64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S

General Description

The Sanrise SRC60R064S 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 SRC60R064S break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R064S is available in TO-263-2, TO-220F, TO-220C and TO-247 packages.

Features

- Ultra Low $R_{DS(ON)}$ = 64mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=108nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- Telecom Power
- EV Charger
- High Power Application

Symbol

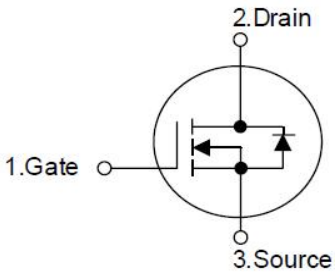


Figure 1 Symbol of SRC60R064S

Package Type

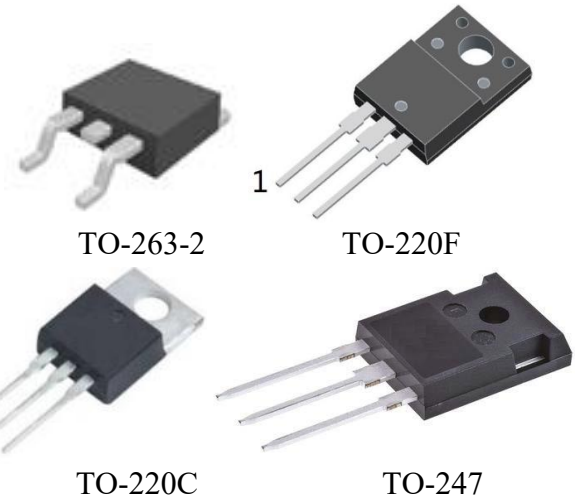


Figure 2 Package Types of SRC60R064S

Ordering Information

SRC60R064S□□–□

Circuit Type

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

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

Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R064ST-G	SRC60R064STG	Tube
TO-263-2	SRC60R064SS2TR-G	SRC60R064SS2G	Tape & Reel
TO-220F	SRC60R064STF-G	SRC60R064STFG	Tube
TO-220C	SRC60R064STC-G	SRC60R064STCG	Tube

64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S

Absolute Maximum Ratings[Note 1]

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage(static)		V_{GSS}	±30	V
Gate-Source Voltage (dynamic), AC (f>1 Hz)		V_{GSS}	±30	V
Power Dissipation(T_C=25ºC,TO-247,TO-220C,TO-263)		P_{tot}	357	W
Power Dissipation(T_C=25ºC,TO-220F)		P_{tot}	35.7	W
Continuous Drain Current	T_C=25ºC	I_D	48	A
	T_C=100ºC		30.4	
	T_C=125ºC		21.5	
Pulsed Drain Current (Note 2)		I_{DM}	144	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	400	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	3.5	A
Continuous Diode Forward Current		I_S	48	A
Diode Pulse Current		$I_{S.PULSE}$	144	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	15	V/ns
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} = 3.5A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.5	ºC /W
	TO-247				0.35	
	TO-220C				0.35	
	TO-263				0.35	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			70	ºC /W
	TO-247				58	
	TO-220C				58	
	TO-263				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			2	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=1.0mA	2.7	3.5	4.3	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=24A		55	64	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		4.2		nF
Output Capacitance		C_{OSS}			171		pF
Reverse Transfer Capacitance		C_{RSS}			2.7		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…400V		94		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			550		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=24A R_G=3.3Ω, V_{GS}=10V		16		ns
Rise Time		t_r			6.0		
Turn-off Delay Time		$t_{d(off)}$			98		
Fall Time		t_f			4.0		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=24A V_{GS}=0 to 10V		25.4		nC
Gate to Drain Charge		Q_{gd}			54.9		
Gate Charge Total		Q_g			108		
Gate Plateau Voltage		$V_{plateau}$			6.0		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=24A		0.85	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=24A dI_F/dt=100A/us		310		ns
Reverse Recovery Charge		Q_{rr}			4.2		uC
Peak Reverse Recovery Current		I_{rrm}			27.0		A

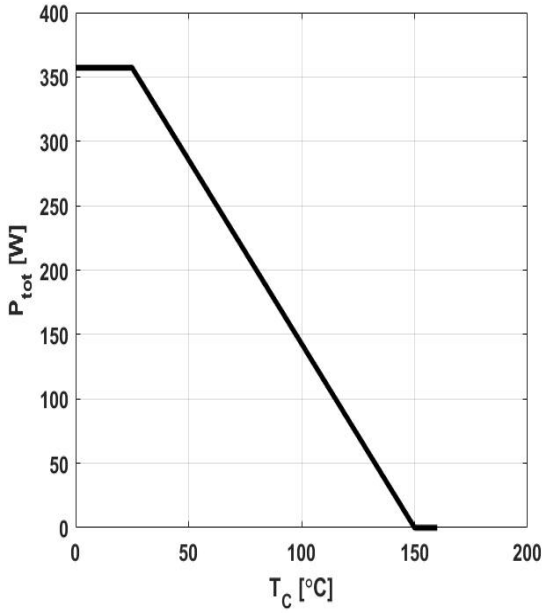
Note:

