3.7mΩ, 40V, N-Channel Power MOSFET SRT04N037L

General Description

The Sanrise SRT04N037L 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.

The SRT04N037L break down voltage is 40V and it has a high rugged avalanche characteristics.

The SRT04N037L is available in PDFN5*6 and PDFN3.3*3.3 packages.

Symbol

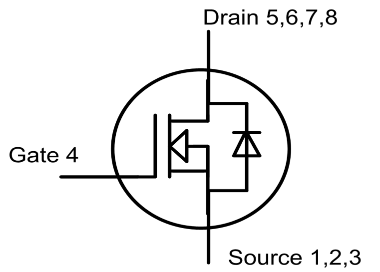


Figure 1 Symbol of SRT04N037L

Features

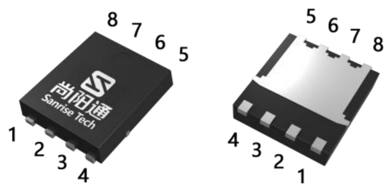
- Ultra Low

$R_{DS(ON)\_TYP}$ = 3.25mΩ,PDFN5*6@V_{GS} = 10V.

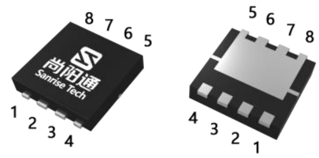
$R_{DS(ON)\_TYP}$ = 3.55mΩ,PDFN3.3*3.3@V_{GS} = 10V.

- Ultra Low Gate Charge, Qg=26nC typ.
- Fast switching capability
- Robust design with better EAS performance
- Non-automotive Qualified

Package Type



PDFN5*6



PDFN3.3*3.3

Figure 2 Package Type of SRT04N037L

Application

- Motor Driver
- E-Tools
- BMS
- Synchronous Rectifier

Ordering Information

SRT04N037L□□-□

Circuit Type

Package
D56: PDFN5*6
D33: PDFN3.3*3.3

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
PDFN5*6	SRT04N037LD56TR-G	SRT04N037LD56G	Tape & Reel
PDFN3.3*3.3	SRT04N037LD33TR-G	04N037LD33G	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=25°C	I_D	PDFN5*6	80	A
			PDFN3.3*3.3	60	
	T_C=125°C		PDFN5*6	40	
			PDFN3.3*3.3	38	
Continuous Drain Current, Silicon	T_C=25°C		PDFN5*6	90	
			PDFN3.3*3.3	86	
Pulsed Drain Current (Note 2)		I_{DM}	PDFN5*6	240	A
			PDFN3.3*3.3	180	
Power Dissipation (T_C = 25°C)		P_D	54		W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	225		mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	36		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.1		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	20		A
Continuous Diode Forward Current		I_S	80		A
Diode Pulse Current		$I_{S.PULSE}$	240		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:

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}= 12A, V_{DD}= 20V, R_G= 25Ω, Starting T_J= 25°C
4. I_{AS_Limit}= 30A, 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}			2.3	°C/W
	PDFN3.3*3.3	R_{thJC}			2.3	
Thermal Resistance，Junction-to-Ambient	PDFN5*6	R_{thJA}			50	
	PDFN3.3*3.3	R_{thJA}			60	

Electrical Characteristics

T_J = 25℃, unless otherwise specified.

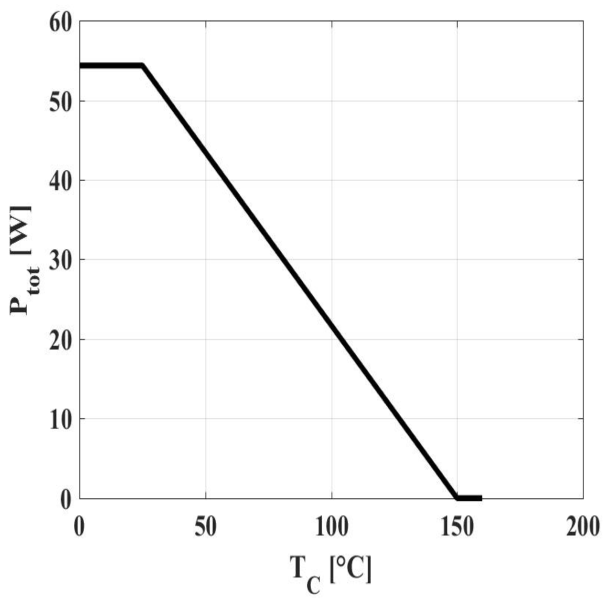
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	40			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=40V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			200	nA
	Reverse	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=20A (DFN5*6)		3.25	3.7	mΩ
			V_{GS}=10V,I_D=20A(DFN3.3*3.3)		3.55	4.1	
			V_{GS}=4.5V, I_D=5A (DFN5*6)		5.4	8.0	
			V_{GS}=4.5V, I_D=5A(DFN3.3*3.3)		5.7	8.5	
Gate Resistance		R_G	f=1MHz, Open Drain		3.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=20V, V_{GS}=0V, f=1MHz		1.8		nF
Output Capacitance		C_{OSS}			487		pF
Reverse Transfer Capacitance		C_{RSS}			31		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…20V		760		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			936		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=20V, I_D=20A R_G=1.6Ω, V_{GS}=10V		13		ns
Rise Time		t_r			35		
Turn-off Delay Time		$t_{d(off)}$			40		
Fall Time		t_f			8		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=20V, I_D=20A V_{GS}=0 to 10V		3.9		nC
Gate to Drain Charge		Q_{gd}			3.0		
Gate Charge Total		Q_g			26		
Gate Plateau Voltage		$V_{plateau}$			2.4		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		24.6		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=20A		0.82	1.0	V
Reverse Recovery Time		t_{rr}	V_R=20V, I_F=20A dI_F/dt=100A/us		46		ns
Reverse Recovery Charge		Q_{rr}			70		nC
Peak Reverse Recovery Current		I_{rrm}			3.1		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 32 V

