

General Description

The Sanrise SRT10N090L 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 SRT10N090L break down voltage is 100V and it has a high rugged avalanche characteristics. The SRT10N090L is available in PDFN5*6 and TO-252 and TO-220C and SOP-8 packages.

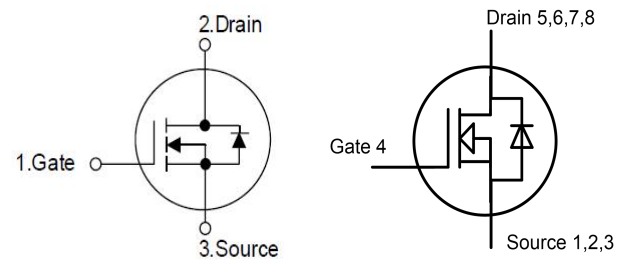
Features

- Ultra Low
 $R_{DS(ON_TYP)} = 7.6m\Omega$,PDFN5*6 @ $V_{GS} = 10V$.
 $R_{DS(ON_TYP)} = 7.8m\Omega$,TO-252 @ $V_{GS} = 10V$.
 $R_{DS(ON_TYP)} = 7.8m\Omega$,TO-220C @ $V_{GS} = 10V$.
 $R_{DS(ON_TYP)} = 8.0m\Omega$,SOP-8 @ $V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g=28.5nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- Non-automotive Qualified

Application

- Charger / Adapter
- Server/Telecom
- High Power Supply
- E-Tools

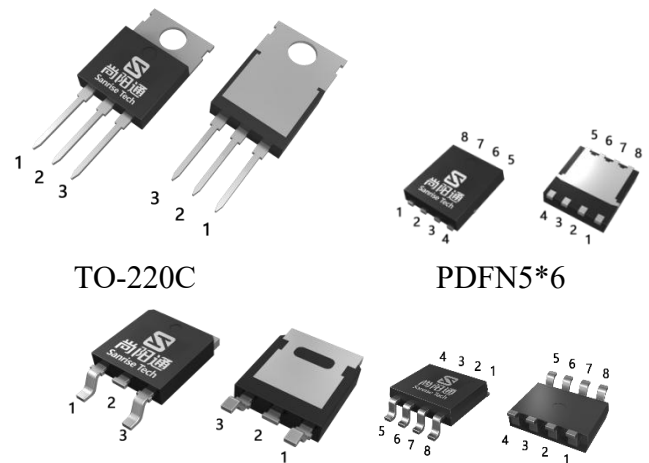
Symbol



TO-220C, TO-252 PDFN5*6, SOP-8

Figure 1 Symbol of SRT10N090L

Package Type



TO-220C

PDFN5*6

TO-252

SOP-8

Figure 2 Package Type of SRT10N090L

9mΩ, 100V, N-Channel Power MOSFET**SRT10N090L****Ordering Information**

SRT10N090L □ □ - □

Circuit Type _____ E: Lead Free
G: Green
Package _____ Blank: Tube
D56: PDFN5*6
D: TO-252
TC: TO-220C
M: SOP-8
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
PDFN5*6	SRT10N090LD56TR-G	SRT10N090LD56G	Tape & Reel
TO-252	SRT10N090LDTR-G	SRT10N090LDG	Tape & Reel
TO-220C	SRT10N090LTC-E	SRT10N090LTCE	Tube
SOP-8	SRT10N090LMTR-G	10N090LMG	Tape & Reel

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 =25°C	I _D	PDFN5*6	65	A
			TO-252	68	
			TO-220C	68	
			SOP-8	17.5	
	T _C =100°C		PDFN5*6	41	
			TO-252	43	
			TO-220C	43	
			SOP-8	11	
Pulsed Drain Current (Note 2)		I _{DM}	195		A
Avalanche Energy, Single Pulse (Note 3)		E _{AS}	60		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	65		A
Diode Pulse Current		I _{S,PULSE}	195		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. $I_{AS}= 15.0\text{A}$, $V_{DD}= 50\text{V}$, $R_G= 25\Omega$, Starting $T_J= 25^{\circ}\text{C}$

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	PDFN5*6	R_{thJC}			1.7	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient		R_{thJA}			50	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Case	TO-252	R_{thJC}			1.55	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient		R_{thJA}			62	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Case	TO-220C	R_{thJC}			1.55	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient		R_{thJA}			62	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Lead	SOP8	R_{thJL}			25	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	SOP8	R_{thJA}			80	$^{\circ}\text{C/W}$

9mΩ, 100V, N-Channel Power MOSFET
SRT10N090L
Electrical Characteristics
 $T_J = 25^\circ\text{C}$, unless otherwise specified.

