16mΩ, 100V, N-Channel Power MOSFET SRT10N160L

General Description

The Sanrise SRT10N160L 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 SRT10N160L break down voltage is 100V and it has a high rugged avalanche characteristics. The SRT10N160L is available in DFN5*6 and SOP-8 and TO-252 packages.

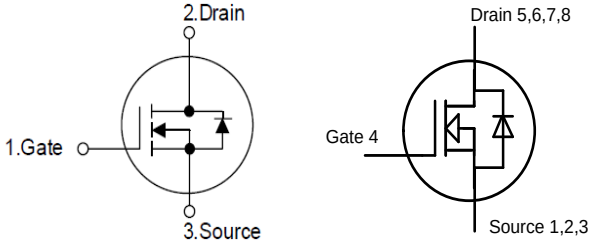
Features

- Ultra Low $R_{DS(ON)}$
  $R_{DS(ON)\_TYP}$ = 13.5mΩ@V_{GS} = 10V.
  $R_{DS(ON)\_TYP}$ = 18.3mΩ@V_{GS} = 4.5V
- Ultra Low Gate Charge,
  Qg=16.1nC typ@V_{GS} = 10V.
  Qg=8.0nC typ@V_{GS} = 4.5V.
- Fast switching capability
- Robust design with better EAS performance

Application

- Charger/Adapter
- DC/DC Power Supply
- E-Tools
- BMS

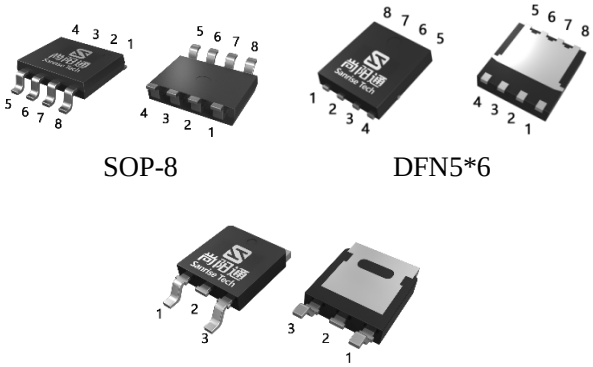
Symbol



TO-252 PDFN5*6 SOP-8

Figure 1 Symbol of SRT10N160L

Package Type



SOP-8 DFN5*6

TO-252

Figure 2 Package Type of SRT10N160L

16mΩ, 100V, N-Channel Power MOSFET **SRT10N160L**

Ordering Information

SRT10N160L□□–□

Circuit Type

Package
D56: PDFN5*6
M: SOP-8
D: TO-252

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
	Green	Green	
PDFN5*6	SRT10N160LD56TR-G	SRT10N160LD56G	Tape &Reel
SOP-8	SRT10N160LMTR-G	10N160LMG	Tape &Reel
TO-252	SRT10N160LDTR-G	SRT10N160LDG	Tape &Reel

16mΩ, 100V, N-Channel Power MOSFET **SRT10N160L**

Absolute Maximum Ratings

Parameter		Symbol	Rating		Unit
Drain-Source Voltage		V_{DSS}	100		V
Gate-Source Voltage		V_{GSS}	±20		V
Continuous Drain Current	T_C=25ºC	I_D	PDFN5*6	40	A
	T_C=25ºC		TO252	41	
	T_A=25ºC		SOP-8	7.1	
	T_C=100ºC		PDFN5*6	25	
	T_C=100ºC		TO252	26	
	T_A=100ºC		SOP-8	4.5	
Pulsed Drain Current (Note 2)		I_{DM}	PDFN5*6	120	A
			TO252	123	
			SOP-8	21	
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	40		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.1		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	15		A
Continuous Diode Forward Current		I_S	40		A
Diode Pulse Current		$I_{S.PULSE}$	120		A
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}= 15.0A, V_{DD}= 50V, 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}			2.5	ºC/W
Thermal Resistance，Junction-to-Case	TO252	R_{thJC}			2.3	ºC/W
Thermal Resistance，Junction-to-Lead	SOP8	R_{thJL}			25	ºC/W
Thermal Resistance，Junction-to-Ambient	PDFN5*6	R_{thJA}			50	ºC/W
Thermal Resistance，Junction-to-Ambient	TO252	R_{thJA}			62	ºC/W
Thermal Resistance，Junction-to-Ambient	SOP8	R_{thJA}			80	ºC/W

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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	100			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=100V, V_{GS}=0V			1	uA
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	1.2	1.8	2.4	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=4.5V, I_D=10A		18.3	23.5	mΩ
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=20A		13.5	16	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		1000		pF
Output Capacitance		C_{OSS}			310		pF
Reverse Transfer Capacitance		C_{RSS}			6		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…60V		422		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			497		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=50V, I_D=20A R_G=3.0Ω, V_{GS}=10V		5.9		nS
Rise Time		t_r			3.9		
Turn-off Delay Time		$t_{d(off)}$			14.8		
Fall Time		t_f			3.1		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=50V, I_D=20A V_{GS}=0 to 4.5V		3.5		nC
Gate to Drain Charge		Q_{gd}			2.8		
Gate Charge Total		Q_g			8.0		
Gate Charge Total		Q_g	V_{DD}=50V, I_D=20A V_{GS}=0 to 10V		16.1		nC
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		14.3		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=20A		0.89	1.1	V
Reverse Recovery Time		t_{rr}	V_R=50V, I_F=20A dI_F/dt=100A/us		25		nS
Reverse Recovery Charge		Q_{rr}			24		nC
Peak Reverse Recovery Current		I_{rrm}			1.9		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 60V
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 60 V

