600mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R600E

General Description

The Sanrise SRC65R600E 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 SRC65R600E break down voltage is 650V and it has a high rugged avalanche characteristics.

The SRC65R600E is available in TO-252 and TO-220F packages.

Features

- Ultra Low $R_{DS(ON)}$ = 600mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=18.4nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved Design ***(SnowMOS^{TM} Gen.2)***

Application

- TV Power
- High Performance Charger / Adapter
- LED Lighting Power

Symbol

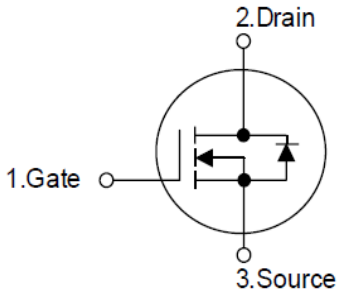
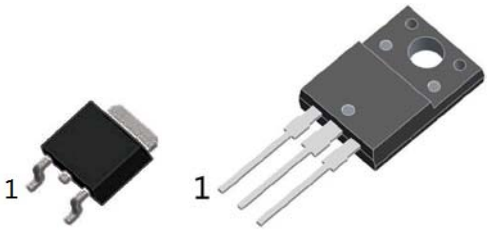


Figure 1 Symbol of SRC65R600E

Package Type



TO-252 TO-220F

Figure 2 Package Types of SRC65R600E

Ordering Information

SRC65R600E□□–□

Circuit Type

Package
D: TO-252
TF: TO-220F

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-252	SRC65R600EDTR-E	SRC65R600EDTR-G	SRC65R600EDE	SRC65R600EDG	Tape & Reel
TO-220F	SRC65R600ETF-E	SRC65R600ETF-G	SRC65R600ETFE	SRC65R600ETFG	Tube

600mΩ, 650V, Super Junction N-Channel Power MOSFET **SRC65R600E**

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	680	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current	T_C=25ºC (Note 2)	I_D	8.4	A
	T_C=125ºC		3.3	
Pulsed Drain Current (Note 3)		I_{DM}	24.0	A
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	105	mJ
Avalanche Energy, Repetitive (Note 3)		E_{AR}	0.15	mJ
Avalanche Current, Repetitive (Note 3)		I_{AR}	1.3	A
Continuous Diode Forward Current		I_S	7.3	A
Diode Pulse Current		$I_{S.PULSE}$	24.0	A
Operating Junction Temperature		T_J	150	ºC
Storage Temperature		T_{STG}	-55 to 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	300	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. Limited by T_{J_MAX}, Maximum duty cycle D=0.75
3. Repetitive Rating: Pulse width limited by maximum junction temperature
4. I_{AS} = 1.3A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C

600mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R600E

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	650			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			1	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	2.7	3.6	4.5	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=4.0A		460	600	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		8.9		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		356		pF
Output Capacitance		C_{OSS}			31.8		
Reverse Transfer Capacitance		C_{RSS}			18.7		
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		16		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			72		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=4.0A R_G=10Ω, V_{GS}=10V		10		ns
Rise Time		t_r			12		
Turn-off Delay Time		$t_{d(off)}$			36		
Fall Time		t_f			14		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=4.0A V_{GS}=0 to 10V		4.2		nC
Gate to Drain Charge		Q_{gd}			9.1		
Gate Charge Total		Q_g			18.4		
Gate Plateau Voltage		$V_{plateau}$			5.9		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=4.0A		0.84	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=4.0A dI_F/dt=100A/us		206		ns
Reverse Recovery Charge		Q_{rr}			1.63		uC
Peak Reverse Recovery Current		I_{rrm}			15.8		A

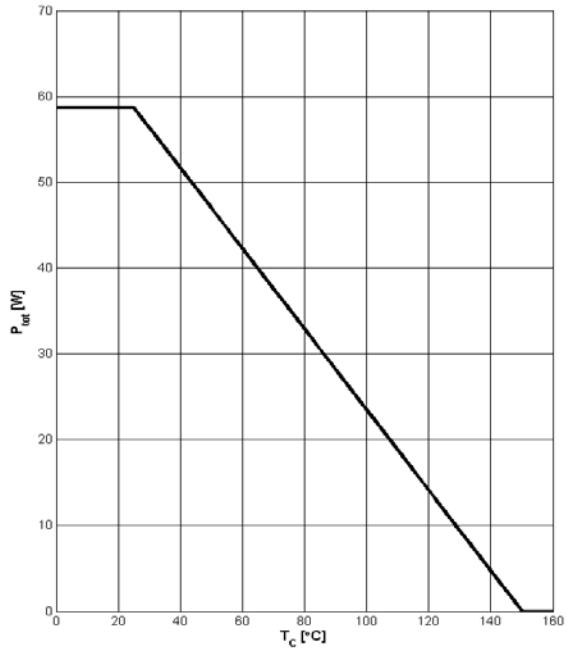
Note:

