1.6mΩ, 40V, N-Channel Power MOSFET SRT04N016L

General Description

The Sanrise SRT04N016L 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 SRT04N016L break down voltage is 40V and it has a high rugged avalanche characteristics.

The SRT04N016L is available in PDFN5*6 package.

Symbol

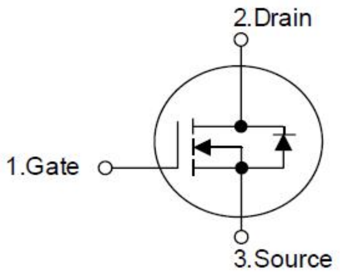


Figure 1 Symbol of SRT04N016L

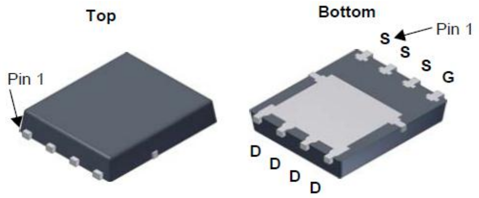
Features

- Ultra Low $R_{DS(ON)\_TYP} = 1.15m\Omega@V_{GS} = 10V$.
- Ultra Low Gate Charge, Qg=85nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

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

Package Type



PDFN5*6

Figure 2 Package Type of SRT04N016L

Ordering Information

SRT04N016L□□–□

Circuit Type

Package
D56: PDFN5*6

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
PDFN5*6	SRT04N016LD56TR-E	SRT04N016LD56TR-G	SRT04N016LD56E	SRT04N016LD56G	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,Package Limited	T_C=25ºC	I_D	100	A
	T_C=100ºC		100	
	T_C=125ºC		77	
Continuous Drain Current,Silicon	T_C=25ºC		173	
Pulsed Drain Current (Note 2)		I_{DM}	692	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	100	mJ
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	756	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.2	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	50.0	A
Continuous Diode Forward Current		I_S	173	A
Diode Pulse Current		$I_{S.PULSE}$	692	A
Max Power Dissipation		P_D	100	W
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}= 20A, V_{DD}= 20V, R_G= 25Ω, Starting T_J= 25°C
4. I_{AS_Limit}= 55A, V_{DD}= 20V, R_G= 25Ω, Starting T_J= 25°C

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance，Junction-to-Case	PDFN5*6	R_{thJC}			1.2	ºC/W
Thermal Resistance，Junction-to-Ambient	PDFN5*6	R_{thJA}			50	

Electrical Characteristics

T_J = 25℃, unless otherwise specified.

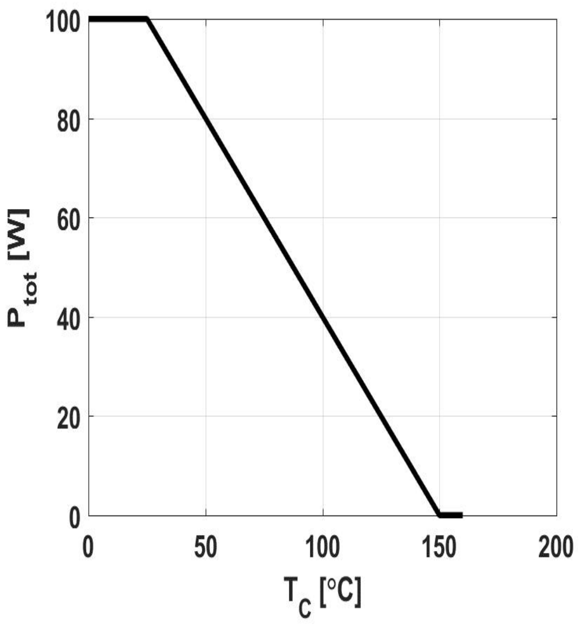
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	40			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=40V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			200	nA
	Reverse	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=50A		1.15	1.6	mΩ
			V_{GS}=4.5V, I_D=50A		2.0	3.05	
Gate Resistance		R_G	f=1MHz, Open Drain		1.3		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=20V, V_{GS}=0V, f=1MHz		5.8		nF
Output Capacitance		C_{OSS}			1.6		nF
Reverse Transfer Capacitance		C_{RSS}			98		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…32V		2.4		nF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			3.0		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=20V, I_D=50A R_G=1.6Ω, V_{GS}=10V		18		ns
Rise Time		t_r			55		
Turn-off Delay Time		$t_{d(off)}$			60		
Fall Time		t_f			12		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=20V, I_D=50A V_{GS}=0 to 10V		12.5		nC
Gate to Drain Charge		Q_{gd}			9.5		
Gate Charge Total		Q_g			85		
Gate Plateau Voltage		$V_{plateau}$			2.3		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		79		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=50A		0.84	1.0	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=50A dI_F/dt=100A/us		60		ns
Reverse Recovery Charge		Q_{rr}			120		nC
Peak Reverse Recovery Current		I_{rrm}			4.0		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 32V
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 32V