Typical Performance Characteristics

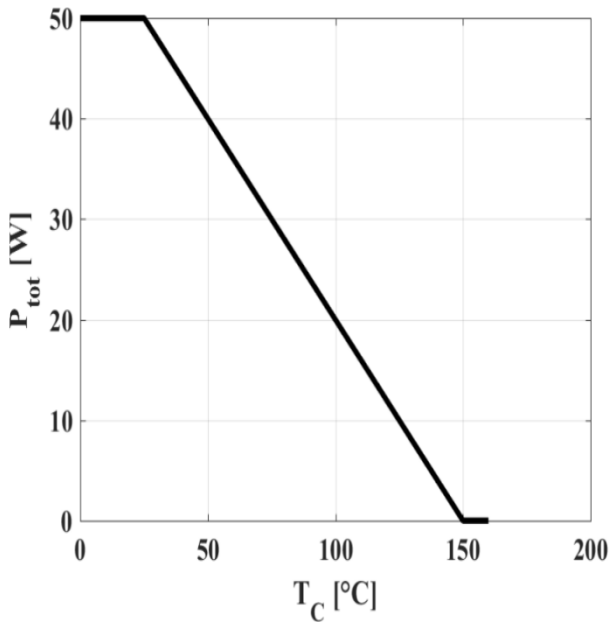
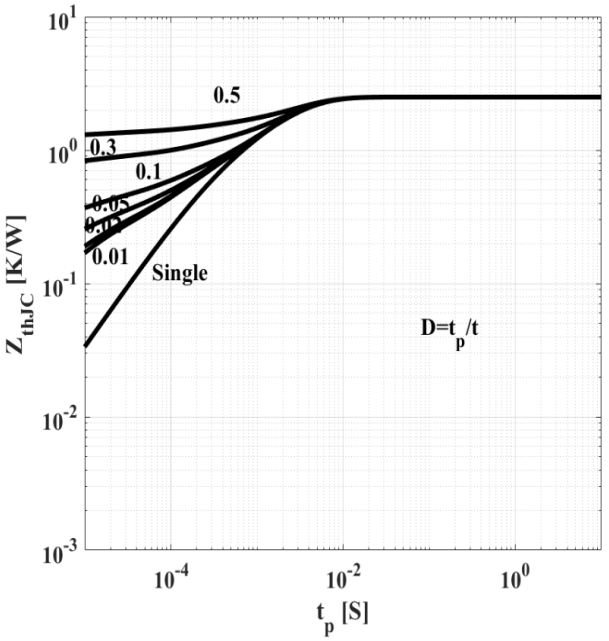
Figure 3: Power Dissipation	Figure 4: Max. Transient Thermal Impedance
	
$P_{tot}=f(T_c)$ (DFN5*6)	$Z_{(thJC)}=f(t_p)$;parameter:$D=t_p/T$ (DFN5*6)

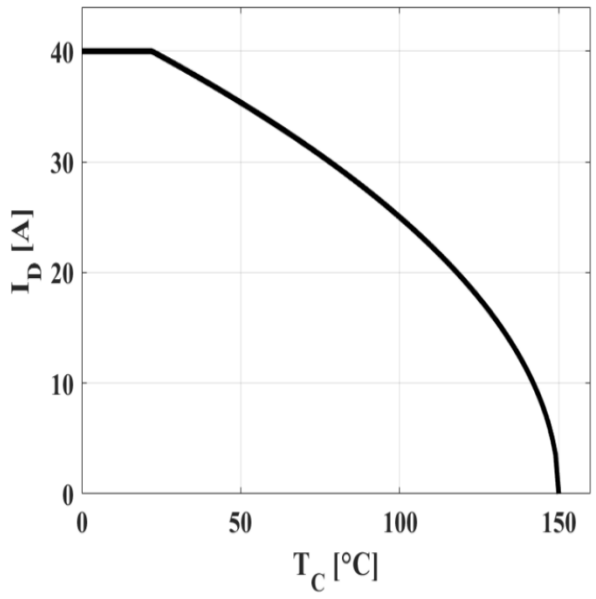
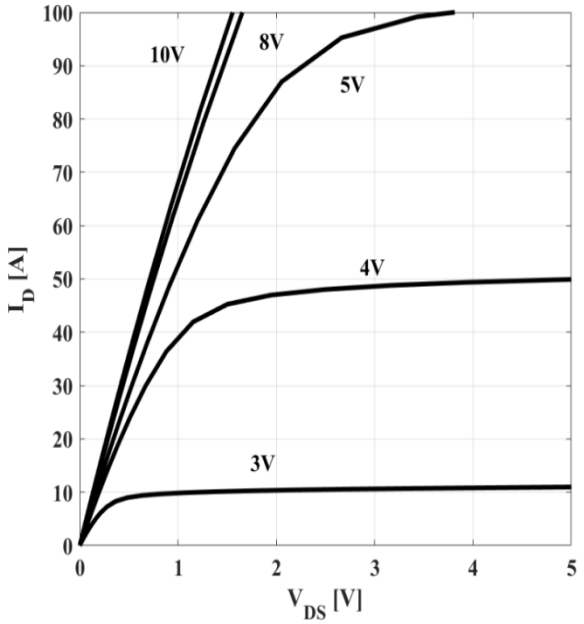
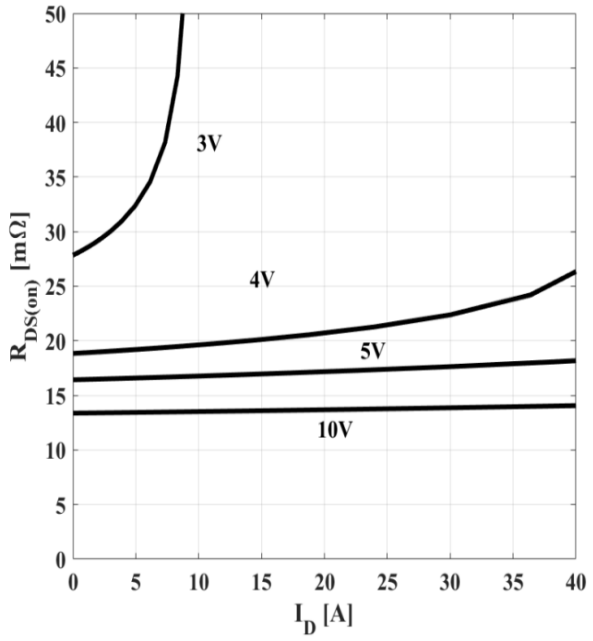
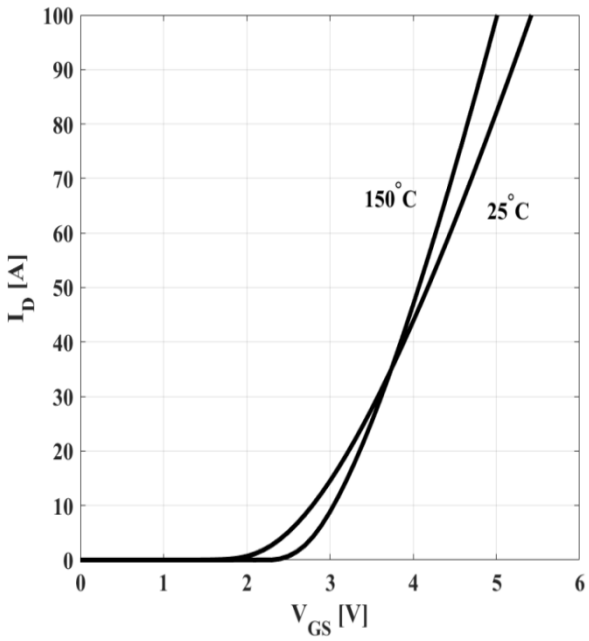
Figure5: Drain Current	Figure6: Typ. Output Characteristics
	