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

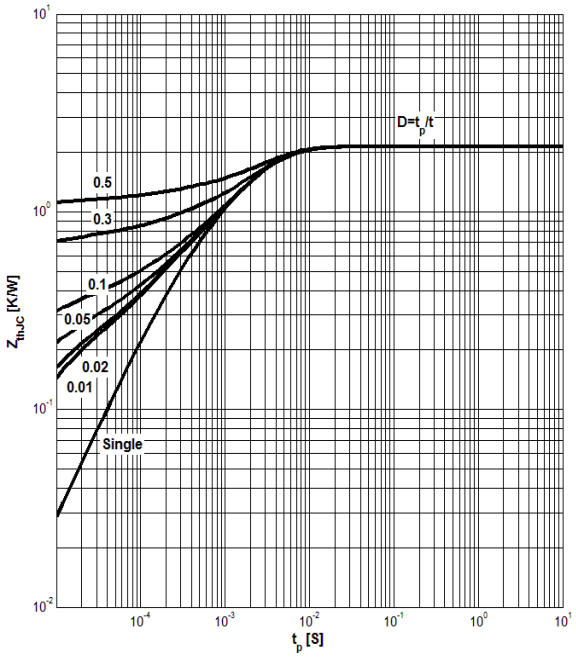
Typical Performance Characteristics

Figure 1: Power Dissipation



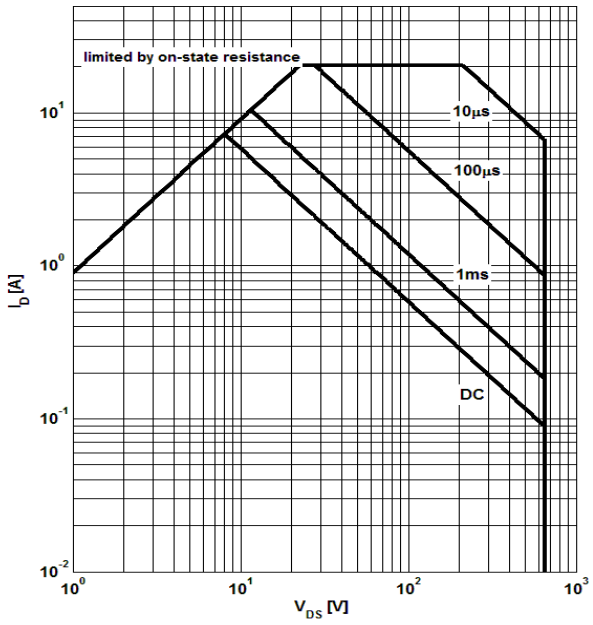
$P_{tot} = f(T_c)$

Figure 2: Max. Transient Thermal Impedance



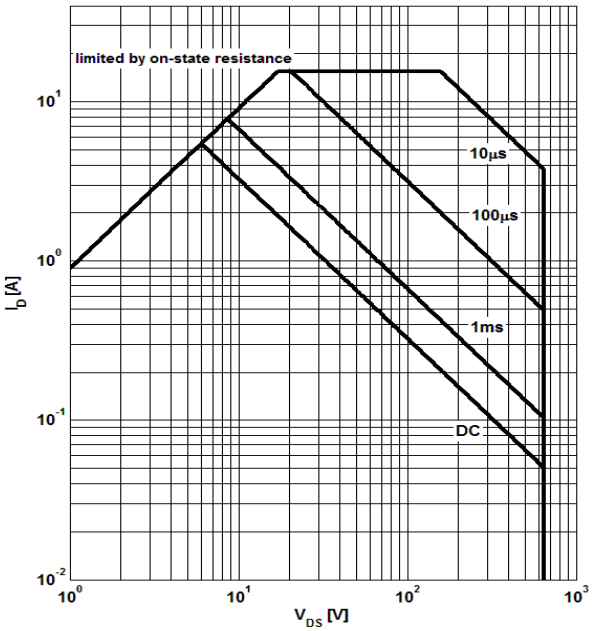
$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

