

General Description

The Sanrise SRT04N010L is a low voltage power MOSFET, fabricated using advanced split gate trench 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 synchronous rectification.

The SRT04N010L break down voltage is 40V and it has a high rugged avalanche characteristics. The SRT04N010L is available in PDFN5*6 package.

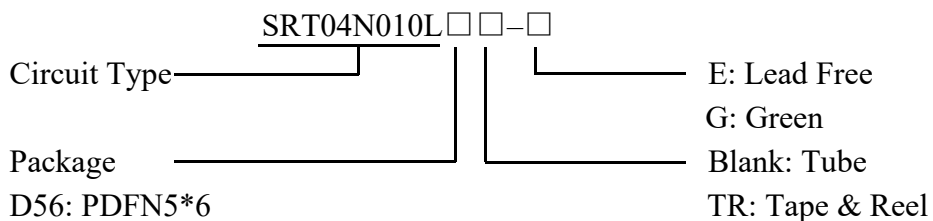
Features

- Ultra Low $R_{DS(ON)_{TYP}} = 0.88m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 105nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- Server/Telecom
- DC/DC Converter
- High Power Supply
- E-Tools
- BMS

Ordering Information



Symbol

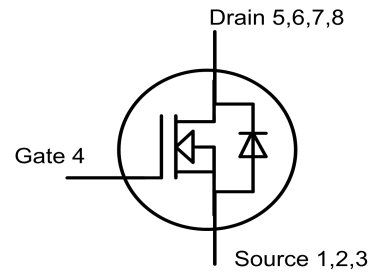
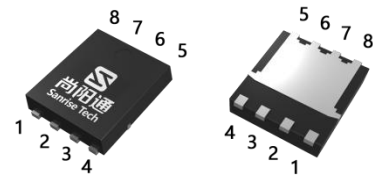


Figure 1 Symbol of SRT04N010L

Package Type



PDFN5*6

Figure 2 Package Type of SRT04N010L

Package	Part Number	Marking ID	Packing Type
PDFN5*6	SRT04N010LD56TR-G	SRT04N010LD56G	Tape & Reel

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current, Silicon	$T_C=25^{\circ}\text{C}$	I_D	280	A
	$T_C=100^{\circ}\text{C}$		198	
Pulsed Drain Current (Note 3)		I_{DM}	1120	A
Power Dissipation ($T_C = 25^{\circ}\text{C}$)		P_D	157	W
Avalanche Destructive Energy, Single Pulse (Note 5)		E_{AS_Limit}	625	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	121	mJ
Avalanche Energy, Repetitive (Note 3)		E_{AR}	0.3	mJ
Avalanche Current, Repetitive (Note 3)		I_{AR}	50.0	A
Continuous Diode Forward Current		I_S	280	A
Diode Pulse Current		$I_{S,PULSE}$	1120	A
Operating Junction Temperature		T_J	175	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 to 175	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	$^{\circ}\text{C}$

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. Current Limited by Package.
3. Repetitive Rating: Pulse width limited by maximum junction temperature
4. $I_{AS}=22\text{A}$, $V_{DD}=20\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
5. $I_{AS_Limit}=50.0\text{A}$, $V_{DD}=20\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

Thermal Resistance

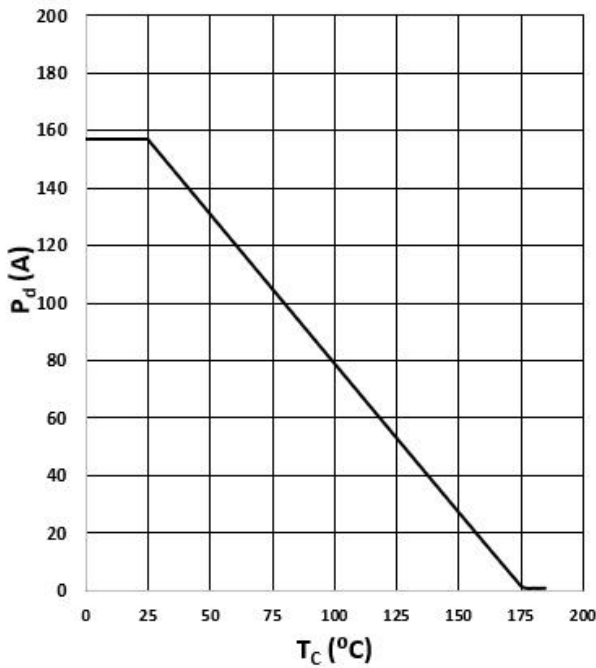
Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	PDFN5*6	R_{thJC}			0.95	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	PDFN5*6	R_{thJA}			50	

1.0mΩ, 40V, N-Channel Power MOSFET
SRT04N010L
Electrical Characteristics
 $T_J = 25^\circ\text{C}$, unless otherwise specified.