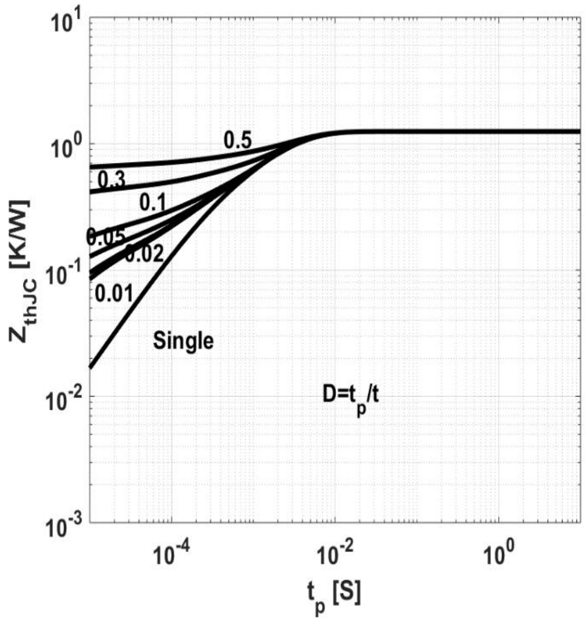
Typical Performance Characteristics

Figure 3: Power Dissipation



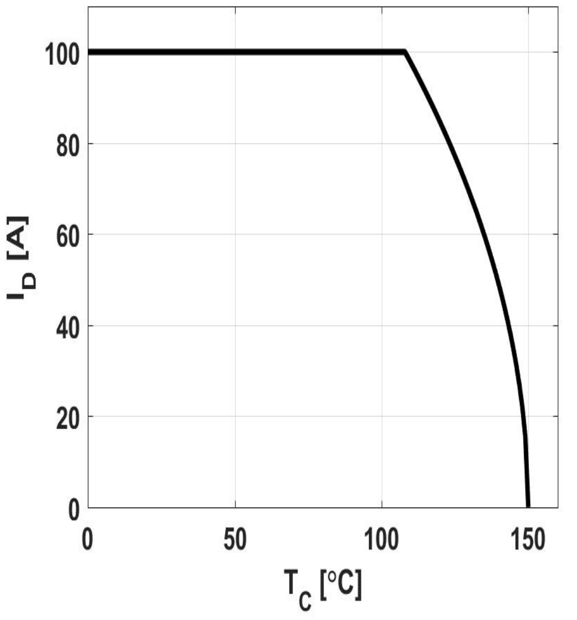
$P_{tot}=f(T_c)$

Figure 4: Max. Transient Thermal Impedance



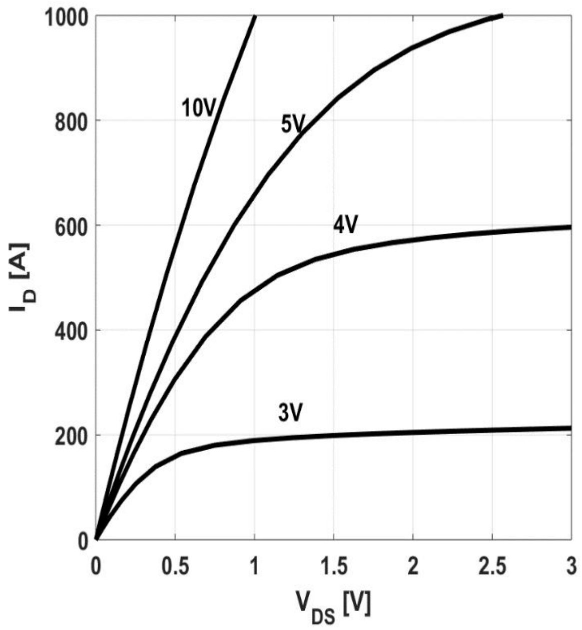
$Z_{(thJC)}=f(t_p)$;parameter:$D=t_p/T$

Figure5: Drain Current