Figure 3: Safe Operating Area



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

Figure 4: Safe Operating Area



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

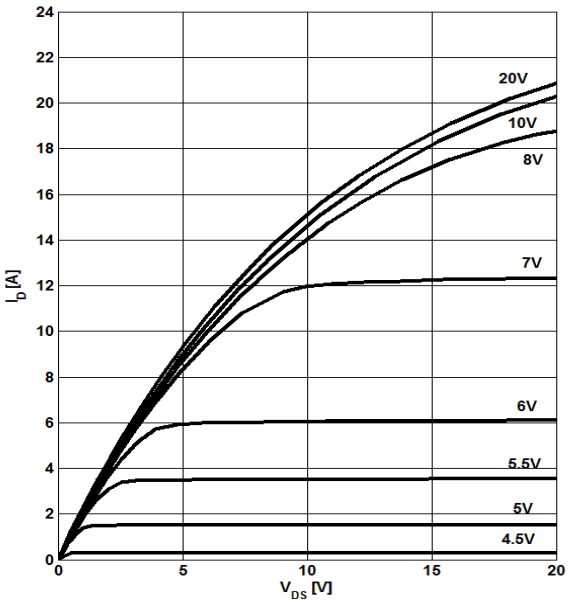
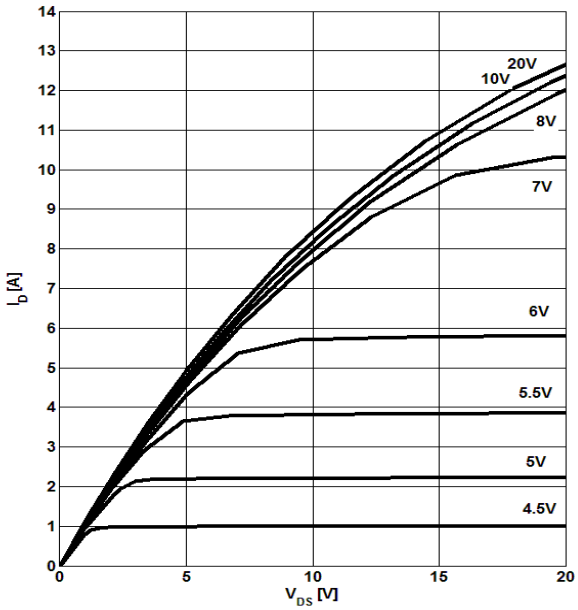
Figure 5: Typ. Output Characteristics	Figure 6: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

