

3.0mΩ, 40V, N-Channel Power MOSFET
SRT04N030LS
General Description

The Sanrise SRT04N030LS 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.

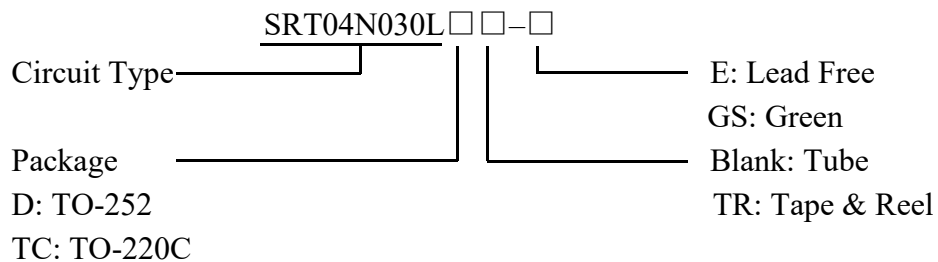
The SRT04N030LS break down voltage is 40V and it has a high rugged avalanche characteristics. The SRT04N030LS is available in TO-252 and TO-220C packages.

Features

- Ultra Low $R_{DS(ON)}_{TYP} = 2.9m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 40nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- BMS
- High Power Supply
- E-Tools
- Motor Drive

Ordering Information


Package	Part Number	Marking ID	Packing Type
TO-252	SRT04N030LDTR-GS	SRT04N030LDGS	Tape & Reel
TO-220C	SRT04N030LTC-GS	SRT04N030LTCGS	Tube

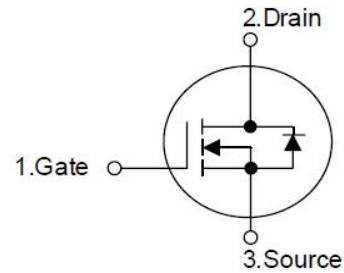
Symbol


Figure 1 Symbol of SRT04N030LS

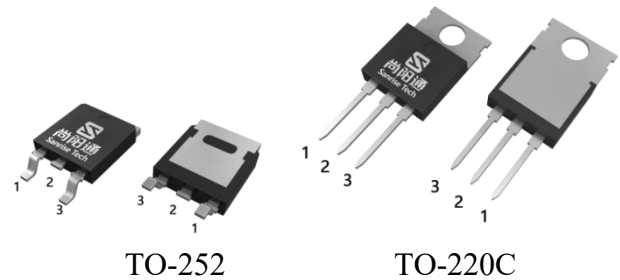
Package Type


Figure 2 Package Type of SRT04N030LS

3.0mΩ, 40V, N-Channel Power MOSFET
SRT04N030LS
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	$T_C=25^{\circ}\text{C}$	I_D	50	A
	$T_C=125^{\circ}\text{C}$		50	
Continuous Drain Current, Silicon	$T_C=25^{\circ}\text{C}$		144	
Pulsed Drain Current (Note 2)		I_{DM}	150	A
Power Dissipation ($T_C = 25^{\circ}\text{C}$)		P_D	113	W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	400	mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	64	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.2	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	20.0	A
Continuous Diode Forward Current		I_S	50	A
Diode Pulse Current		$I_{S,PULSE}$	150	A
Operating Junction Temperature		T_J	150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 to 150	$^{\circ}\text{C}$
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. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $I_{AS} = 16\text{A}$, $V_{DD} = 20\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
4. $I_{AS_Limit} = 40.0\text{A}$, $V_{DD} = 20\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}			1.1	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}			62	