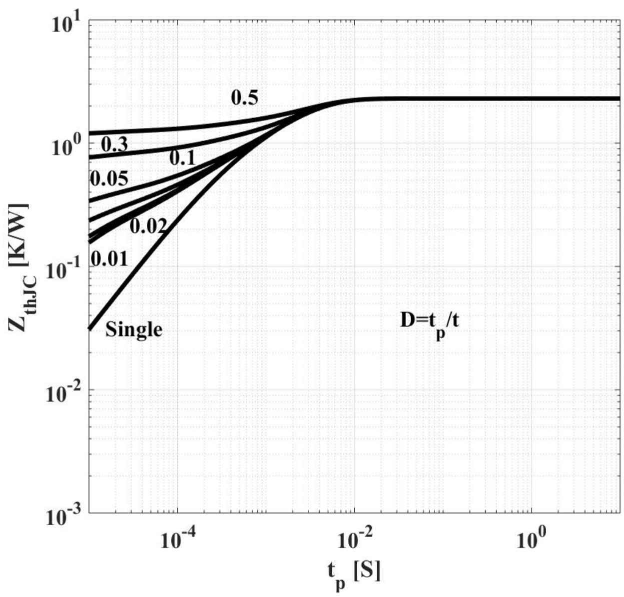
Typical Performance Characteristics

Figure 3: Power Dissipation



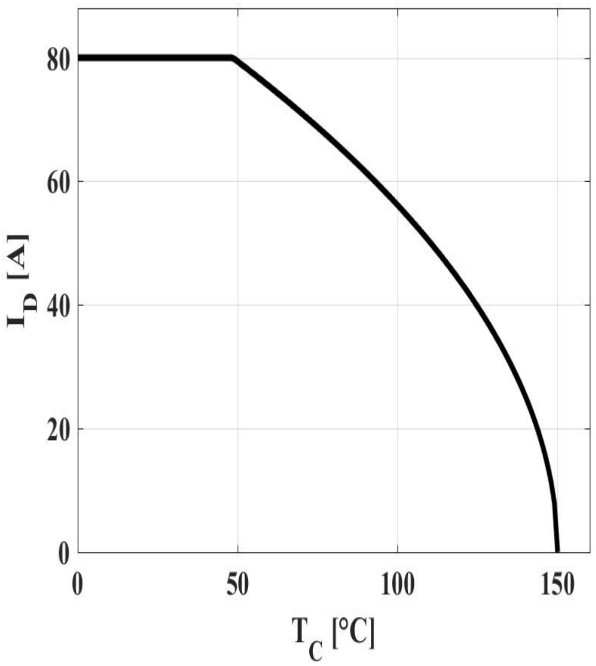
$P_{tot}=f(T_c)$

Figure 4: Max. Transient Thermal Impedance



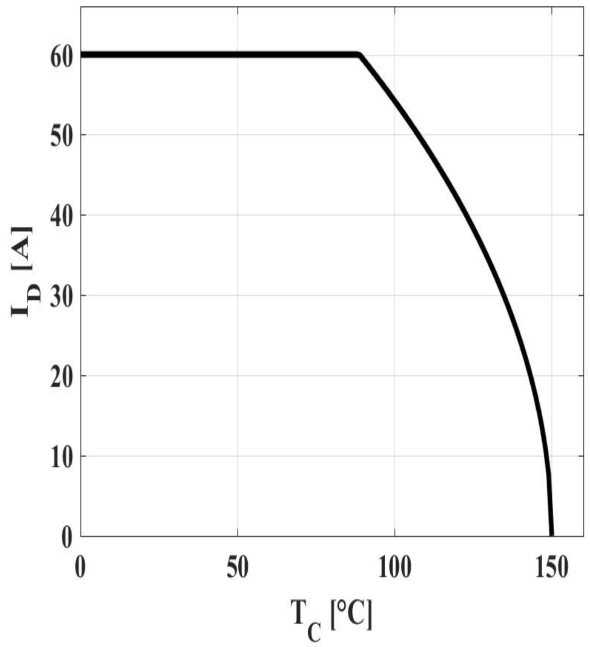
$Z_{(thJC)}=f(t_p)$;parameter:$D=t_p/T$

Figure5A: Drain Current(PDFN5*6)



$I_D=f(T_C)$;$V_{GS}\geq10V$

Figure5B: Drain Current(PDFN3.3*3.3)