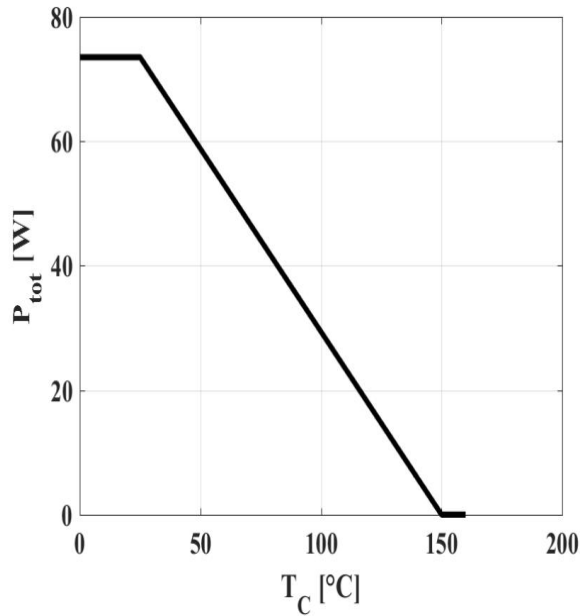
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	100			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =100V, V _{GS} =0V			1	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =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	PDFN5*6	R _{DS(ON)}	V _{GS} =4.5V, I _D =10A		10.5	13.8	mΩ
	TO-252				10.7	14.0	
	TO-220C				10.7	14.0	
	SOP-8				10.7	14.0	
	PDFN5*6		V _{GS} =10V, I _D =20A		7.6	9.0	mΩ
	TO-252				7.8	9.0	
	TO-220C				7.8	9.0	
	SOP-8				8.0	9.0	
Gate Resistance		R _G	f=1MHz, Open Drain		1.2		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =50V, V _{GS} =0V, f=1MHz		1.8		nF
Output Capacitance		C _{OSS}			530		pF
Reverse Transfer Capacitance		C _{RSS}			10		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...60V		720		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			850		
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			4.3		
Turn-off Delay Time		t _{d(off)}			19.1		
Fall Time		t _f			6.0		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =50V, I _D =20A V _{GS} =0 to 4.5V		6.2		nC
Gate to Drain Charge		Q _{gd}			5.0		
Gate Charge Total		Q _g			14.2		
Gate Charge Total		Q _g	V _{DD} =50V, I _D =20A, V _{GS} =0 to 10V		28.5		nC
Gate Charge Total, sync FET		Q _g	V _{DD} =0.1V, V _{GS} =0 to 10V		25.3		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =20A		0.85	1.1	V
Reverse Recovery Time		t _{rr}	V _R =50V, I _F =20A dI _F /dt=100A/us		33		nS
Reverse Recovery Charge		Q _{rr}			41		nC
Peak Reverse Recovery Current		I _{rrm}			2.5		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

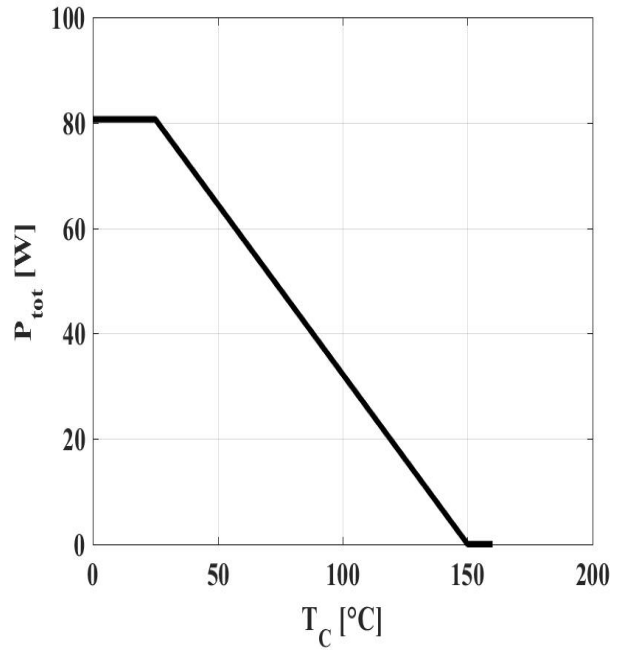
Typical Performance Characteristics

Figure 3A: Power Dissipation (PDFN5*6)