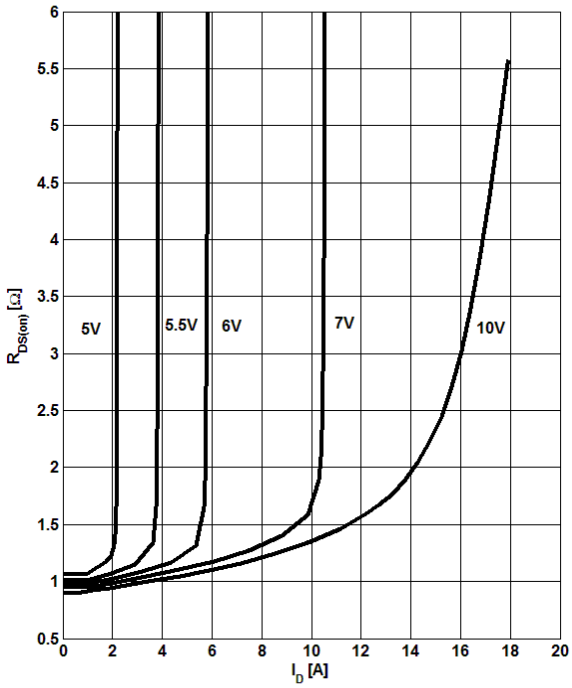
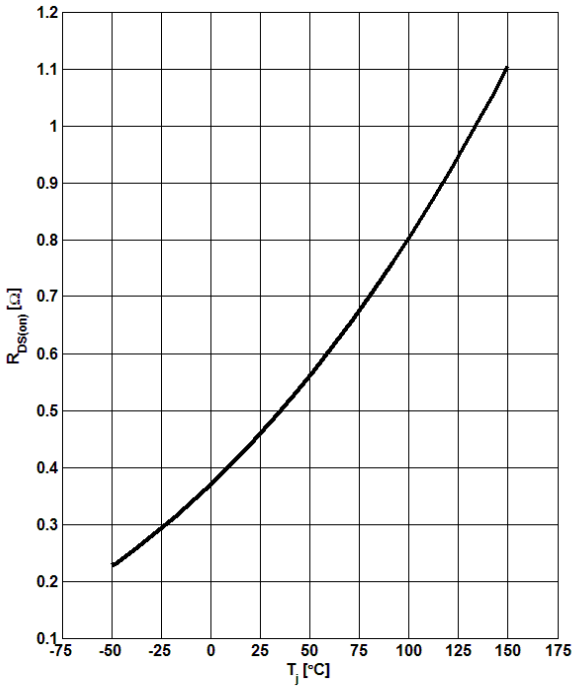
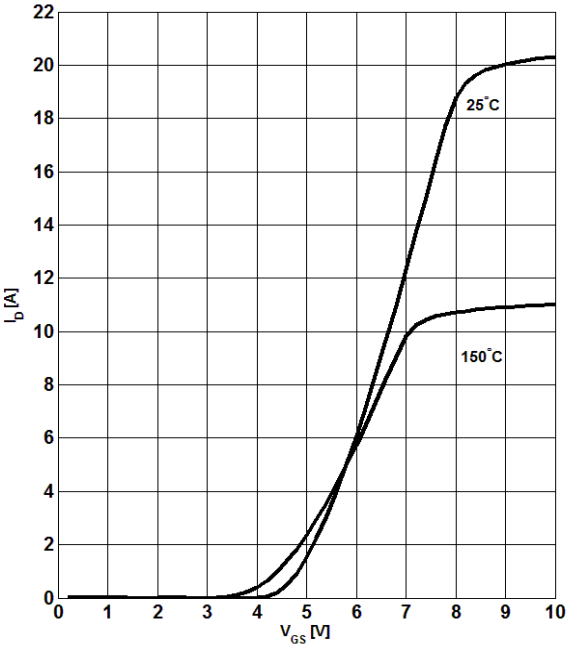
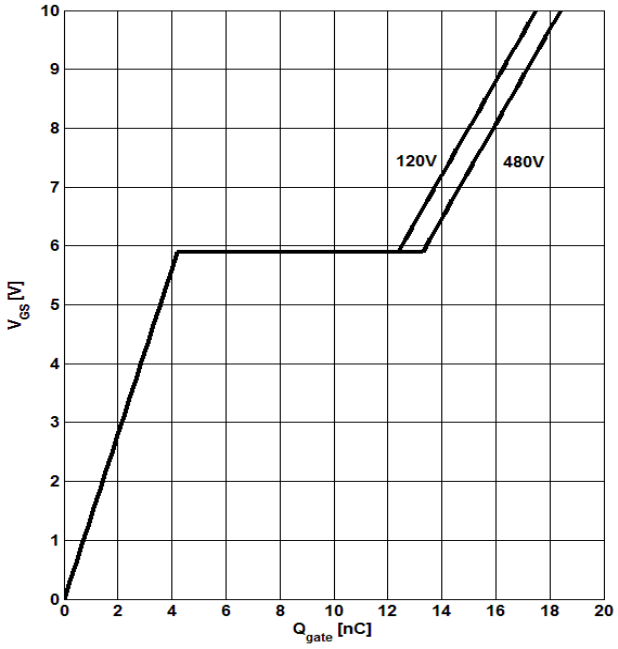
Figure 7: Typ. Drain-Source On-State Resistance	Figure 8: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)}$ =f(I_D); T_j=125ºC; parameter: V_{GS}	$R_{DS(ON)}$=f(T_j); I_D=4.0A; V_{GS}=10V