$I_D=f(T_C)$;$V_{GS}\geq10V$

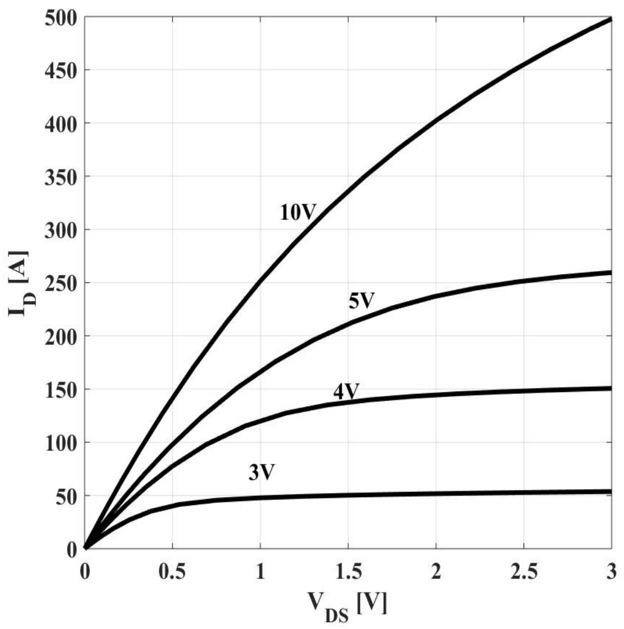
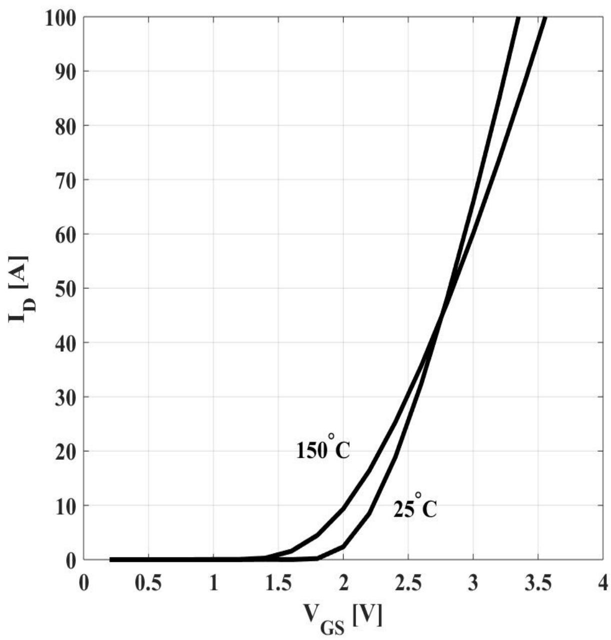
Figure6: Typ. Output Characteristics	Figure7: Typ. Transfer Characteristics
	
I_D=f(V_{DS});Tj=25ºC; parameter:V_{GS}	I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

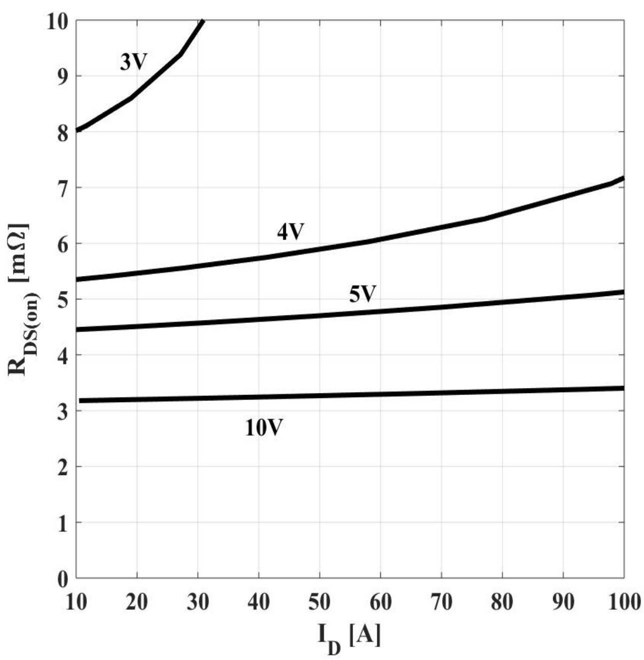
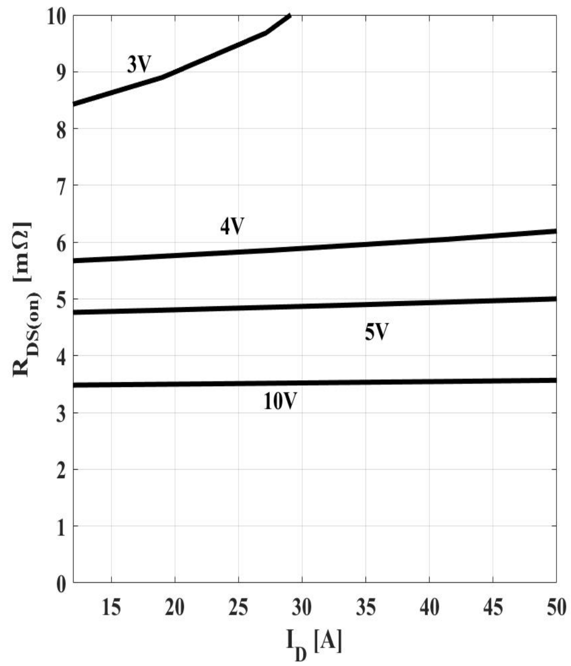
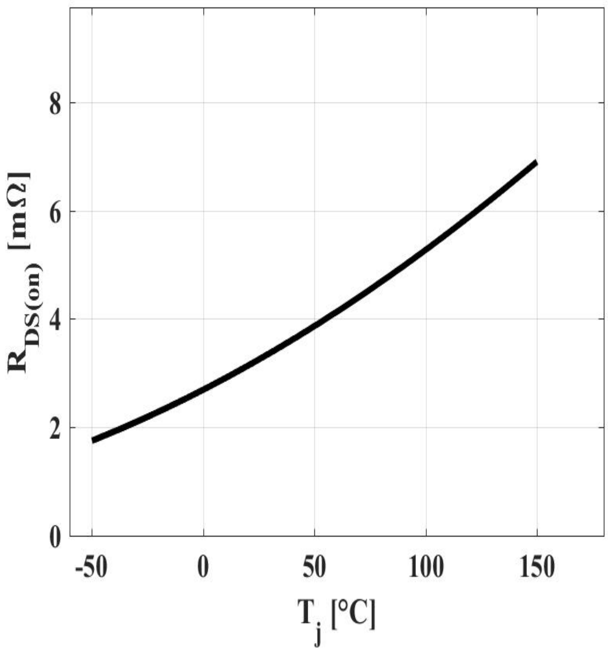
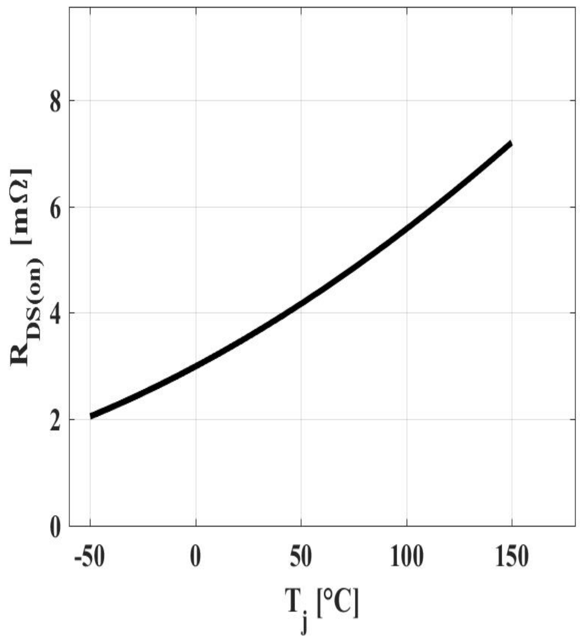
Figure8A: Typ. Drain-Source On-State Resistance (PDFN5*6)	Figure8B: Typ. Drain-Source On-State Resistance(PDFN3.3*3.3)
	
