360mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R360B

General Description

The Sanrise SRC60R360B 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 SRC60R360B break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R360B is available in PDFN5*6, TO-220F, TO-252 and TO-220C packages.

Features

- Ultra Low $R_{DS(ON)}$ = 360mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=18.3nC typ.
- Intrinsic Fast-Recovery Body Diode
- Fast switching capability
- Robust design with better EAS performance

Application

- TV Power
- High Performance Charger / Adapter
- PC Power

Symbol

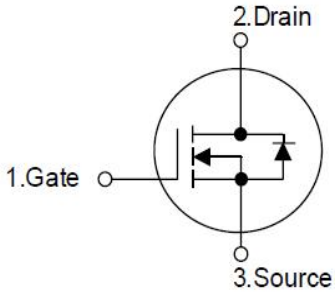
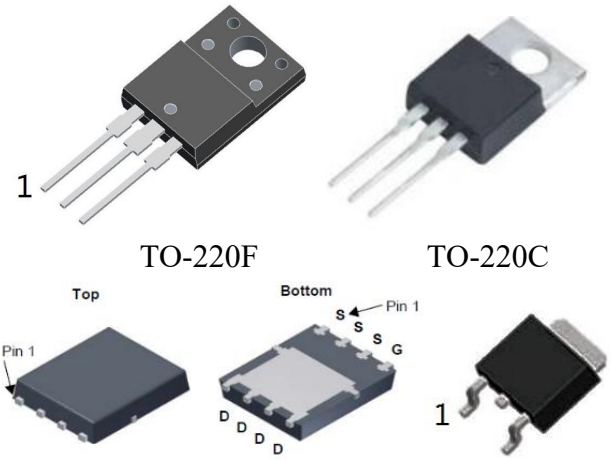


Figure 1 Symbol of SRC60R360B

Package Type



TO-220F TO-220C

PDFN5*6 TO-252

Figure 2 Package Types of SRC60R360B

Ordering Information

SRC60R360B□□–□

Circuit Type

Package
TF: TO-220F
TC: TO-220C
D56: PDFN5*6

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

Package	Part Number	Marking ID	Packing Type
TO-220F	SRC60R360BTF-G	SRC60R360BTFG	Tube
TO-220C	SRC60R360BTC-G	SRC60R360BTCG	Tube
TO-252	SRC60R360BDTR-G	SRC60R360BDG	Tape & Reel
PDFN5*6	SRC60R360BD56TR-G	SRC60R360BD56G	Tape & Reel

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Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage (Note2)		V_{DSS}	600	V
Gate-Source Voltage (static)		V_{GSS}	±30	V
Gate-Source Voltage (transient) (Note5)		V_{GSS}	±40	V
Continuous Drain Current	T_C=25ºC	I_D	10.3	A
	T_C=100ºC		6.5	
	T_C=125ºC		4.6	
Pulsed Drain Current (Note 3)		I_{DM}	30.9	A
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	175	mJ
Avalanche Energy, Repetitive (Note 3)		E_{AR}	0.16	mJ
Avalanche Current, Repetitive (Note 3)		I_{AR}	2.5	A
Continuous Diode Forward Current		I_S	10.3	A
Diode Pulse Current		$I_{S.PULSE}$	30.9	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		P_D	67.9	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. For voltage spike.
3. Repetitive Rating: Pulse width limited by maximum junction temperature
4. I_{AS} = 2.5A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C
5. For short period of Vgs spike greater than 30V is allowed, but at customer's own risk.

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance， Junction-to-Case	TO-252	R_{thJC}			1.84	ºC/W
	TO-220F				4.3	
	PDFN5*6				1.84	
	TO-220C				1.84	
Thermal Resistance， Junction-to-Ambient	TO-252	R_{thJA}			60	
	TO-220F				78	
	PDFN5*6				60	
	TO-220C				60	

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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	
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250uA	3	4	5	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=4.5A		274	360	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		8.5		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		430		pF
Output Capacitance		C_{OSS}			45		
Reverse Transfer Capacitance		C_{RSS}			1		
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		21		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			111		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=4.5A R_G=10Ω, V_{GS}=10V		10		ns
Rise Time		t_r			12		
Turn-off Delay Time		$t_{d(off)}$			32		
Fall Time		t_f			13		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=4.5A V_{GS}=0 to 10V		5.4		nC
Gate to Drain Charge		Q_{gd}			6.0		
Gate Charge Total		Q_g			18.3		
Gate Plateau Voltage		$V_{plateau}$			5.7		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=4.5A		0.87	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=4.5A dI$_F$/dt=100A/us		87		ns
Reverse Recovery Charge		Q_{rr}			0.29		uC
Peak Reverse Recovery Current		I_{rrm}			6.7		A