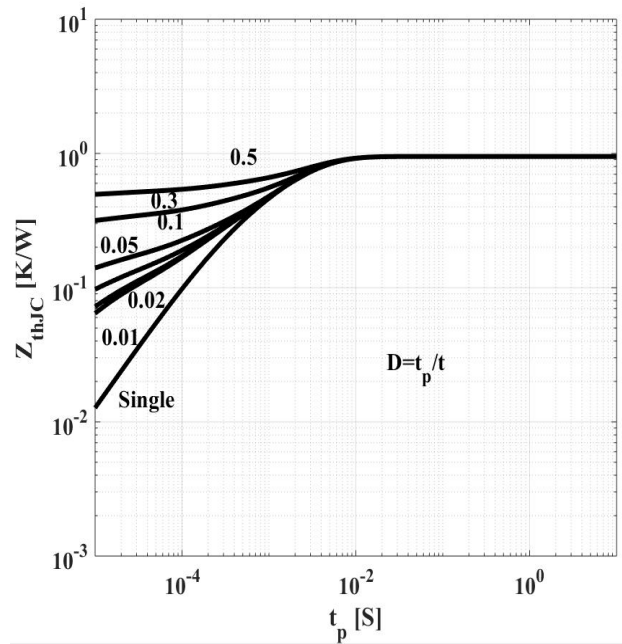
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	40			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =40V, V _{GS} =0V			1	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V			200	nA
	Reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V			-200	
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =0.25mA	1.2	1.8	2.4	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =60A		0.88	1.0	mΩ
			V _{GS} =4.5V, I _D =20A		1.40	2.2	
Gate Resistance		R _G	f=1MHz, Open Drain		1.1		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =20V, V _{GS} =0V, f=1MHz		7.4		nF
Output Capacitance		C _{OSS}			2.0		nF
Reverse Transfer Capacitance		C _{RSS}			125		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...32V		3.1		nF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			3.8		
Turn-on Delay Time		t _{d(on)}	V _{DD} =20V, I _D =60A R _G =1.6Ω, V _{GS} =10V		19		ns
Rise Time		t _r			57		
Turn-off Delay Time		t _{d(off)}			62		
Fall Time		t _f			13		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =20V, I _D =60A V _{GS} =0 to 10V		16		nC
Gate to Drain Charge		Q _{gd}			12		
Gate Charge Total		Q _g			105		
Gate Plateau Voltage		V _{plateau}			2.4		V
Gate Charge Total, sync FET		Q _g	V _{DD} =0.1V, V _{GS} =0 to 10V		99		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =60A		0.84	1.0	V
Reverse Recovery Time		t _{rr}	V _R =20V, I _F =60A dI _F /dt=100A/us		62		ns
Reverse Recovery Charge		Q _{rr}			130		nC
Peak Reverse Recovery Current		I _{rrm}			4.3		A

Note:

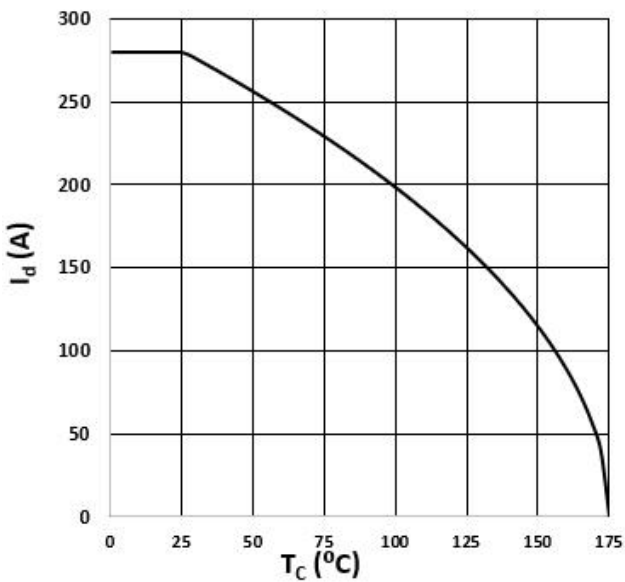
- $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 32V
- $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 32V