$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter:V_{GS}	$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter:V_{GS}

Figure9A: Typ. Drain-Source On-State Resistance (PDFN5*6)



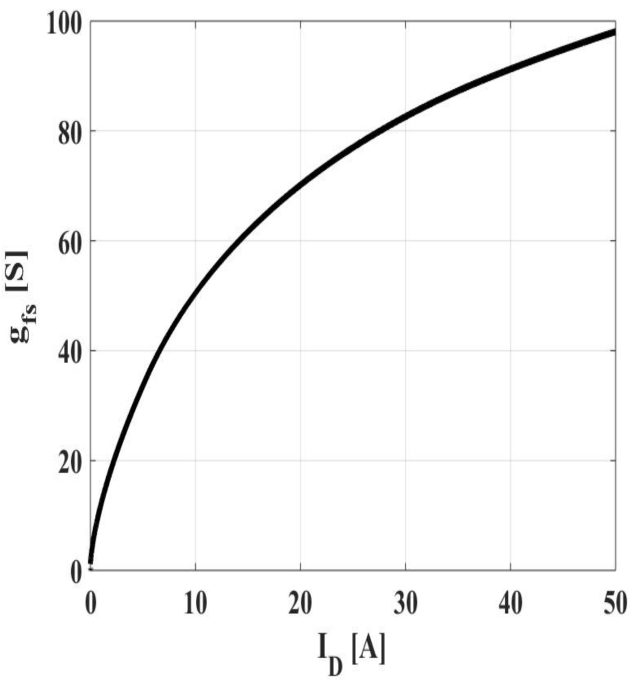
$R_{DS(ON)}$=f(T_j);I_D=20A;V_{GS}=10V

Figure9B: Typ. Drain-Source On-State Resistance (PDFN3.3*3.3)