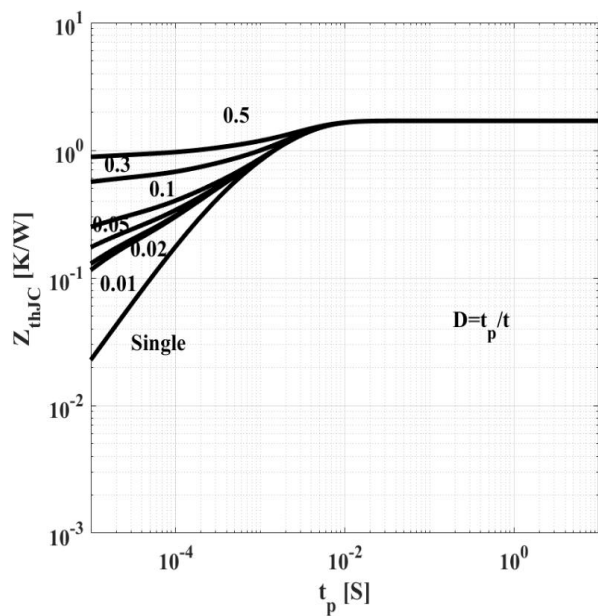
$$P_{tot}=f(T_c)$$

Figure 3B: Power Dissipation (TO-252&TO-220C)



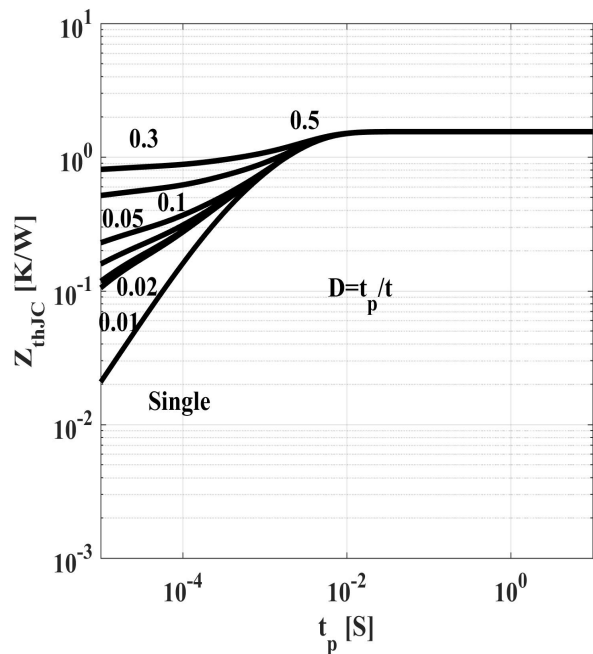
$$P_{tot}=f(T_c)$$

Figure 4A: Max. Transient Thermal Impedance (PDFN5*6)