$I_D=f(T_C)$;$V_{GS}\geq 10V$	$I_D=f(V_{DS})$;Tj=25ºC; parameter:V_{GS}

Figure7: Typ. Drain-Source On-State Resistance



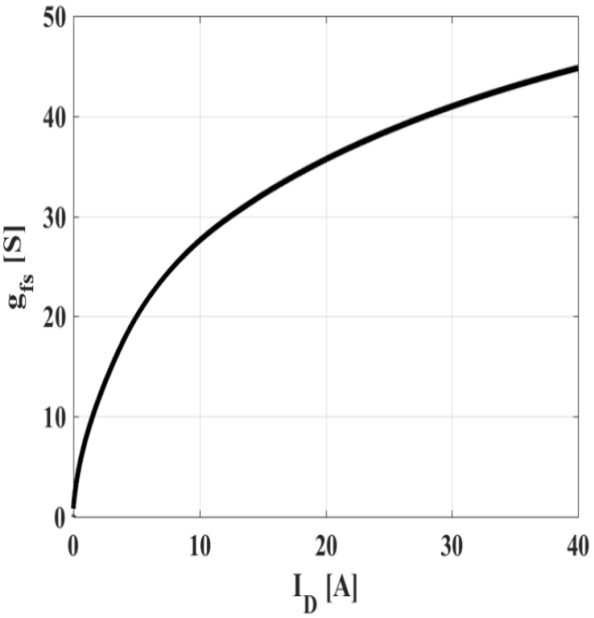
$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter:V_{GS}

Figure8: Typ. Transfer Characteristics



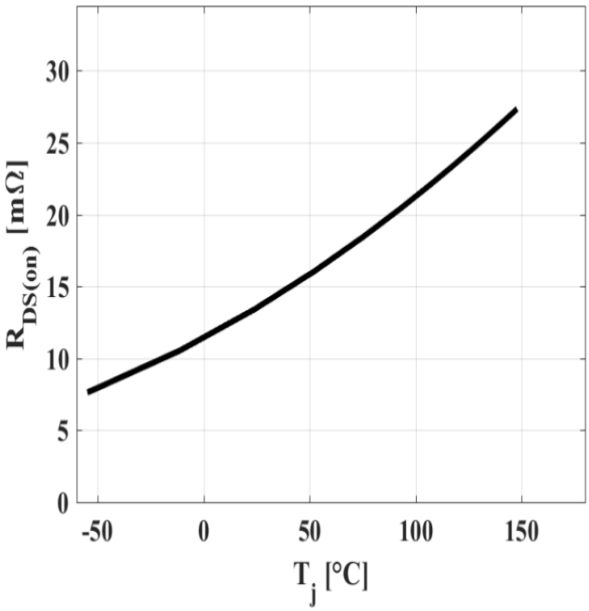
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