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

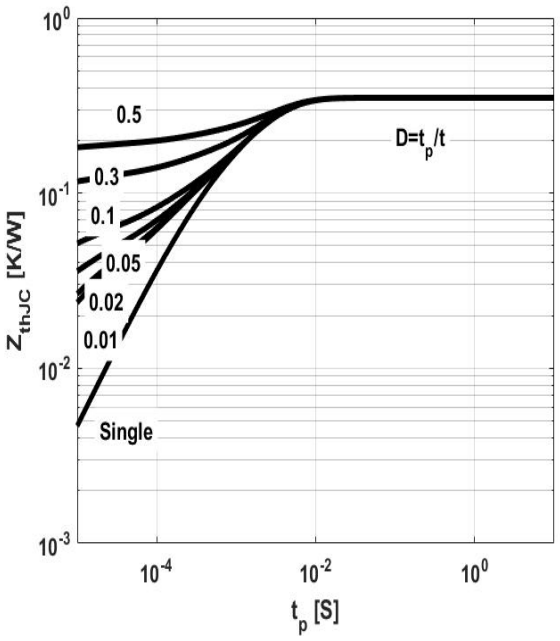
Typical Performance Characteristics

Figure 3: Power Dissipation



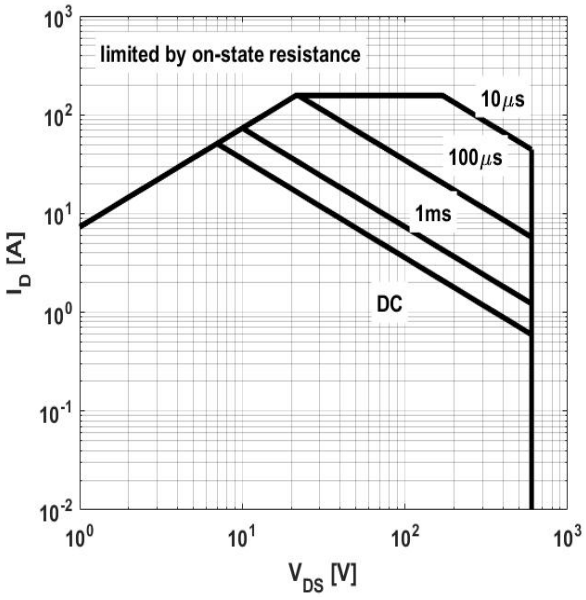
$P_{tot} = f(T_c)$; TO-247

Figure 4: Max. Transient Thermal Impedance



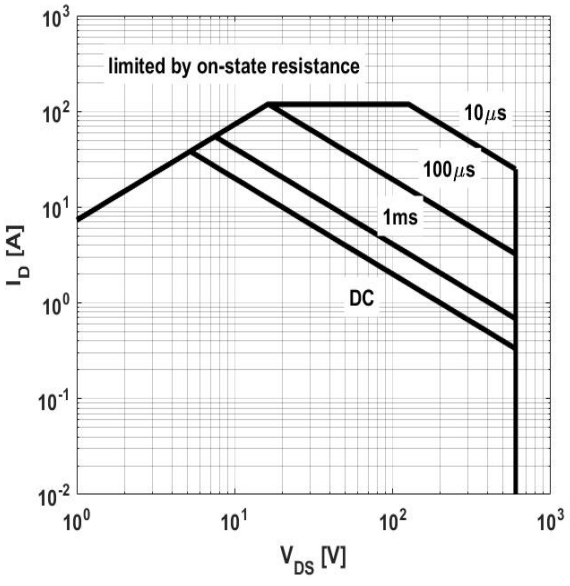
$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$; TO-247

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

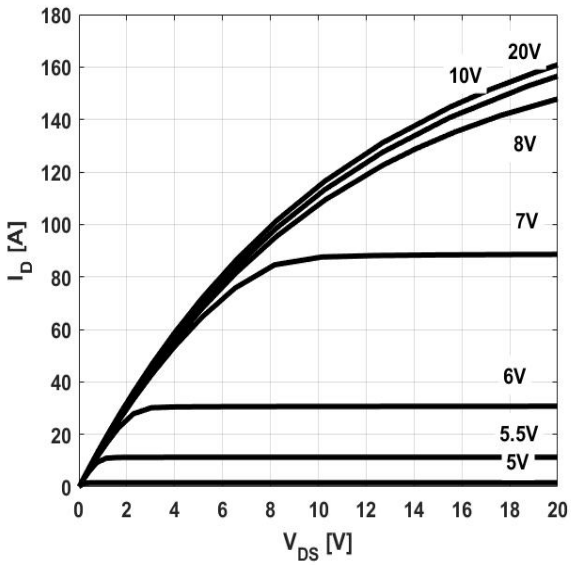
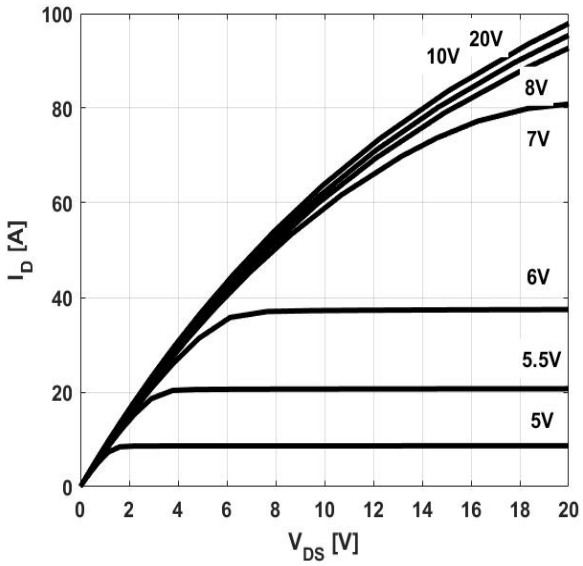
Figure 7: Typ. Output Characteristics	Figure 8: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

