670mΩ, 700V, Super Junction N-Channel Power MOSFET SRC70R670

General Description

The Sanrise SRC70R670 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 SRC70R670 break down voltage is 700V and it has a high rugged avalanche characteristics.

The SRC70R670 is available in TO-251, TO-252, TO-263-2 and TO-220F packages.

Features

- Ultra Low $R_{DS(ON)}$ = 670mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=14.3nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved

Application

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

Symbol

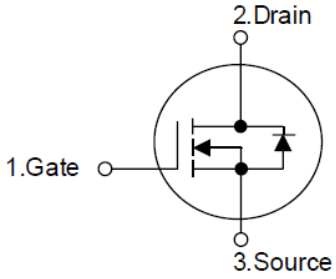

Figure 1 Symbol of SRC70R670

Package Type

TO-251

TO-252

TO-263-2

TO-220F

Figure 2 Package Types of SRC70R670

Ordering Information

SRC70R670□□–□

Circuit Type

Package

D1: TO-251

D: TO-252

S2: TO-263-2

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-251	SRC70R670D1-E	SRC70R670D1-G	SRC70R670D1E	SRC70R670D1G	Tube
TO-252	SRC70R670DTR-E	SRC70R670DTR-G	SRC70R670DE	SRC70R670DG	Tape & Reel
TO-263-2	SRC70R670S2TR-E	SRC70R670S2TR-G	SRC70R670S2E	SRC70R670S2G	Tape & Reel
TO-220F	SRC70R670TF-E	SRC70R670TF-G	SRC70R670TFE	SRC70R670TFG	Tube

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Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	730	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current	T_C=25ºC	I_D	7.2	A
	T_C=125ºC		3.2	
Pulsed Drain Current (Note 2)		I_{DM}	20.0	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	150	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.3	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	2.0	A
Continuous Diode Forward Current		I_S	7.2	A
Diode Pulse Current		$I_{S.PULSE}$	20.0	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. Repetitive Rating: Pulse width limited by maximum junction temperature
3. I_{AS} = 2.0A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C

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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	700			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=700V, 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	2.5	3.4	4.3	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=3.0A		580	670	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		2.83		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		574		pF
Output Capacitance		C_{OSS}			56		
Reverse Transfer Capacitance		C_{RSS}			6.2		
Effective output capacitance, energy related NOTE4		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		30		pF
Effective output capacitance, time related NOTE5		$C_{O(tr)}$			89		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=3.5A R_G=10Ω, V_{GS}=10V		8		ns
Rise Time		t_r			16		
Turn-off Delay Time		$t_{d(off)}$			12		
Fall Time		t_f			18		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=3.5A V_{GS}=0 to 10V		4.1		nC
Gate to Drain Charge		Q_{gd}			5.5		
Gate Charge Total		Q_g			14.3		
Gate Plateau Voltage		$V_{plateau}$			5.4		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=3.5A		0.83	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=3.5A dI_F/dt=100A/us		244		ns
Reverse Recovery Charge		Q_{rr}			2.34		uC
Peak Reverse Recovery Current		I_{rrm}			19		A

Note:

4. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V

5. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480 V

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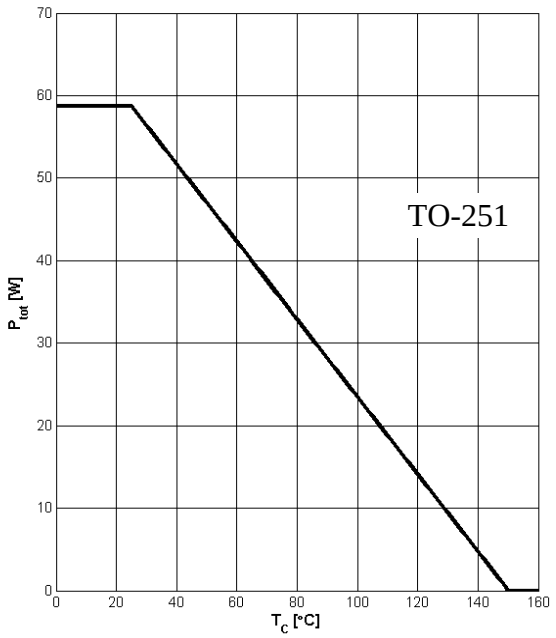
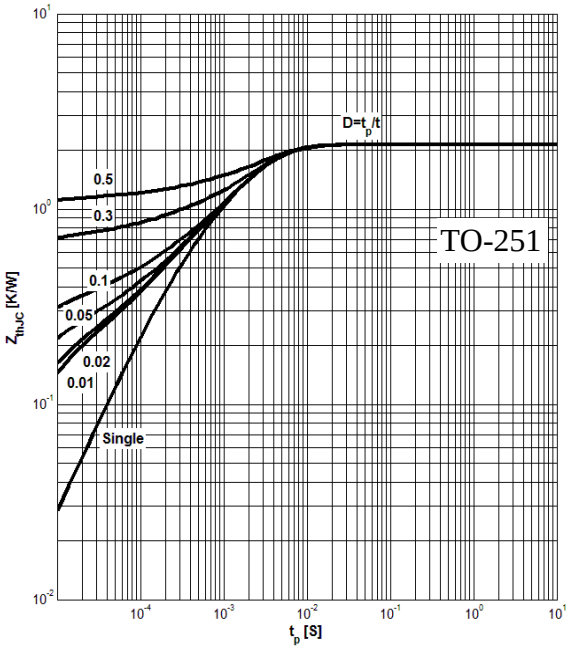
Typical Performance Characteristics