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=20A;V_{GS}=10V

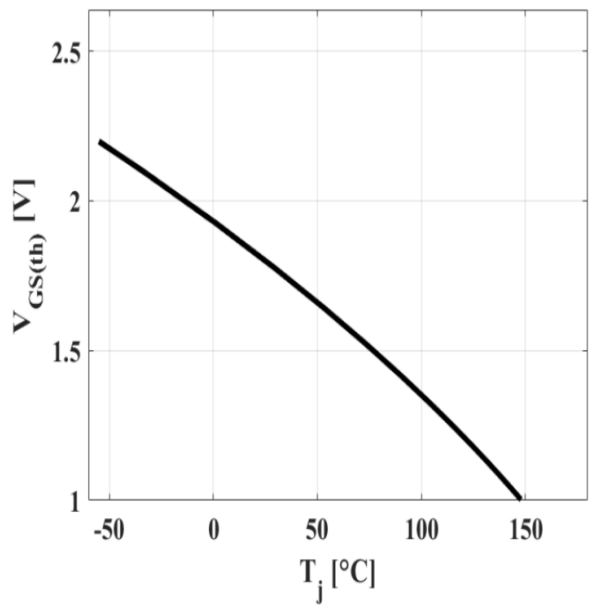
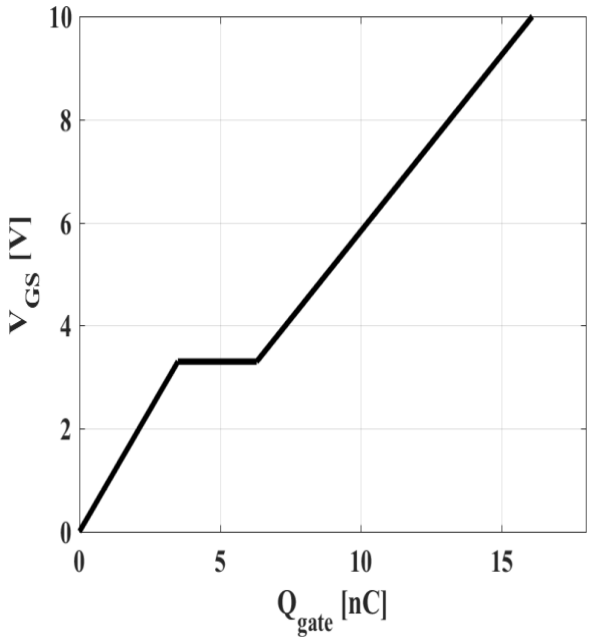
Figure11: Typ.Gate Threshold Voltage	Figure 12: Typ. Gate Charge
	
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$	$V_{GS}= f(Q_{gate})$, $I_D=20A$ pulsed

