30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

General Description

The Sanrise SRC60R030FBS 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 SRC60R030FBS break down voltage is 600V and it has a high rugged avalanche characteristics.

The SRC60R030FBS is available in TO-247 package.

Features

- Ultra Low $R_{DS(ON)}$ = 30mΩ @ V_{GS} = 10V.
- Vds@Tjmax=650V.
- Ultra Low Gate Charge, Qg=187nC typ.
- Fast switching capability
- Robust design with better EAS performance
- Low Qrr
- Non-automotive Qualified
- Ultra-fast body diode

Application

- High Performance Application
- High Power Application
- EV Charger

Symbol

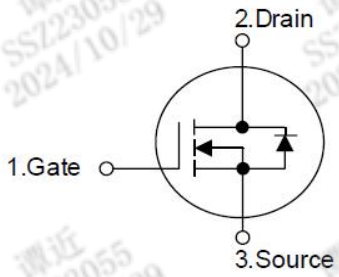
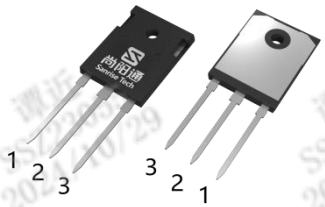


Figure 1 Symbol of SRC60R030FBS

Package Type



TO-247

Figure 2 Package Type of SRC60R030FBS

Ordering Information

SRC60R030FBS□□–□

- Circuit Type
- Package
  T: TO-247
- E: Lead Free
  G: Green
- Blank: Tube
  TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R030FBST-G	SRC60R030FBSTG	Tube

30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

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>1 Hz)		V_{GSS}	±30	V
Power Dissipation(T_C=25ºC,TO-247)		P_{tot}	500	W
Continuous Drain Current	T_C=25ºC	I_D	91	A
	T_C=100ºC		57	
	T_C=125ºC		41	
Pulsed Drain Current (Note 2)		I_{DM}	273	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	200	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	1889	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	1.0	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	6.4	A
Continuous Diode Forward Current		I_S	91	A
Diode Pulse Current		$I_{S.PULSE}$	273	A
MOSFET dv/dt Ruggedness, V_{DS}<=480V		dv/dt	120	V/ns
Reverse Diode dv/dt, V_{DS}<=480V, I_{SD}<=I_D		dv/dt	50	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} =6.4A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Finish goods test condition.
4. I_{AS} =19.4A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Typical Eas.

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.25	ºC /W
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			60	ºC /W

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}=20V, V_{DS}=0V			100	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-100	
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=2.2mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=34A		23.7	30	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=400V, V_{GS}=0V, f=100kHz		8.6		nF
Output Capacitance		C_{OSS}			165		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…400V		222		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			1354		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=34A R_G=3Ω, V_{GS}=12V		66		ns
Rise Time		t_r			39		
Turn-off Delay Time		$t_{d(off)}$			103		
Fall Time		t_f			10		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=400V, I_D=34A V_{GS}=0 to 10V		70		nC
Gate to Drain Charge		Q_{gd}			69.5		
Gate Charge Total		Q_g			187		
Gate Plateau Voltage		$V_{plateau}$			6.9		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=34A		0.9	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=34A dI$_F$/dt=100A/us		197		ns
Reverse Recovery Charge		Q_{rr}			2.4		uC
Peak Reverse Recovery Current		I_{rrm}			20		A

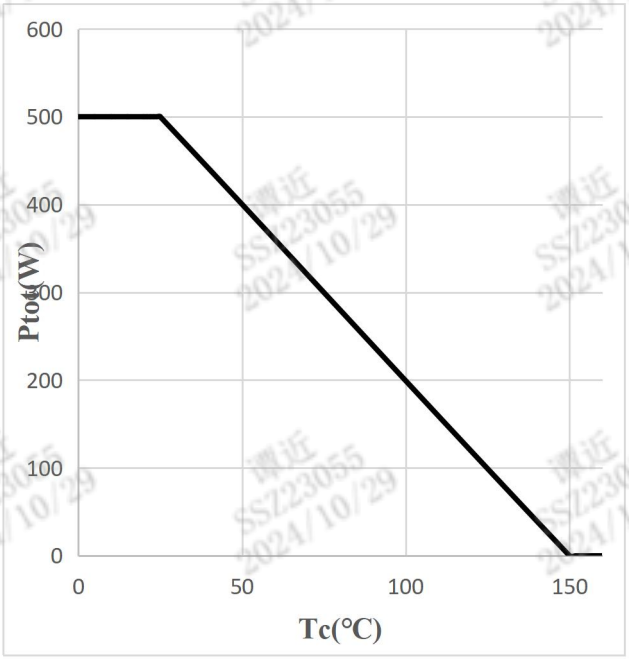
Note:

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

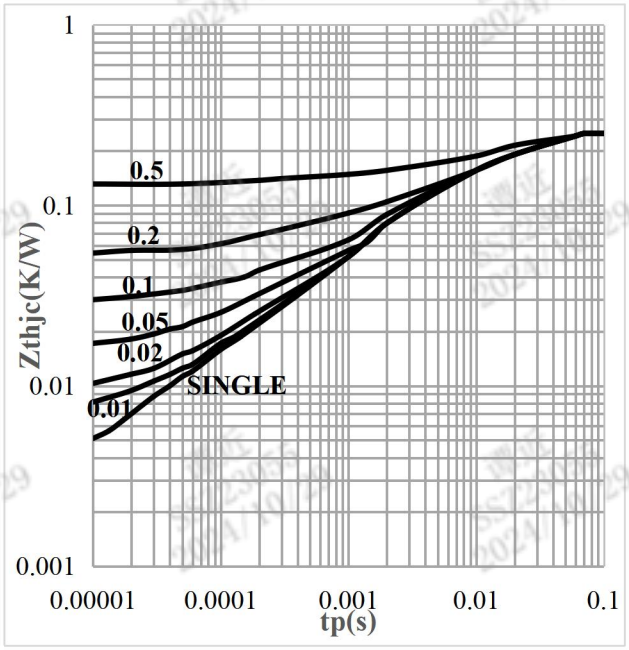
Typical Performance Characteristics

Figure 3: Power Dissipation



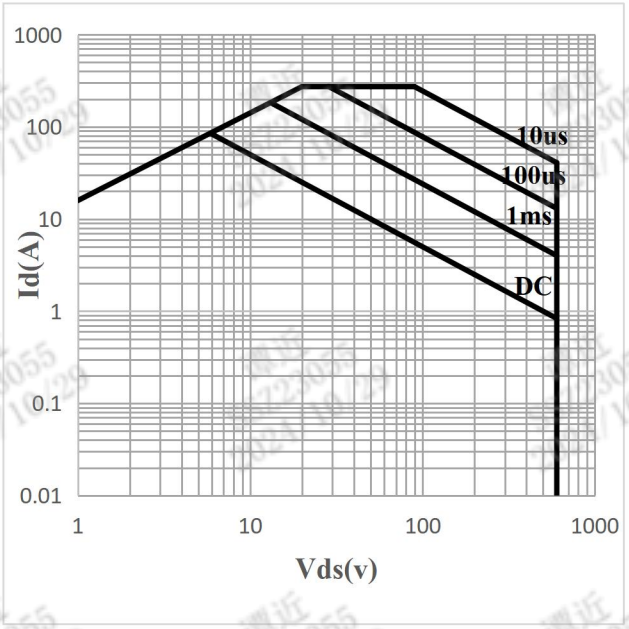
$P_{tot} = f(T_c)$

Figure 4: Max. Transient Thermal Impedance



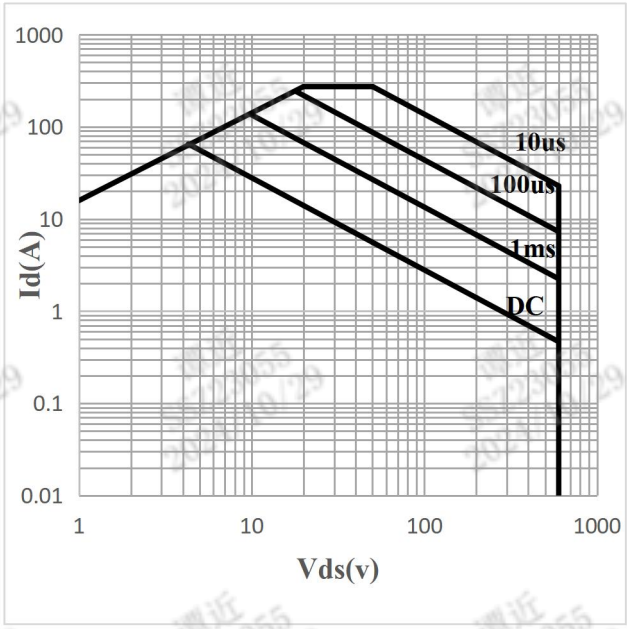
$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

Figure 5: Safe Operating Area



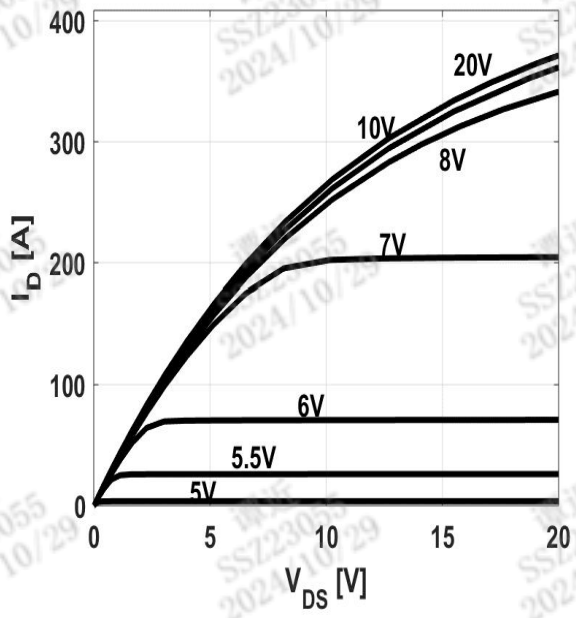
$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

Figure 6: Safe Operating Area



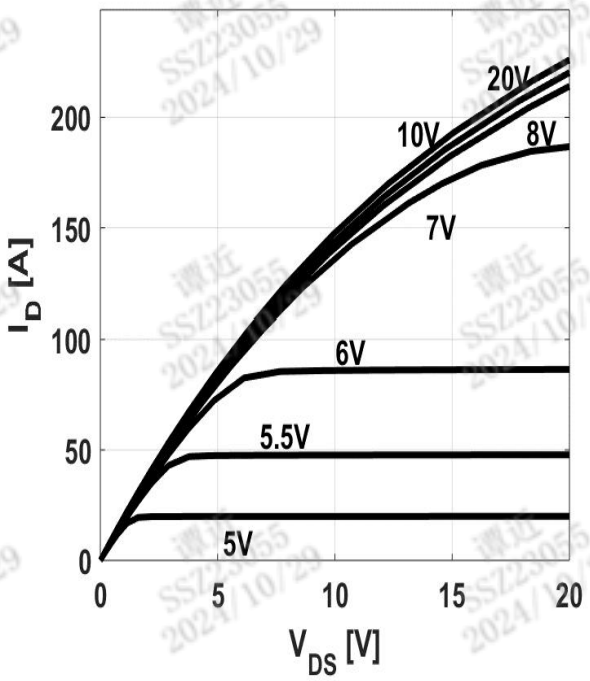
$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