Figure 1: Power Dissipation



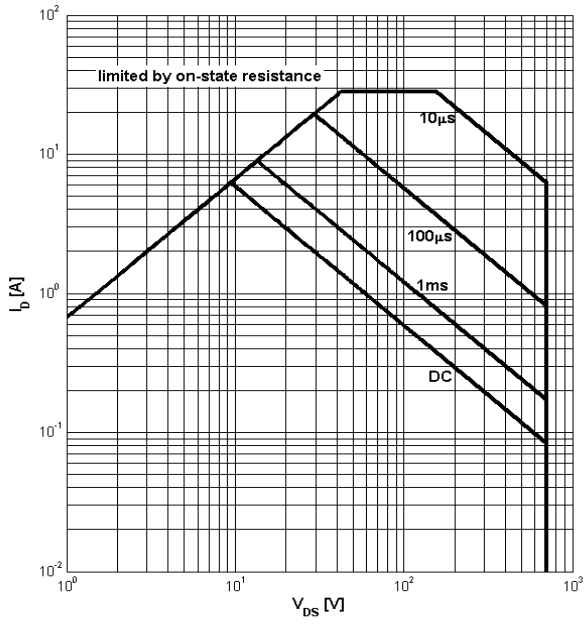
$P_{tot} = f(T_c)$

Figure 2: Max. Transient Thermal Impedance



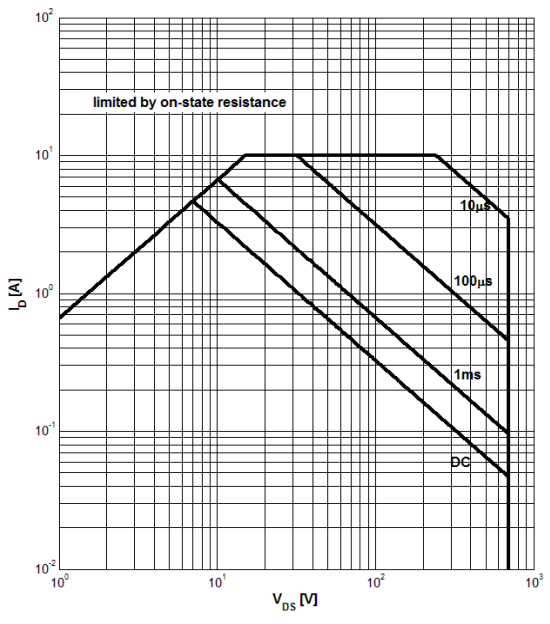
$Z(_{thJC}) = f(t_p)$; parameter: $D = t_p/T$

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

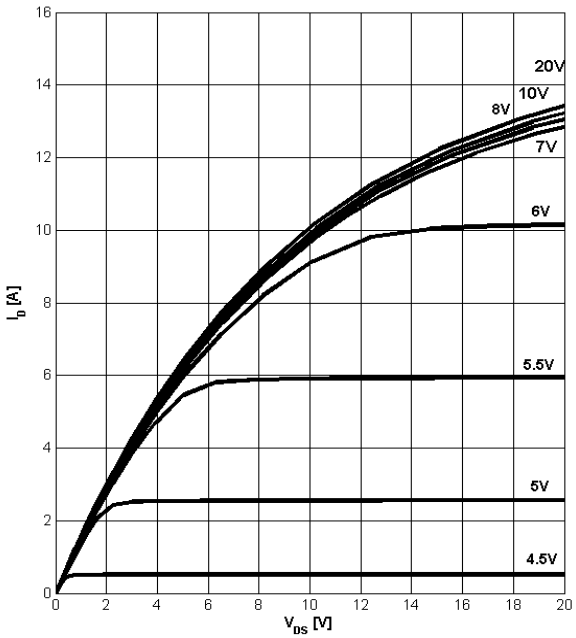
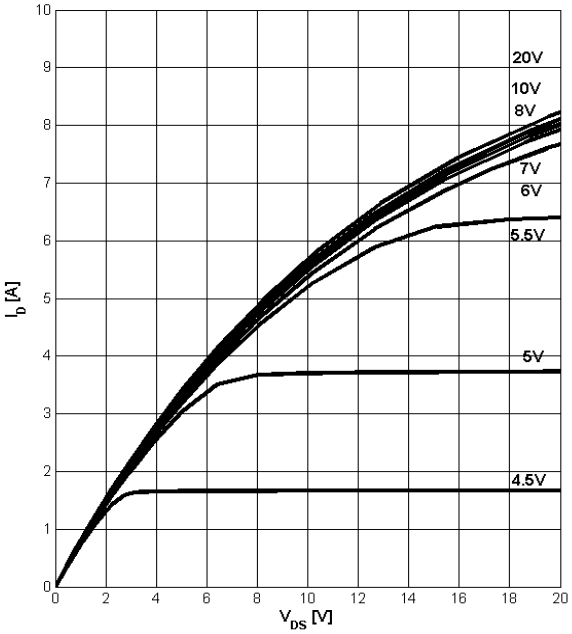
Figure 5: Typ. Output Characteristics	Figure 6: Typ. Output Characteristics
	