Typical Performance Characteristics
Figure 3: Power Dissipation


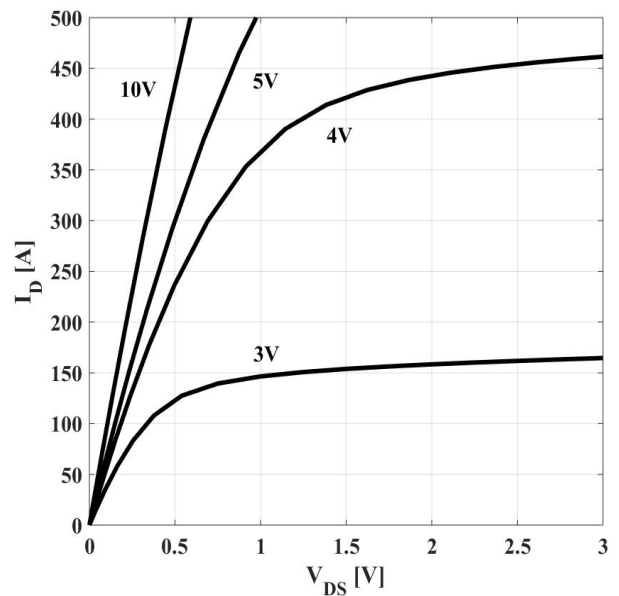
$$P_{tot}=f(T_c)$$

Figure 4: Max. Transient Thermal Impedance


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

Figure5: Drain Current


$$I_D=f(T_c); V_{GS} \geq 10V$$

Figure6: Typ. Output Characteristics


$$I_D=f(V_{DS}); T_j=25^\circ C; \text{ parameter: } V_{GS}$$

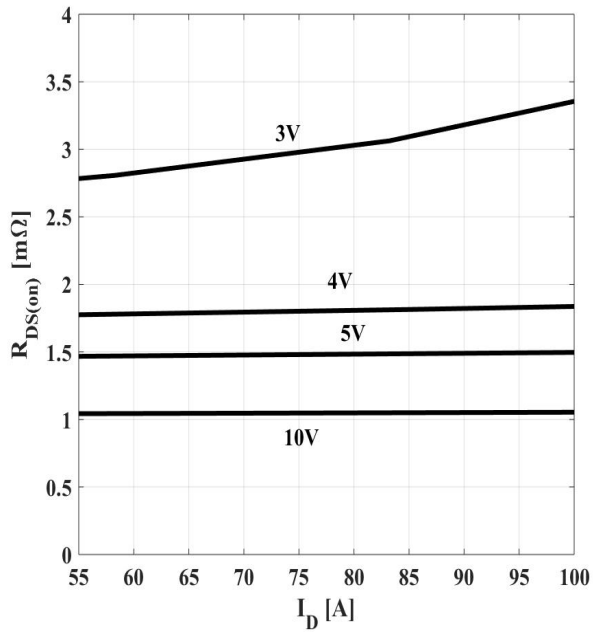