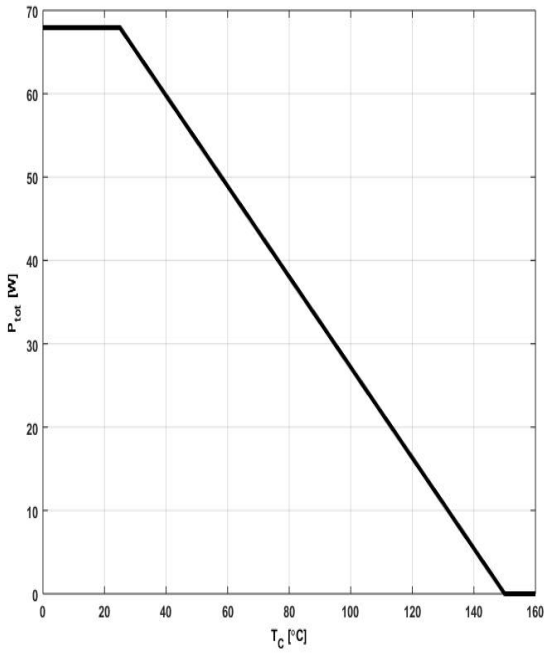
Note:

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

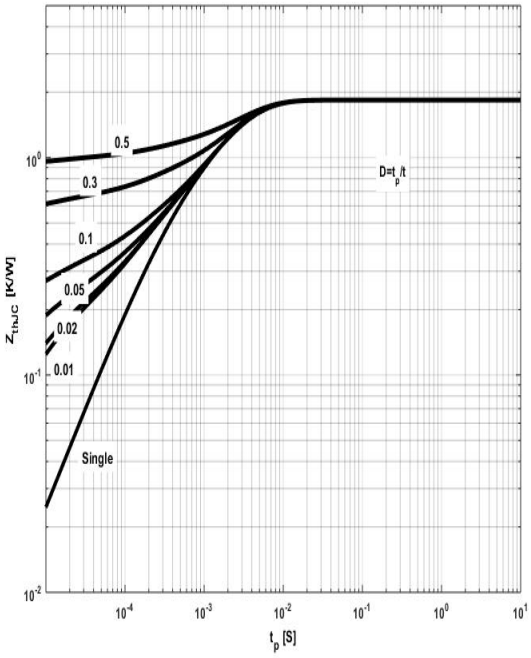
Typical Performance Characteristics

Figure 3: Power Dissipation



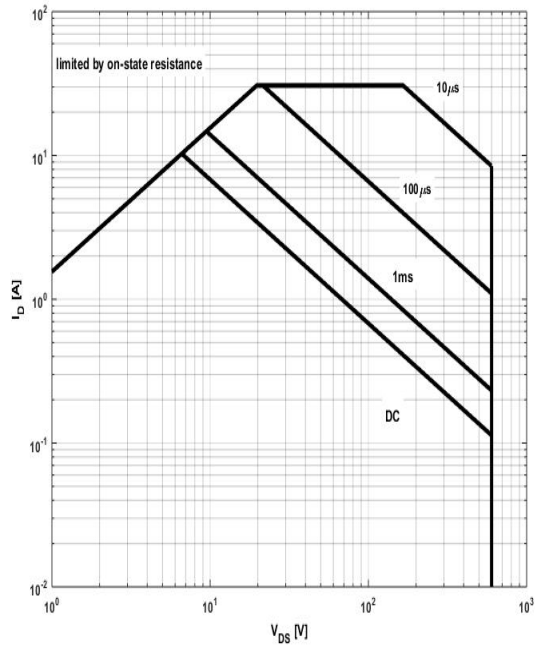
$P_{tot} = f(T_c)$

Figure 4: Max. Transient Thermal Impedance



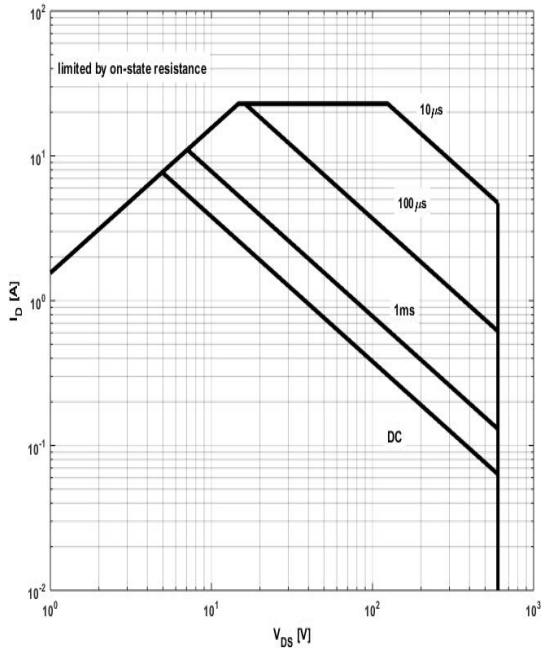
$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