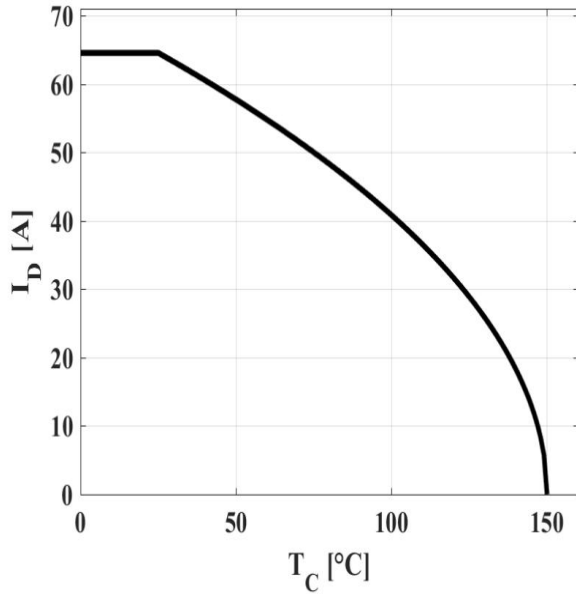


$$Z_{(th)JC}=f(t_p); \text{parameter: } D=t_p/T$$

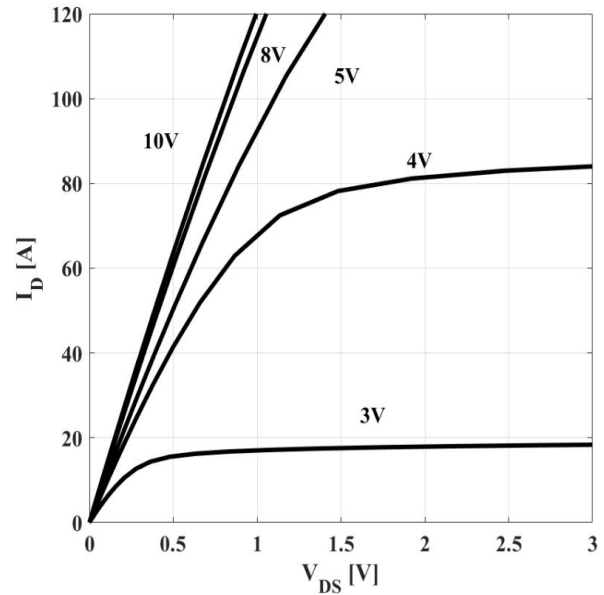
Figure 4B: Max. Transient Thermal Impedance (TO-252&TO-220C)



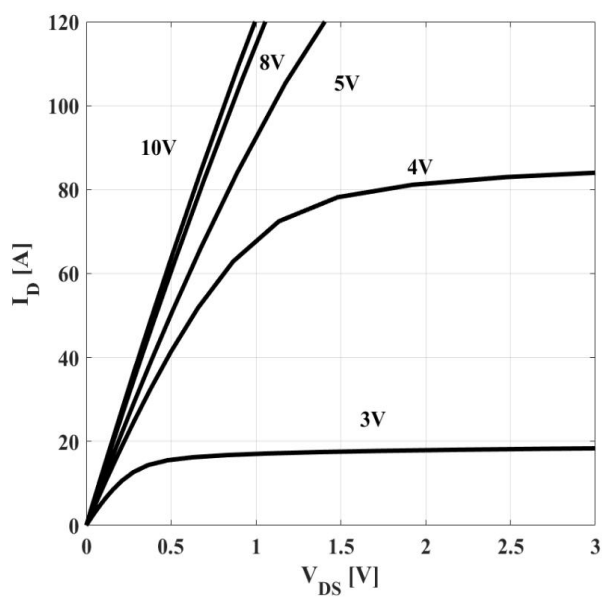
$$Z_{(th)JC}=f(t_p); \text{parameter: } D=t_p/T$$

Figure5A: Drain Current(PDFN5*6)


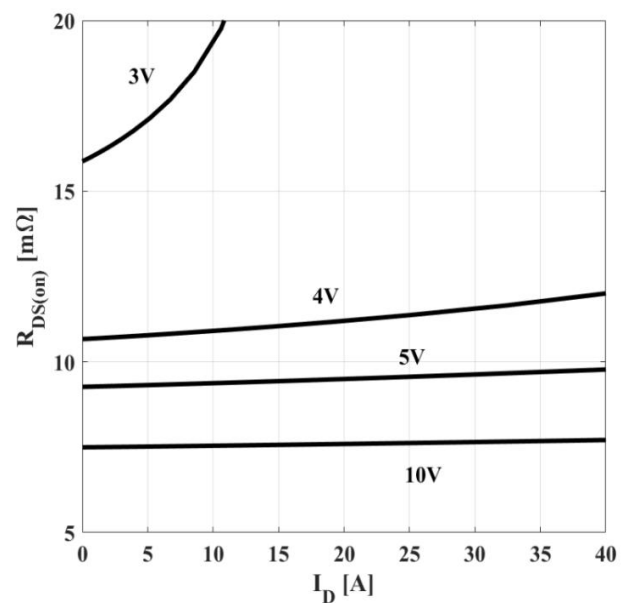
$$I_D = f(T_C); V_{GS} \geq 10V$$

Figure5B: Drain Current(TO-252&TO-220C)