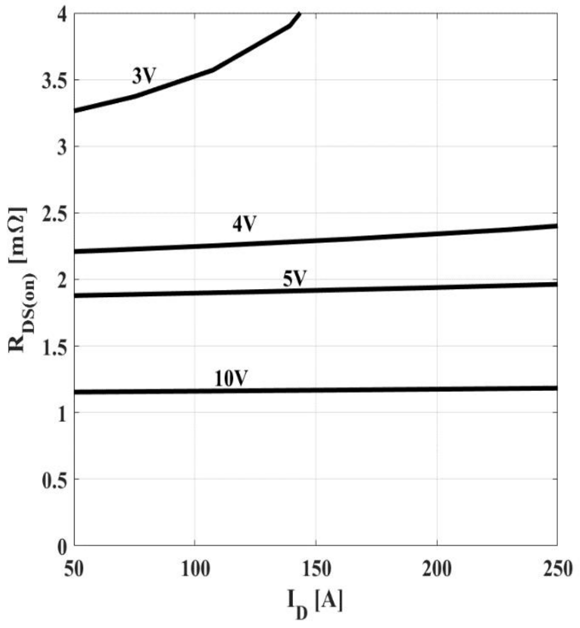
$I_D=f(T_C)$;$V_{GS}\geq 10V$

Figure6: Typ. Output Characteristics



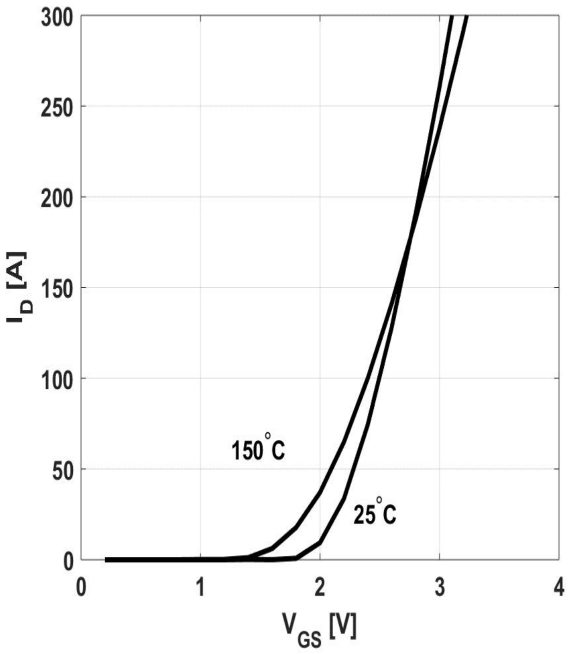
$I_D=f(V_{DS})$;Tj=25°C; parameter:V_{GS}

Figure7: Typ. Drain-Source On-State Resistance



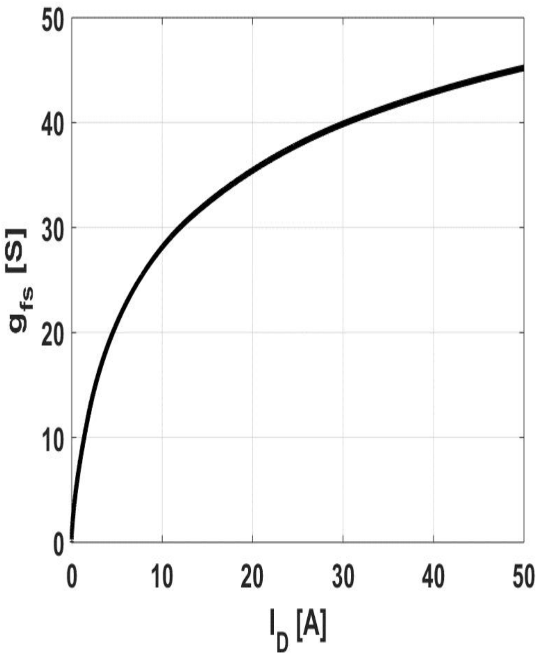
$R_{DS(ON)}=f(I_D)$;T_j=25ºC; parameter:V_{GS}