Figure 5: Safe Operating Area



$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

Figure 6: Safe Operating Area



$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

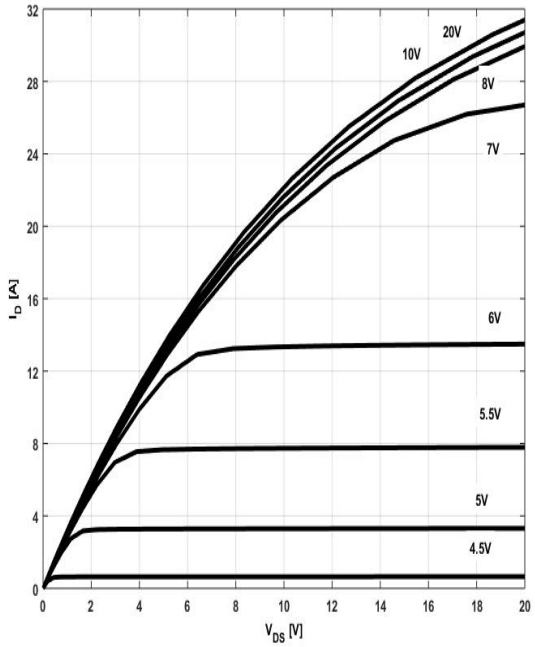
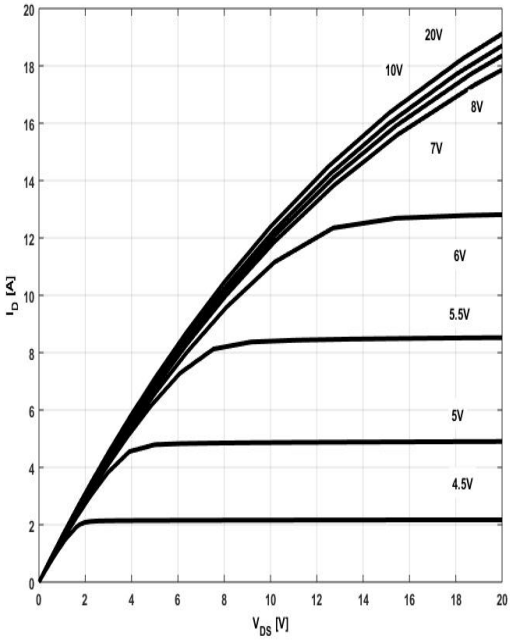
Figure 7: Typ. Output Characteristics	Figure 8: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

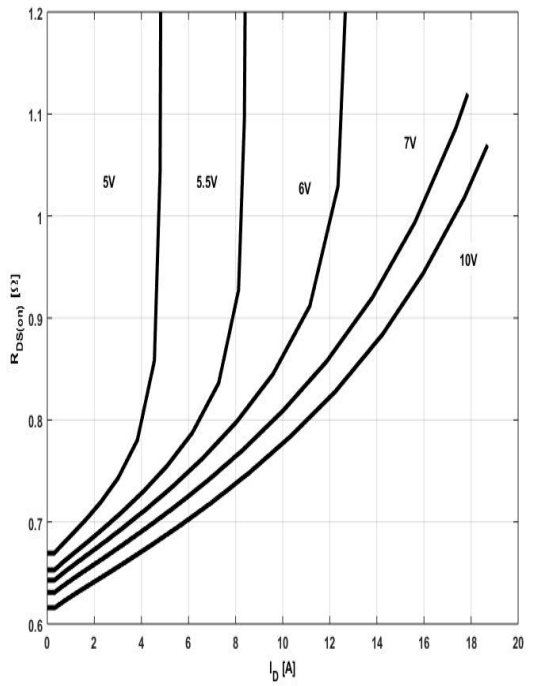
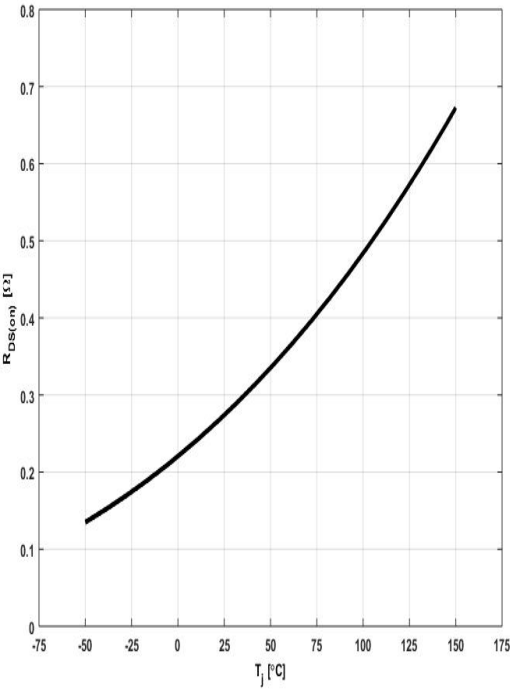
Figure 9: Typ. Drain-Source On-State Resistance	Figure 10: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)} = f(I_D)$; T_j=125ºC; parameter: V_{GS}	$R_{DS(ON)} = f(T_j)$; I_D=4.5A; V_{GS}=10V