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

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


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

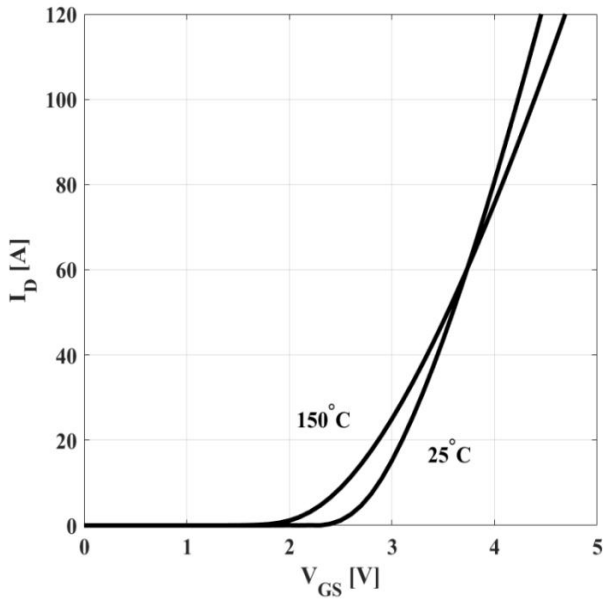
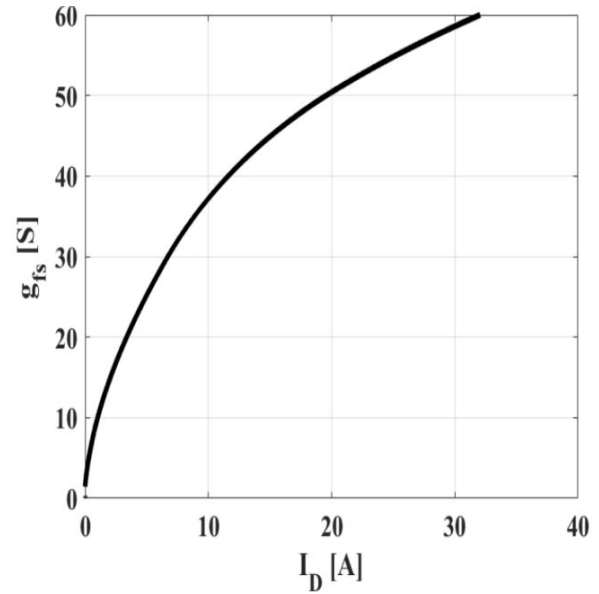
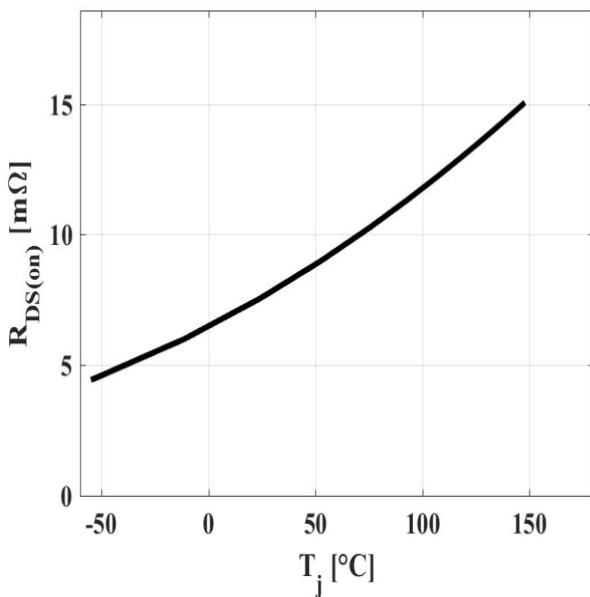
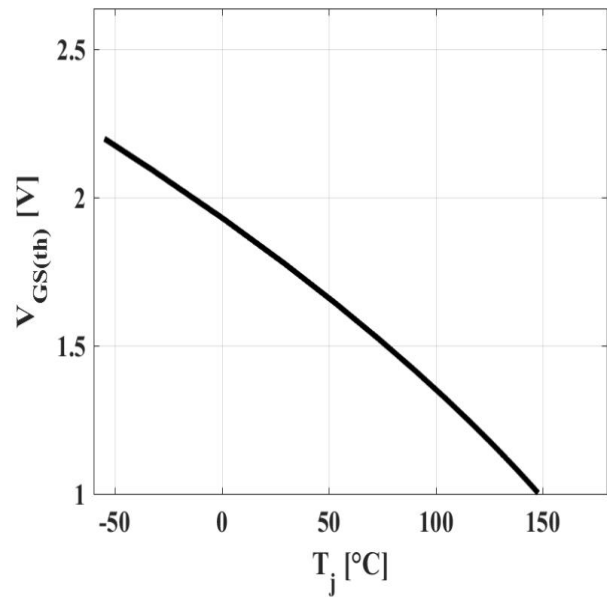
Figure8: Typ. Transfer Characteristics