Figure 7: Typ. Output Characteristics



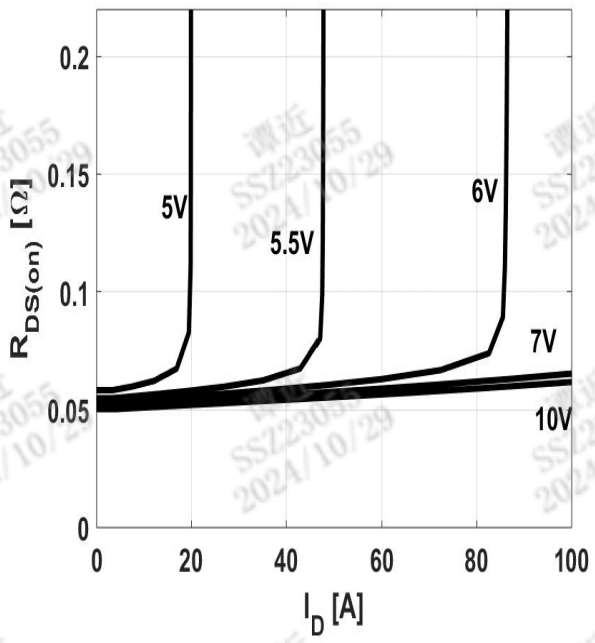
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}

Figure 8: Typ. Output Characteristics



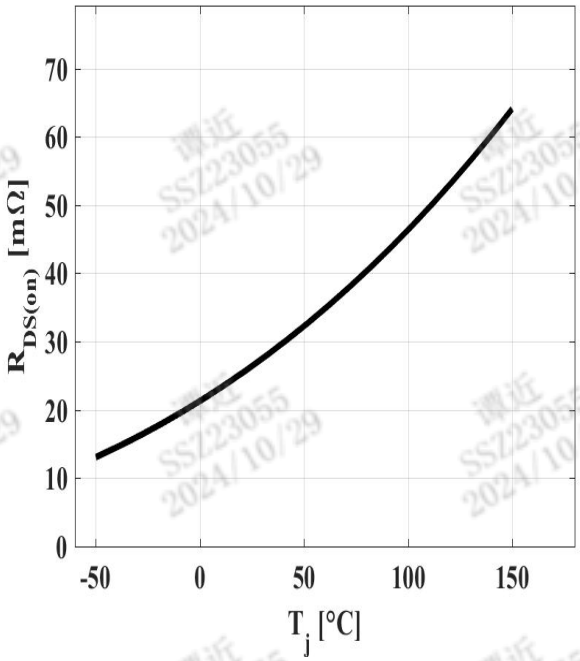
$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

Figure 9: Typ. Drain-Source On-State Resistance



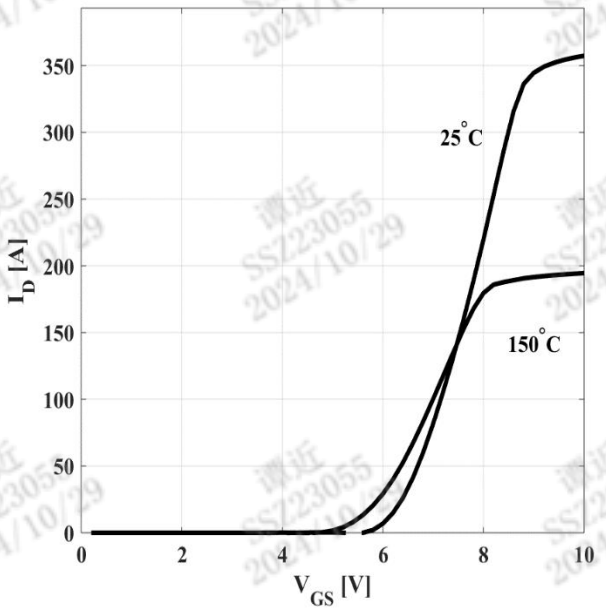
$R_{DS(ON)}$ =f(I_D); T_j=125ºC; parameter: V_{GS}

Figure 10: Typ. Drain-Source On-State Resistance



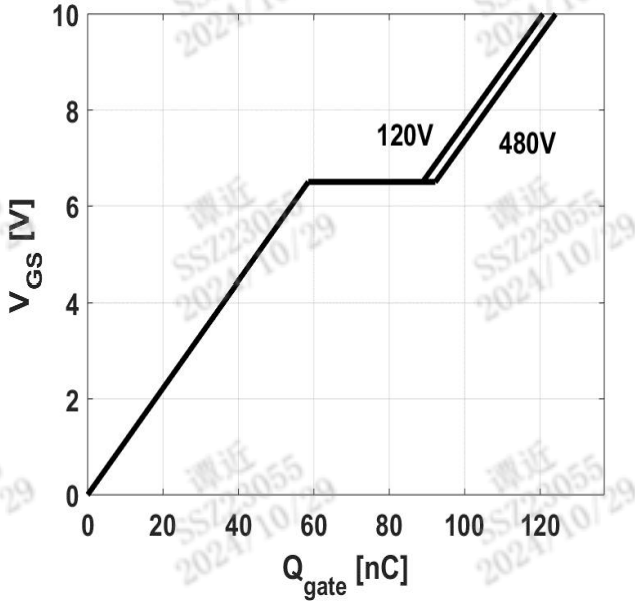
$R_{DS(ON)}$=f(T_j); I_D=34A; V_{GS}=10V