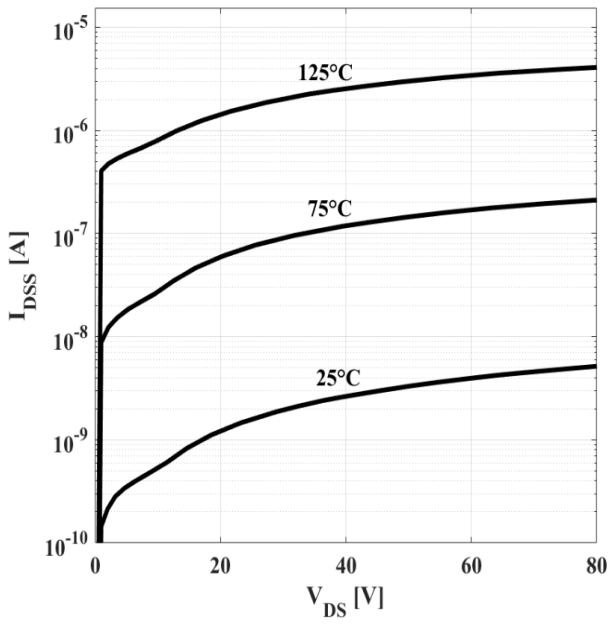
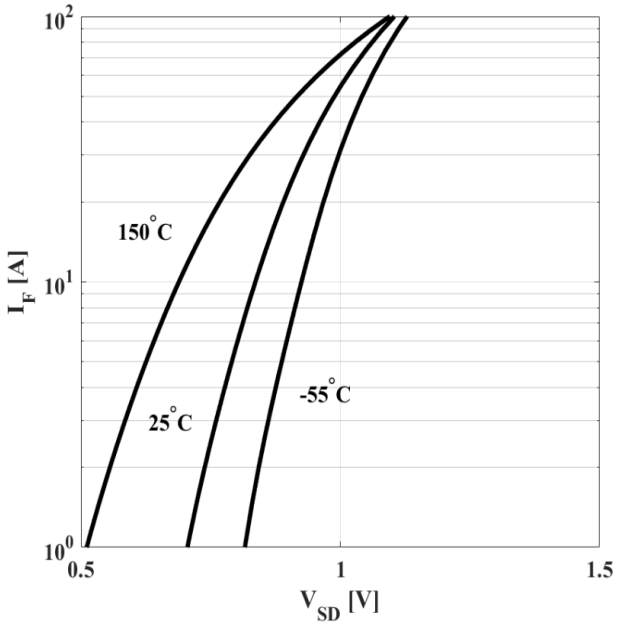
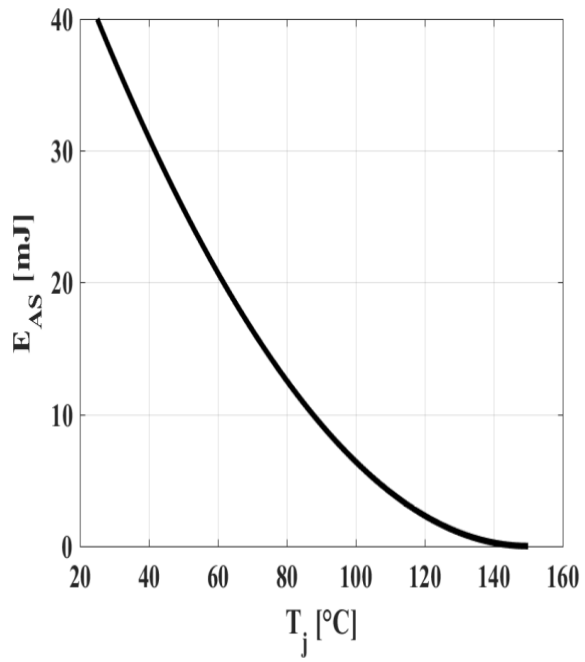
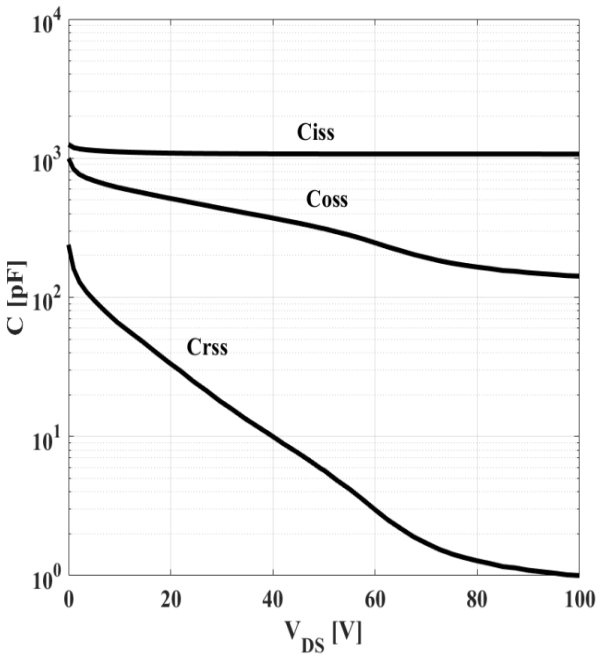
Figure 13: Drain-Source Leakage Current	Figure 14: Forward Characteristics of Reverse Diode
	