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

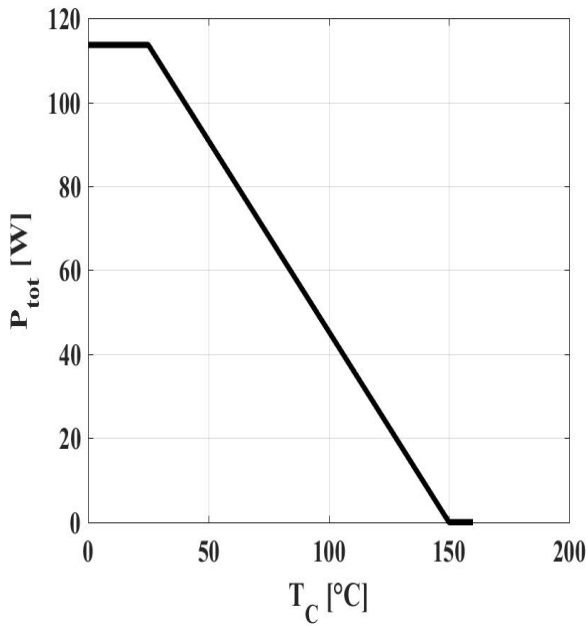
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	40			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =40V, V _{GS} =0V			1	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V			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} =10V, I _D =35A		2.9	3.4	mΩ
Gate Resistance		R _G	f=1MHz, Open Drain		1.2		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =20V, V _{GS} =0V, f=1MHz		2.8		nF
Output Capacitance		C _{OSS}			762		pF
Reverse Transfer Capacitance		C _{RSS}			48		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...20V		1.2		nF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			1.5		
Turn-on Delay Time		t _{d(on)}	V _{DD} =20V, I _D =35A R _G =1.6Ω, V _{GS} =10V		9		ns
Rise Time		t _r			31		
Turn-off Delay Time		t _{d(off)}			34		
Fall Time		t _f			7		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =20V, I _D =35A V _{GS} =0 to 10V		6.1		nC
Gate to Drain Charge		Q _{gd}			4.7		
Gate Charge Total		Q _g			40		
Gate Plateau Voltage		V _{plateau}			2.4		V
Gate Charge Total, sync FET		Q _g	V _{DD} =0.1V, V _{GS} =0 to 10V		38		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =35A		0.87	1.0	V
Reverse Recovery Time		t _{rr}	V _R =20V, I _F =35A dI _F /dt=100A/us		52		ns
Reverse Recovery Charge		Q _{rr}			91		nC
Peak Reverse Recovery Current		I _{rrm}			3.5		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 32 V