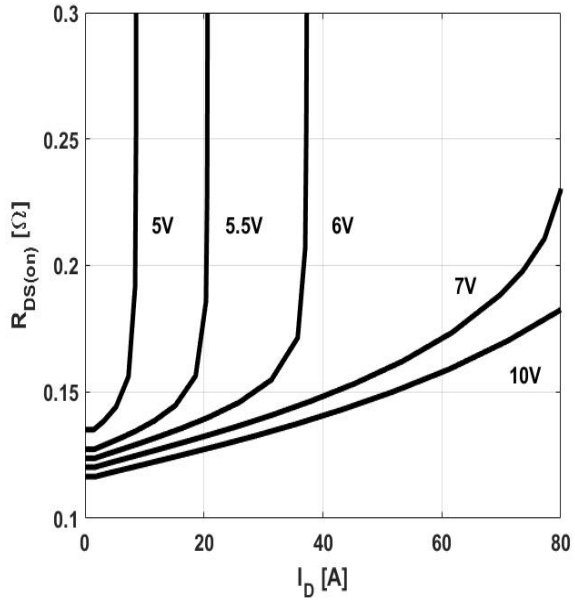
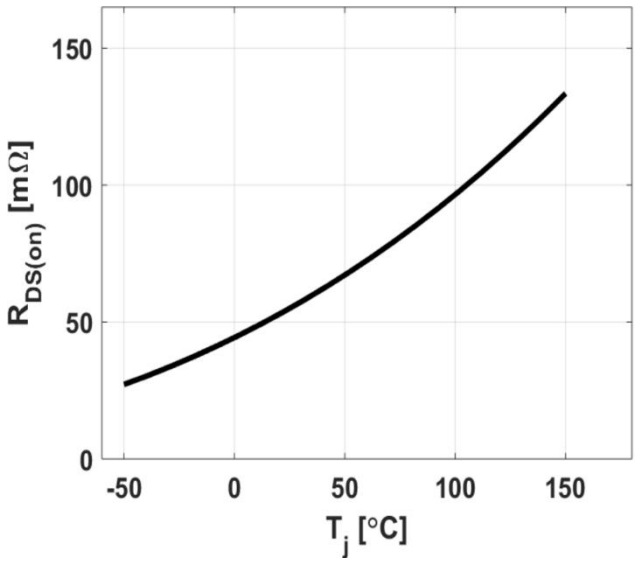
Figure 9: Typ. Drain-Source On-State Resistance	Figure 10: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)} = f(I_D)$; T_j=125ºC; parameter: V_{GS}	$R_{DS(ON)} = f(T_j)$; I_D=24A; V_{GS}=10V

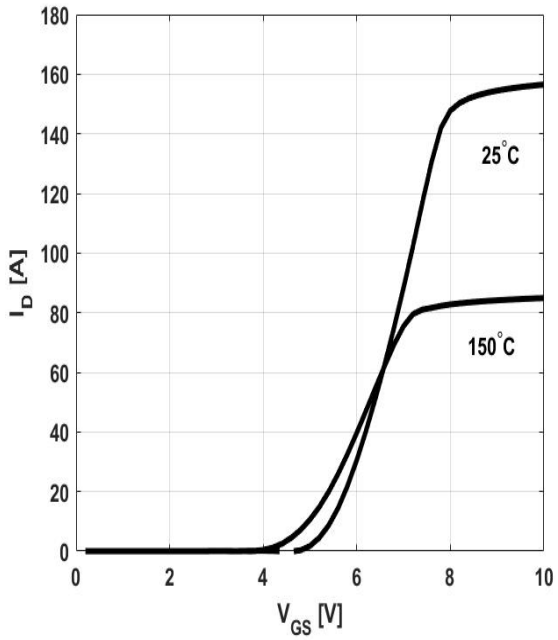
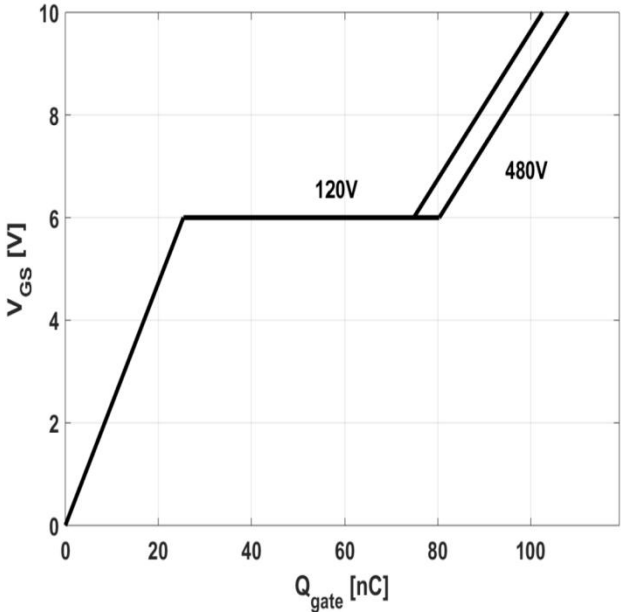
Figure 11: Typ. Transfer Characteristics	Figure 12: Typ. Gate Charge
	
