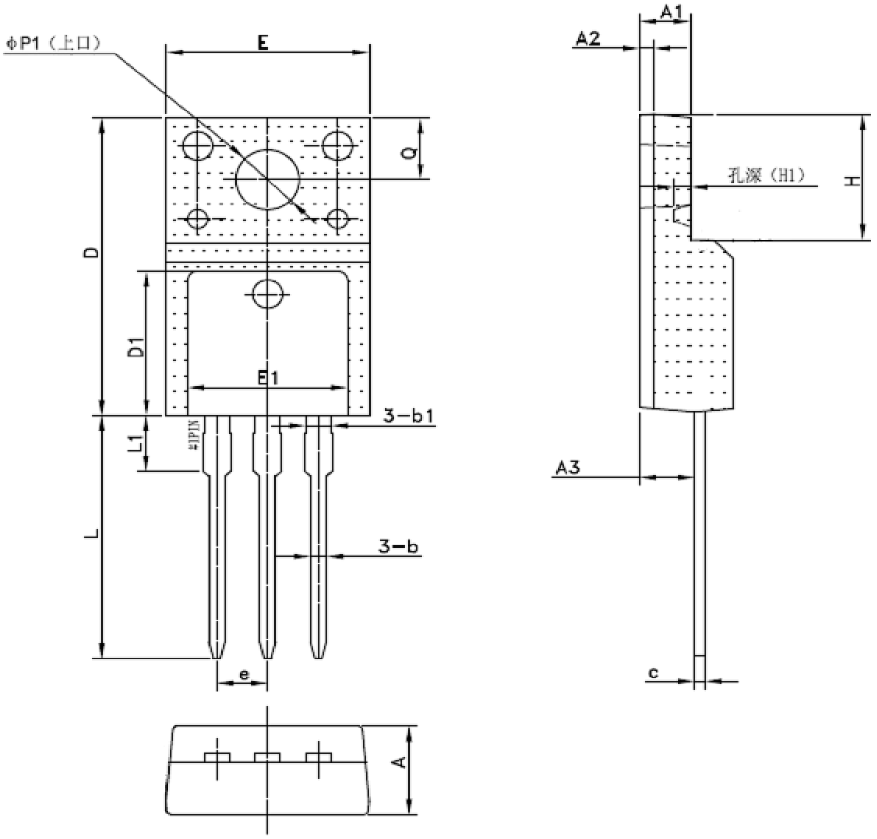




Mechanical Dimensions

TO-220F

Unit: mm

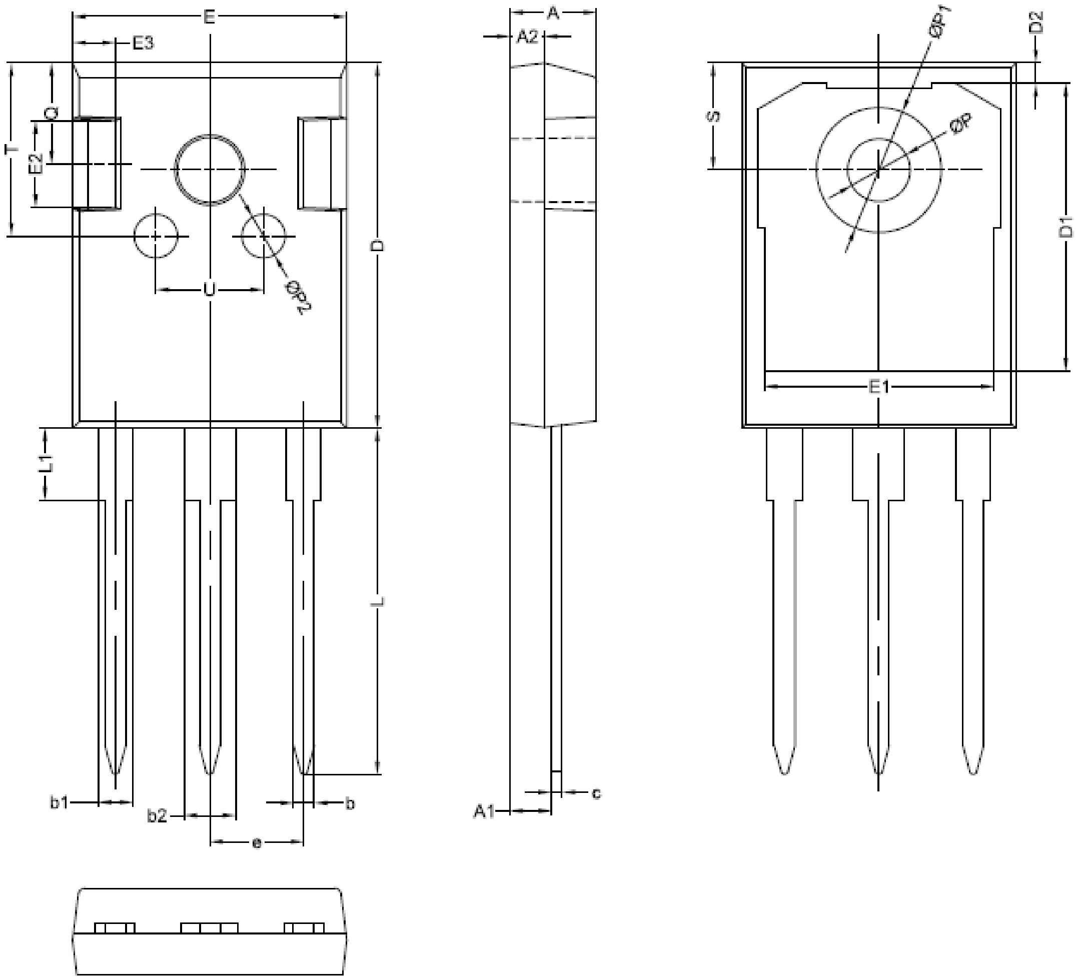


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
ΦP1	-	3.18	-
Q	2.90	3.30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

Mechanical Dimensions (Continued)

TO-247

Unit: mm

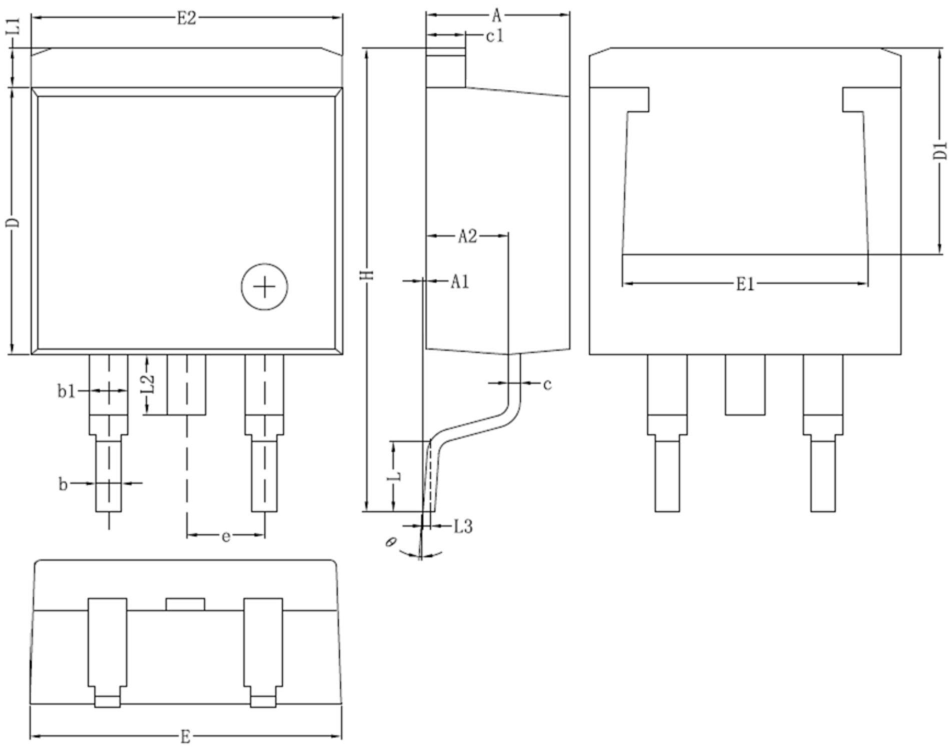


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.90	2.00	2.10
b	1.10	1.20	1.35
b1	-	2.00	-
b2	-	3.00	-
c	0.55	0.60	0.75
D	20.80	21.00	21.20
D1	-	16.55	-
D2	-	1.20	-
E	15.60	15.80	16.00
E1	-	13.30	-
E2	-	5.00	-
E3	-	2.50	-
e	5.44(BSC)		
L	19.42	19.92	20.42
L1	-	4.13	-
P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

TM
Sanrise Tech
尚阳通

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IMPORTANT NOTICE

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