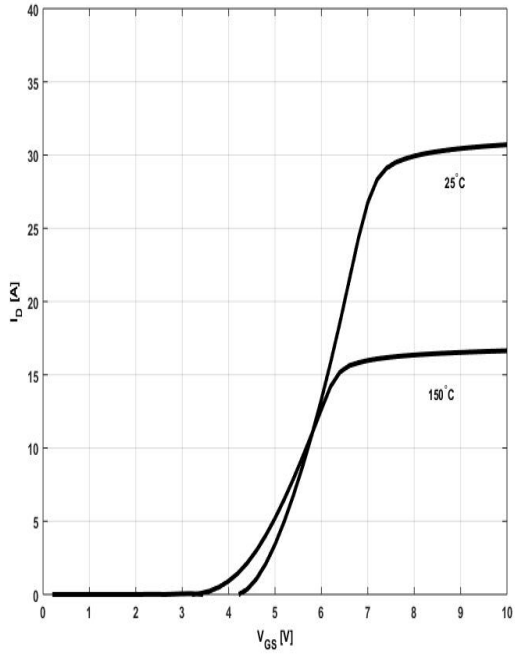
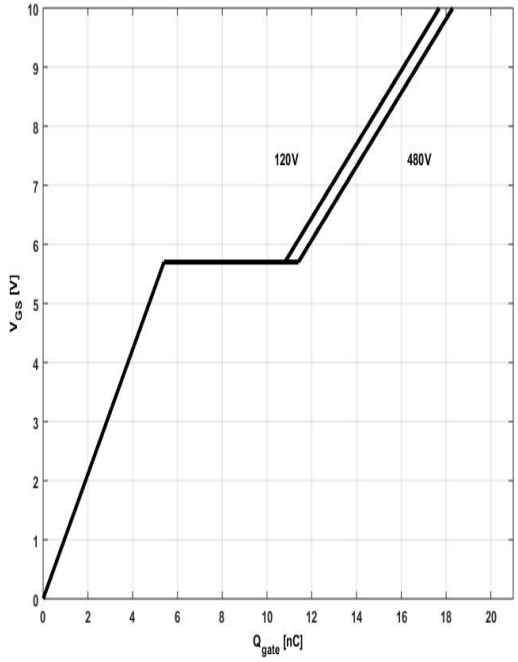
Figure 11: Typ. Transfer Characteristics	Figure 12: Typ. Gate Charge
	
$I_D = f(V_{GS})$; $V_{DS} = 20V$	$V_{GS} = f(Q_{gate})$, I_D=4.5A pulsed