Figure8: Typ. Transfer Characteristics



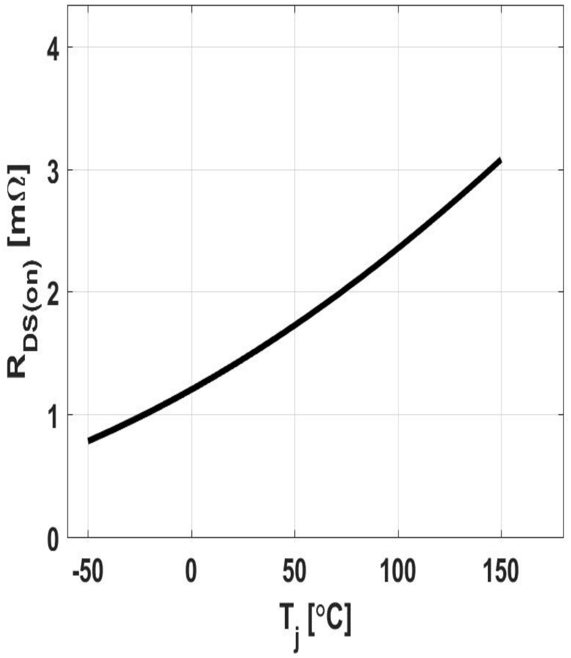
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Figure9: Typ. Forward Transconductance