$I_D = f(V_{GS})$; $V_{DS} = 20V$	$V_{GS} = f(Q_{gate})$, $I_D = 24A$ pulsed

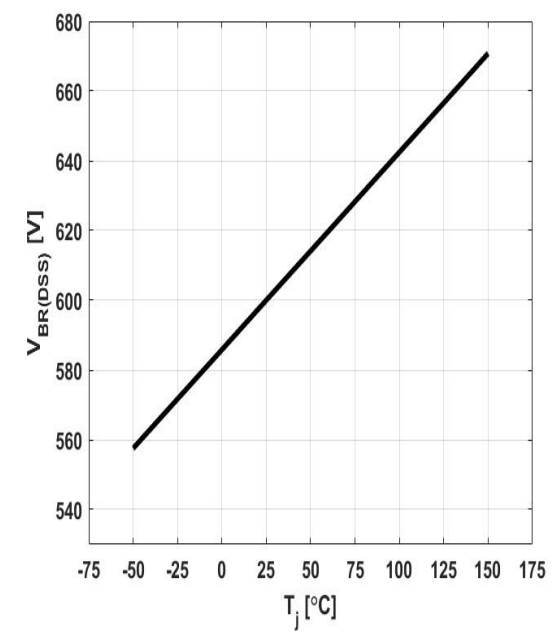
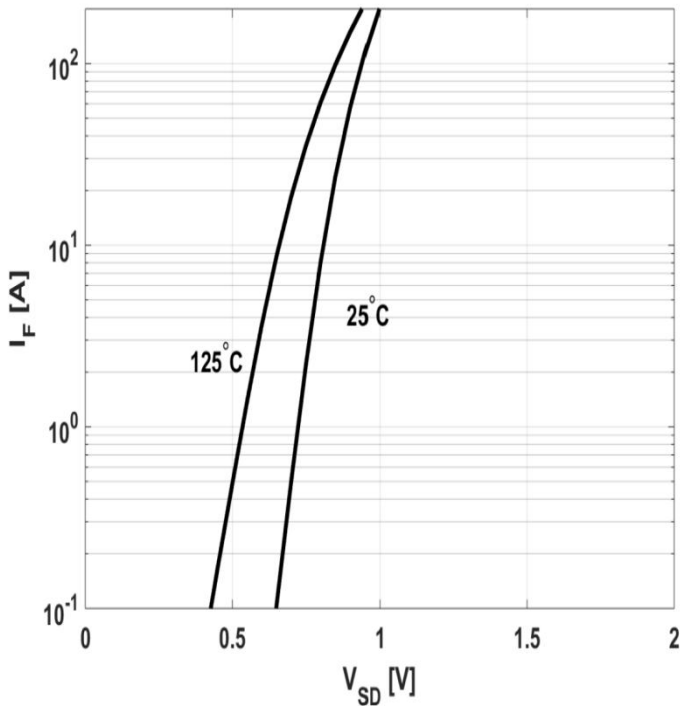
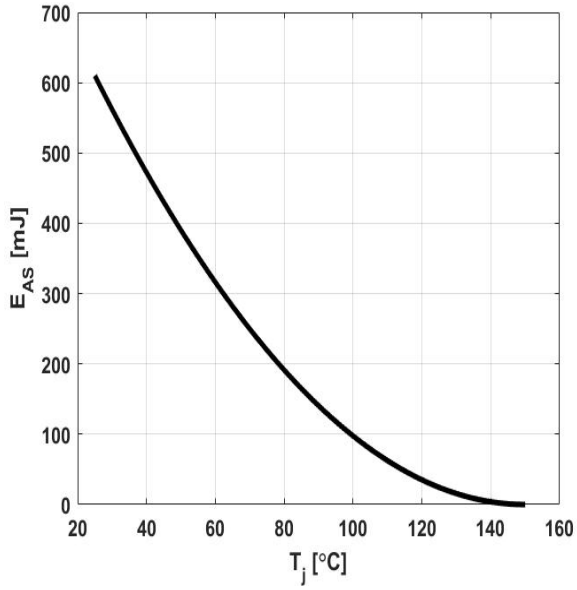
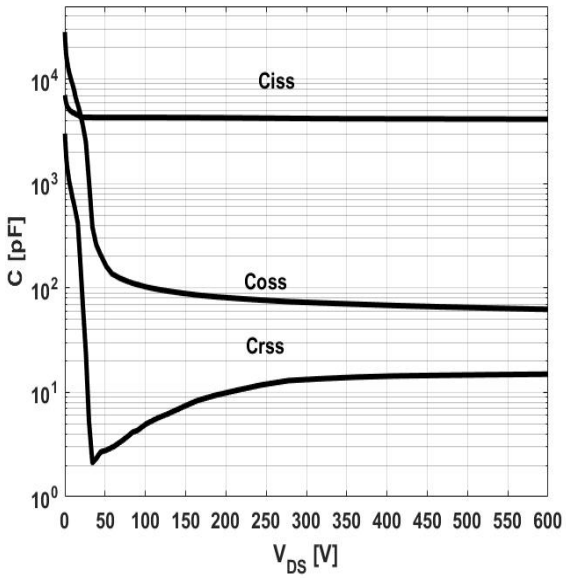
Figure 13: Drain-Source Breakdown Voltage	Figure 14: Forward Characteristics of Reverse Diode
	
$V_{BR(DSS)} = f(T_j)$; $I_D = 1mA$	$I_F = f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