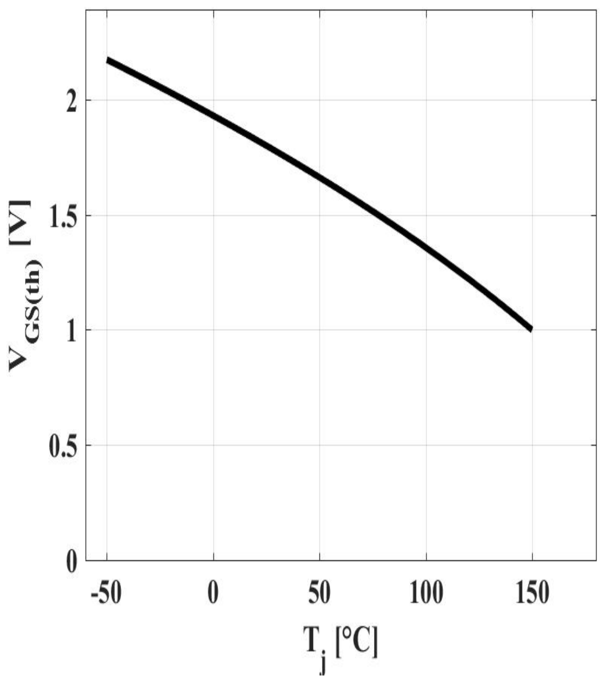
$R_{DS(ON)}$=f(T_j);I_D=20A;V_{GS}=10V

Figure10: Typ. Forward Transconductance



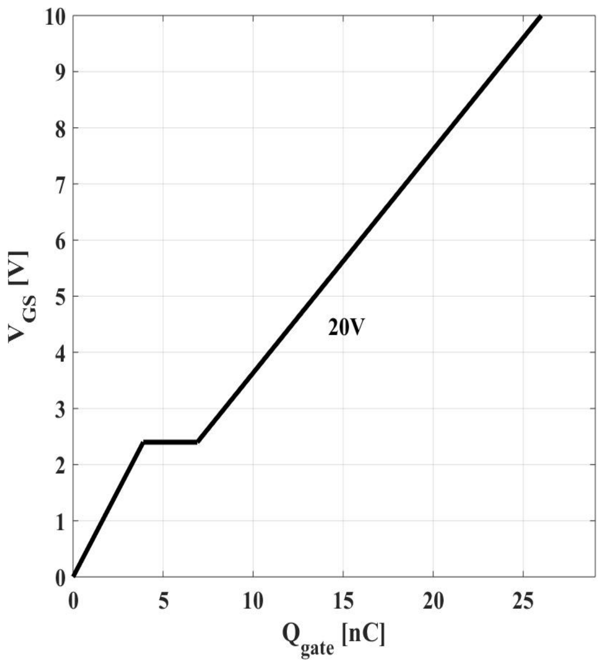
g_{fs}=f(I_D); T_j=25°C

Figure11: Typ.Gate Threshold Voltage



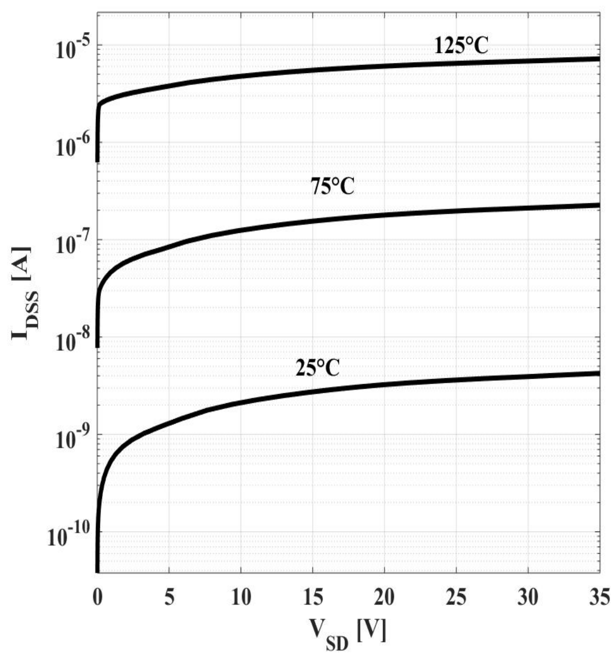
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; I_{DS}=250μA

Figure 12: Typ. Gate Charge



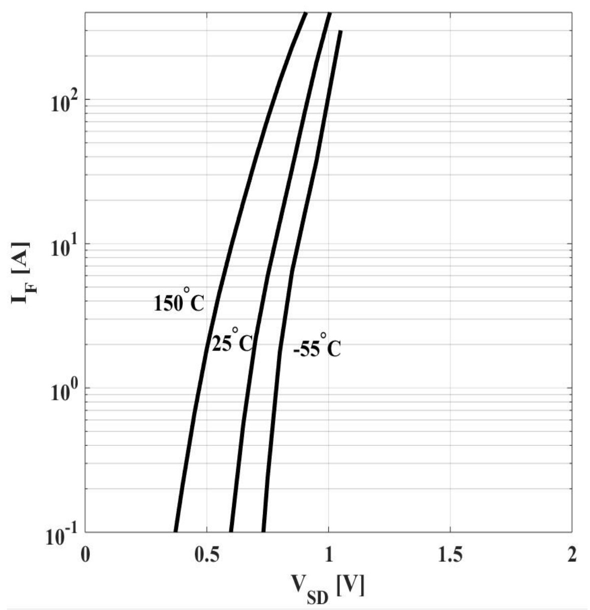
V_{GS}= f(Q_{gate}), I_D=20A pulsed

Figure 13: Drain-Source Leakage Current



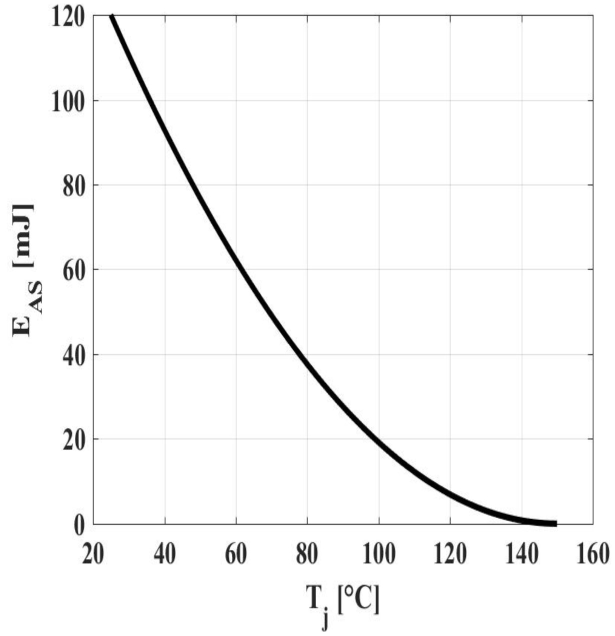
I_{DSS}=f(V_{DS}); V_{GS}=0V; parameter: T_j