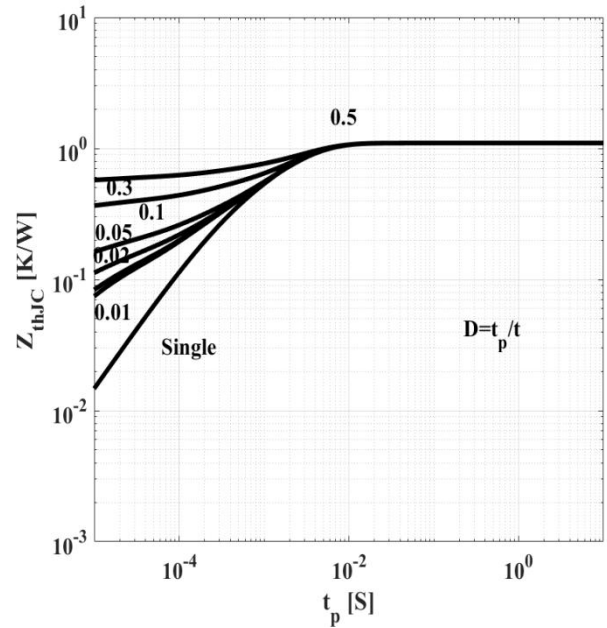
Typical Performance Characteristics

Figure 3: Power Dissipation



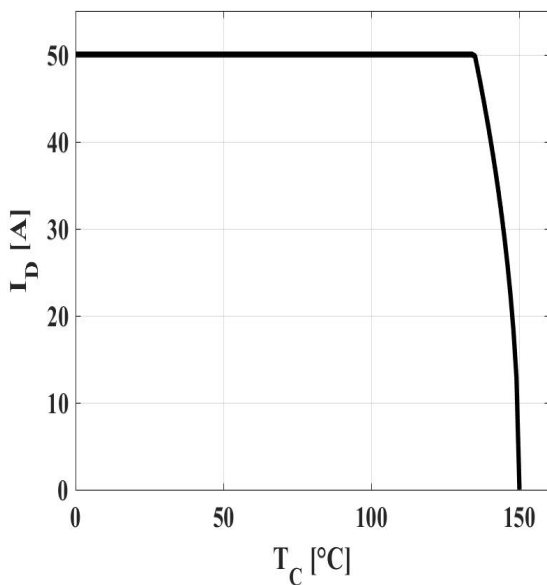
$$P_{tot}=f(T_c)$$

Figure 4: Max. Transient Thermal Impedance



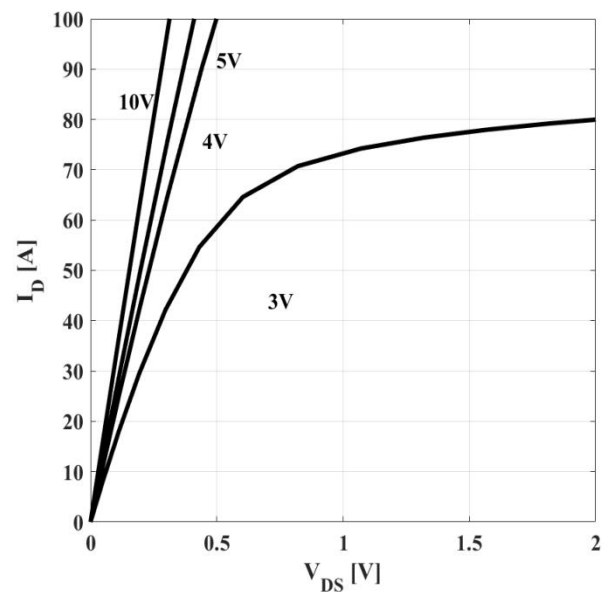