Figure 9: Typ. Transfer Characteristics



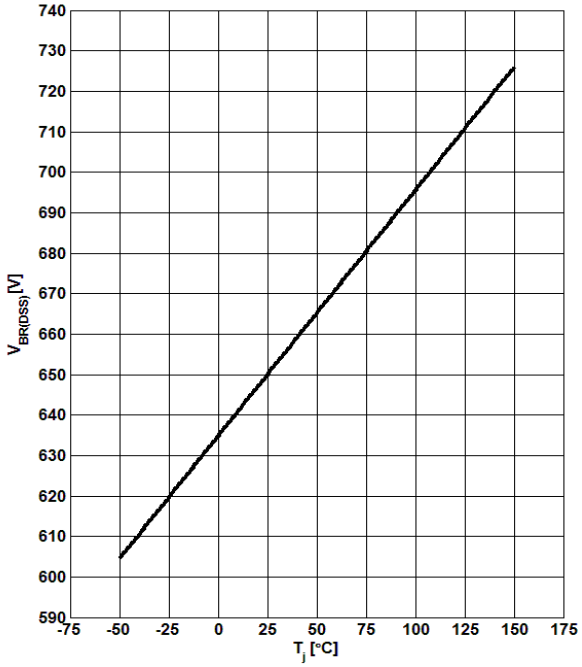
$I_D = f(V_{GS})$; V_{DS} = 20V

Figure 10: Typ. Gate Charge



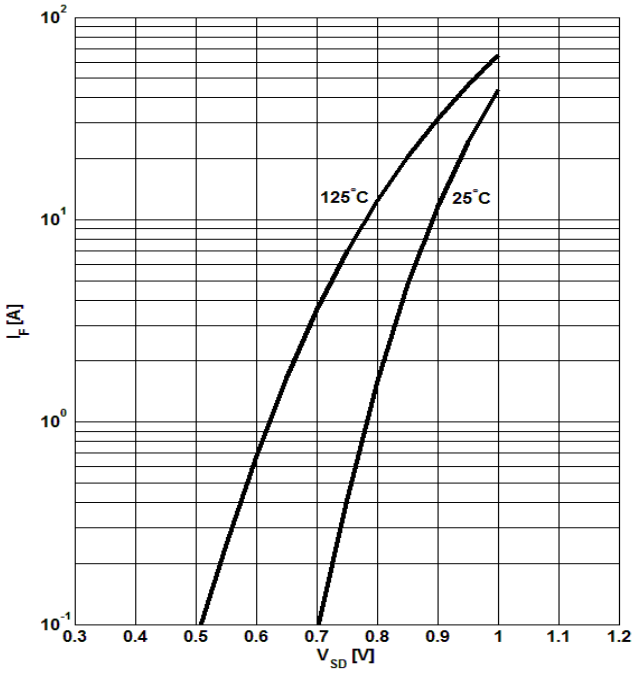
V_{GS}= f(Q_{gate}), I_D=4.0A pulsed

Figure 11: Drain-Source Breakdown Voltage



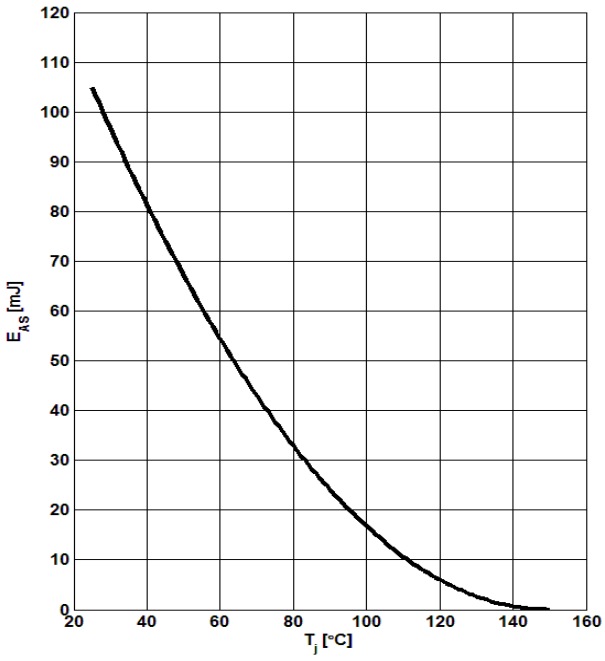