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}	$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

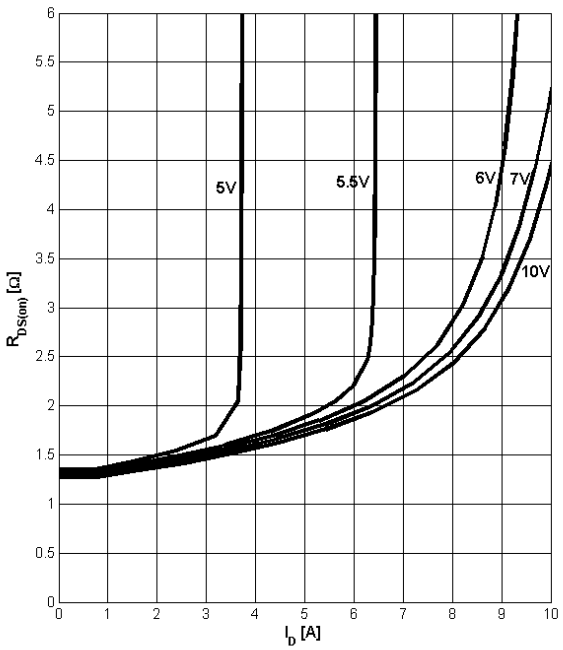
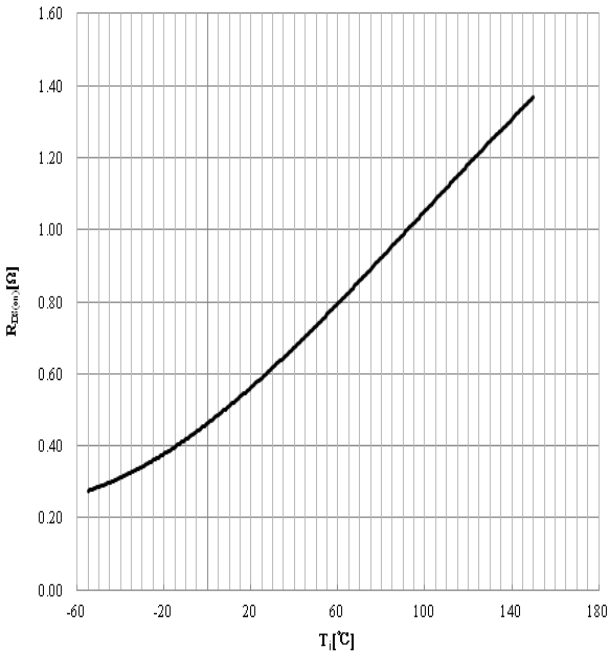
Figure 7: Typ. Drain-Source On-State Resistance	Figure 8: Typ. Drain-Source On-State Resistance
	
$R_{DS(ON)} = f(I_D)$; T_j=125ºC; parameter: V_{GS}	$R_{DS(ON)} = f(T_j)$; I_D=3A; V_{GS}=10V

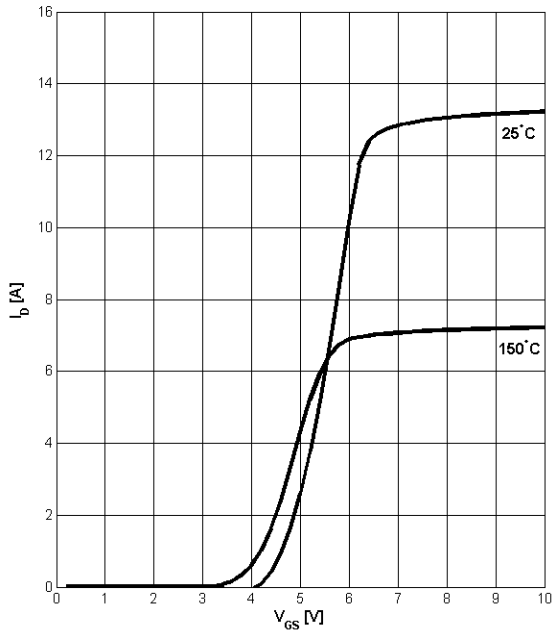
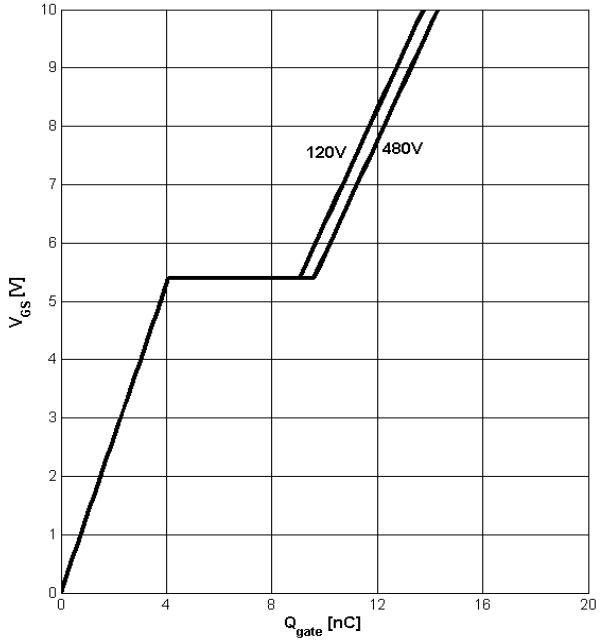
Figure 9: Typ. Transfer Characteristics	Figure 10: Typ. Gate Charge
	