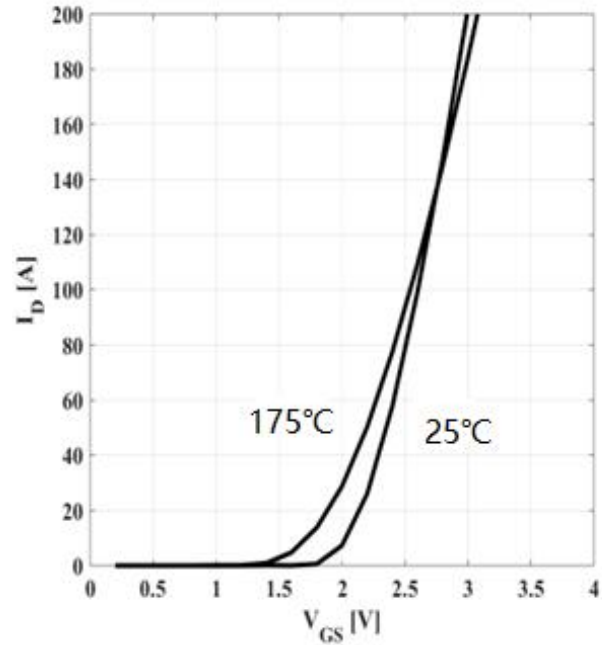
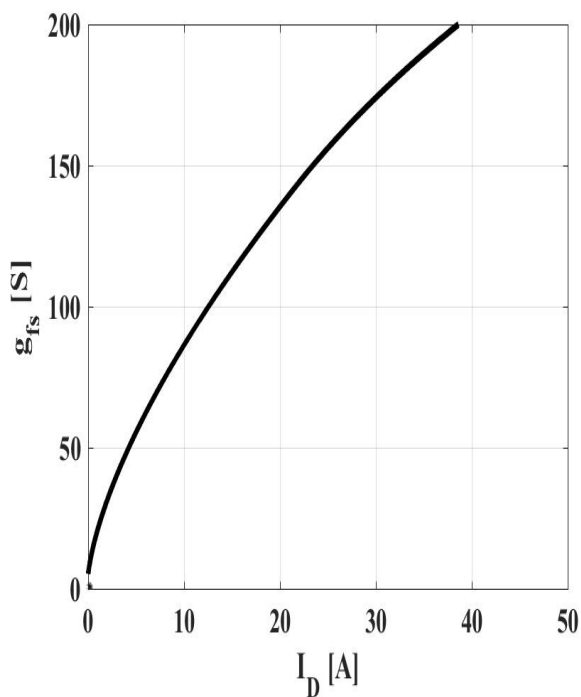
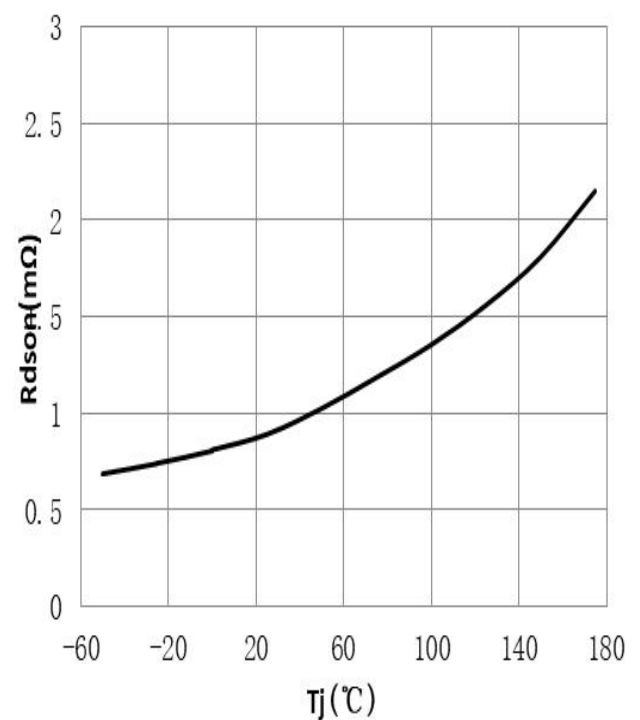
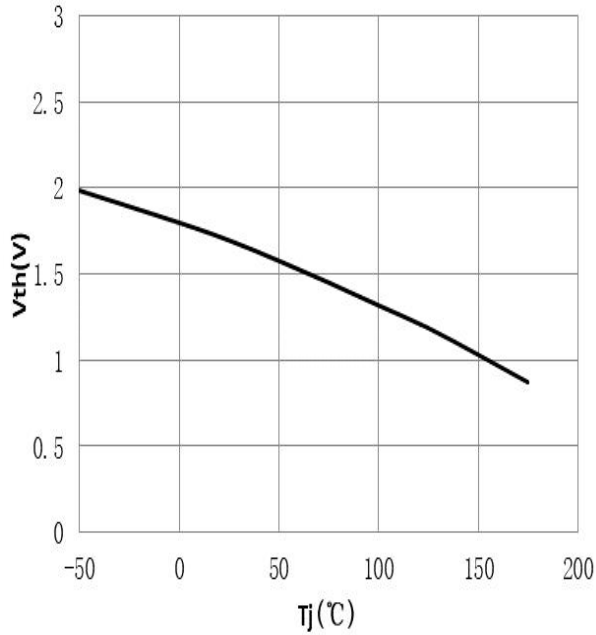
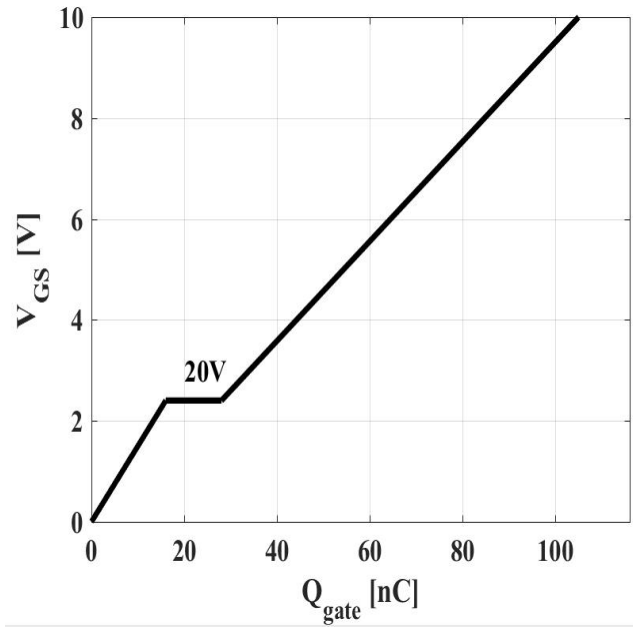
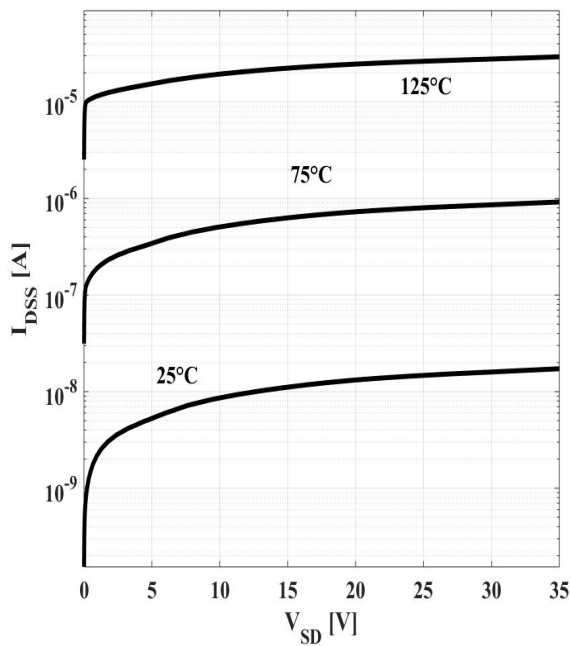
Figure7: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)}=f(I_D); T_j=25^{\circ}\text{C}; \text{parameter: } V_{GS}$
Figure8: Typ. Transfer Characteristics