$V_{BR(DSS)}$=f(T_j); I_D=1mA

Figure 12: Forward Characteristics of Reverse Diode



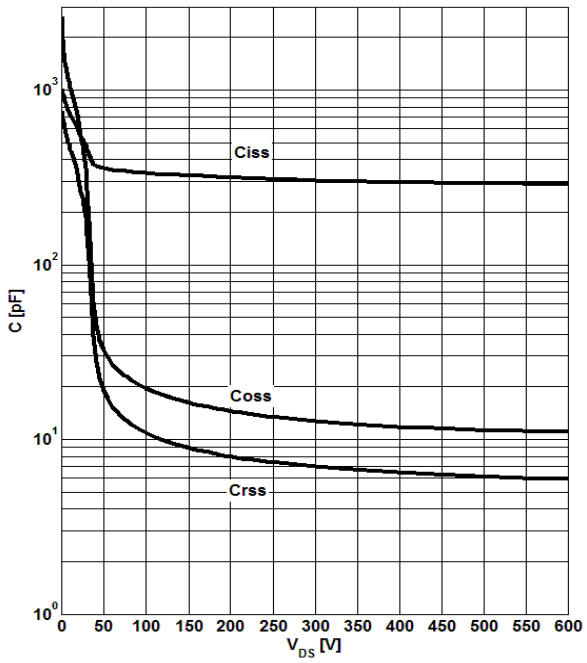
I_F=f(V_{SD}); parameter: T_j

Figure 13: Avalanche Energy



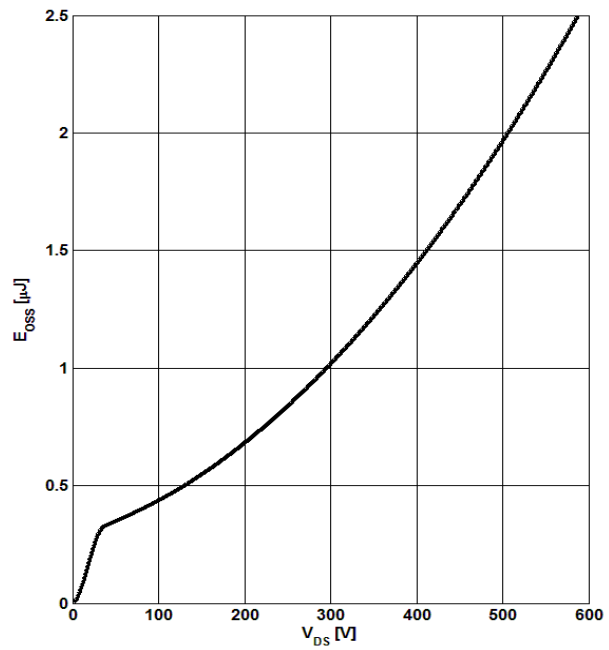
$E_{AS}=f(T_j)$; $I_D=1.3A$; $V_{DD}=60V$