$$Z_{(th)JC}=f(t_p); \text{ parameter: } D=t_p/T$$

Figure5: Drain Current

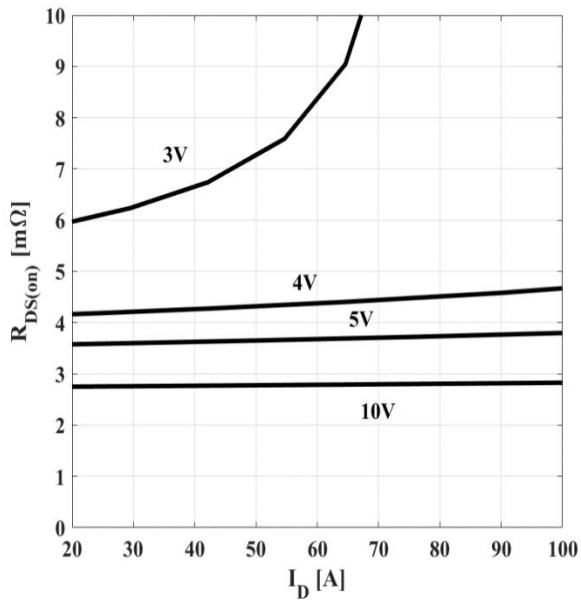
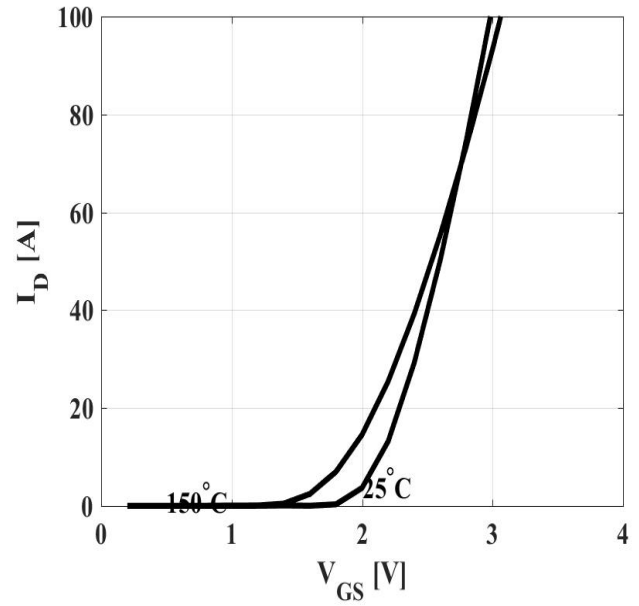
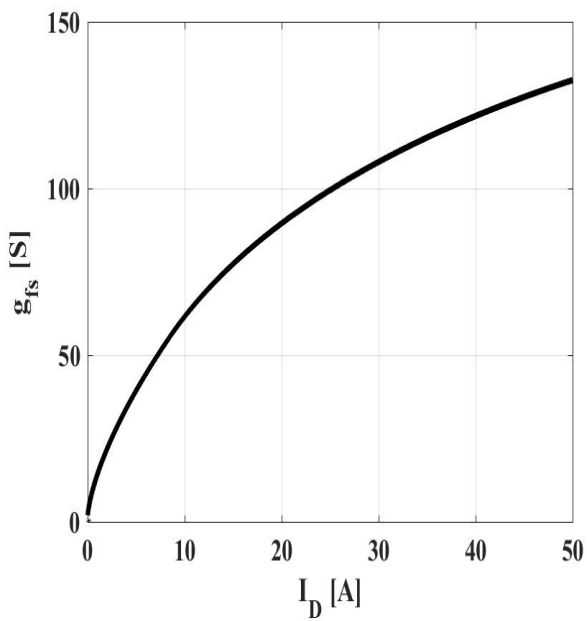
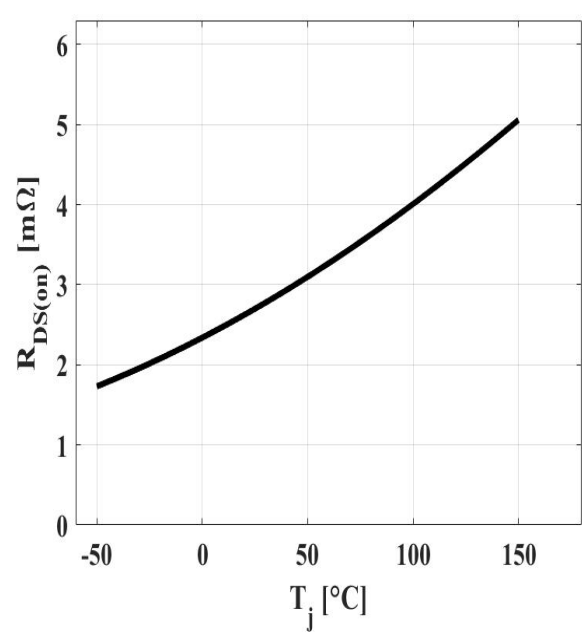


