

General Description

The Sanrise SRT03N050LD56TR-G uses advanced split gate trench technology. It has extremely low on resistance, low gate charge and fast switching time. This device is ideal for Motor driver, BMS, DC-DC converter and power management.

The SRT03N050LD56TR-G break down voltage is 30V and it has a high rugged avalanche characteristic.

The SRT03N050LD56TR-G is available in PDFN5*6 package.

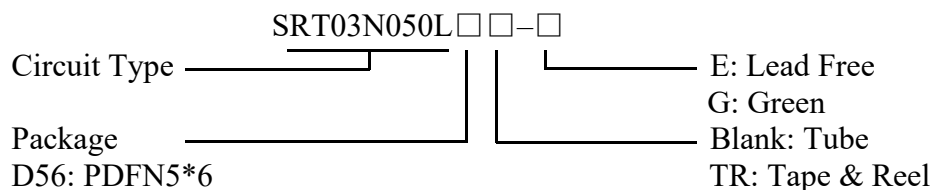
Features

- Ultra Low $R_{DS(ON)} = 3.8m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 18.2nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- Non-automotive Qualified

Application

- Server / Telecom
- High Power Supply, such as DCDC converter
- Motor Driver, such as E-Tools
- BMS

Ordering Information



Symbol

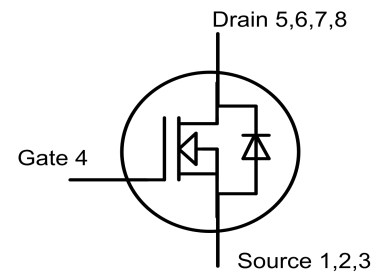


Figure 1 Symbol of SRT03N050LD56TR-G

Package Type

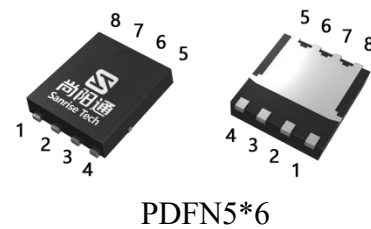


Figure 2 Package Types of SRT03N050LD56TR-G

Package	Part Number	Marking ID	Packing Type
PDFN5*6	SRT03N050LD56TR-G	SRT03N050LD56G	Tape & Reel

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	30	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current	$T_C=25^{\circ}C$	I_D	55	A
	$T_C=100^{\circ}C$		35	
Pulsed Drain Current (Note 2)		I_{DM}	220	A
Power Dissipation ($T_C = 25^{\circ}C$)		P_D	33	W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	121	mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	20	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	9.0	A
Operating Junction Temperature		T_J	150	°C
Storage Temperature		T_{STG}	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	°C

Note:

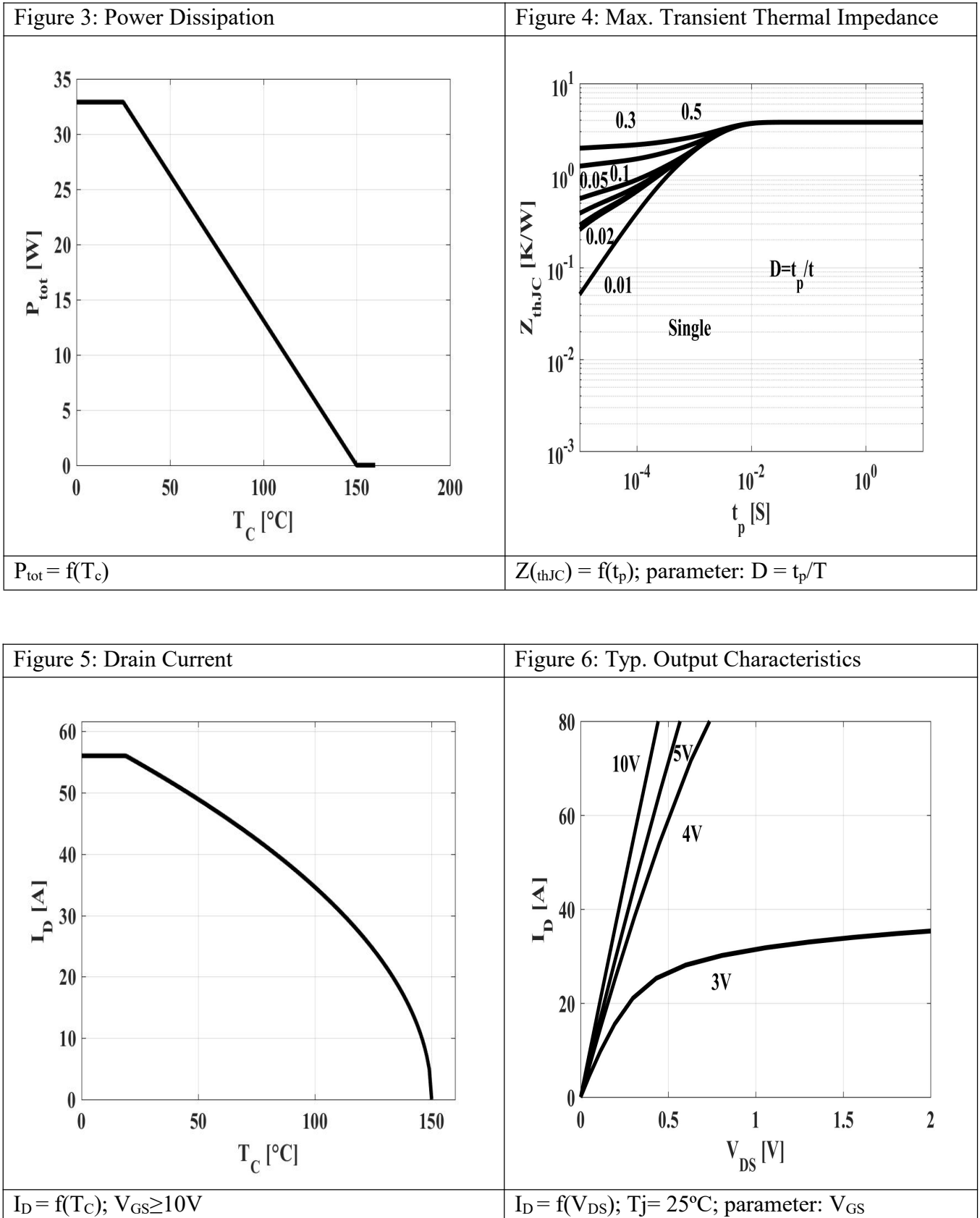
- Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
- Repetitive Rating: Pulse width limited by maximum junction temperature
- $I_{AS} = 9.0A$, $V_{DD} = 15V$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}C$
- $I_{AS_Limit} = 22.0A$, $V_{DD} = 15V$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}C$