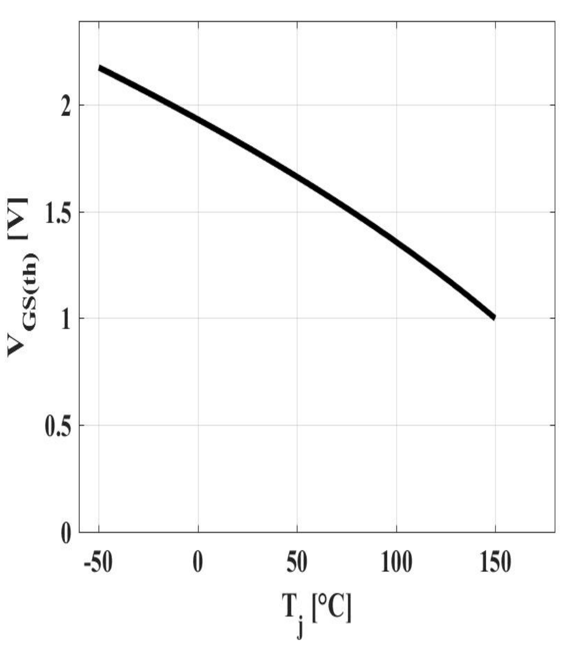
$g_{fs}=f(I_D)$; T_j=25°C

Figure10: Typ. Drain-Source On-State Resistance



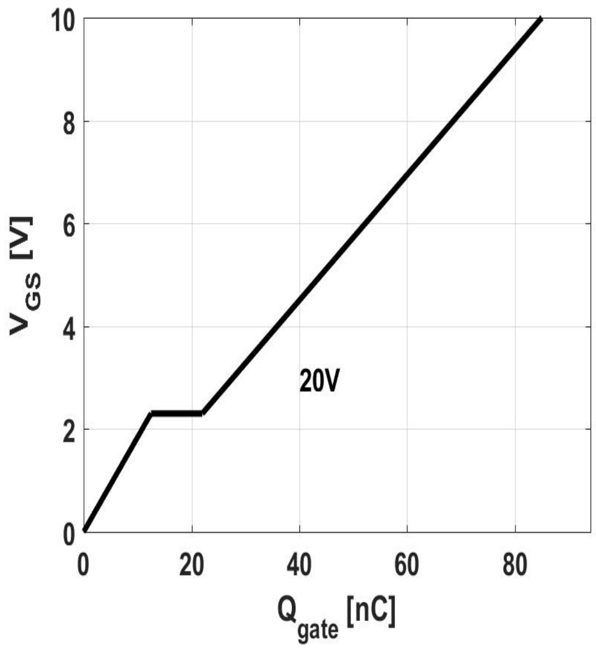
$R_{DS(ON)}=f(T_j)$;I_D=50A;V_{GS}=10V

Figure11: Typ.Gate Threshold Voltage



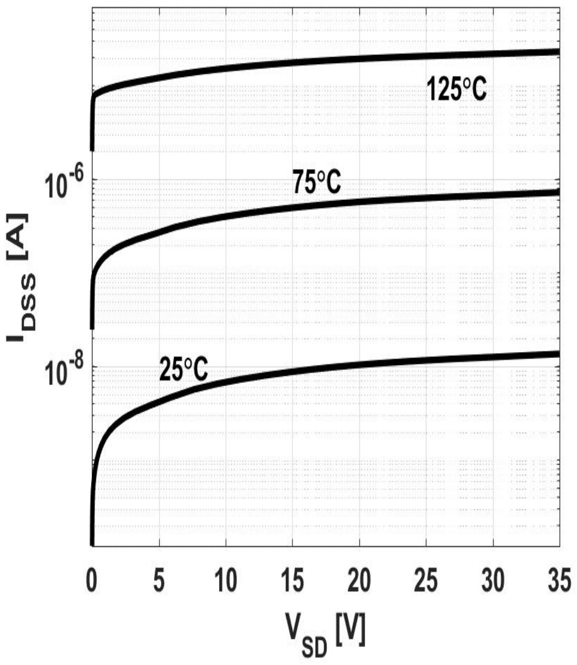
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; I_{DS}=250μA

Figure 12: Typ. Gate Charge



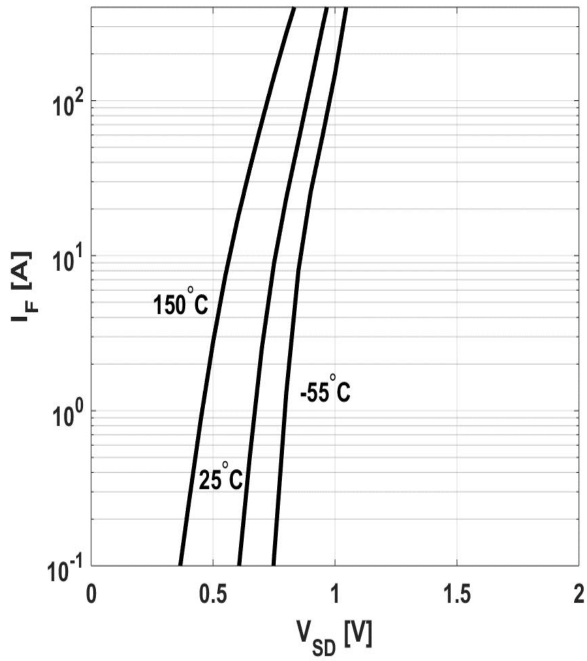
V_{GS}= f(Q_{gate}), I_D=50A pulsed

Figure 13: Drain-Source Leakage Current



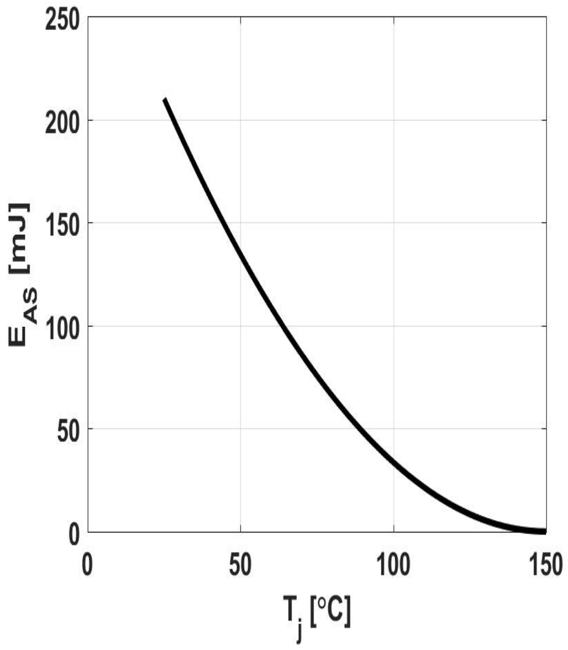
I_{DSS}=f(V_{DS}); V_{GS}=0V; parameter: T_j