$I_D = f(V_{GS})$; V_{DS} = 20V	V_{GS}= f(Q_{gate}), I_D= 3.5A pulsed

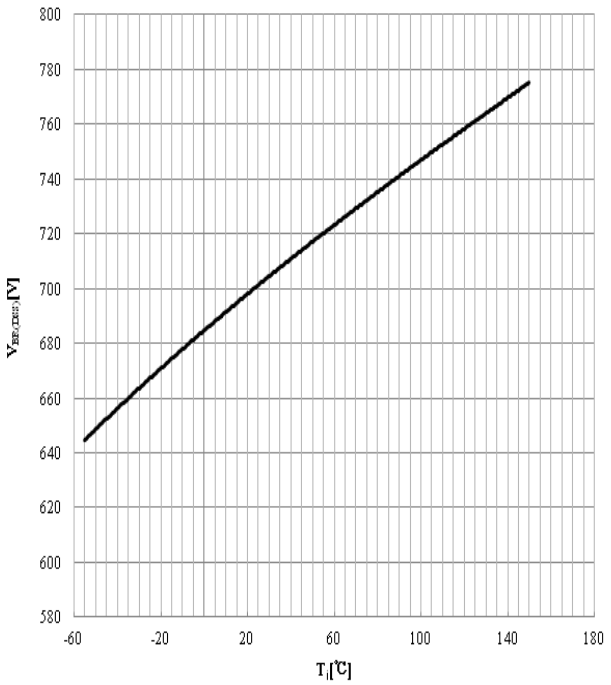
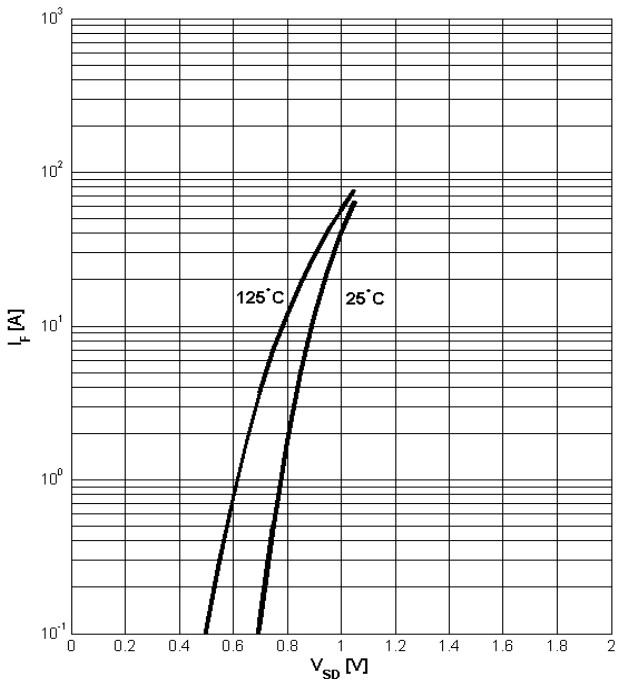
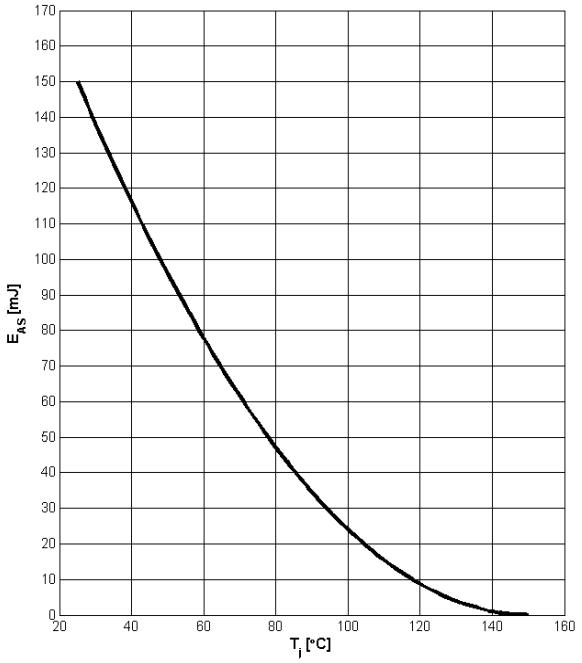
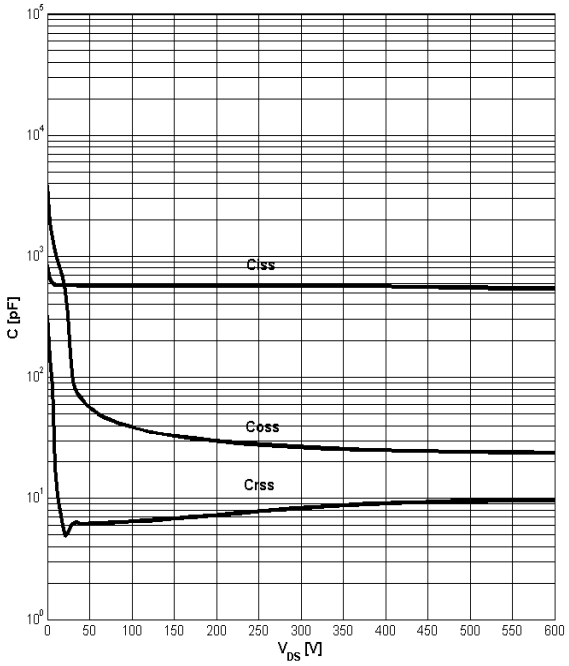
Figure 11: Drain-Source Breakdown Voltage	Figure 12: Forward Characteristics of Reverse Diode
	