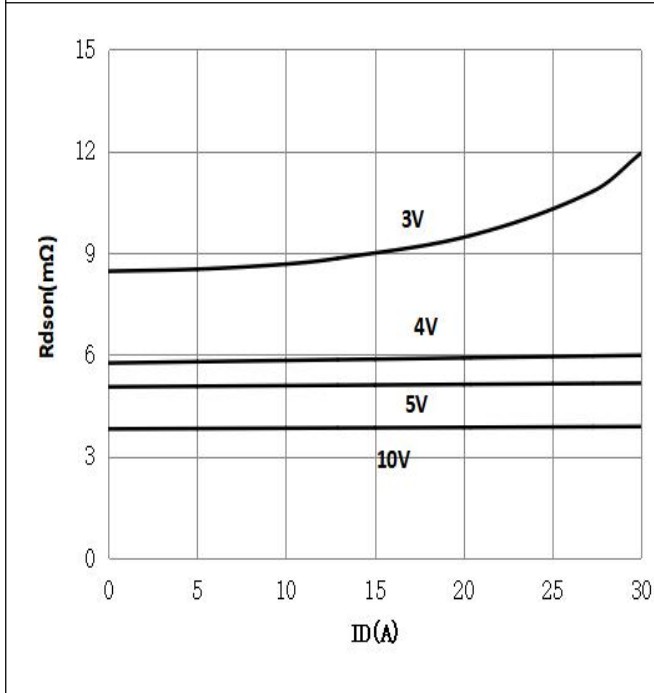
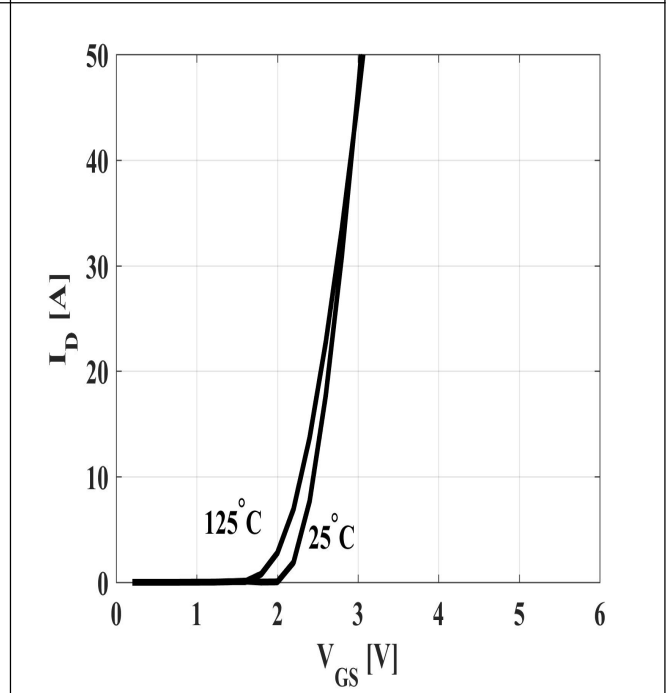
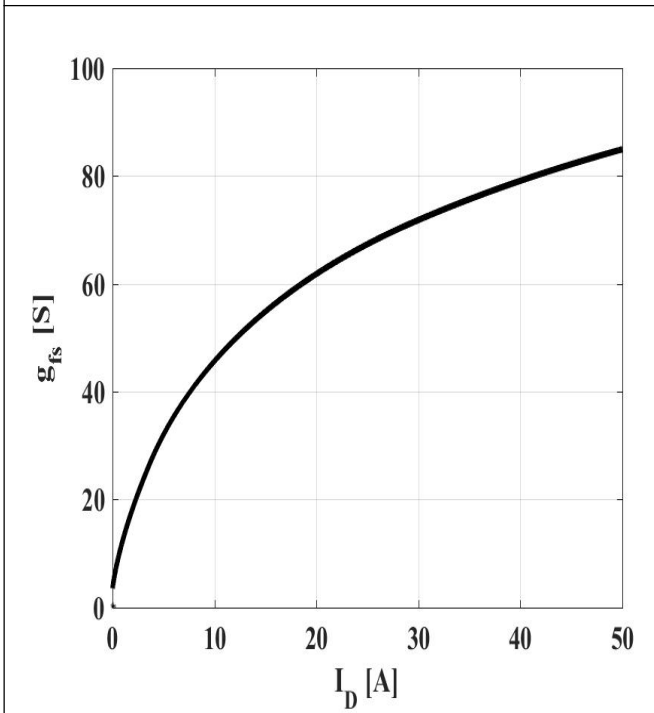
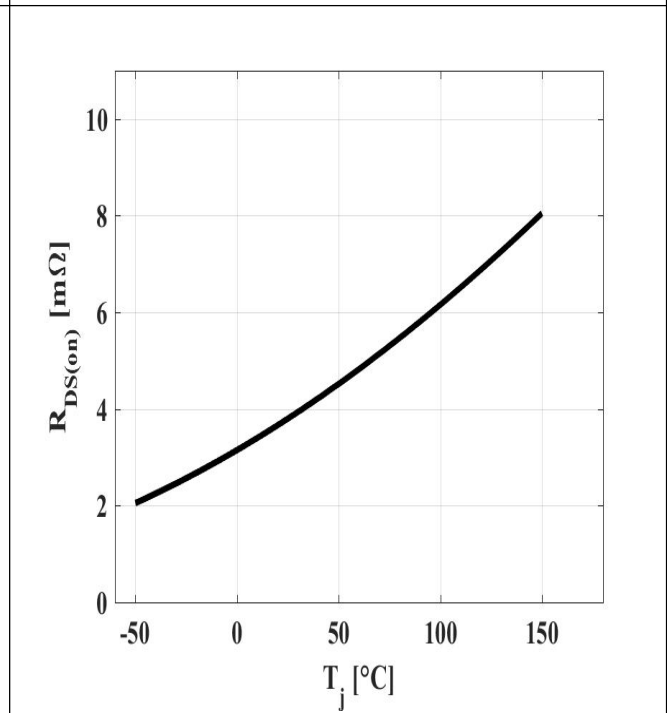
Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}			3.8	°C/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}			50	

Electrical Characteristics
 $T_J = 25^\circ\text{C}$, unless otherwise specified.