 $I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max}; \text{parameter: } T_j$
Figure9: Typ. Forward Transconductance

 $g_{fs}=f(I_D); T_j=25^{\circ}\text{C}$
Figure10: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)}=f(T_j); I_D=60\text{A}; V_{GS}=10\text{V}$

Figure 11: Typ. Gate Threshold Voltage


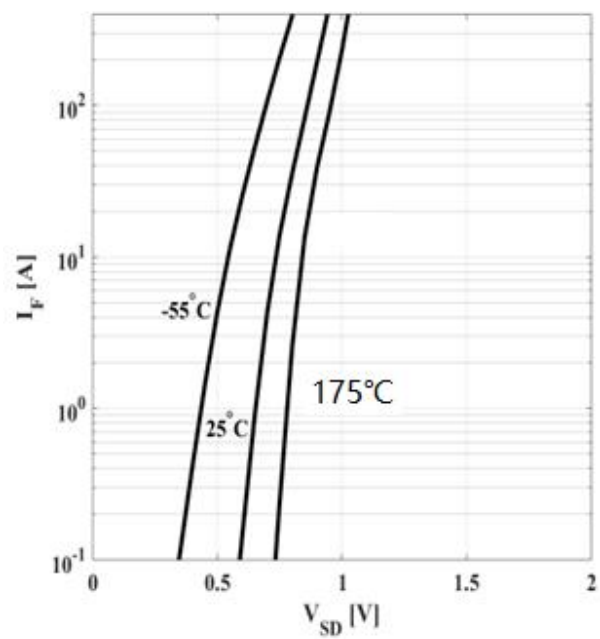
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_{DS} = 250\mu A$$

Figure 12: Typ. Gate Charge


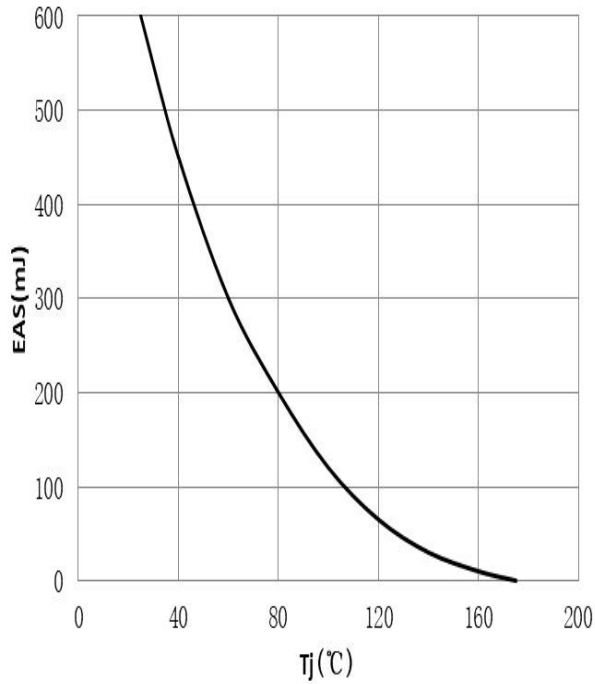
$$V_{GS} = f(Q_{gate}), I_D = 60A \text{ pulsed}$$