$V_{BR(DSS)}$=f(T_j); I_D=1mA	I_F=f(V_{SD}); parameter: T_j

Figure 13: Avalanche Energy



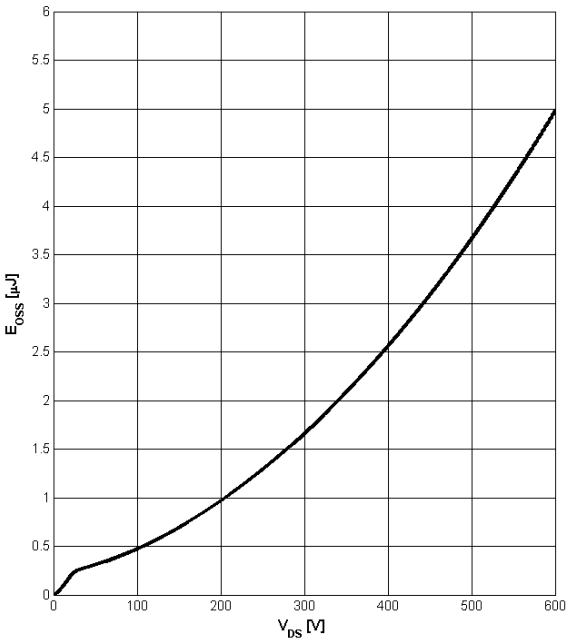
$E_{AS}=f(T_j)$; $I_D=2A$; $V_{DD}=60V$

Figure 14: Typ. Capacitances



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

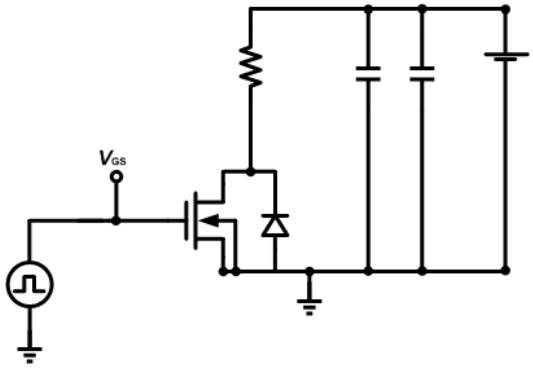
Figure 15: C_{OSS} Stored Energy

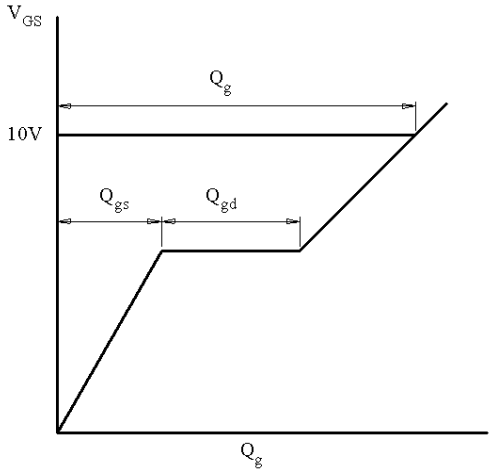


$E_{OSS}=f(V_{DS})$