Figure 11: Typ. Transfer Characteristics



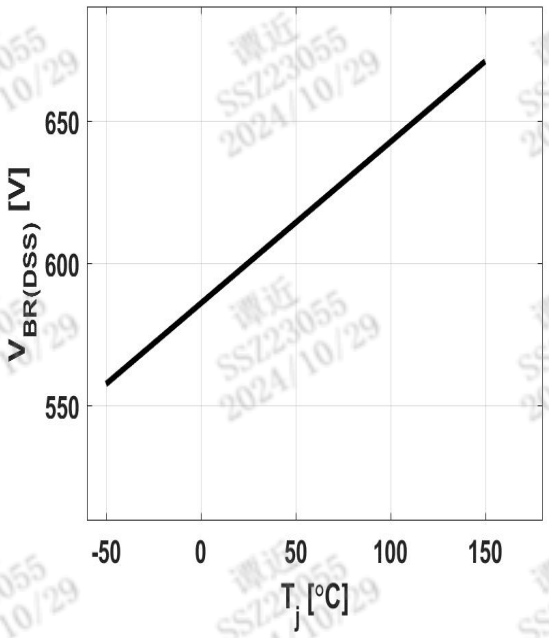
$I_D = f(V_{GS})$; $V_{DS} = 20V$

Figure 12: Typ. Gate Charge



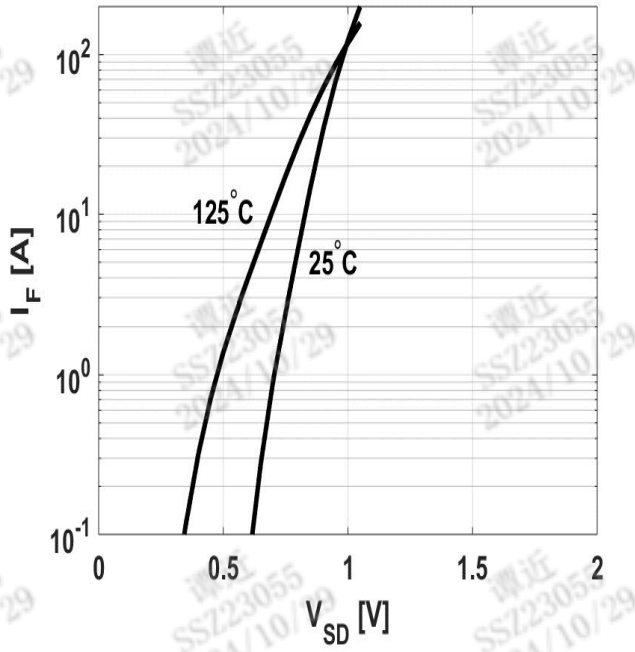
$V_{GS} = f(Q_{gate})$, $I_D = 34A$ pulsed

Figure 13: Drain-Source Breakdown Voltage



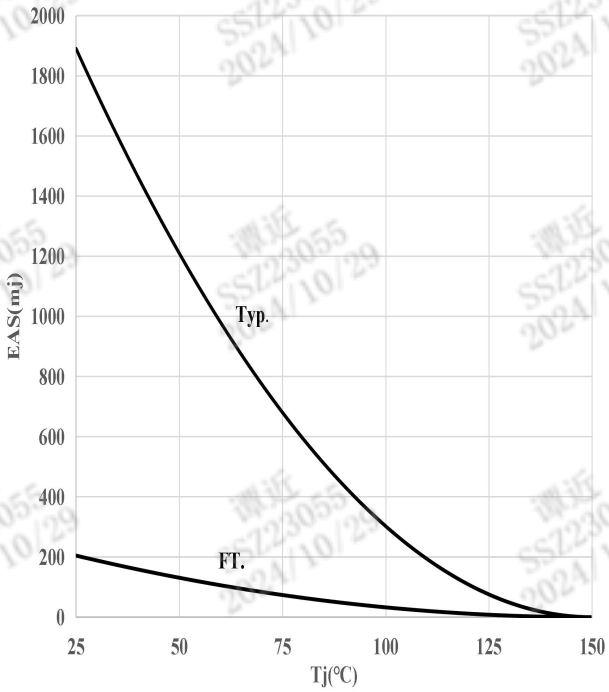
Minimum $V_{BR(DSS)} = f(T_j)$; $I_D = 10mA$

Figure 14: Forward Characteristics of Reverse Diode



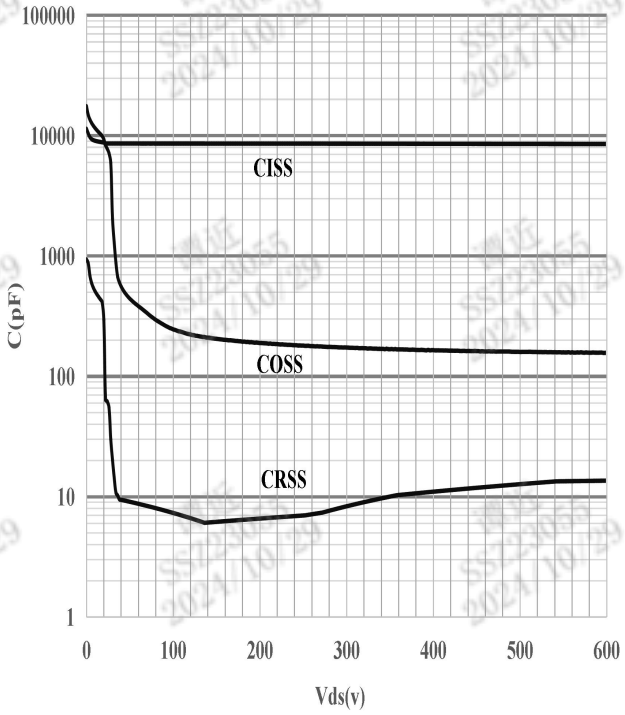
$I_F = f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