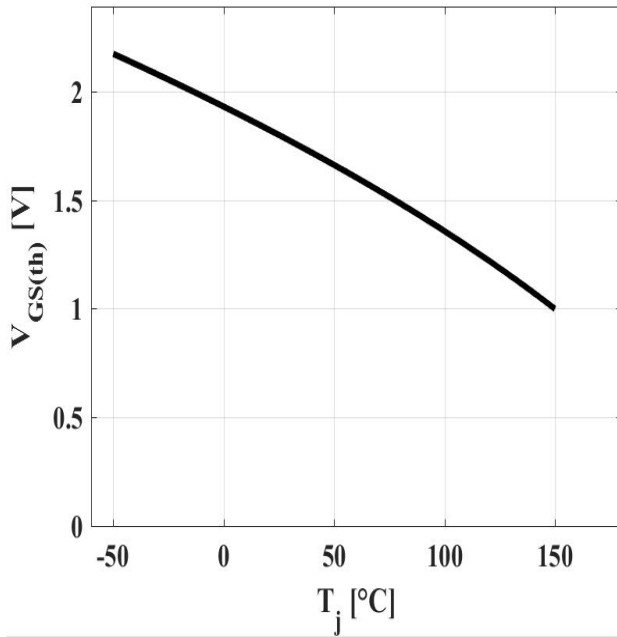
$$I_D=f(T_c); V_{GS} \geq 10V$$

Figure6: Typ. Output Characteristics

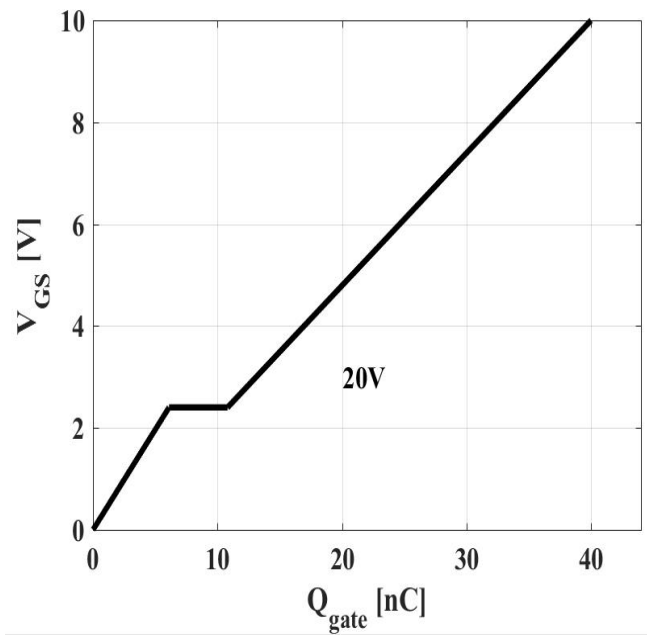


$$I_D=f(V_{DS}); T_j=25^\circ C; \text{ parameter: } V_{GS}$$

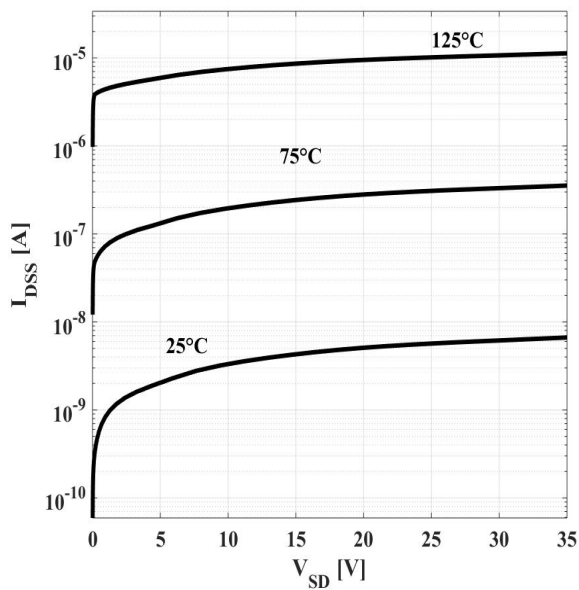
3.0mΩ, 40V, N-Channel Power MOSFET
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Figure7: Typ. Drain-Source On-State Resistance

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

 $R_{DS(ON)}=f(T_j); I_D=35\text{A}; V_{GS}=10\text{V}$

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Figure 11: Typ. Gate Threshold Voltage


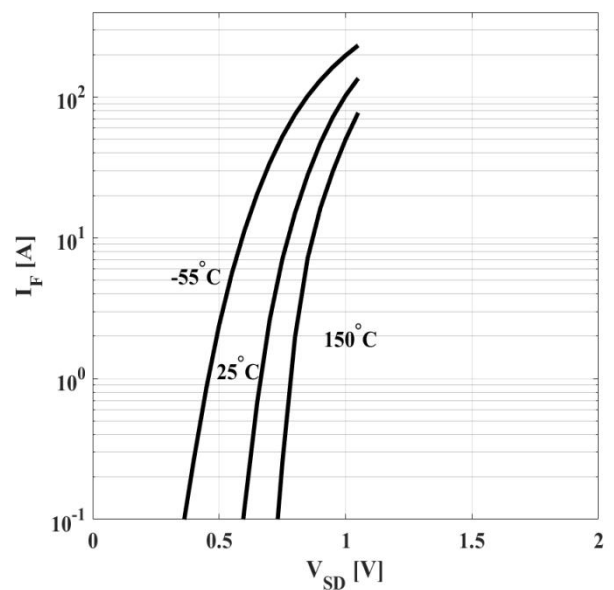
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_{DS} = 250\mu A$$

Figure 12: Typ. Gate Charge


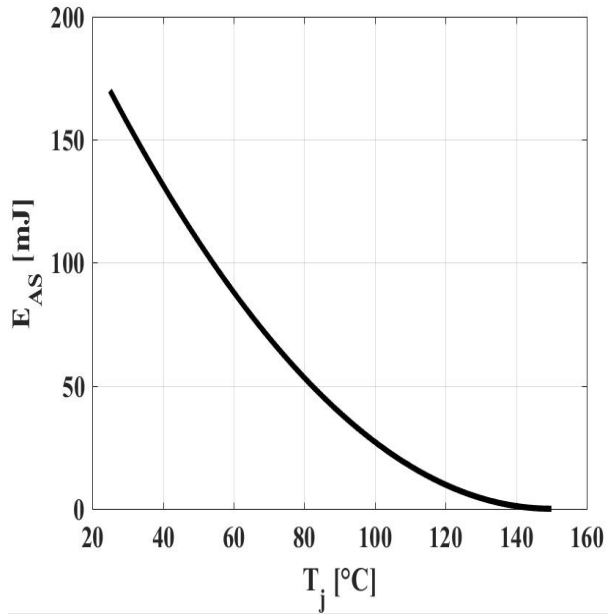
$$V_{GS} = f(Q_{gate}), I_D = 35A \text{ pulsed}$$