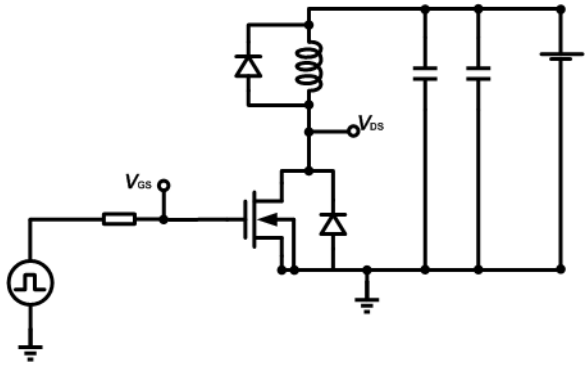
Test Circuits

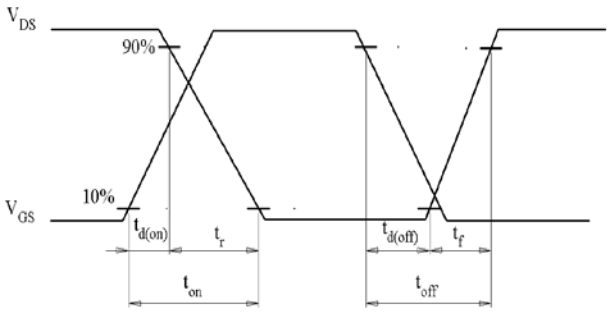
1. Gate Charge Test Circuit & Waveform



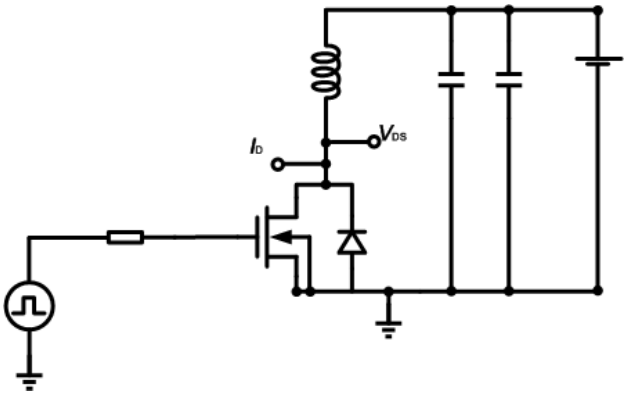


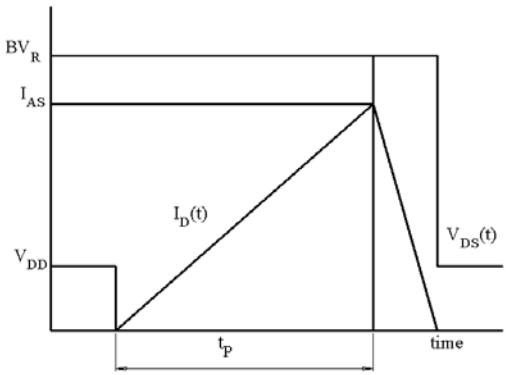
2. Switch Time Test Circuit



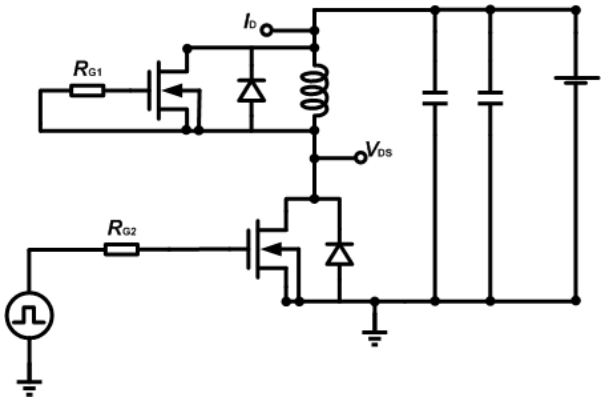


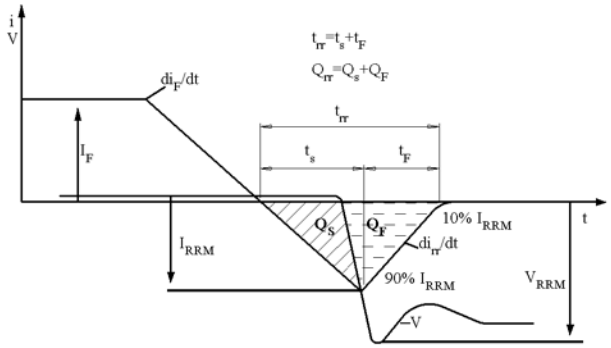
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