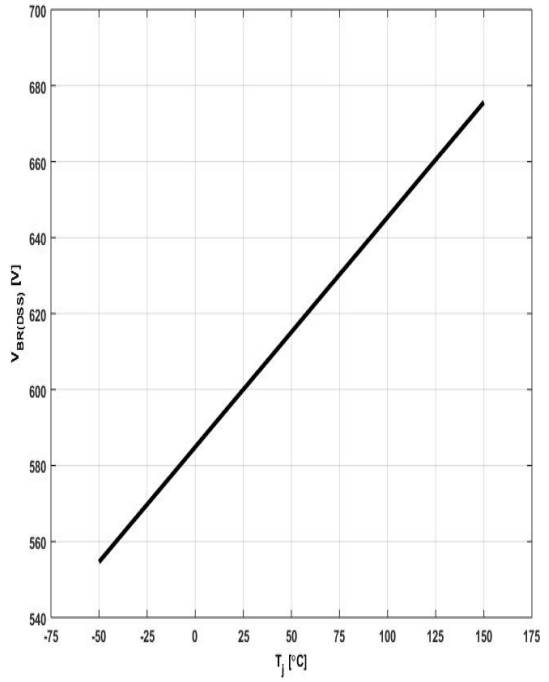
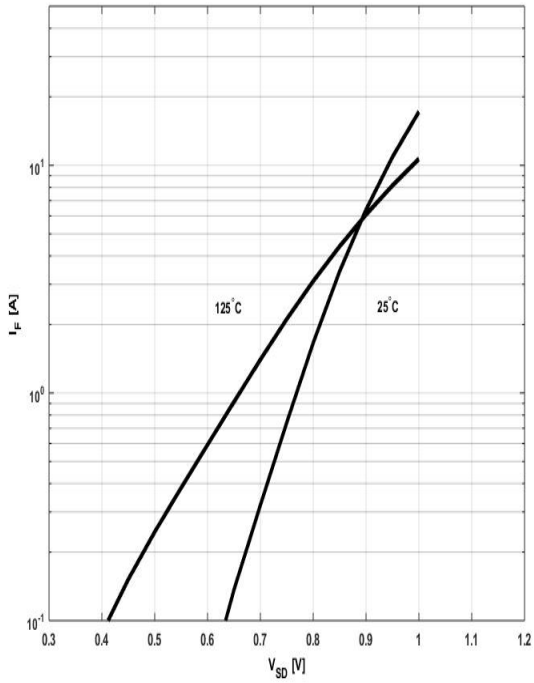
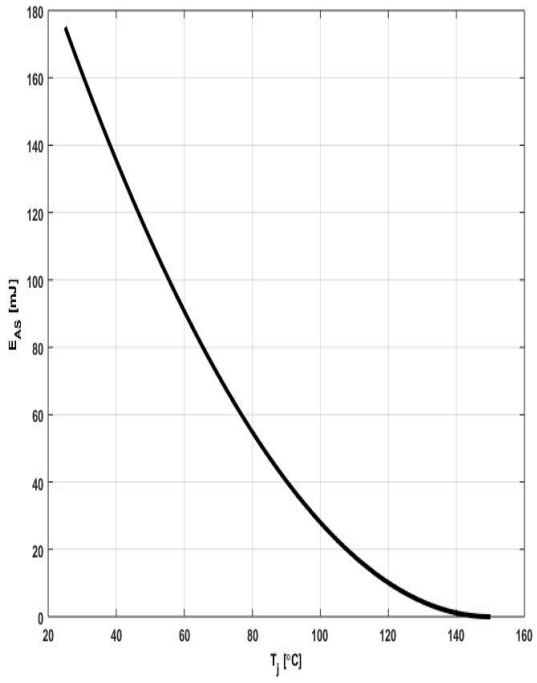
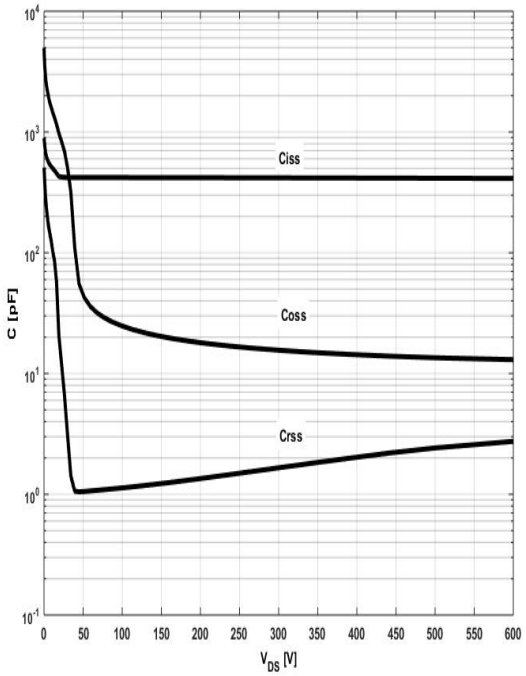
Figure 13: Drain-Source Breakdown Voltage	Figure 14: Forward Characteristics of Reverse Diode
	