$I_{DSS}=f(V_{DS})$; $V_{GS}=0V$; parameter: T_j	$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



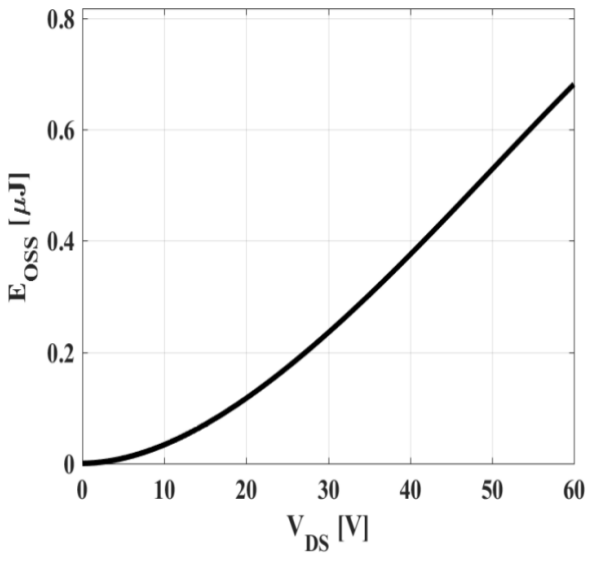
$E_{AS}=f(T_j)$;I_D=15.0A; V_{DD}=50V

Figure 16: Typ. Capacitances



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

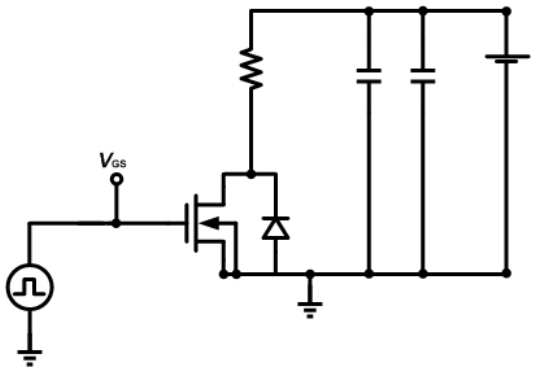
Figure 17: C_{OSS}Stored Energy

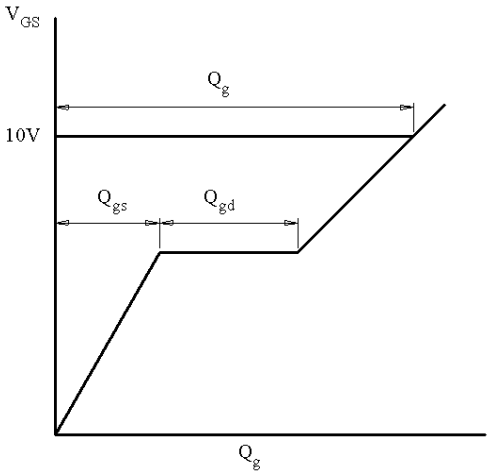


$E_{OSS}=f(V_{DS})$

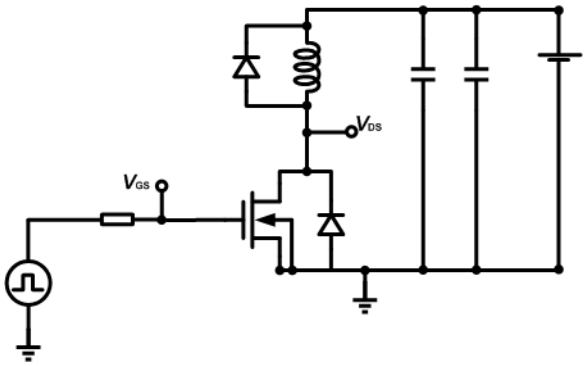
Test Circuits

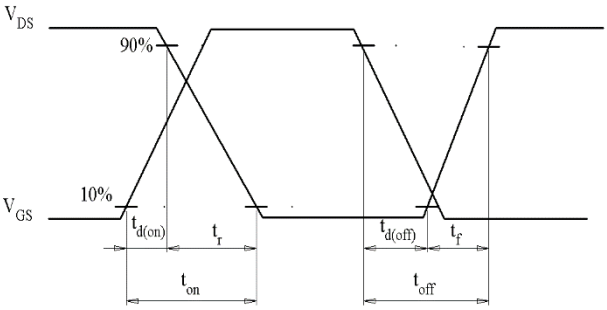
1. Gate Charge Test Circuit & Waveform



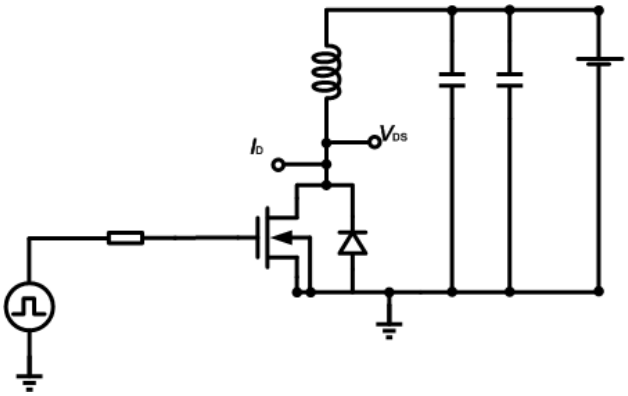


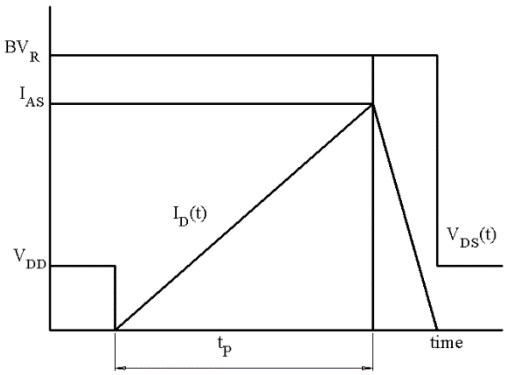
2. Switch Time Test Circuit



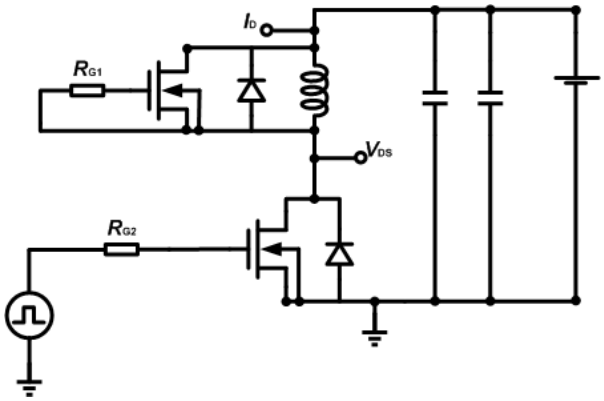


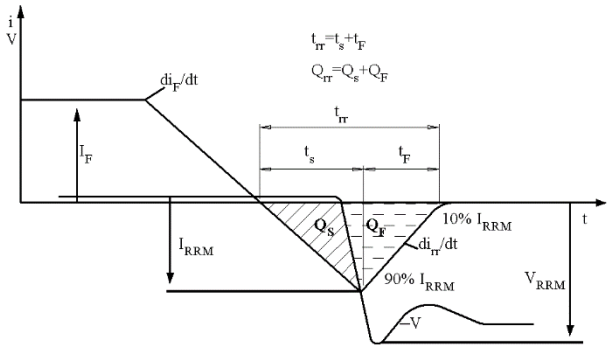
3. Unclamped Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