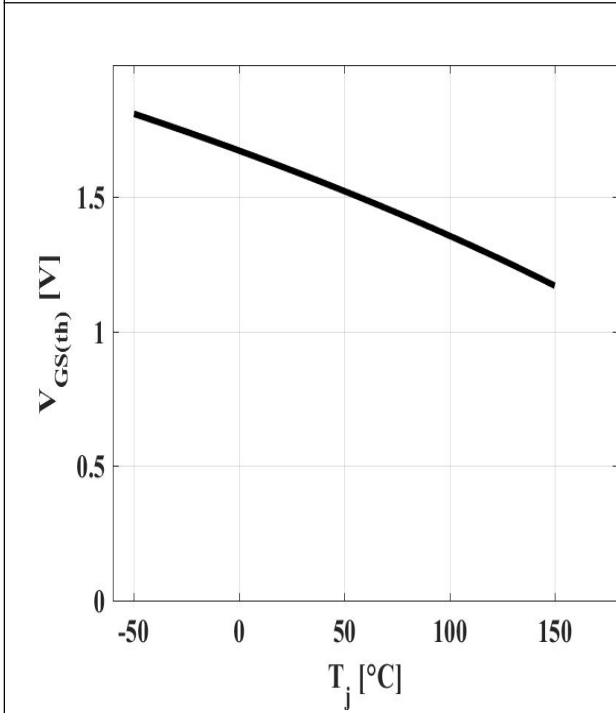
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$			1	μA
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=20V, V_{DS}=0V$			100	nA
	Reverse	$I_{GSSR}, V_{GS}=-20V, V_{DS}=0V$			-100	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=0.25mA$	1.0	1.6	2.2	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=20A$		5.5	8.0	$m\Omega$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$		3.8	5.0	$m\Omega$
Gate Resistance	R_G	$f=1MHz, \text{Open Drain}$		2.6		Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{DS}=15V, V_{GS}=0V, f=1MHz$		1.4		nF
Output Capacitance	C_{OSS}			300		pF
Reverse Transfer Capacitance	C_{RSS}			70		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=20A, R_G=1.6\Omega, V_{GS}=10V$		6		ns
Rise Time	t_r			4		
Turn-off Delay Time	$t_{d(off)}$			19		
Fall Time	t_f			4		
Gate Charge Characteristics						
Gate to Source Charge	Q_{gs}	$V_{DD}=15V, I_D=20A, V_{GS}=0 \text{ to } 10V$		2.5		nC
Gate to Drain Charge	Q_{gd}			2.4		
Gate Charge Total	Q_g			18.2		
Gate Plateau Voltage	$V_{plateau}$			2.8		V
Reverse Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=20A$		0.81	1.1	V
Reverse Recovery Time	t_{rr}	$V_R=15V, I_F=20A$		18		ns
Reverse Recovery Charge	Q_{rr}	$dI_F/dt=100A/\mu s$		11		nC

Typical Performance Characteristics


5.0mΩ, 30V, N-Channel Power MOSFET
SRT03N050LD56TR-G
Figure 7: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(I_D)$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}
Figure 8: Typ. Transfer Characteristics

 $I_D = f(V_{GS})$; $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j
Figure 9: Typ. Forward Transconductance

 $g_{fs} = f(I_D)$; $T_j = 25^\circ\text{C}$
Figure 10: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(T_j)$; $I_D = 50\text{A}$; $V_{GS} = 10\text{V}$

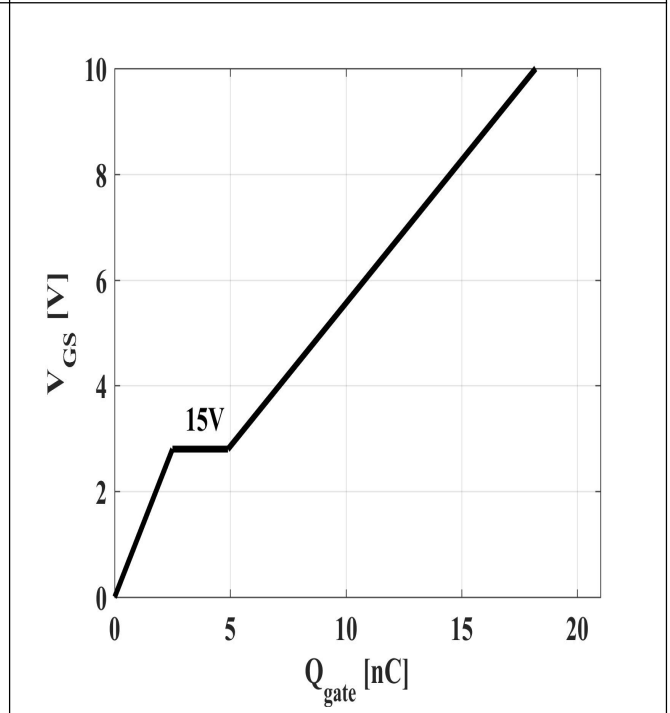
5.0mΩ, 30V, N-Channel Power MOSFET
SRT03N050LD56TR-G