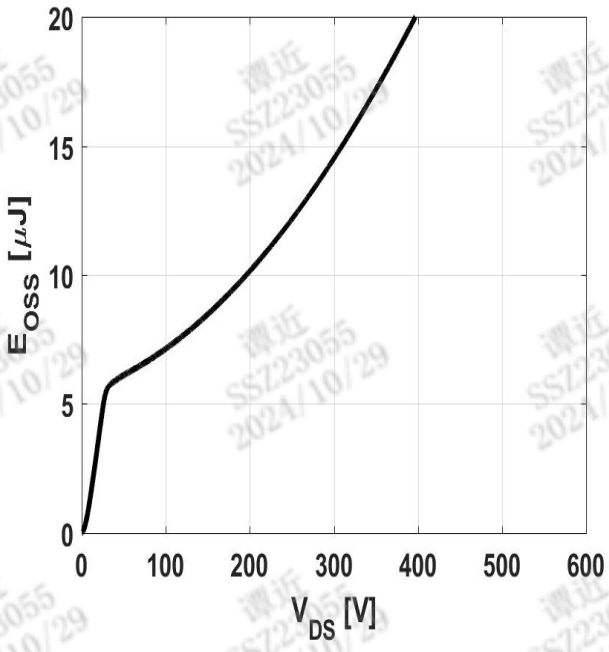
$E_{AS}=f(T_j)$; $V_{DD}=60V$

Figure 16: Typ. Capacitances



$C=f(V_{DS})$; $V_{GS}=0$; f=100kHz

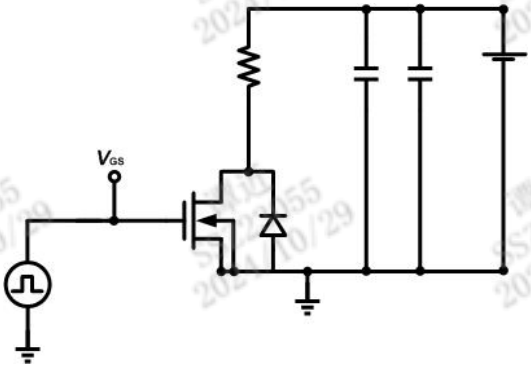
Figure 17: C_{OSS} Stored Energy

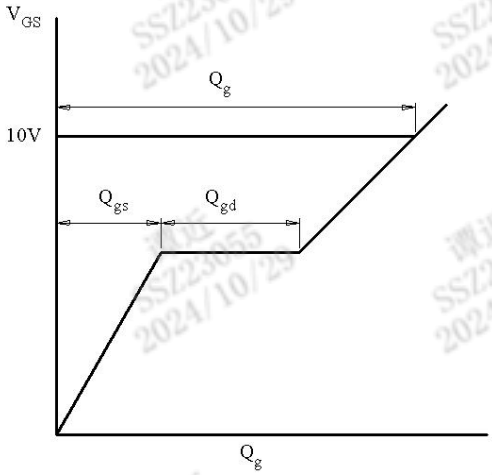


$E_{OSS}=f(V_{DS})$

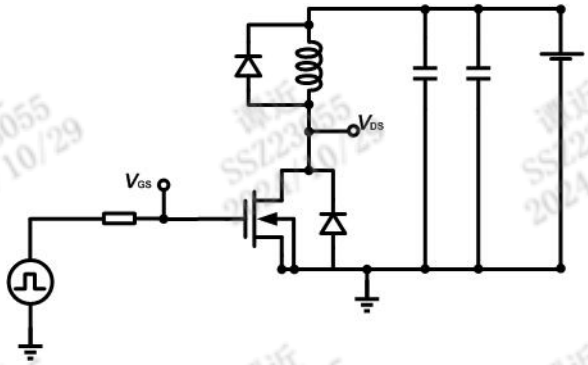
Test Circuits

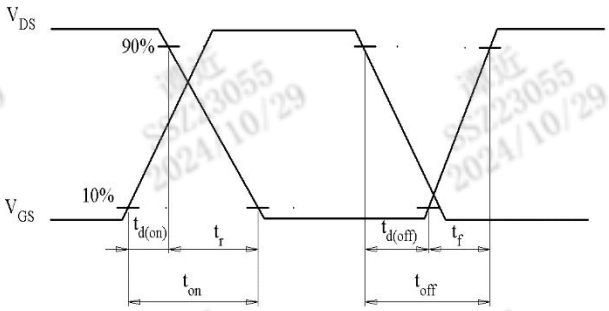
1. Gate Charge Test Circuit & Waveform