Figure 13: Drain-Source Leakage Current


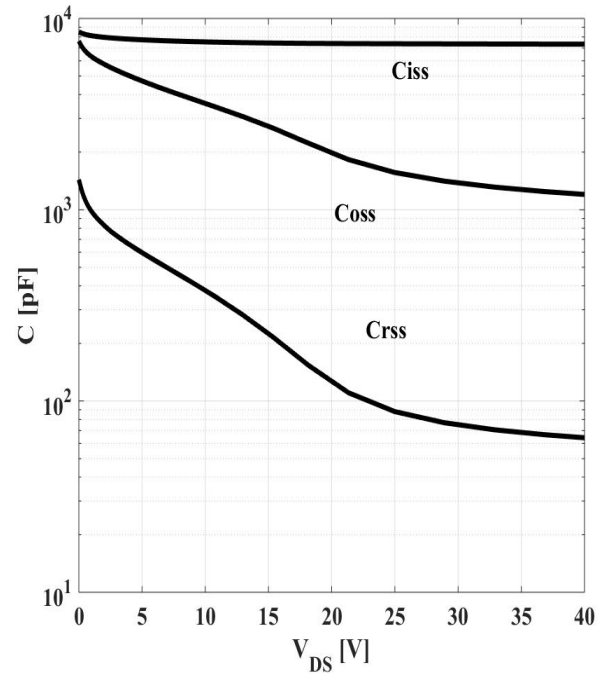
$$I_{DSS} = f(V_{DS}); V_{GS} = 0V; \text{parameter: } T_j$$

Figure 14: Forward Characteristics of Reverse Diode


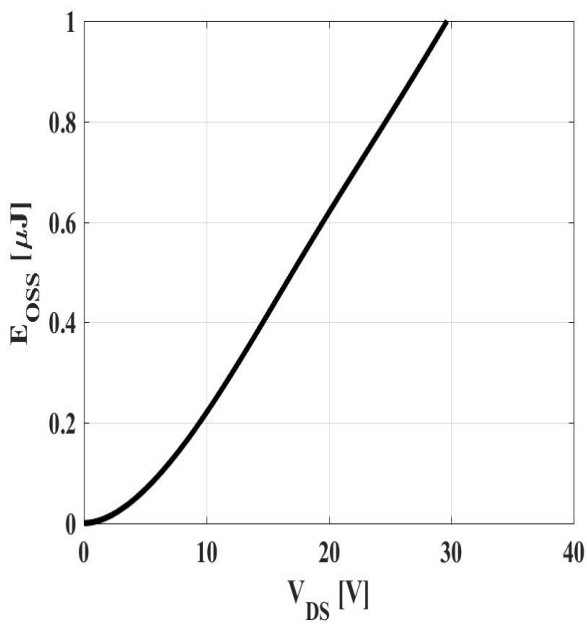
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy


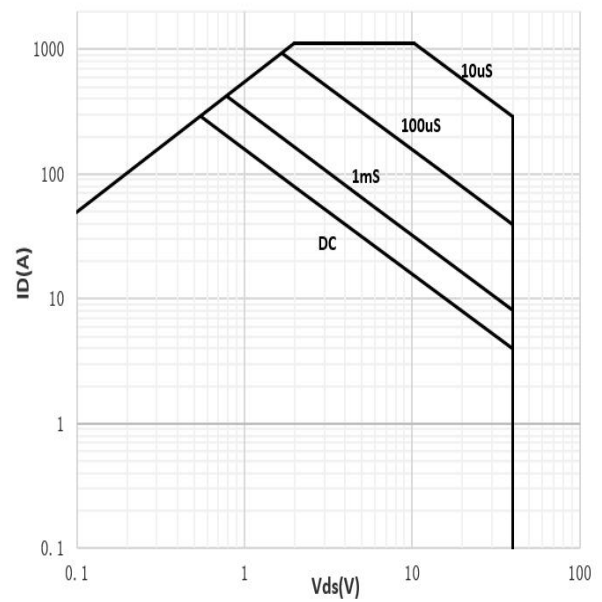
$$E_{AS}=f(T_j); I_D=50.0A; V_{DD}=20V$$