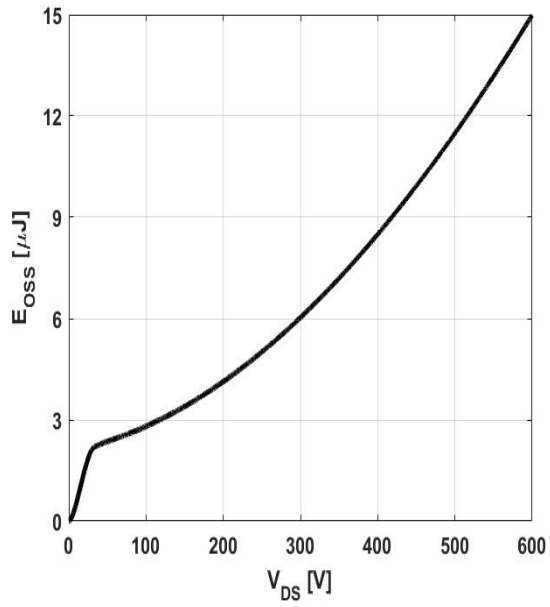
$E_{AS}=f(T_j)$; $I_D=4.8A$; $V_{DD}=60V$

Figure 16: Typ. Capacitances



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

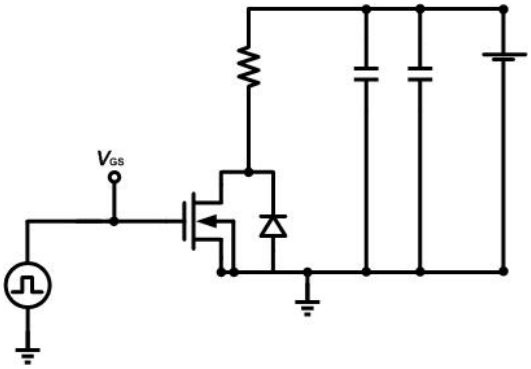
Figure 17: C_{OSS} Stored Energy

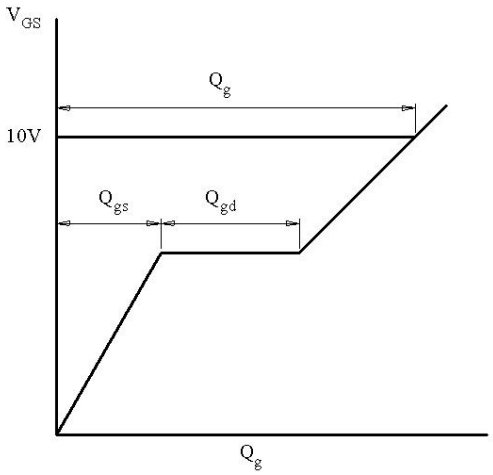


$E_{OSS}=f(V_{DS})$

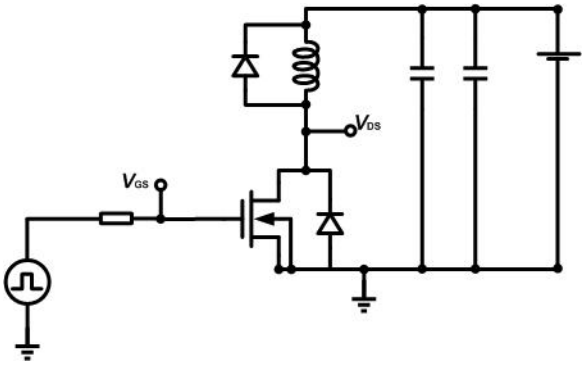
Test Circuits

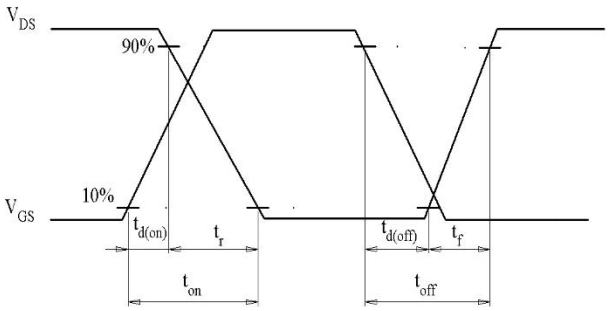
1. Gate Charge Test Circuit & Waveform



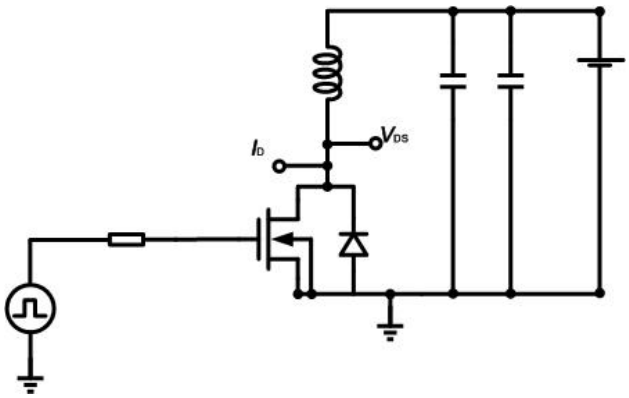


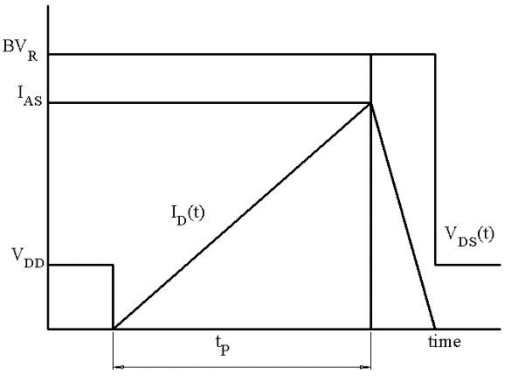
2. Switch Time Test Circuit



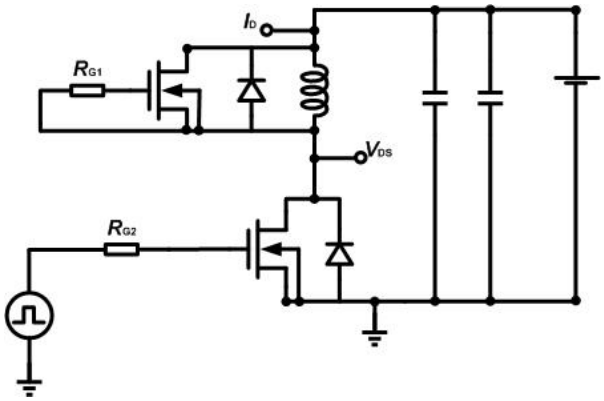


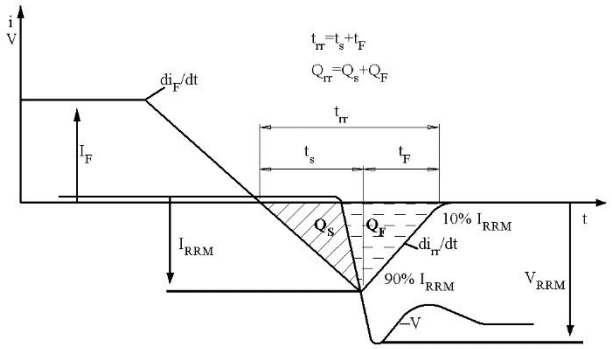
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