Figure 13: Drain-Source Leakage Current


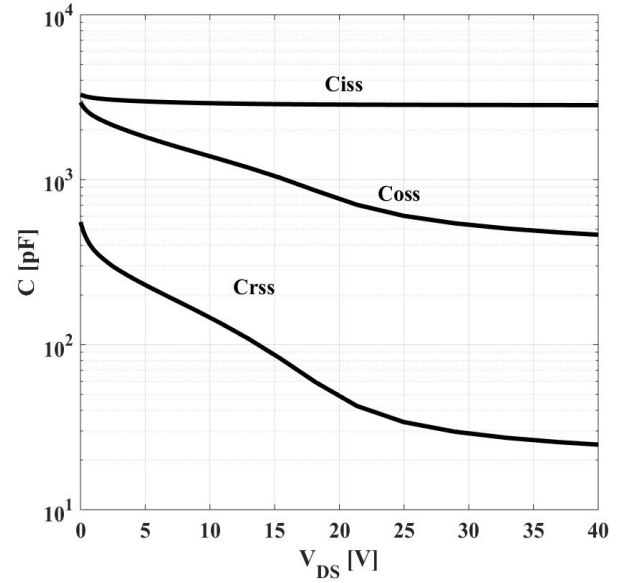
$$I_{DSS} = f(V_{DS}); V_{GS} = 0V; \text{parameter: } T_j$$

Figure 14: Forward Characteristics of Reverse Diode


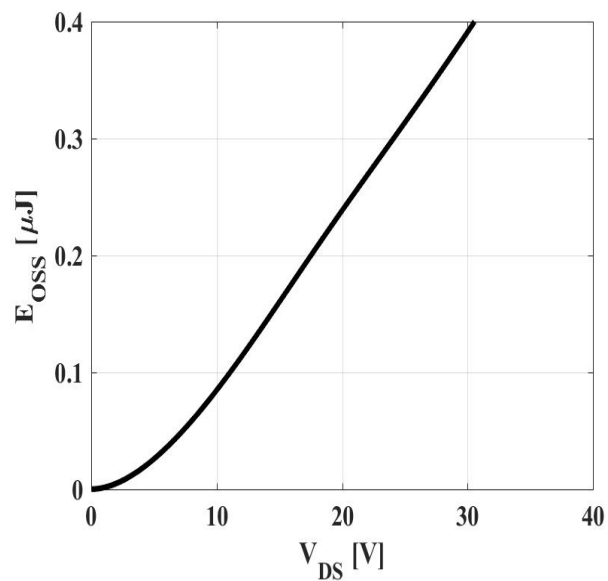
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

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Figure 15: Avalanche Energy


$$E_{AS}=f(T_j); I_D=20.0A; V_{DD}=20V$$

Figure 16: Typ. Capacitances


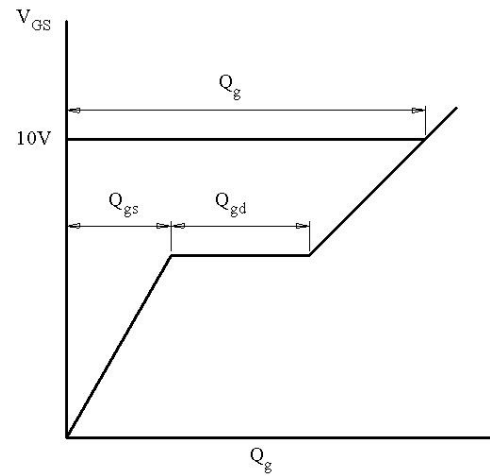
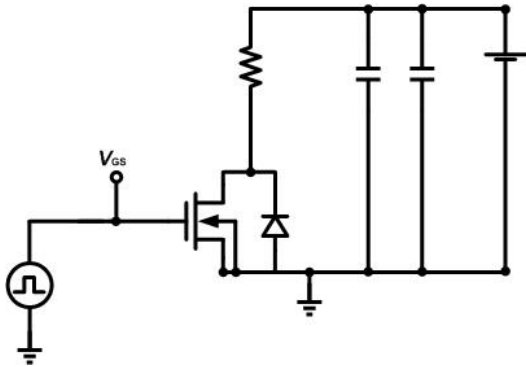
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