Figure 14: Forward Characteristics of Reverse Diode



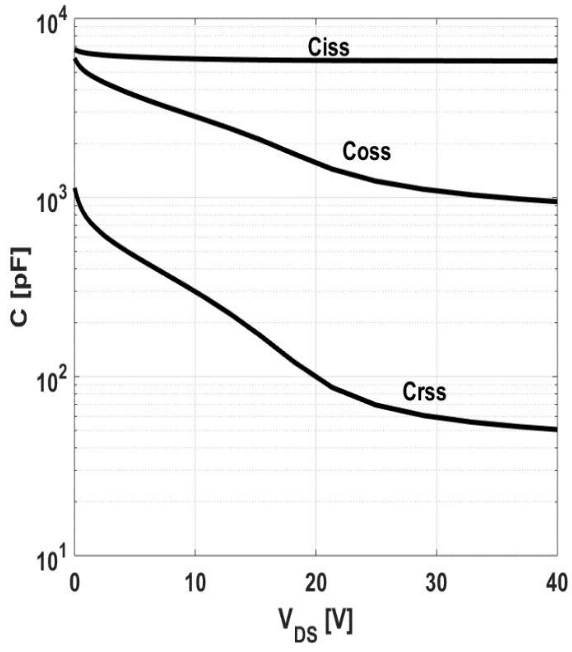
I_F=f(V_{SD}); parameter: T_j

Figure 15: Avalanche Energy



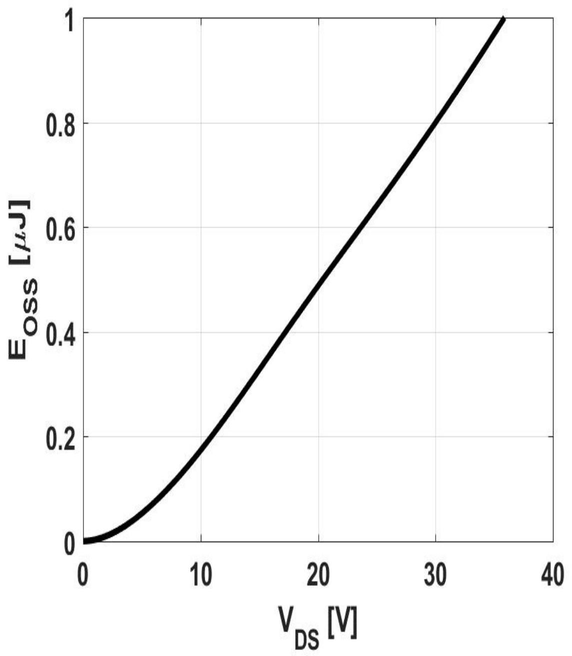
$E_{AS}=f(T_j)$;$I_D=50.0A$; $V_{DD}=20V$