Figure 11: Typ. Gate Threshold Voltage



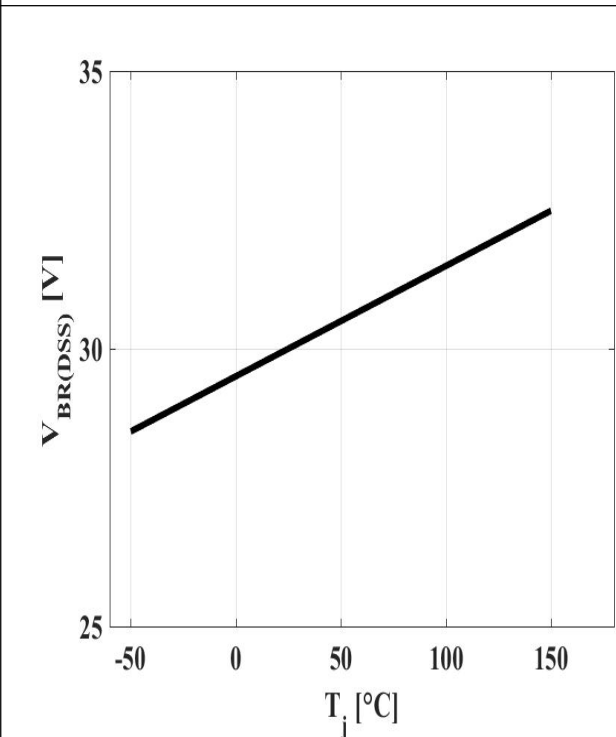
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_{DS} = 250\mu A$$

Figure 12: Typ. Gate Charge



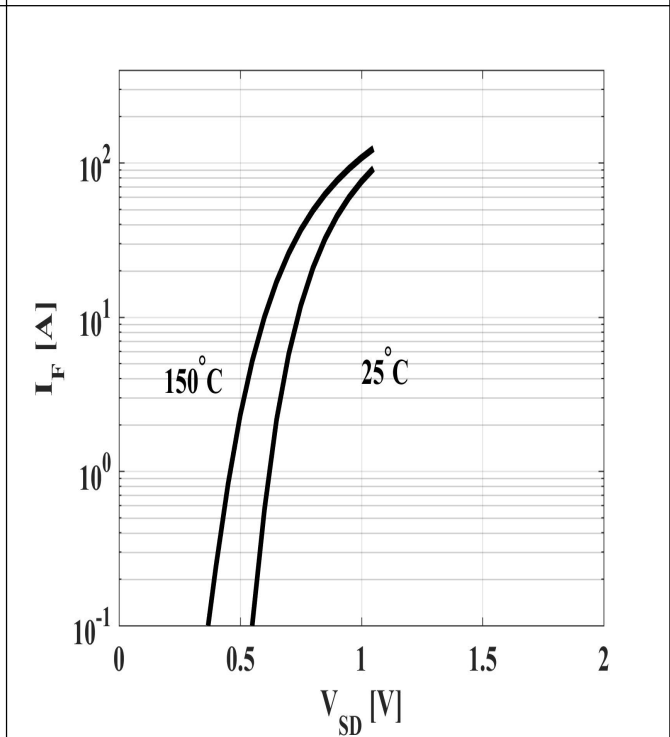
$$V_{GS} = f(Q_{gate}), I_D = 50A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage



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

Figure 14: Forward Characteristics of Reverse Diode



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

5.0mΩ, 30V, N-Channel Power MOSFET
SRT03N050LD56TR-G

Figure 15: Avalanche Energy

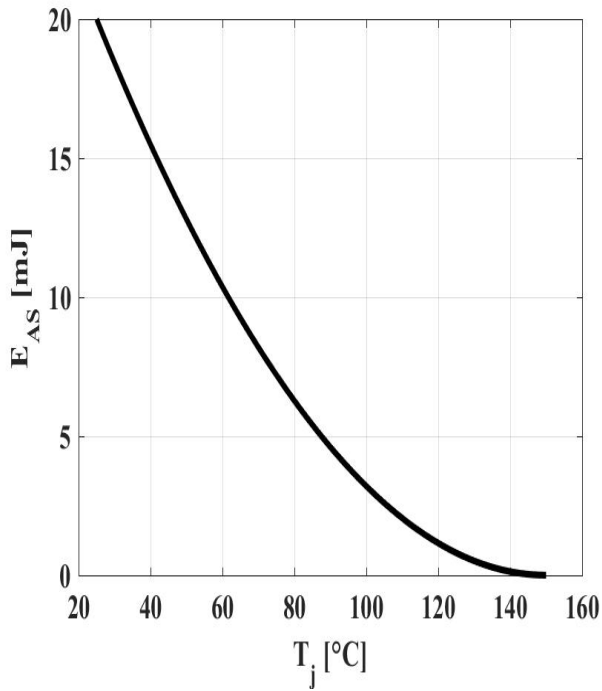

 $E_{AS}=f(T_j)$; $I_D=15.0A$; $V_{DD}=15V$

Figure 16: Typ. Capacitances

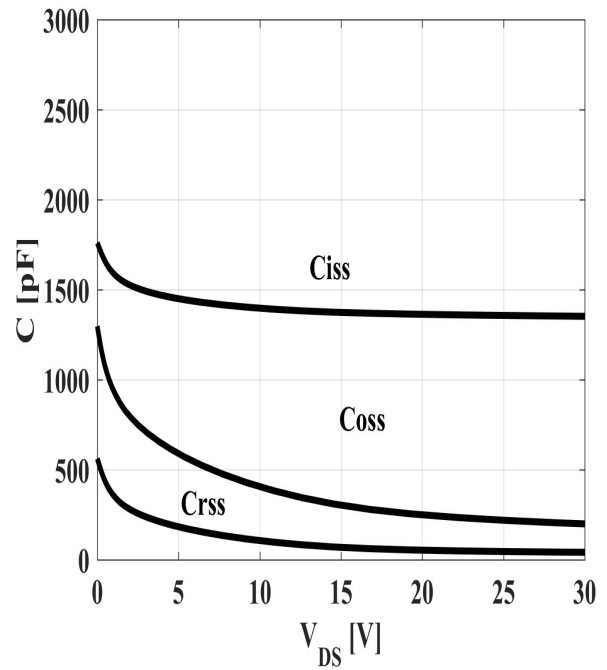