Figure 16: Typ. Capacitances


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

Figure 17: Coss Stored Energy


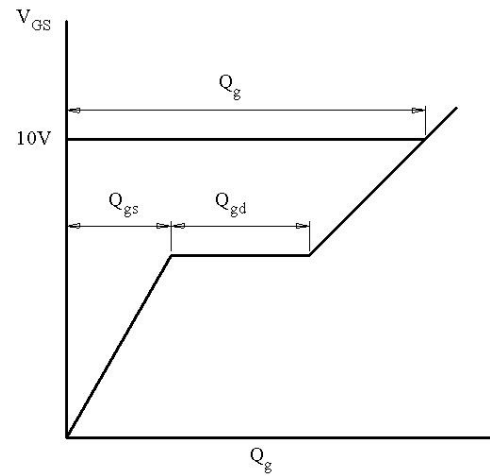
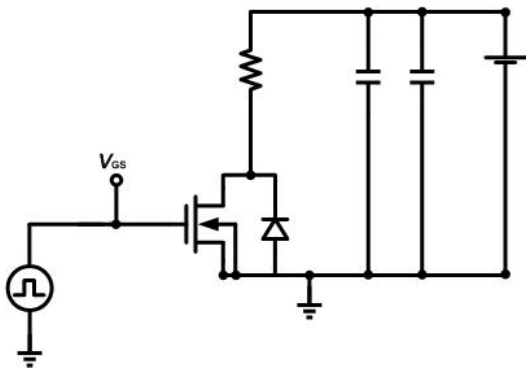
$$E_{OSS}=f(V_{DS})$$

Figure 18: Safe Operating Area


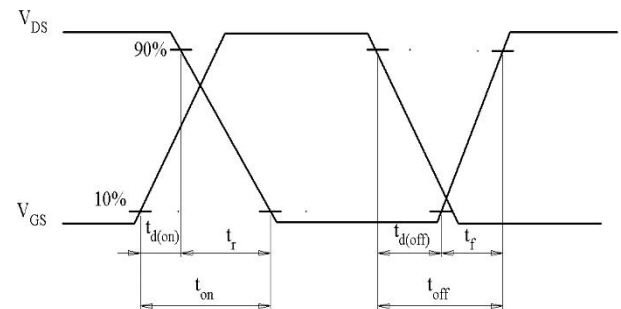
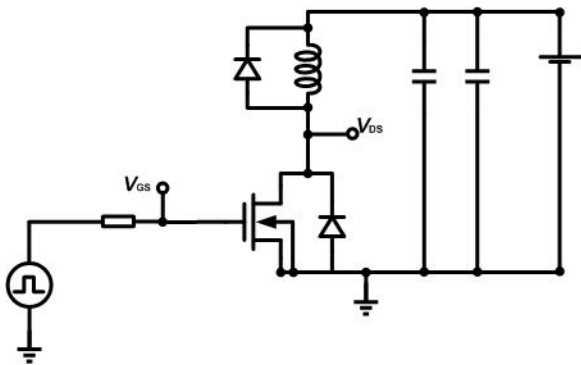
$$I_D = f(V_{DS}); T_c = 25^{\circ}C; V_{GS} > 7V; \text{parameter } t_p$$

Test Circuits

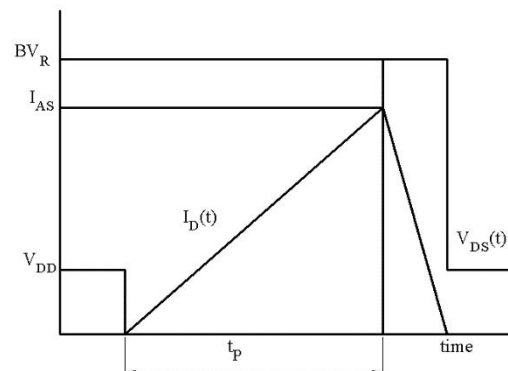
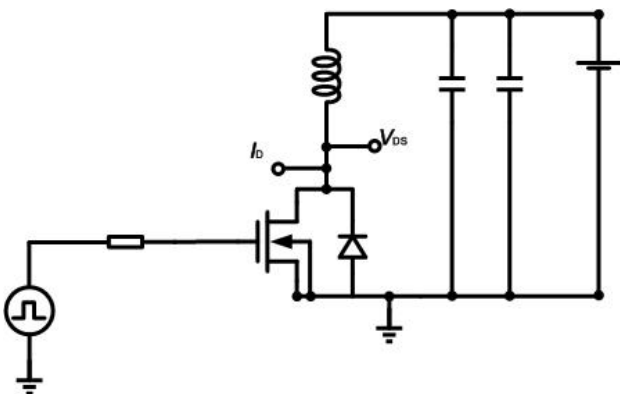
1. Gate Charge Test Circuit & Waveform