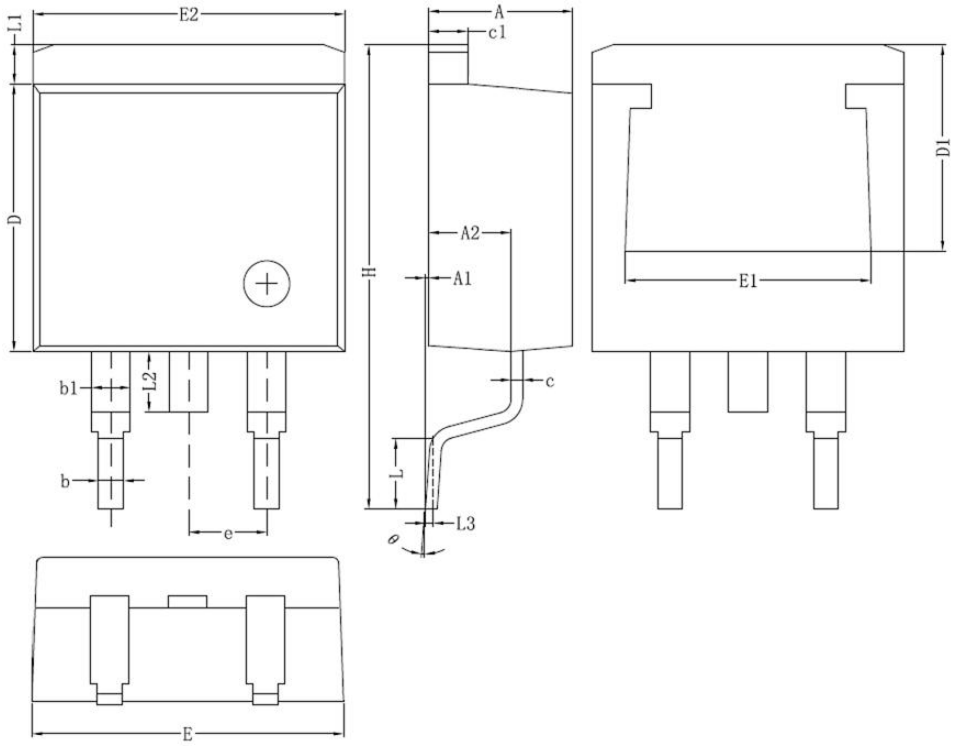




64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S

Mechanical Dimensions

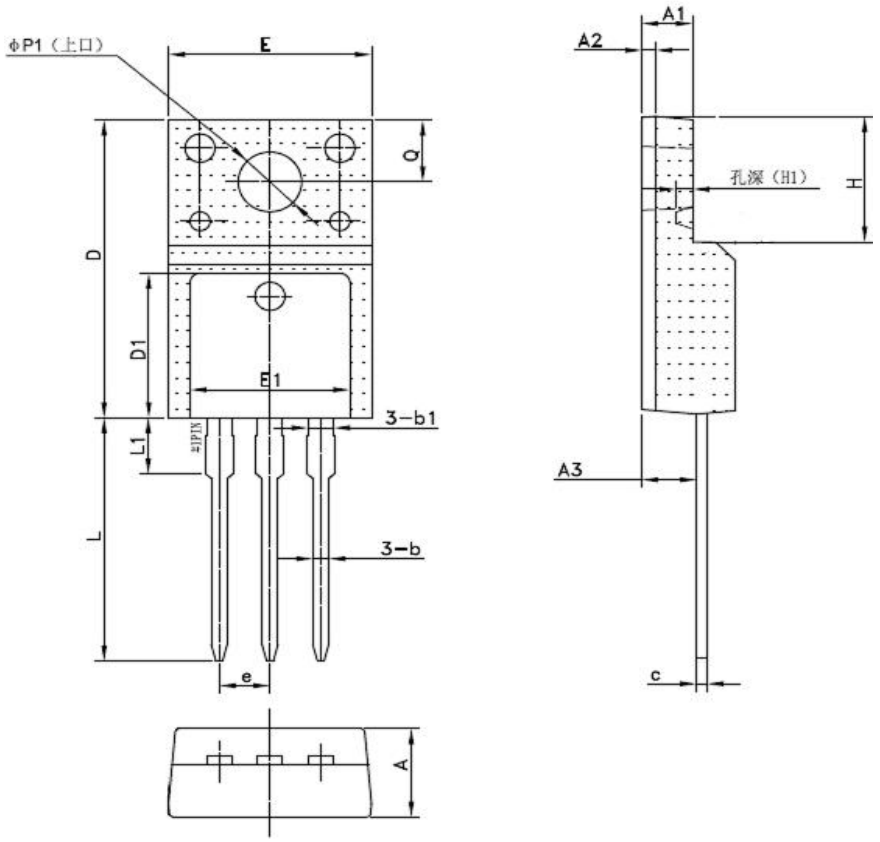
TO-263-2 **Unit: mm**



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°

Mechanical Dimensions (Continued)