$V_{BR(DSS)}=f(T_j)$; I_D=1mA	$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



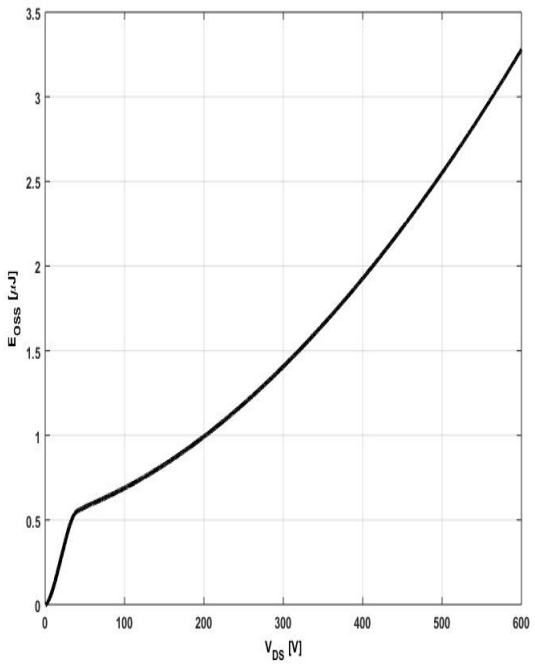
$E_{AS}=f(T_j)$; I_D=2.5A; V_{DD}=60V

Figure 16: Typ. Capacitances



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

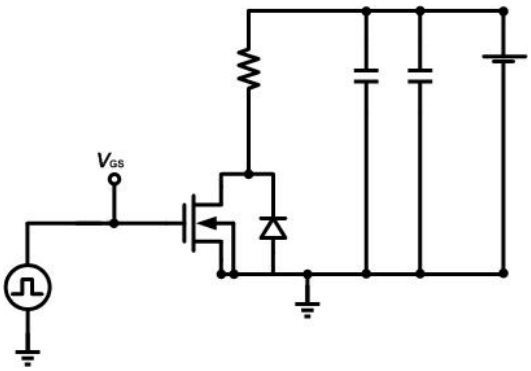
Figure 17: C_{OSS} Stored Energy

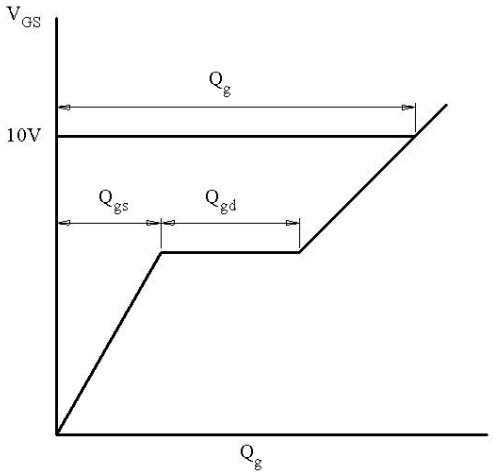


$E_{OSS}=f(V_{DS})$

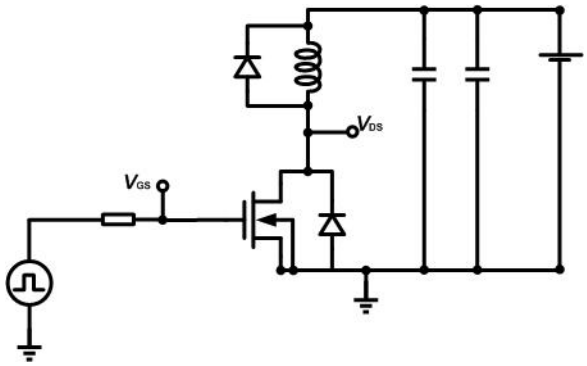
Test Circuits

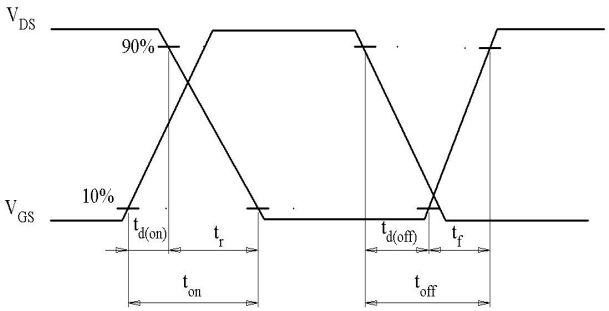
1. Gate Charge Test Circuit & Waveform



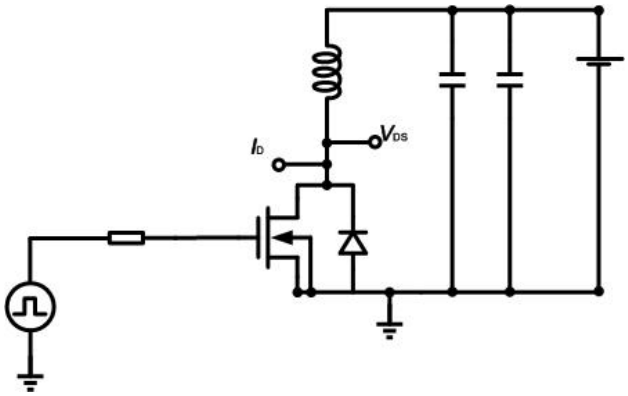


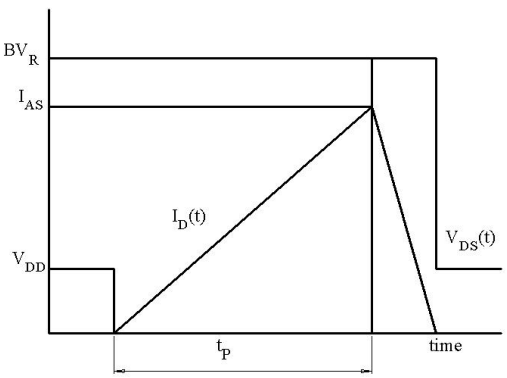
2. Switch Time Test Circuit



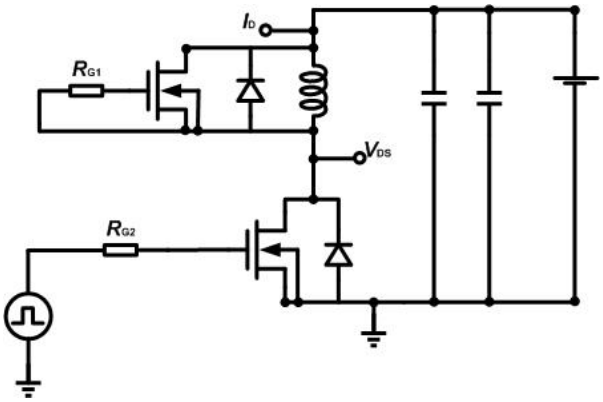


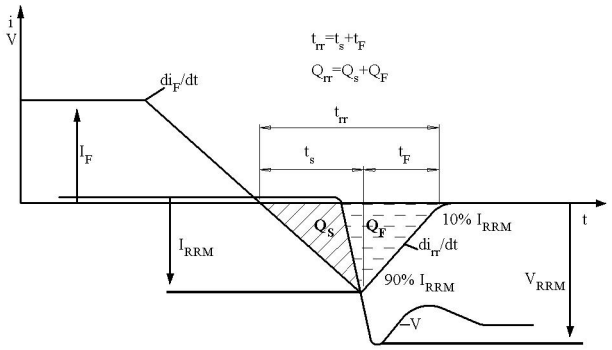
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