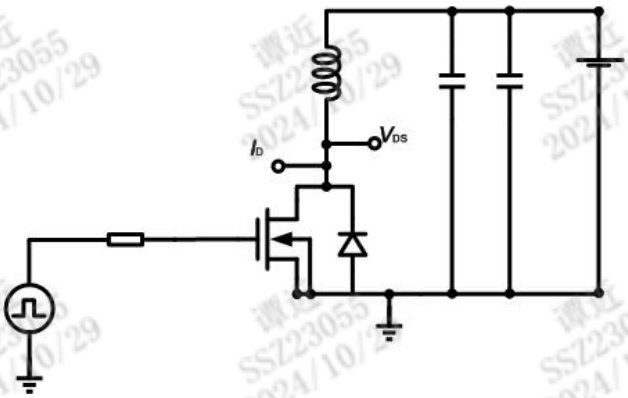


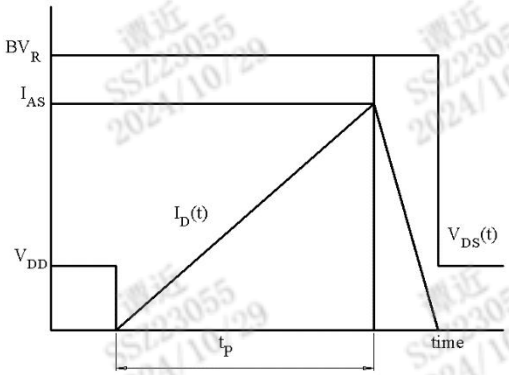
2. Switch Time Test Circuit



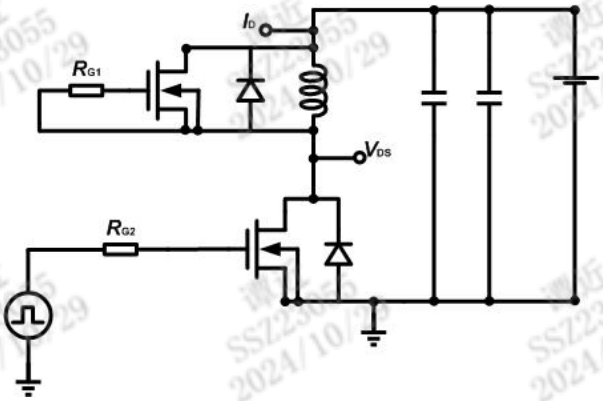


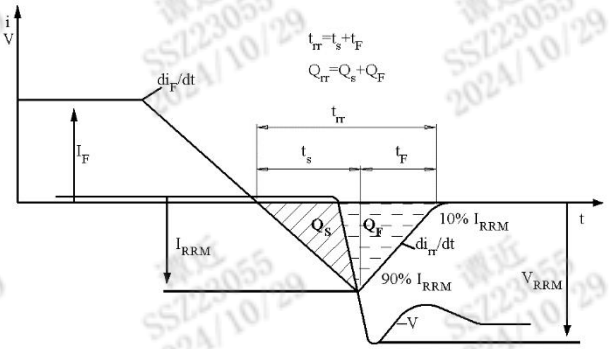
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics



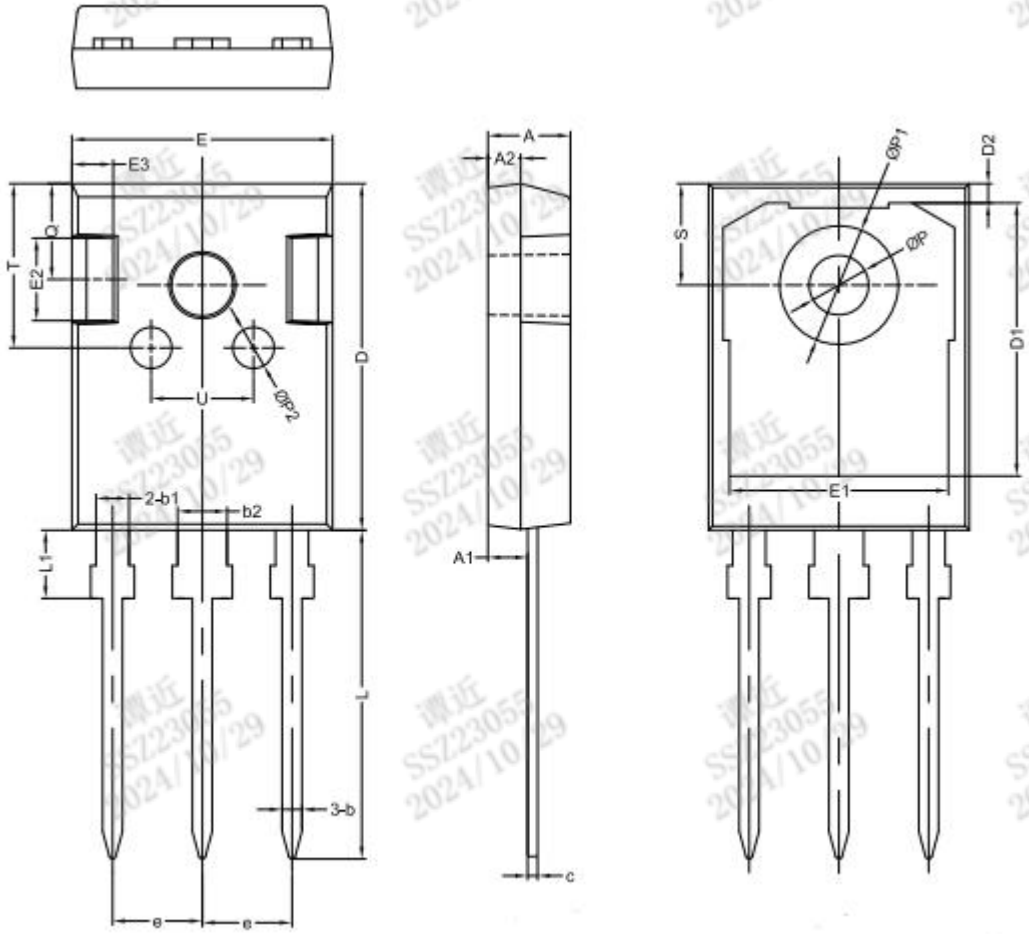


30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

Mechanical Dimensions

TO-247(Package 1)