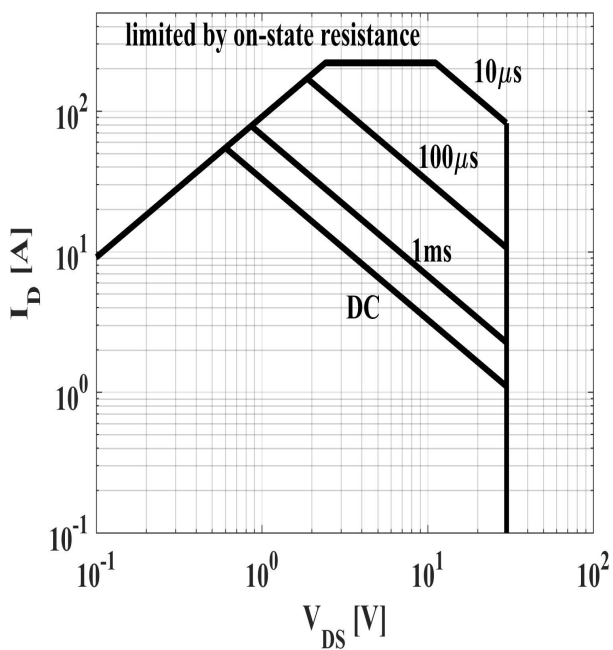
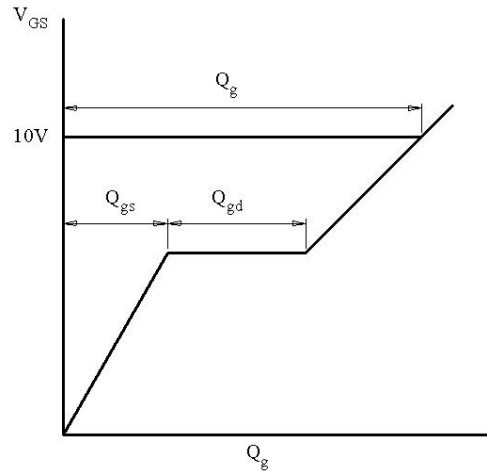
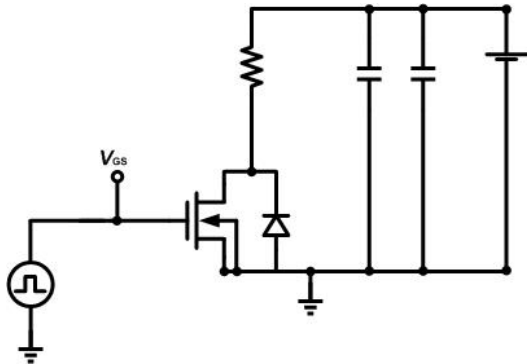
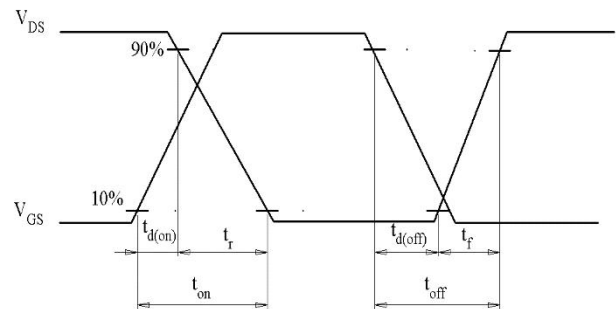
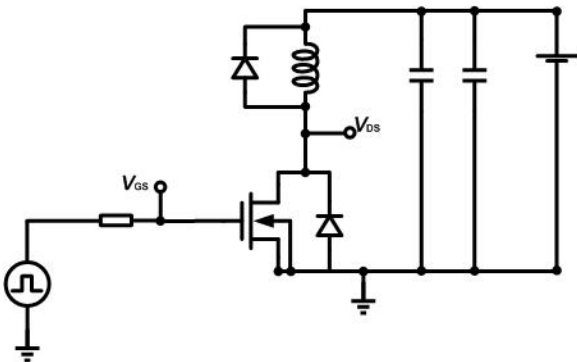
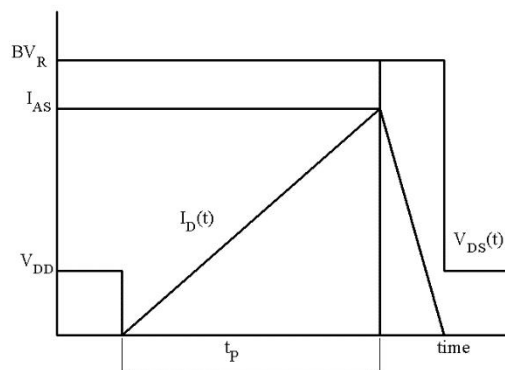
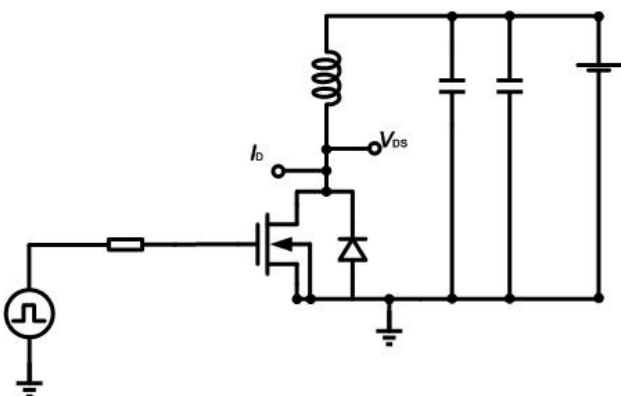
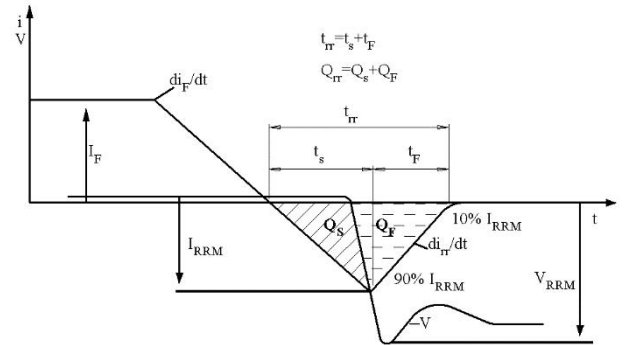
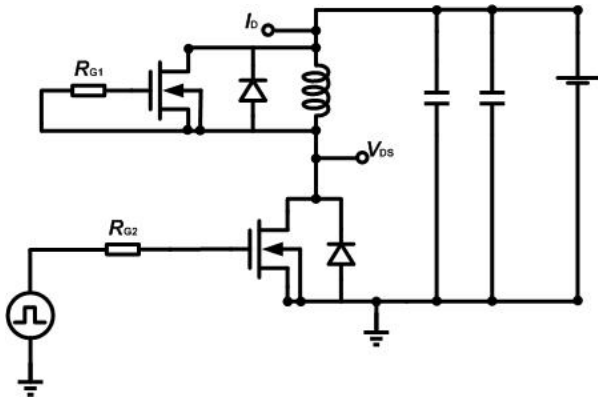