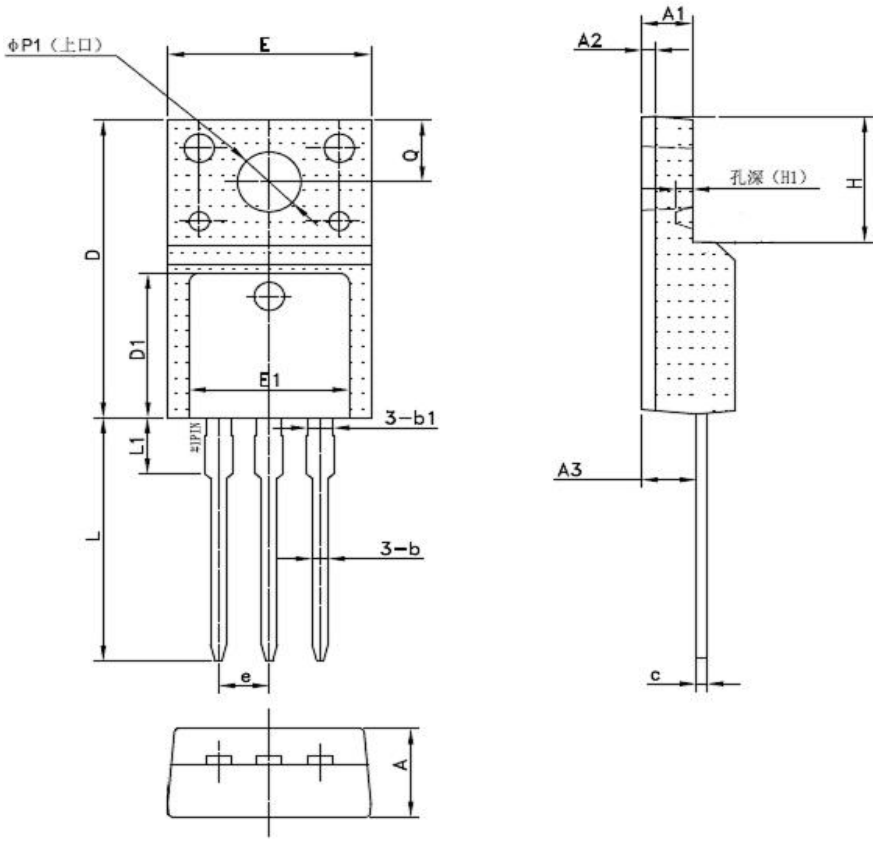




360mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R360B

Mechanical Dimensions

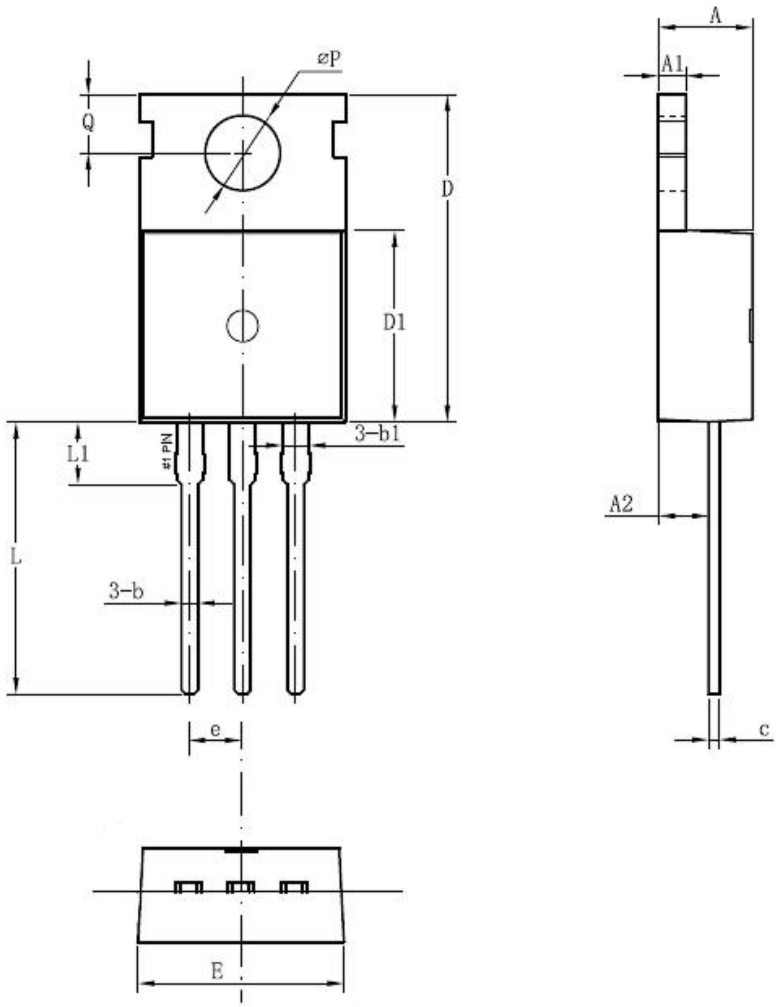
TO-220F **Unit: mm**



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)