Figure 17: Coss Stored Energy


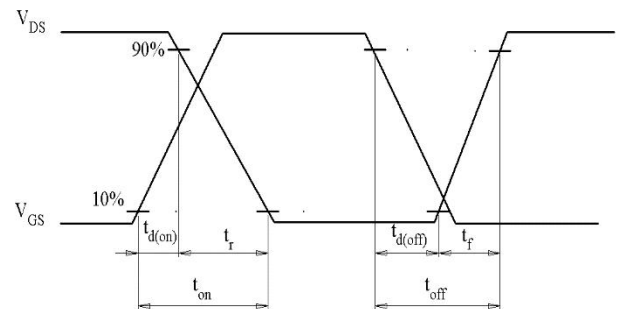
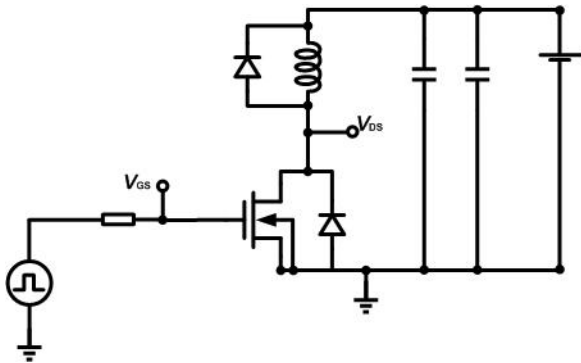
$$E_{OSS}=f(V_{DS})$$

Test Circuits

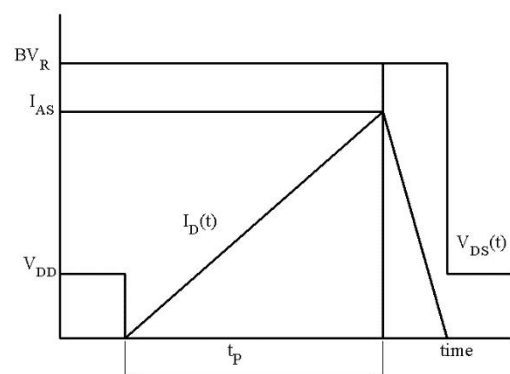
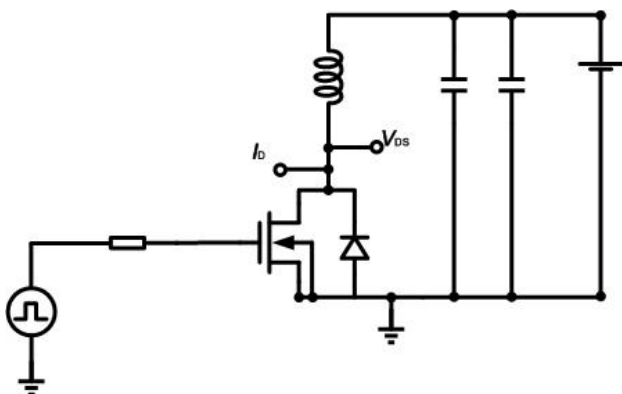
1. Gate Charge Test Circuit & Waveform



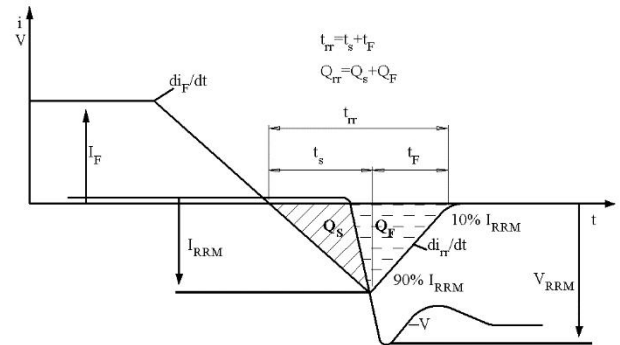
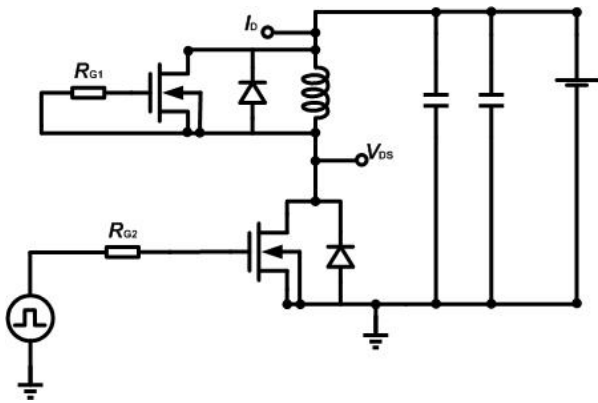
2. Switch Time Test Circuit