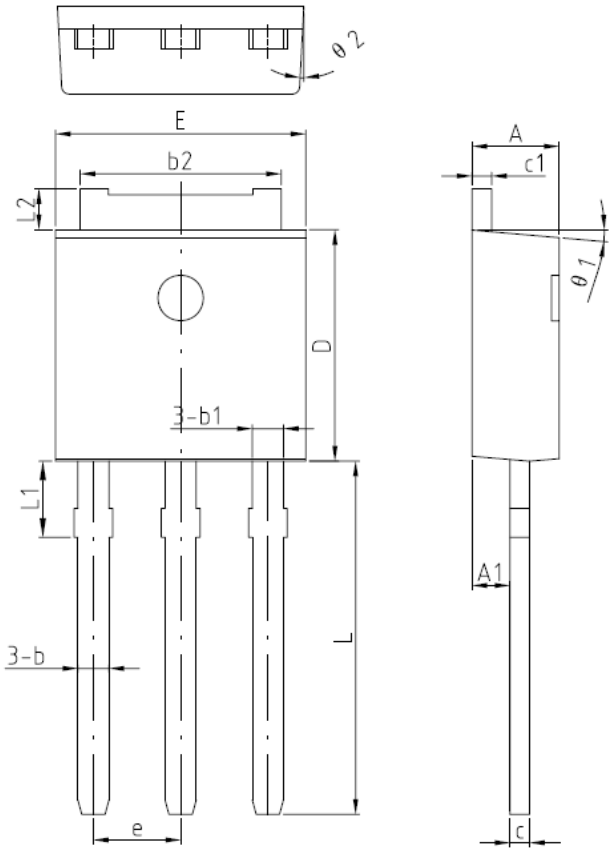




670mΩ, 700V, Super Junction N-Channel Power MOSFET SRC70R670

Mechanical Dimensions

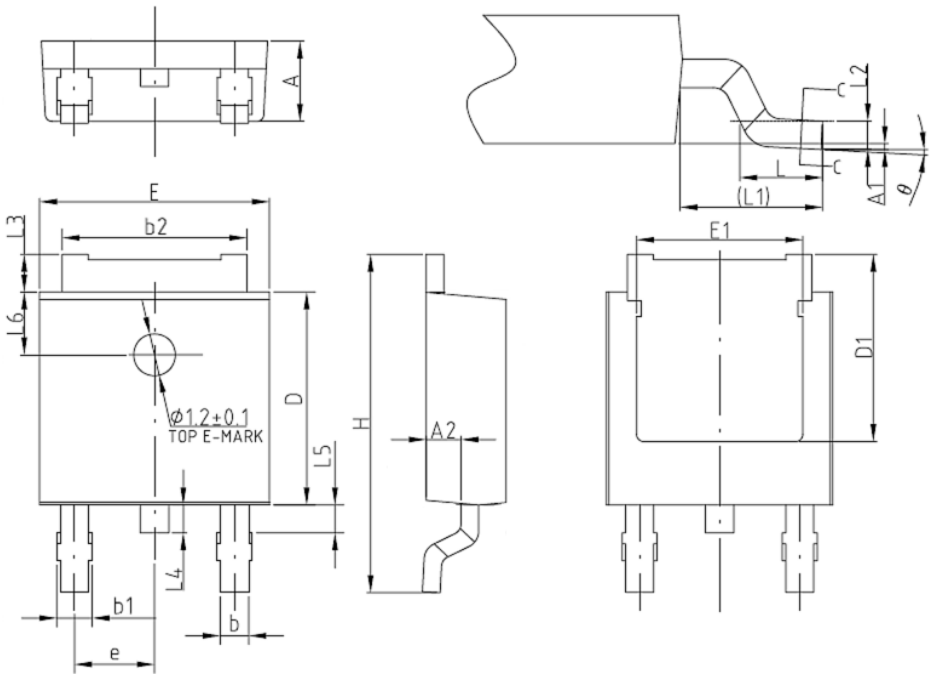
TO-251 **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0.90	1.01	1.17
b	0.50	-	0.91
b1	-	0.81	-
b2	5.13	5.33	5.46
c	0.46	0.50	0.60
c1	0.46	0.50	0.60
D	5.95	6.10	6.25
E	6.45	6.60	6.75
e	2.286(BSC)		
L	9.00	9.30	9.60
L1	-	2.00	-
L2	0.90	-	1.25
θ1	-	5°	-
θ2	-	3°	-

Mechanical Dimensions (Continued)