 $C=f(V_{DS})$; $V_{GS}=0$; $f=1MHz$

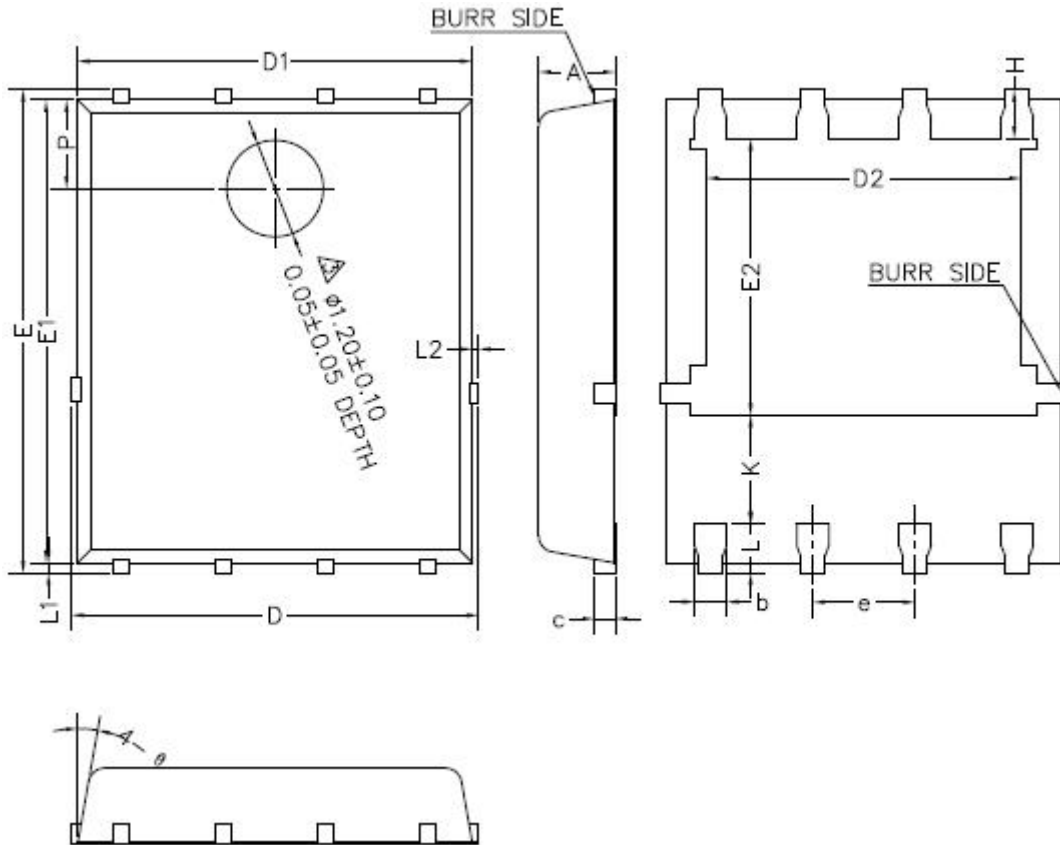
Figure 17: Safe Operating Area


 $I_D=f(V_{DS})$; $T_C=25^{\circ}C$; $V_{GS}>7V$; parameter: t_p

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



Mechanical Dimension
PDFN5*6-8 Unit: mm


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	0.90	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°



Sanrise Technology Limited Company

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