Figure 14: Typ. Capacitances



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

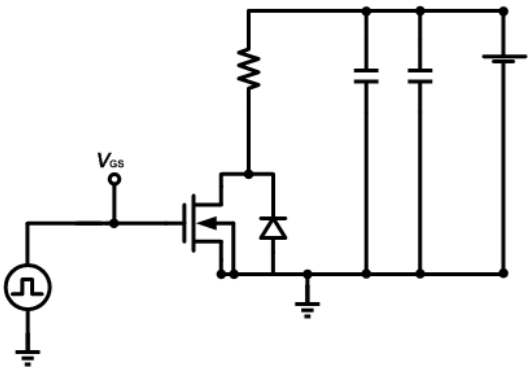
Figure 15: C_{OSS} Stored Energy

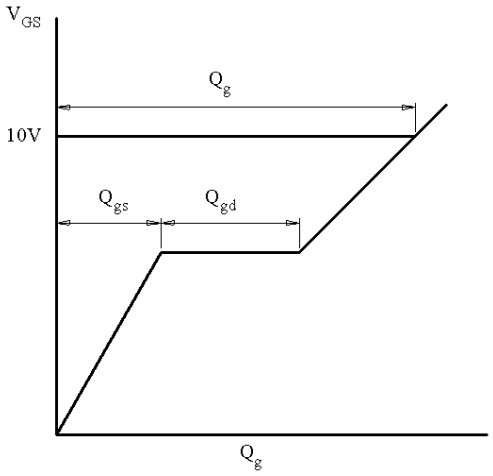


$E_{OSS}=f(V_{DS})$

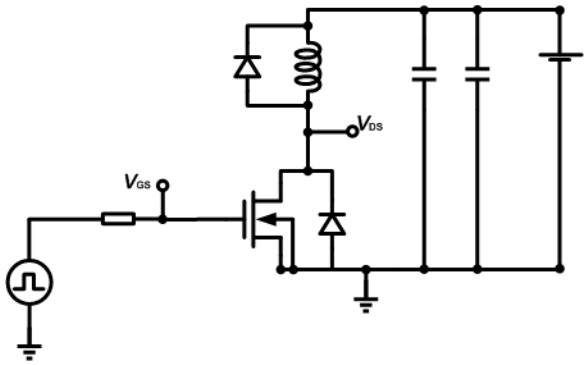
Test Circuits

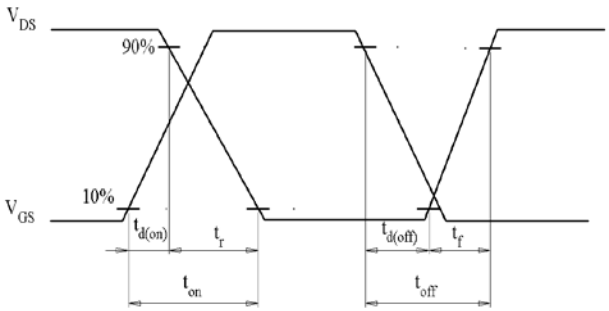
1. Gate Charge Test Circuit & Waveform



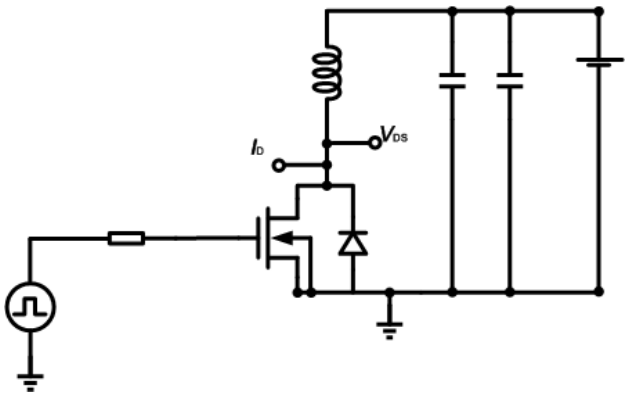


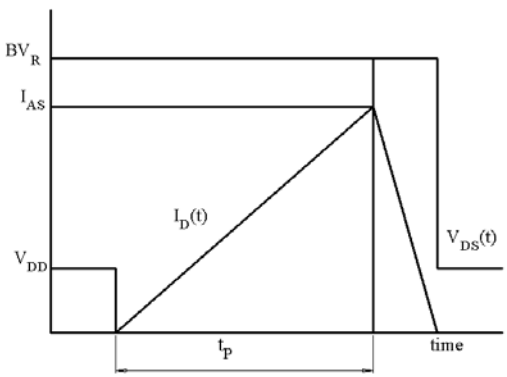
2. Switch Time Test Circuit



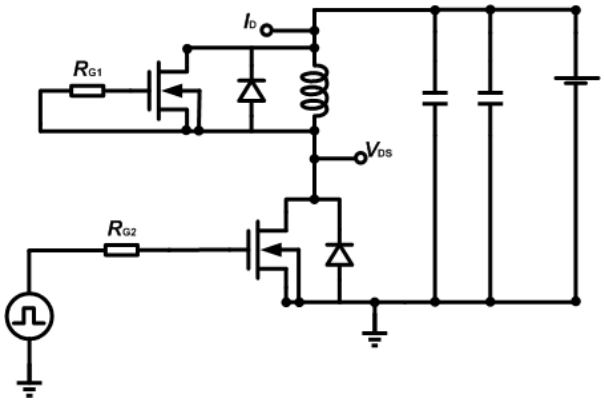


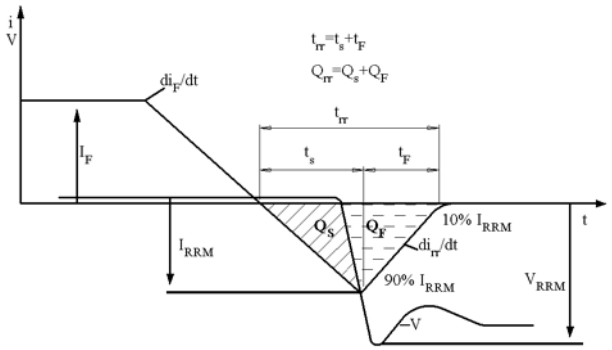
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