TO-252 **Unit: mm**

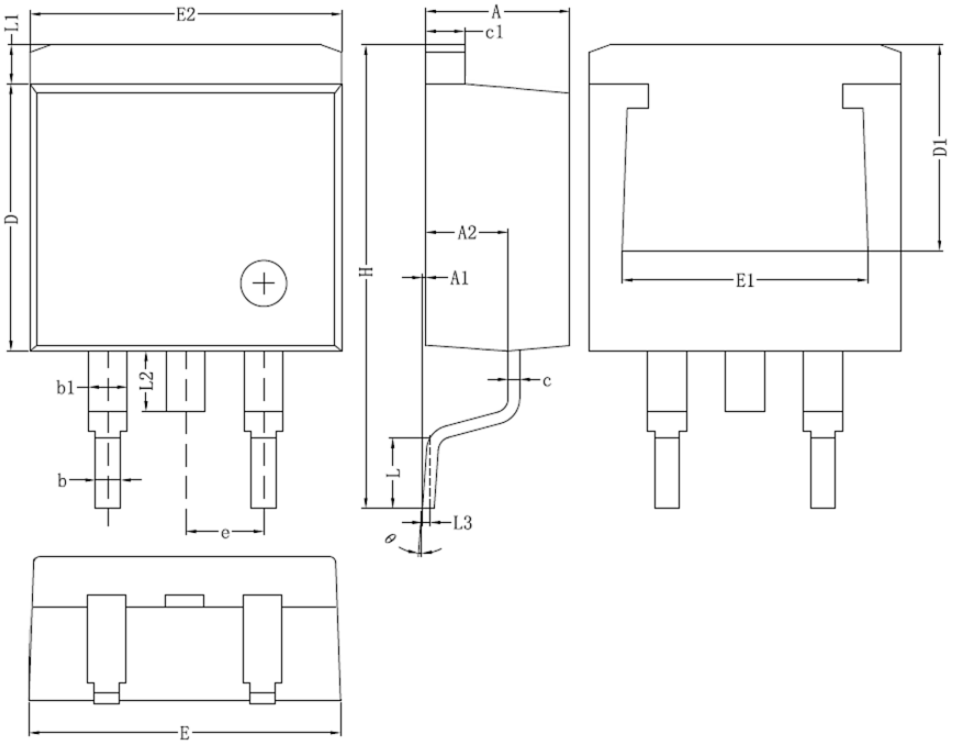


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0	-	0.10
A2	0.90	1.00	1.17
b	0.70	0.76	0.90
b1	0.77	-	1.10
b2	5.13	5.33	5.46
c	0.45	-	0.60
D	5.95	6.10	6.25
D1	-	5.30	-
E	6.45	6.60	6.75
E1	-	4.80	-
e	2.286(BSC)		
H	9.70	10.10	10.40
L	1.25	1.50	1.75
L1	-	2.90	-
L2	-	0.51	-
L3	0.90	-	1.25
L4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

670mΩ, 700V, Super Junction N-Channel Power MOSFET SRC70R670

Mechanical Dimensions (Continued)

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

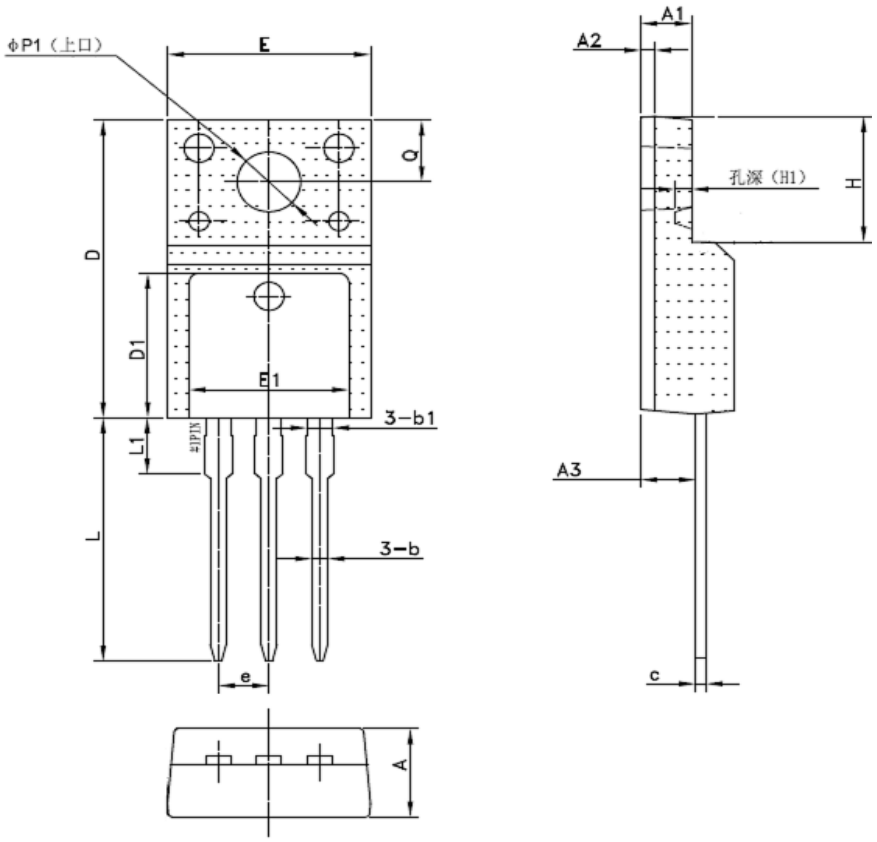


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.60	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
c1	1.15	1.27	1.40
D	8.55	-	9.40
D1	6.40	-	-
E	9.80	10.10	10.31
E1	7.60	-	-
E2	9.80	10.00	10.20
e	2.54(BSC)		
H	14.70	15.20	16.00
L	2.00	2.30	2.84
L1	1.00	1.27	1.40
L2	-	-	2.20
L3	-	0.25	-
θ	0°	-	8°

670mΩ, 700V, Super Junction N-Channel Power MOSFET SRC70R670

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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