Figure 16: Typ. Capacitances



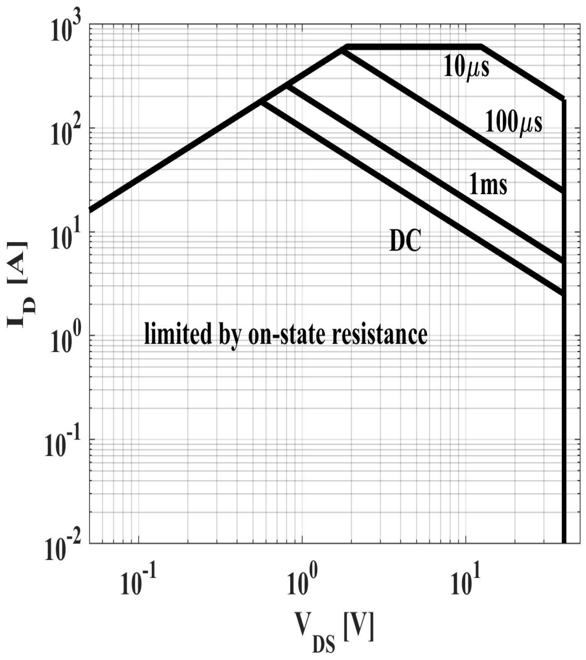
$C=f(V_{DS})$; $V_{GS}=0$; f=1MHz

Figure 17: C_{OSS} Stored Energy



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

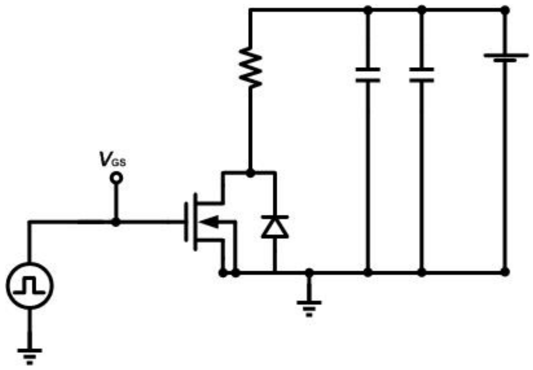
Figure 18: Safe Operating Area

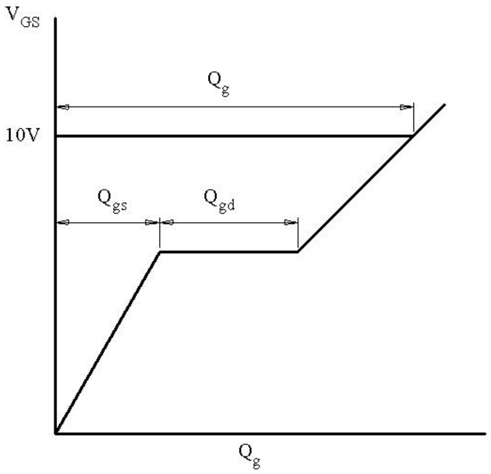


$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

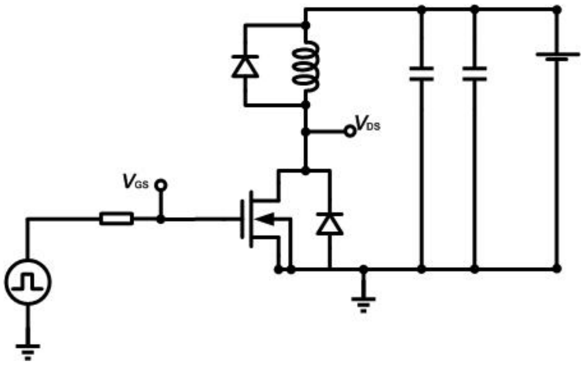
Test Circuits

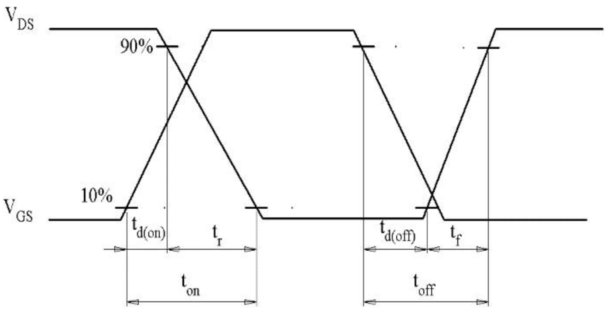
1. Gate Charge Test Circuit & Waveform



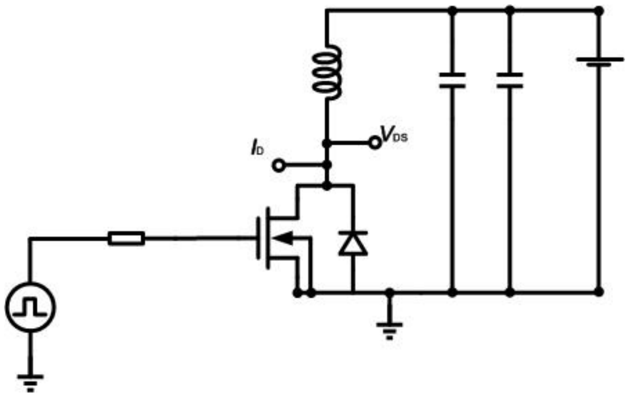


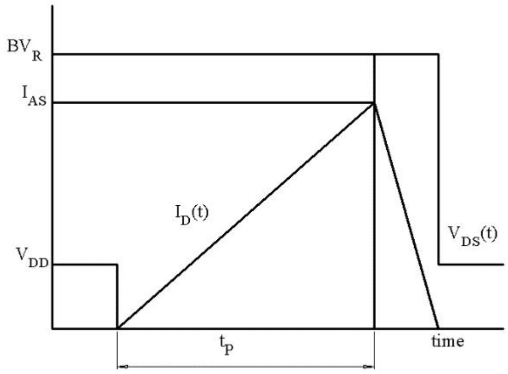
2. Switch Time Test Circuit