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=20.0A; V_{DD}=20V

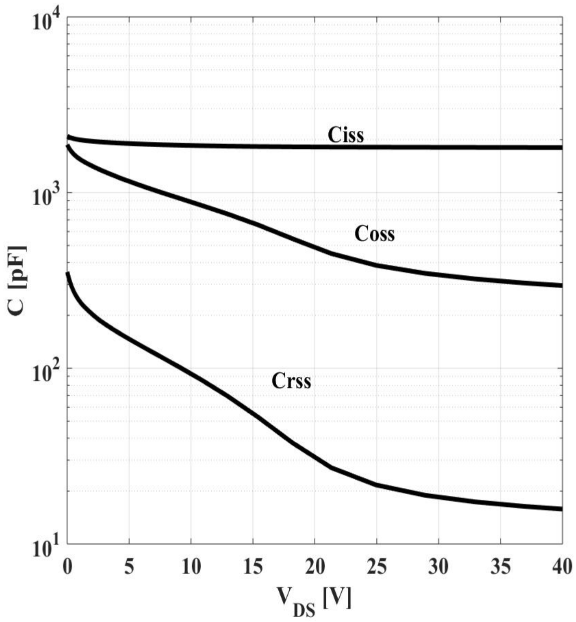
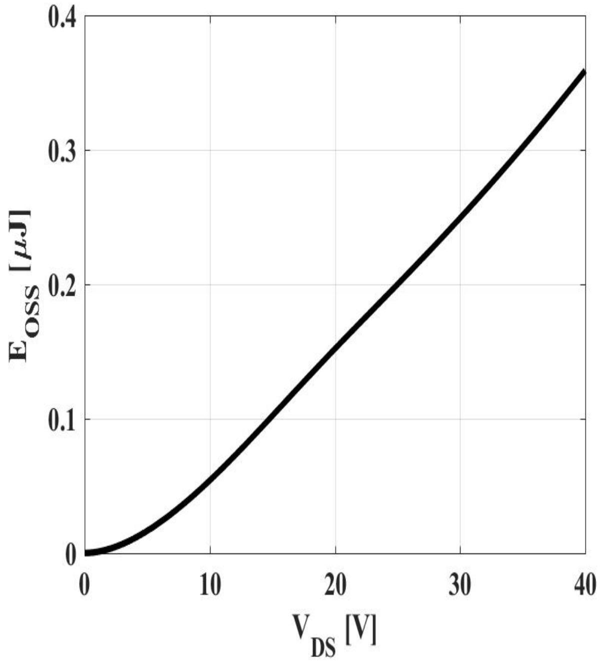
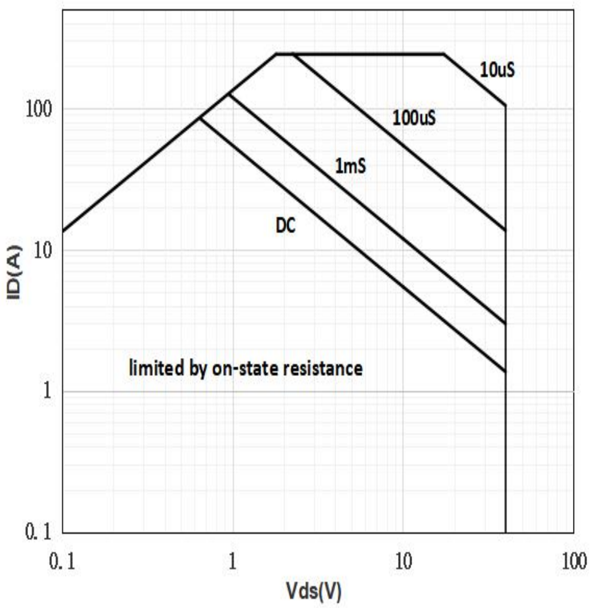
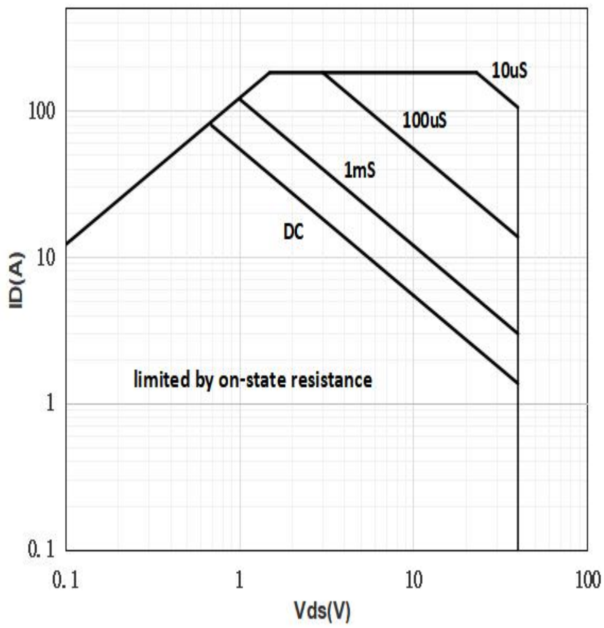
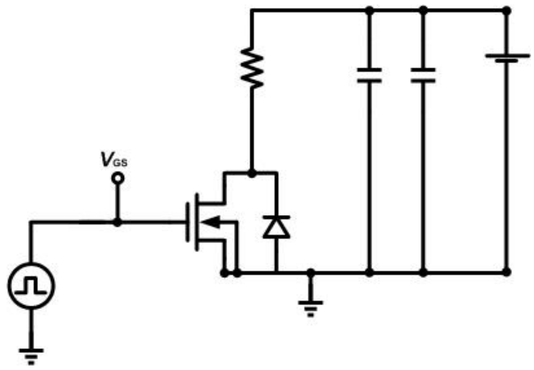
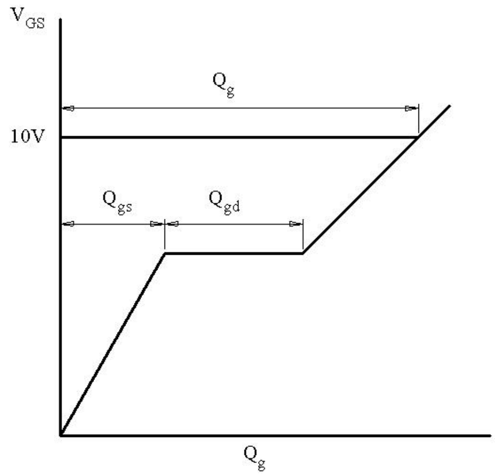
Figure 16: Typ. Capacitances	Figure 17: C_{OSS} Stored Energy
	
$C=f(V_{DS})$; $V_{GS}=0$; f=1MHz	$E_{OSS}=f(V_{DS})$

Figure 18A: Max. Forward Safe Operating Area (PDFN5*6)	Figure 18B: Max. Forward Safe Operating Area (PDFN3.3*3.3)
	
$I_D=f(V_{DS})$; Tc=25℃; $V_{GS}>7.0V$; parameter t_p	$I_D=f(V_{DS})$; Tc=25℃; $V_{GS}>7.0V$; parameter t_p