Unit: mm



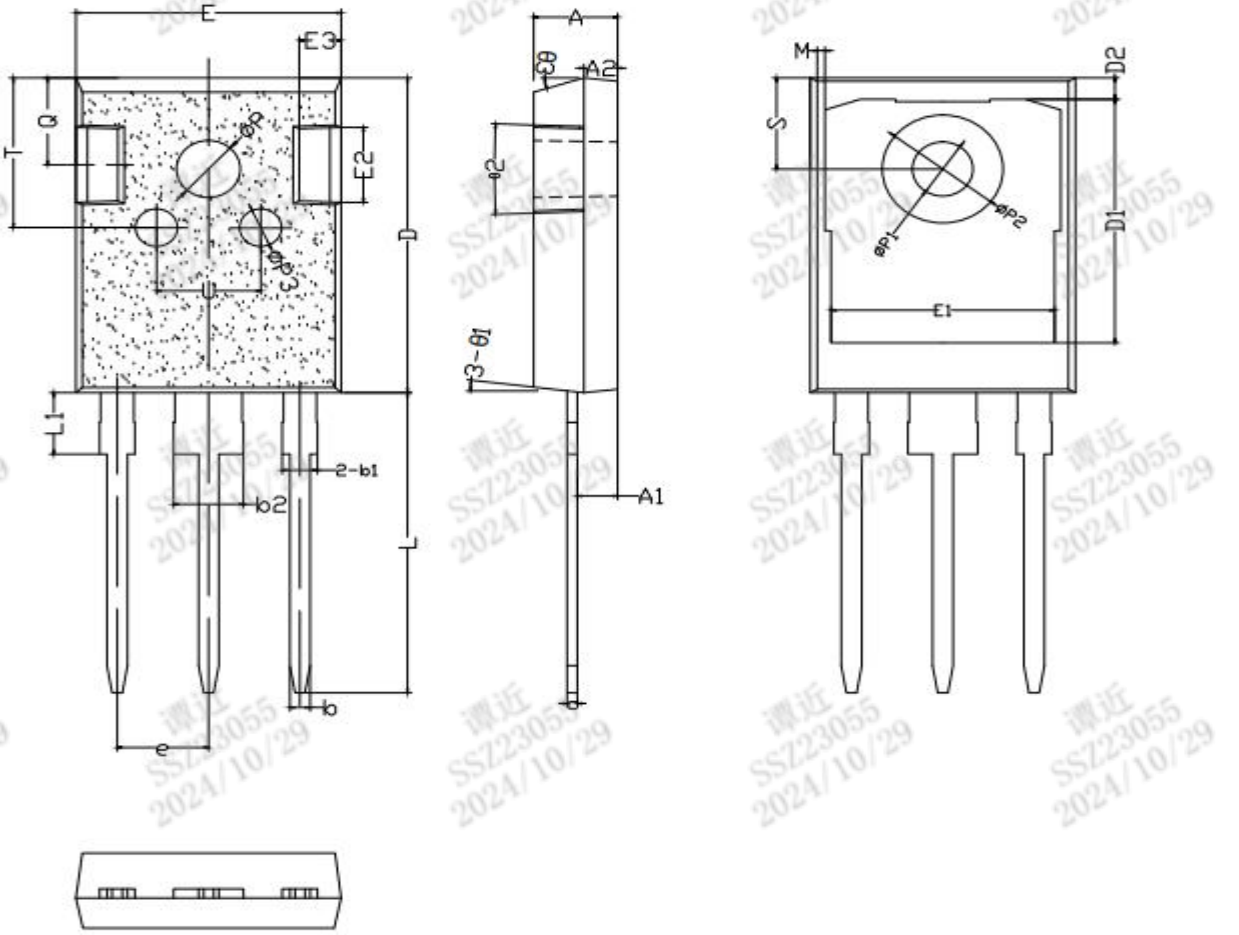
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E1	-	13.30	-
A1	2.21	2.41	2.61	E2	-	5.00	-
A2	1.90	2.00	2.10	E3	-	2.50	-
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	7.19	-
D	20.80	21.00	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	16.0	T	-	10.00	-
U	-	6.20	-	e		5.44	

30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

Mechanical Dimensions

TO-247(Package 2)

Unit: mm



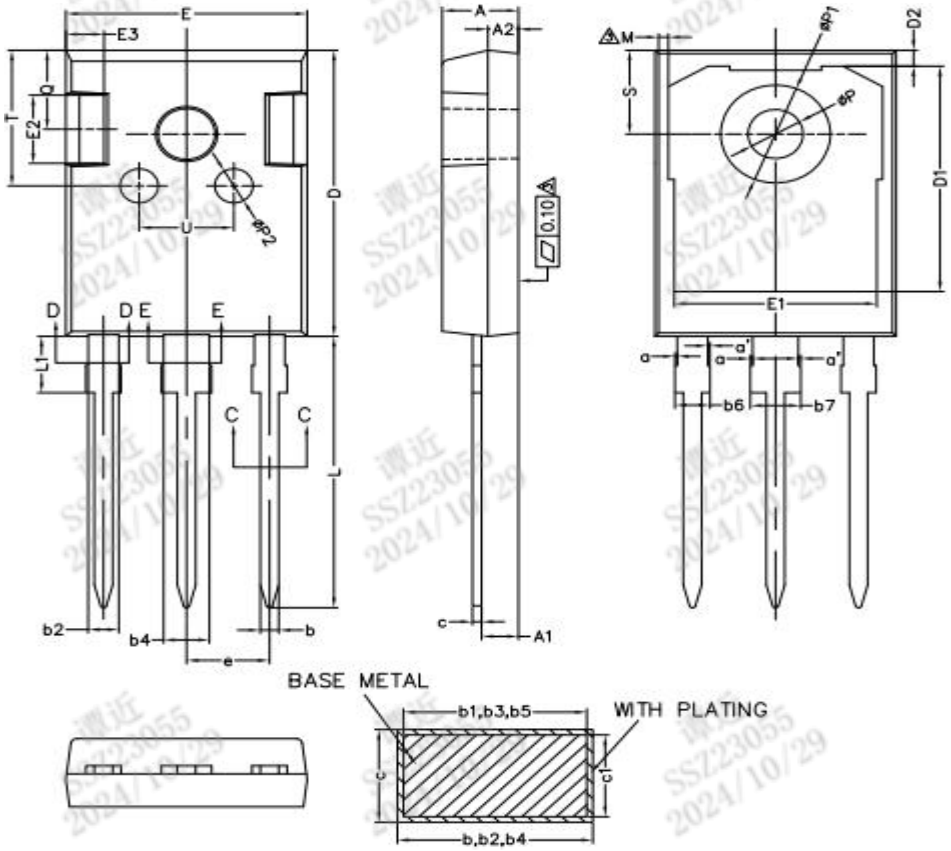
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E1	13.10	13.25	13.40
A1	2.31	2.41	2.51	E2	4.85	4.95	5.10
A2	1.90	2.00	2.10	E3	2.40	2.50	2.60
b	1.15	1.20	1.25	L	19.80	19.98	20.15
b1	1.95	2.10	2.25	L1	-	-	4.30
b2	2.95	3.10	3.25	ΦP	3.60	3.70	3.80
c	0.55	0.60	0.65	ΦP1	3.40	3.50	3.60
D	20.90	21.00	21.10	ΦP2	6.90	7.10	7.30
D1	16.35	16.55	16.75	Q	5.60	5.80	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	10.00	10.20
U	6.00	6.20	6.40	e	5.40	5.44	5.48
Θ1	5°	7°	9°	ΦP3	2.40	2.50	2.60
Θ2	1°	3°	5°	Θ3	13°	15°	17°