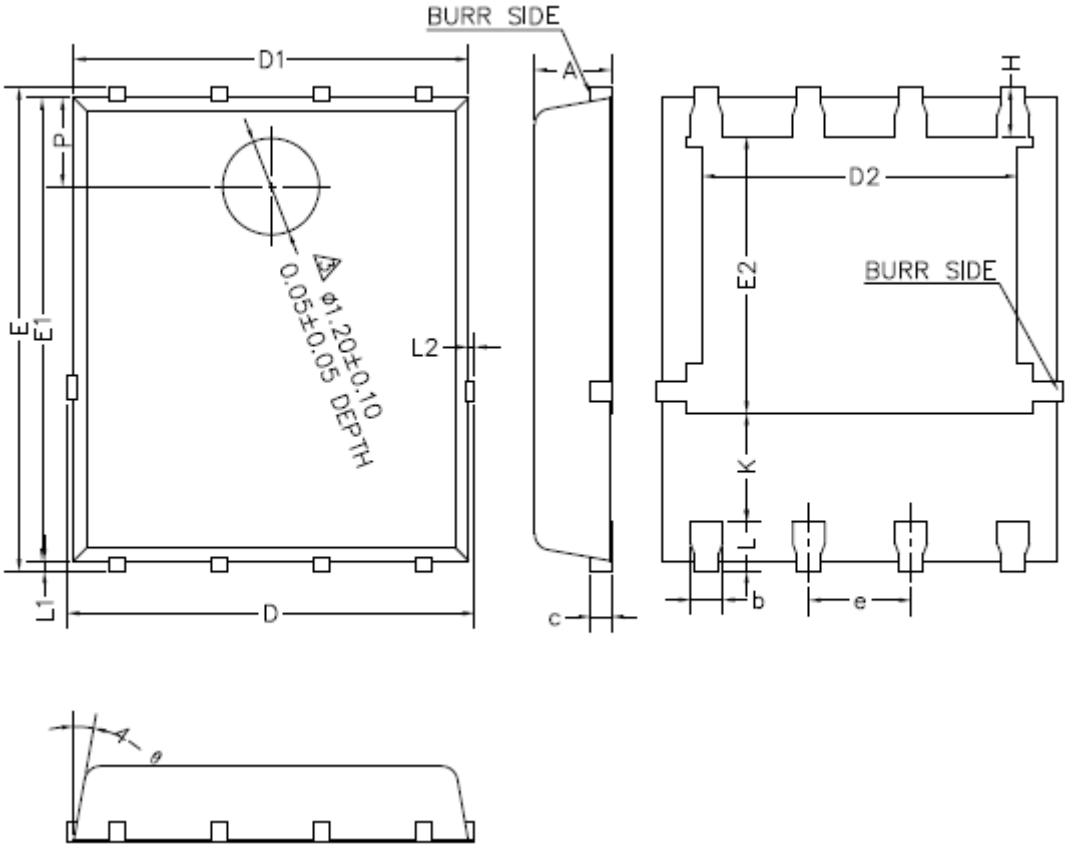




16mΩ, 100V, N-Channel Power MOSFET SRT10N160L

Mechanical Dimensions

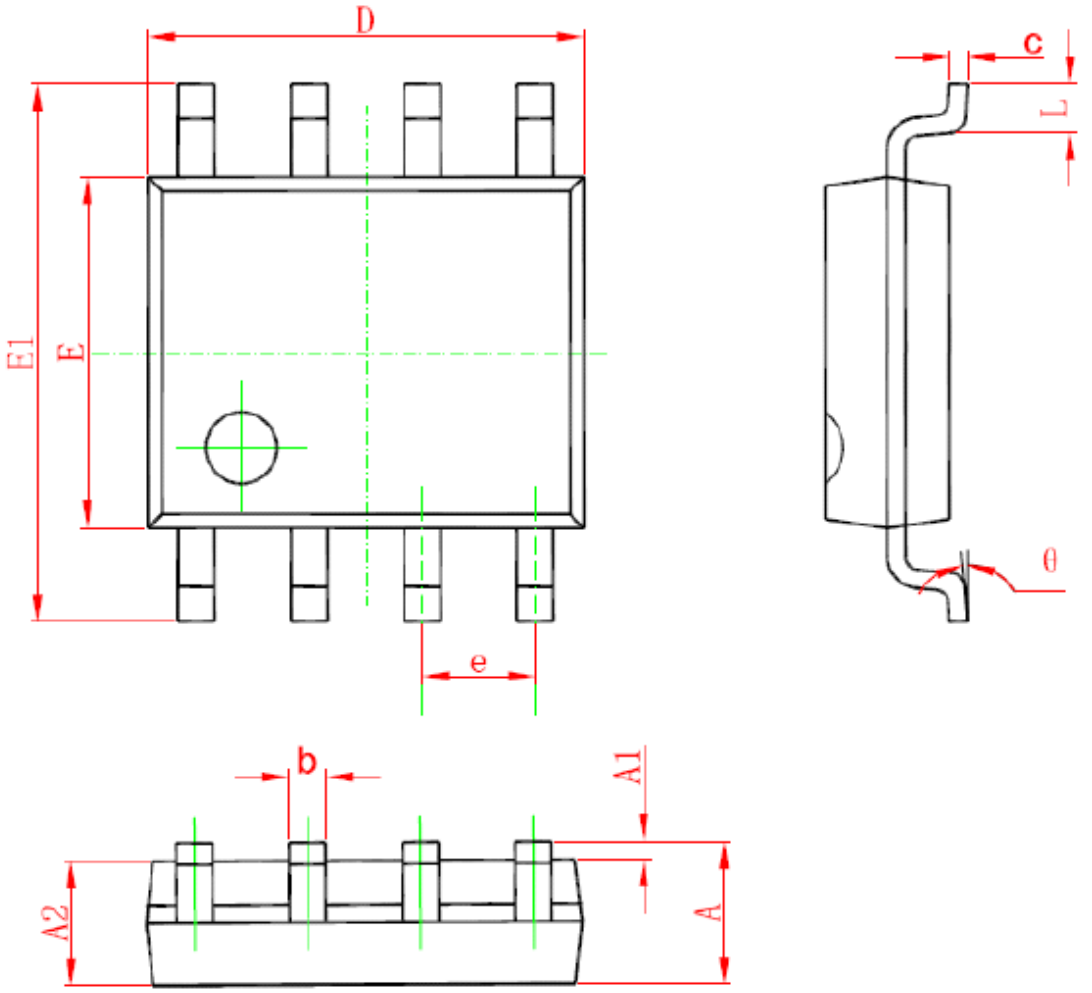
PDFN5*6-8 **Unit: mm**



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

SOP-8 **Unit: mm**

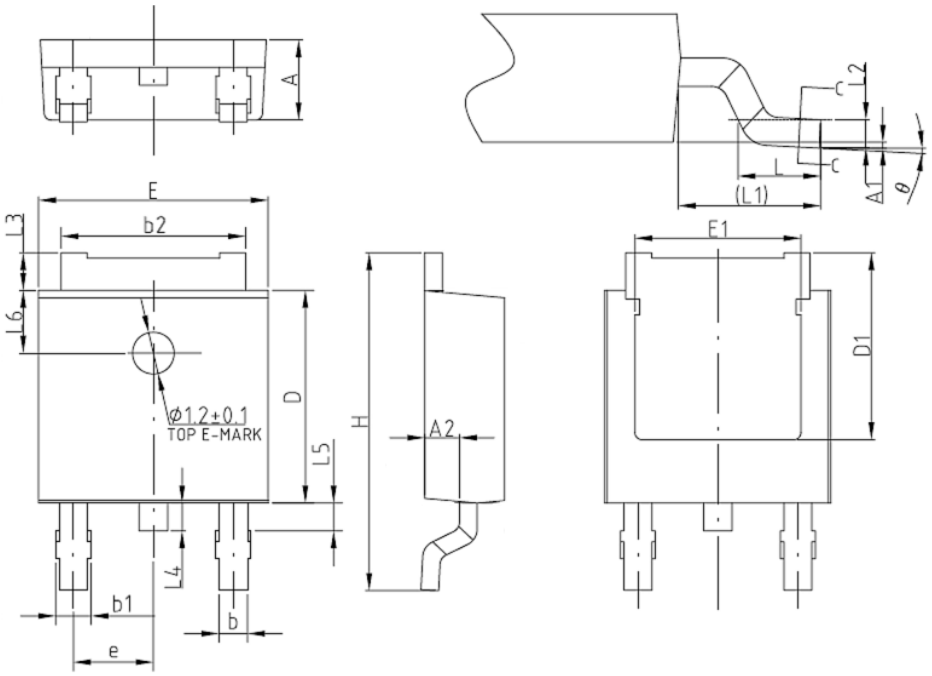


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	1.35	1.55	1.75
A1	0.05	0.15	0.25
A2	1.25	1.40	1.65
b	0.31	-	0.51
c	0.10	-	0.26
D	4.70	4.90	5.15
E	3.70	3.90	4.10
E1	5.80	6.00	6.20
e	1.27(BSC)		
L	0.40	-	1.27
θ	0°	-	8°

16mΩ, 100V, N-Channel Power MOSFET SRT10N160L

Mechanical Dimensions

TO-252 **Unit: mm**

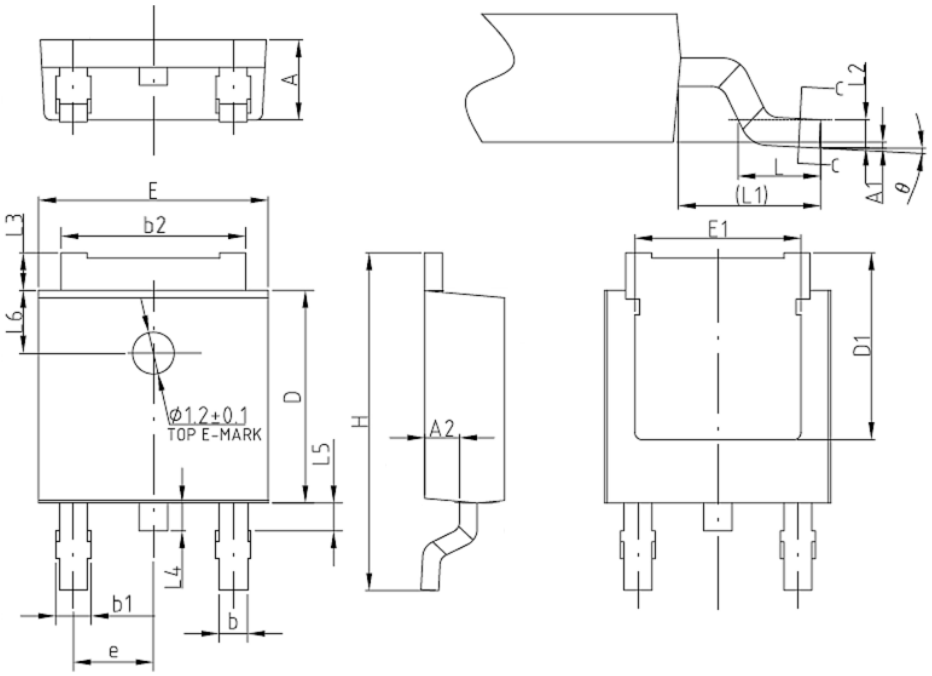


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	2.20	2.30	2.40
A1	0	-	0.10
A2	0.90	1.00	1.17
b	0.70	0.76	0.90
b1	0.77	-	1.10
b2	5.13	5.33	5.46
c	0.45	-	0.60
D	5.95	6.10	6.25
D1	-	5.30	-
E	6.45	6.60	6.75
E1	-	4.80	-
e	2.286(BSC)		
H	9.70	10.10	10.40
L	1.25	1.50	1.75
L1	-	2.90	-
L2	-	0.51	-
L3	0.90	-	1.25
L4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

16mΩ, 100V, N-Channel Power MOSFET SRT10N160L

Mechanical Dimensions

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°

16mΩ, 100V, N-Channel Power MOSFET SRT10N160L

Sanrise Technology Limited Company

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