TO-220F **Unit: mm**

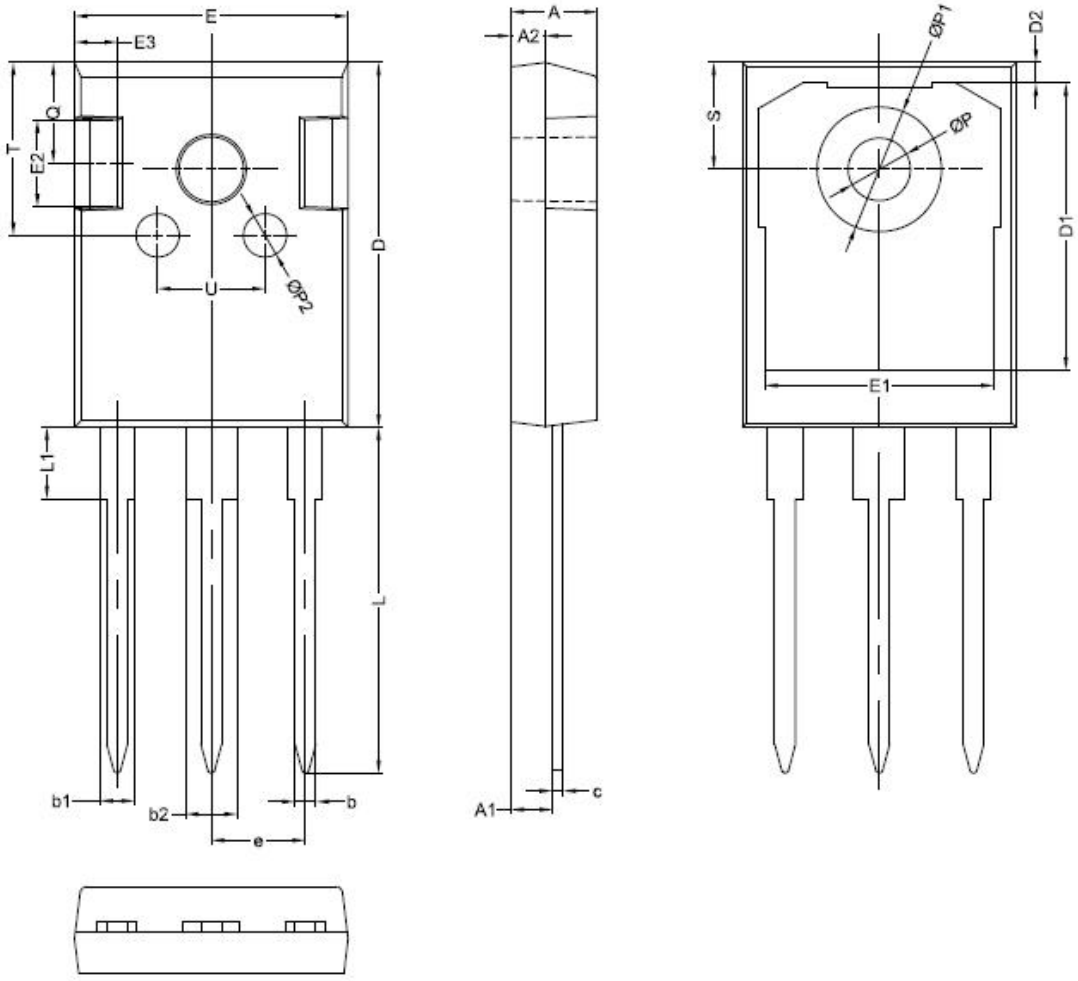


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
ΦP1	-	3.18	-
Q	2.90	3.30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

64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S

Mechanical Dimensions (Continued)