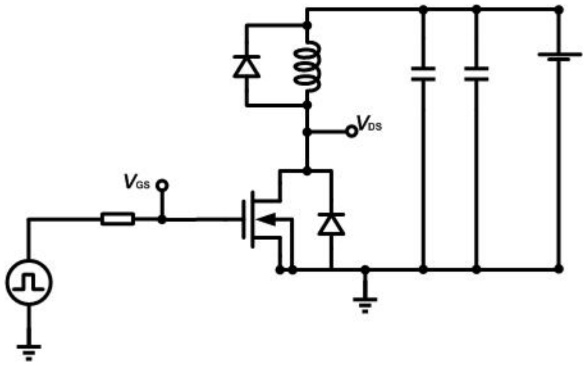
Test Circuits

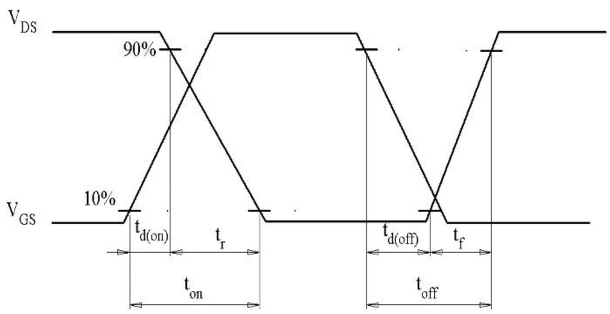
1. Gate Charge Test Circuit & Waveform



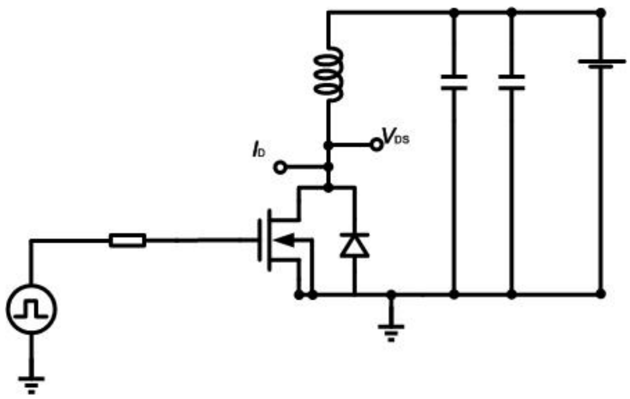


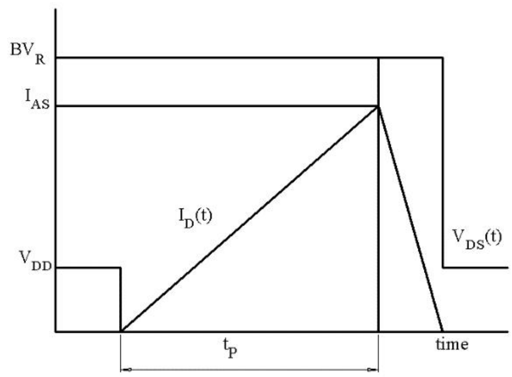
2. Switch Time Test Circuit



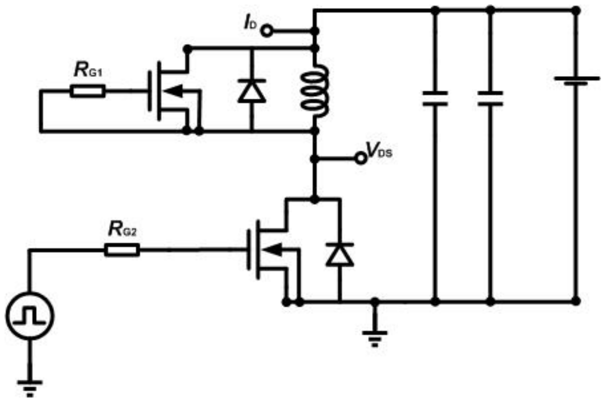


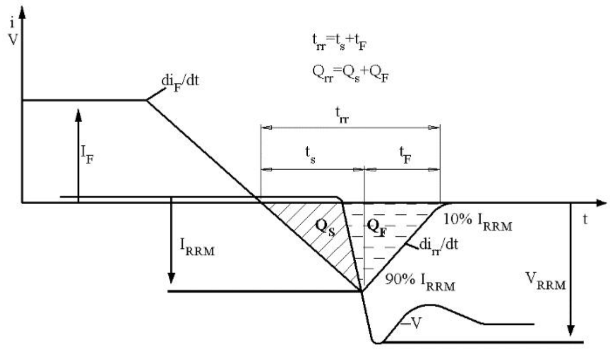
3. Unclamped Inductive Switching Test Circuit & Waveforms





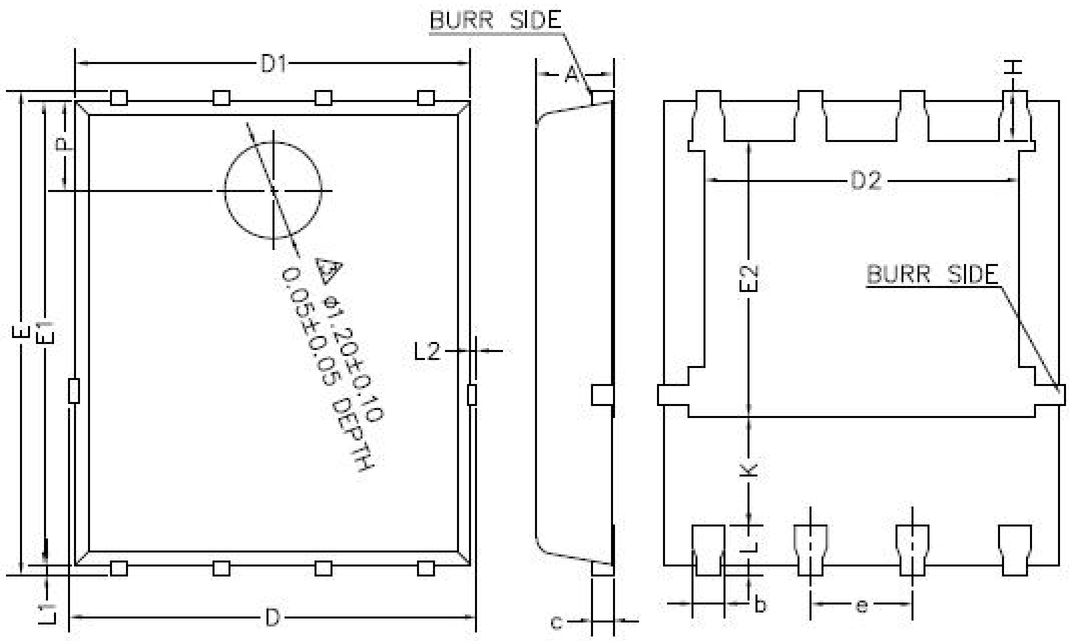
4. Test Circuit and Waveform for Diode Characteristics