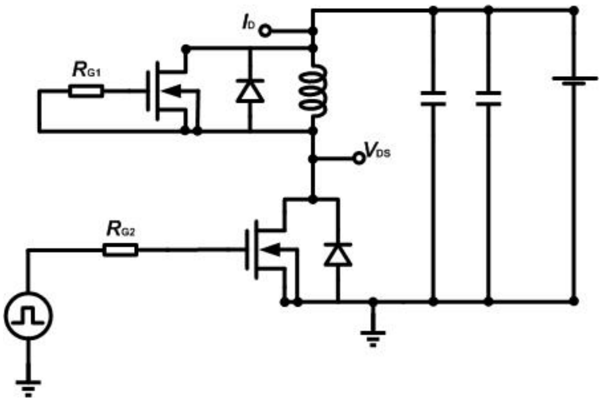


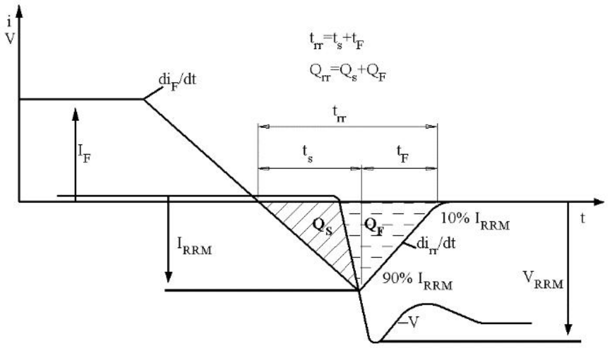
3. Unclamped Inductive Switching Test Circuit & Waveforms





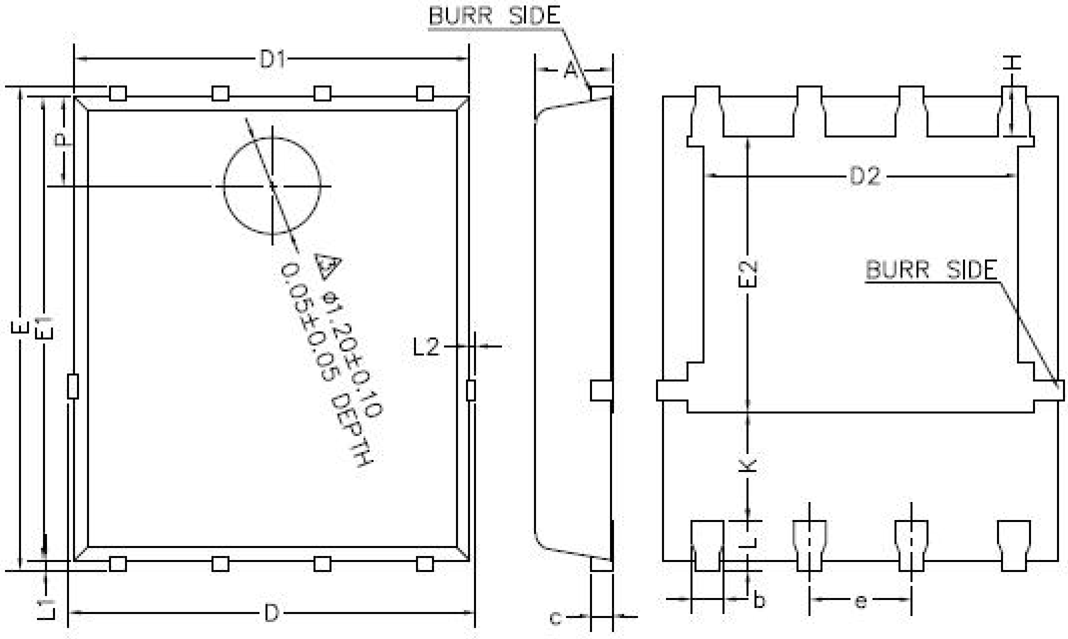
4. Test Circuit and Waveform for Diode Characteristics

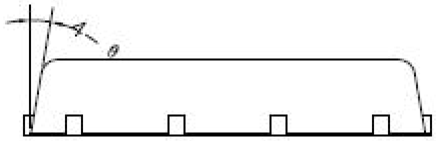




Mechanical Dimensions

PDFN5*6-8 **Unit: mm**





Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	1.0	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	8º	10º	12º

TM
Sanrise Tech
尚阳通

Sanrise Technology Limited Company

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IMPORTANT NOTICE

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