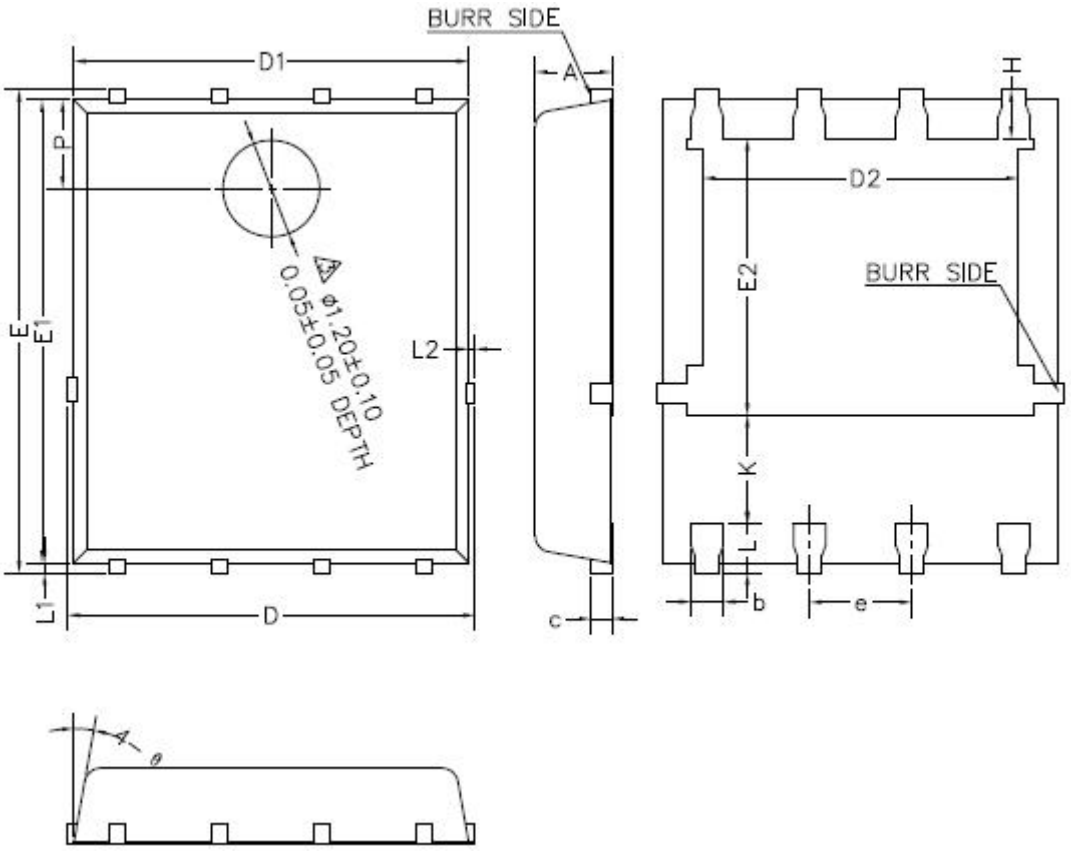
TO-220C **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00

Mechanical Dimensions (Continued)

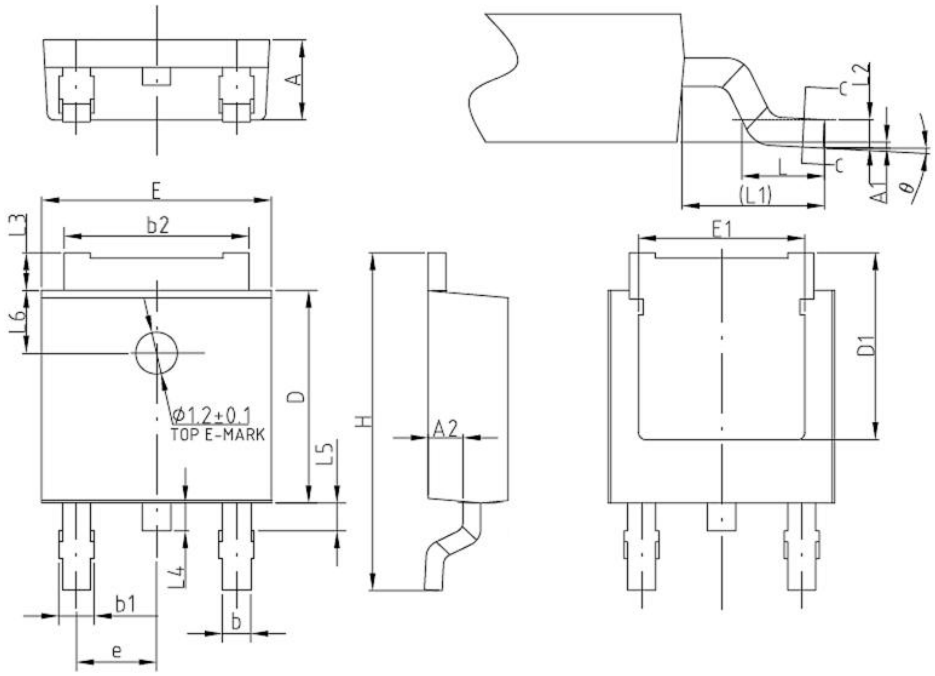
PDFN5*6-8 **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	1.0	1.10	1.20
b	0.35	0.40	0.45
c	0.21	0.25	0.34
D			5.10
D1	4,80	4.90	5.00
D2	3.91	4.01	4.11
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.34	3.44	3.54
H	0.51	0.61	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2			0.10
P	1.00	1.10	1.20
θ	8°	10°	12°

Mechanical Dimensions (Continued)

TO-252 **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0	-	0.10
A2	0.90	1.00	1.17
b	0.70	0.76	0.90
b1	0.77	-	1.10
b2	5.13	5.33	5.46
c	0.45	-	0.60
D	5.95	6.10	6.25
D1	-	5.30	-
E	6.45	6.60	6.75
E1	-	4.80	-
e	2.286(BSC)		
H	9.70	10.10	10.40
L	1.25	1.50	1.75
L1	-	2.90	-
L2	-	0.51	-
L3	0.90	-	1.25
L4	-	0.80	-
L5	-	1.00	-
L6	-	1.80	-
θ	0°	-	8°

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Shenzhen Sanrise Technology Co., LTD

http://www.sanrise-tech.com

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