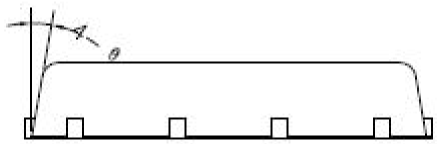




Mechanical Dimensions

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

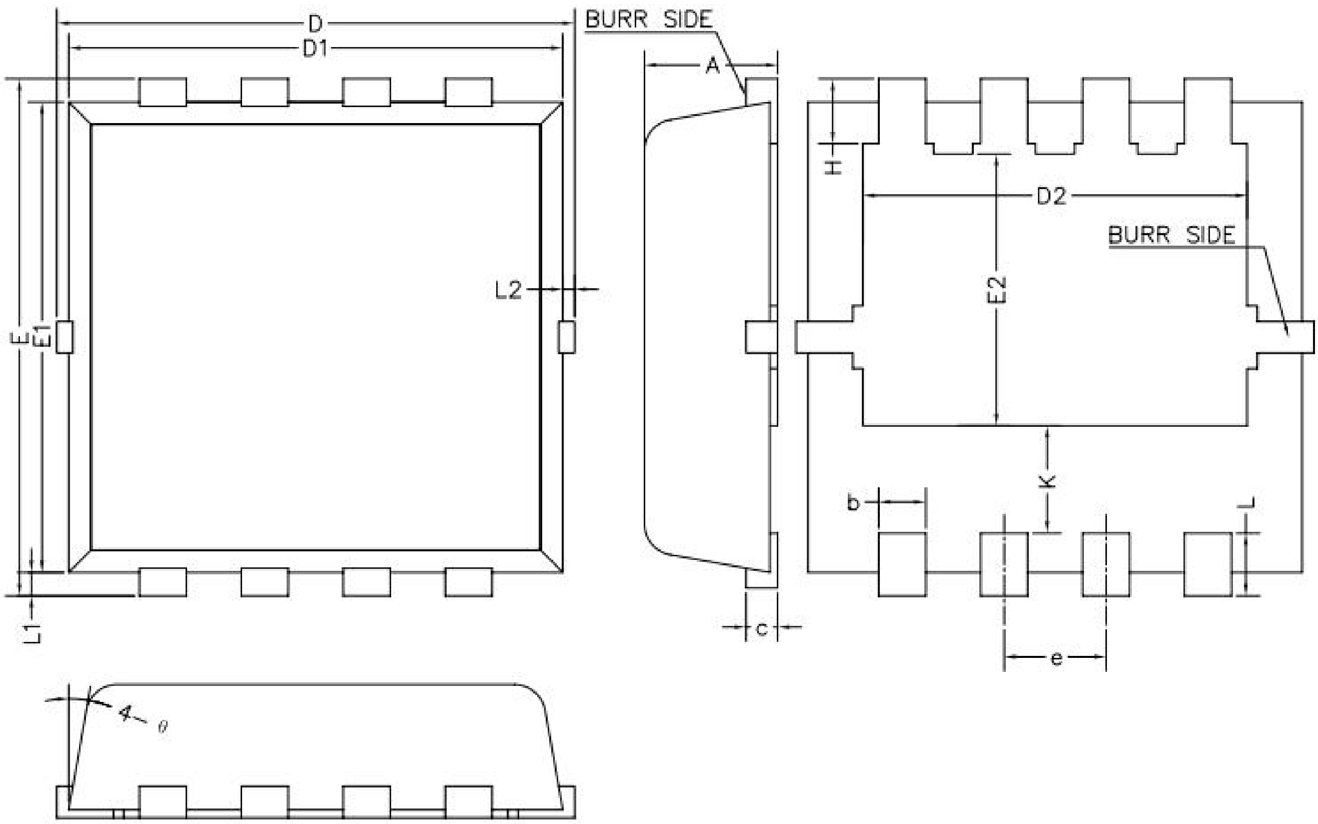




Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	0.90	1.10	1.20
b	0.35	0.40	0.45
c	0.21	0.25	0.34
D			5.10
D1	4,80	4.90	5.00
D2	3.91	4.01	4.11
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.34	3.44	3.54
H	0.51	0.61	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2			0.10
P	1.00	1.10	1.20
θ	8º	10º	12º

Mechanical Dimensions (Continued)

PDFN3.3*3.3-8 **Unit: mm**



Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	0.70	0.80	0.90	E1	2.90	3.00	3.10
b	0.25	0.30	0.35	E2	1.64	1.74	1.84
c	0.14	0.15	0.20	H	0.32	0.42	0.52
D	3.10	3.30	3.50	K	0.59	0.69	0.79
D1	3.05	3.15	3.25	L	0.25	0.40	0.55
D2	2.35	2.45	2.55	L1	0.10	0.15	0.20
e	0.55	0.65	0.75	L2	–	–	0.15
E	3.10	3.30	3.50	θ	8°	10°	12°

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IMPORTANT NOTICE

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