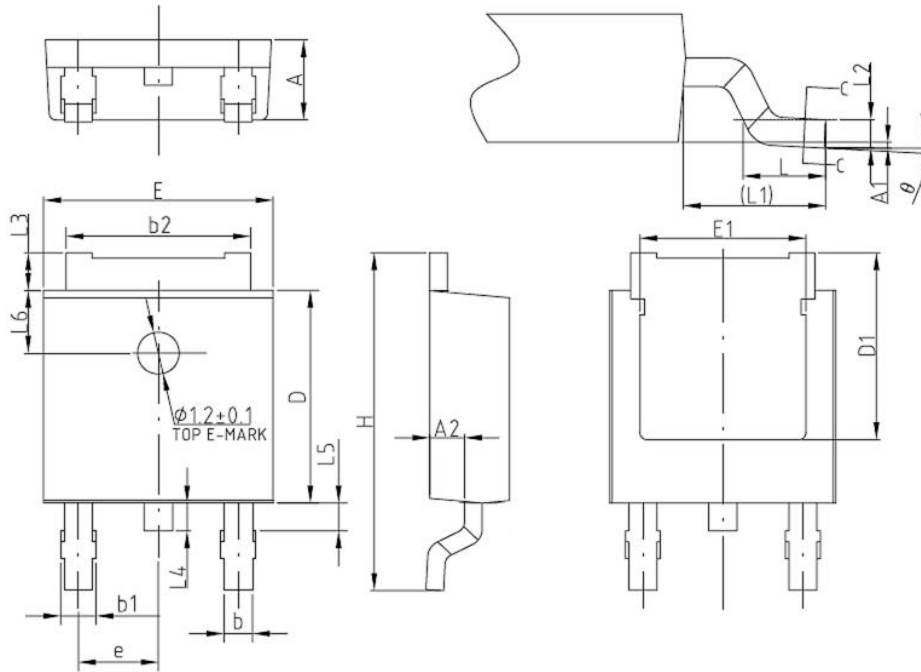


3. Unclamped Inductive Switching Test Circuit & Waveforms



4. Test Circuit and Waveform for Diode Characteristics



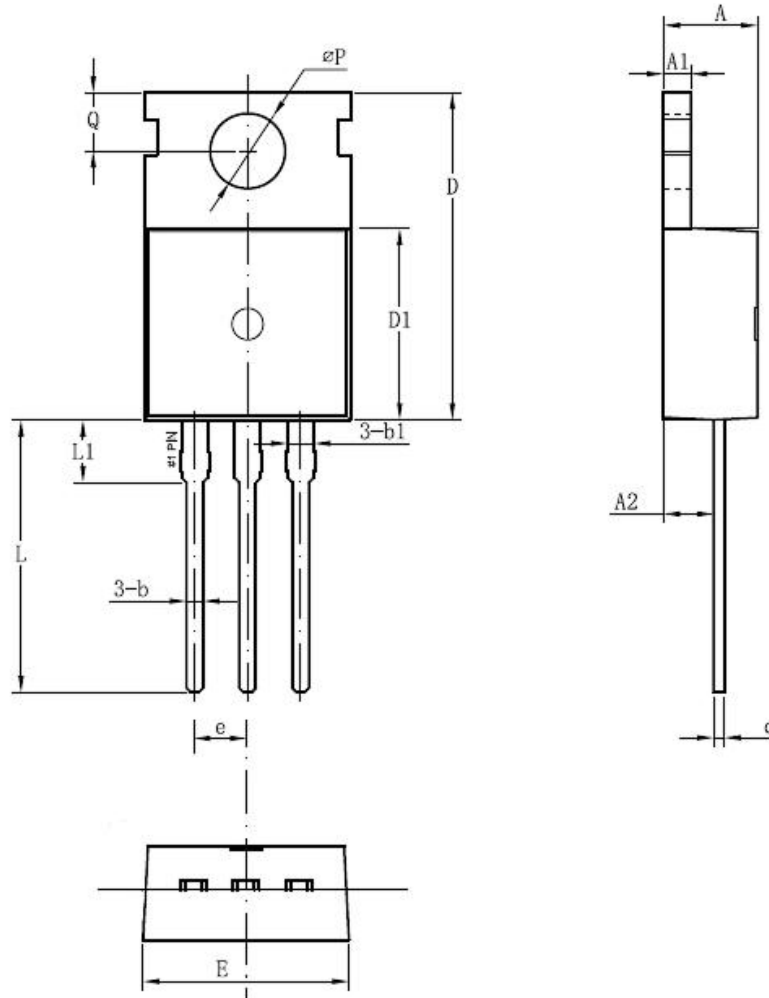
Mechanical Dimensions
TO-252
Unit: mm


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°

Mechanical Dimensions

TO-220C

Unit: mm



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00



Sanrise Technology Limited Company

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