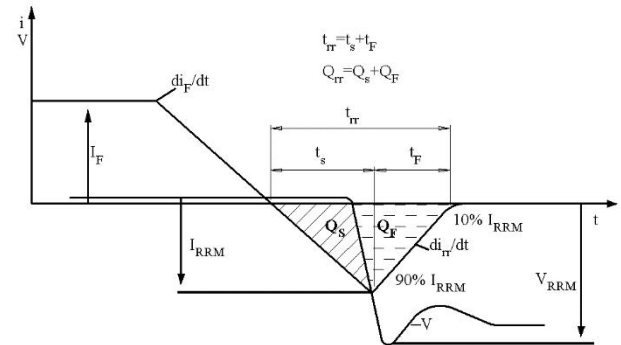
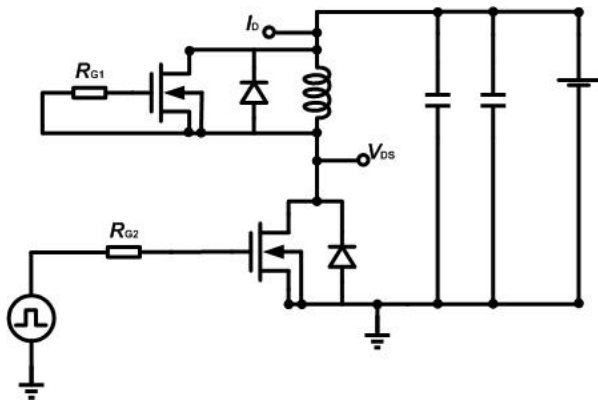
2. Switch Time Test Circuit

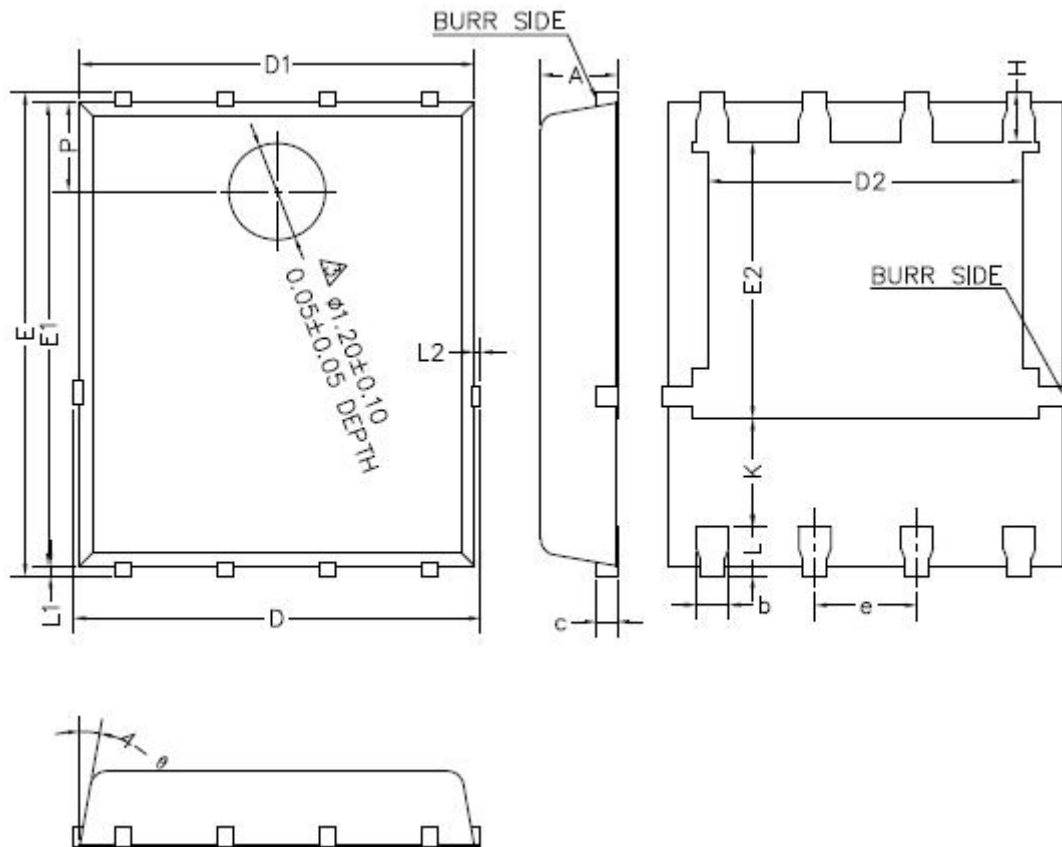


3. Unclamped Inductive Switching Test Circuit & Waveforms



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

<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

Sanrise Technology Limited Company

Rm.401, Building B, No. 666, Zhangheng Road,
Zhangjiang Hi-Tech Park, Shanghai, P.R.China

Tel: +86-21-68825918