30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

Mechanical Dimensions

TO-247(Package 3)

Unit: mm



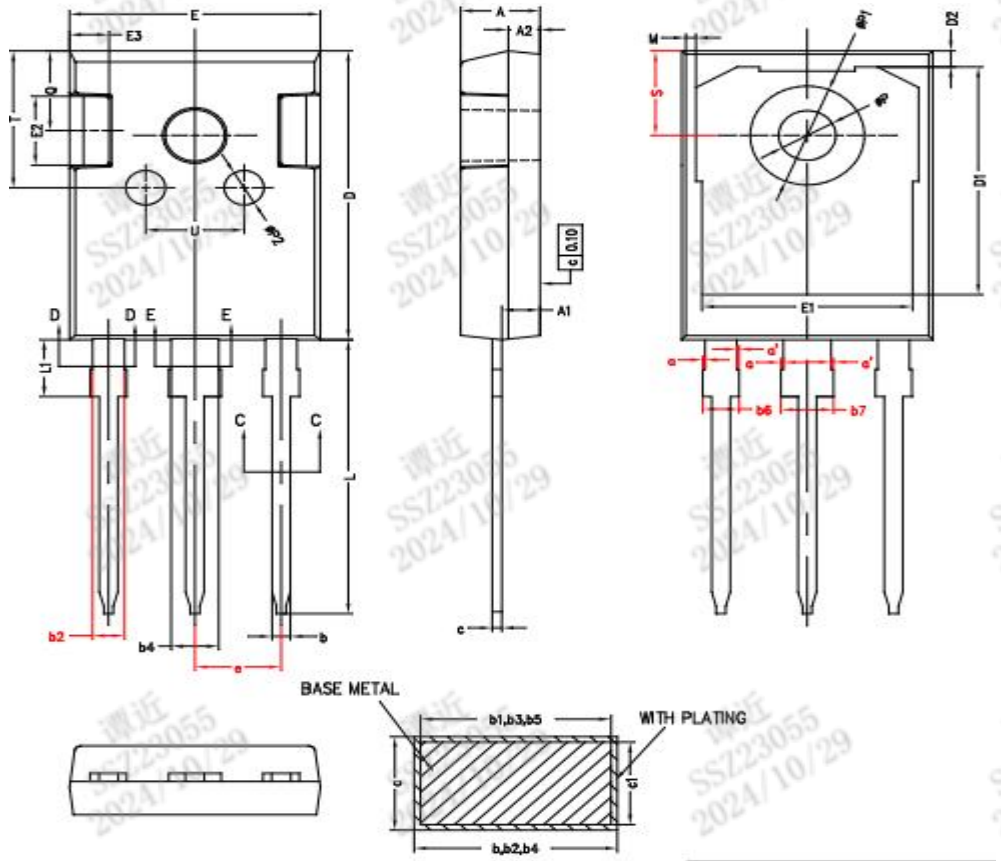
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	c1	0.58	0.60	0.62
A1	2.31	2.41	2.51	D	20.90	21.00	21.10
A2	1.90	2.00	2.10	D1	16.25	16.55	16.85
b	1.16	-	1.26	D2	1.05	1.20	1.35
b1	1.15	1.20	1.22	E	15.70	15.80	15.90
b2	1.96	-	2.06	E1	13.10	13.30	13.50
b3	1.95	2.00	2.02	E2	4.90	5.00	5.10
b4	2.96	-	3.06	E3	2.40	2.50	2.60
b5	2.95	3.00	3.02	e	5.34	5.44	5.54
b6	-	-	2.25	L	19.80	19.92	20.10
b7	-	-	3.25	L1	3.95	4.13	4.30
c	0.59	-	0.66	M	0.35	-	0.95
P	3.50	3.60	3.70	P1	7.00	-	7.40
P2	2.40	2.50	2.60	Q	5.60	-	6.00
S	6.05	6.15	6.25	T	9.80	-	10.20
U	6.00	-	6.40	a	0	-	0.15
a'	0	-	0.15				

30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

Mechanical Dimensions

TO-247(Package 4)

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				

30mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R030FBS

Shenzhen Sanrise Technology Co., LTD

http://www.sanrise-tech.com

IMPORTANT NOTICE

Shenzhen Sanrise Technology Co., LTD reserves the right to make changes without further notice to any products or specifications herein. Shenzhen Sanrise Technology Co., LTD does not assume any responsibility for use of any its products for any particular purpose, nor does Shenzhen Sanrise Technology Co., LTD assume any liability arising out of the application or use of any its products or circuits. Shenzhen Sanrise Technology Co., LTD does not convey any license under its patent rights or other rights nor the rights of others.

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