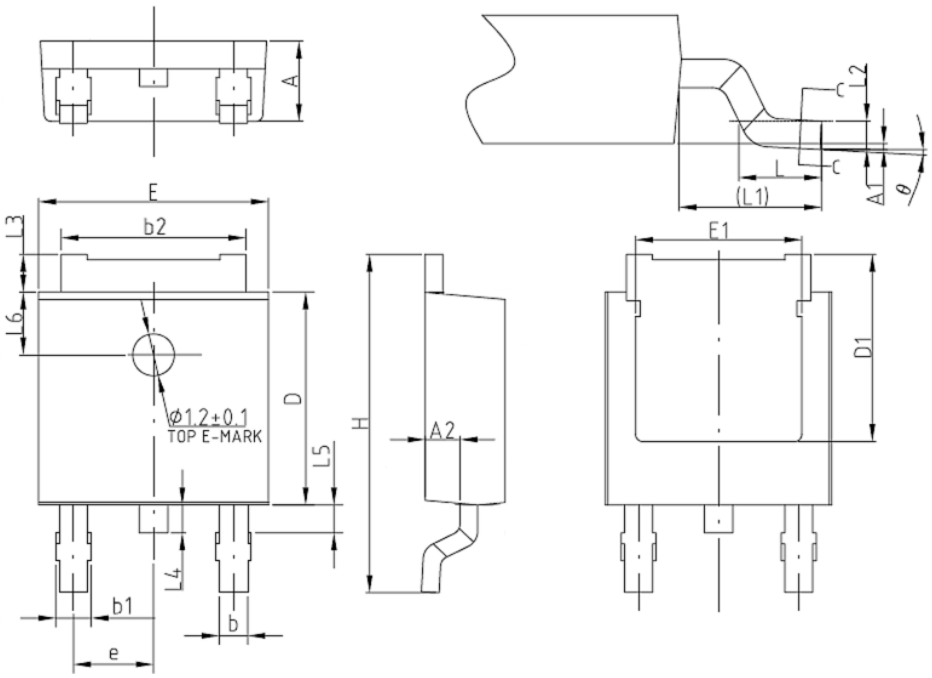




600mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R600E

Mechanical Dimensions

TO-252 **Unit: mm**

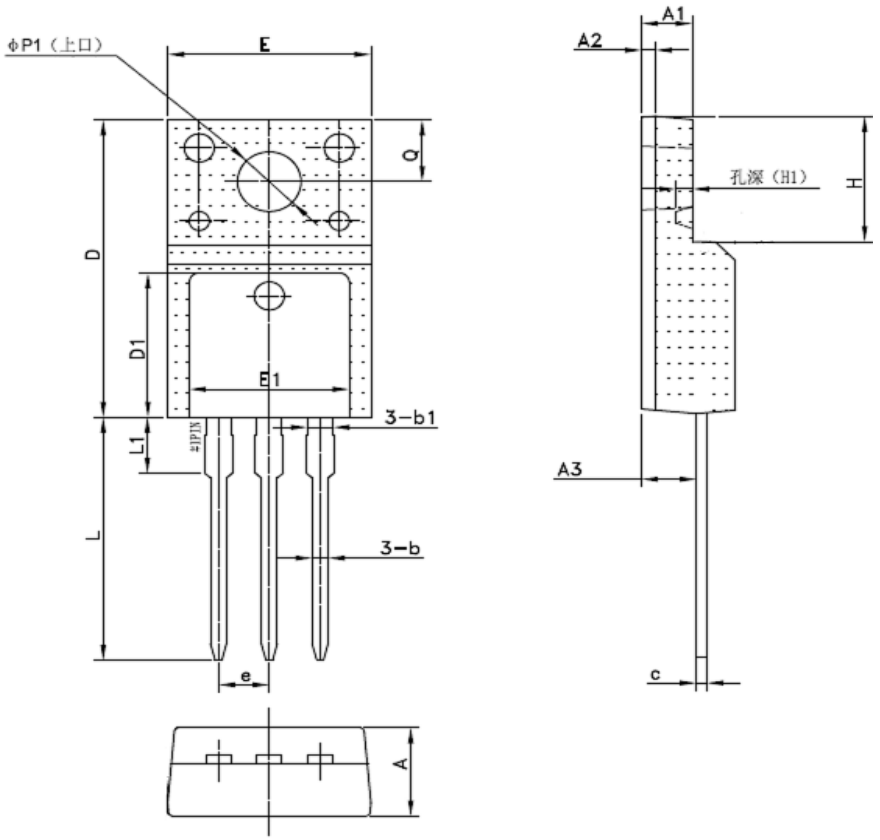


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0	-	0.10
A2	0.90	1.00	1.17
b	0.70	0.76	0.90
b1	0.77	-	1.10
b2	5.13	5.33	5.46
c	0.45	-	0.60
D	5.95	6.10	6.25
D1	-	5.30	-
E	6.45	6.60	6.75
E1	-	4.80	-
e	2.286(BSC)		
H	9.70	10.10	10.40
L	1.25	1.50	1.75
L1	-	2.90	-
L2	-	0.51	-
L3	0.90	-	1.25
L4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

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

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Sanrise Technology Limited Company

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Main Site:

- Headquarter

Sanrise Technology Limited Company

Rm.601~603, Building B, SDG Information Port, No.2, Kefeng Road, Science & Technology Park, Nanshan District, ShenZhen, China

Tel: +86-755-22953335

Fax: +86-755-22916878

- Shanghai Office

Sanrise Technology Limited Company

No. 1159, Cailun Road, Zhangjiang HiTech Park, Pudong District, Shanghai, China

Tel: +86-21-51355061