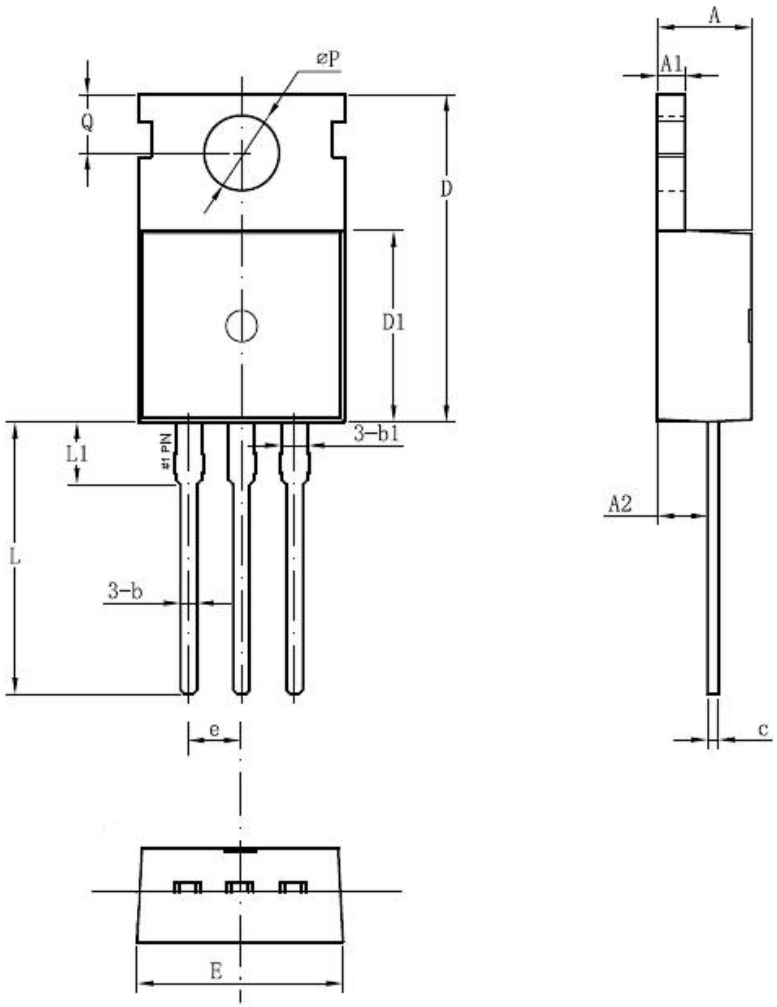
TO-247 **Unit: mm**



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	-

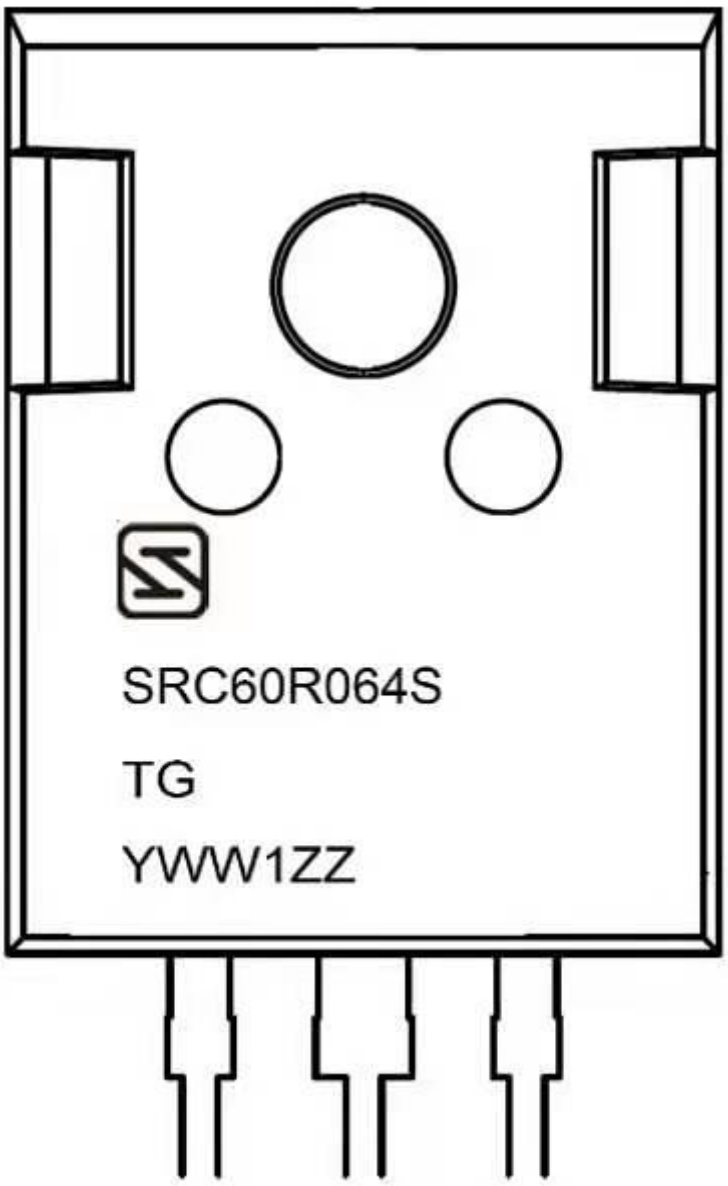
Mechanical Dimensions (Continued)

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

64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S



SRC60R064S TG YWW1ZZ		SanRise Logo	Arial / Arial Narrow Type Font
	SRC60R064STG	Marking ID	
	YWW	Year and work week of mold operation	
	1	Assembly site code	
	ZZ	批号末两位	
	Comments: Laser Mark		

64mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R064S

Shenzhen Sanrise Technology Co., LTD.

http://www.sanrise-tech.com

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