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

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

 $R_{DS(ON)} = f(T_j); I_D = 20\text{A}; V_{GS} = 10\text{V}$
Figure11: Typ. Gate Threshold Voltage

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

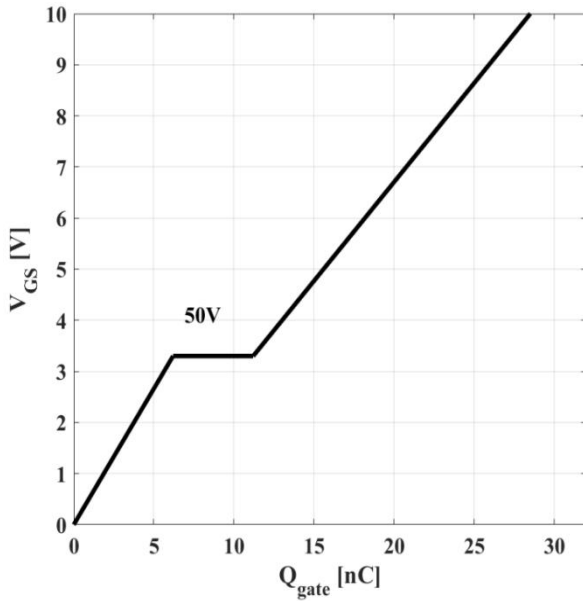
Figure 12: Typ. Gate Charge

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

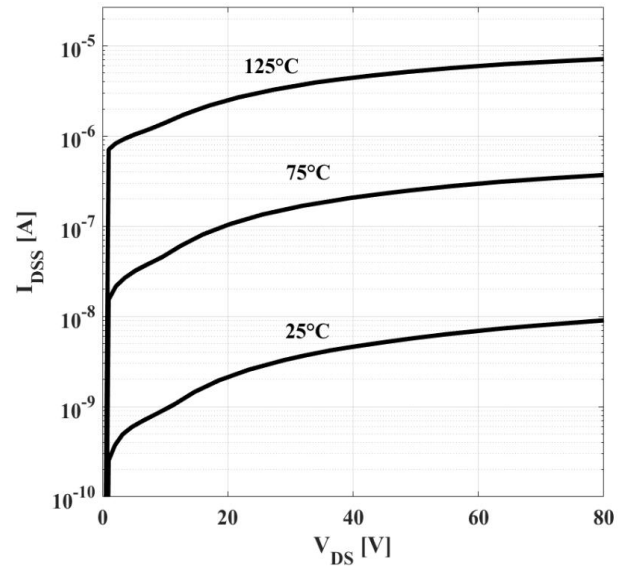
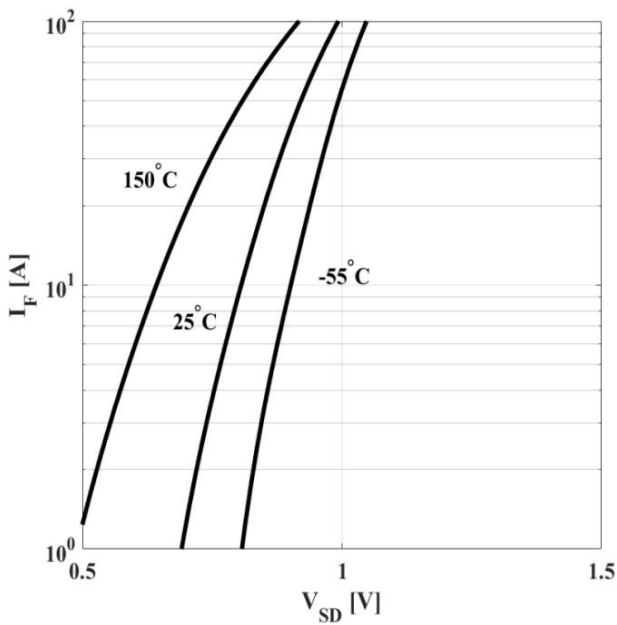
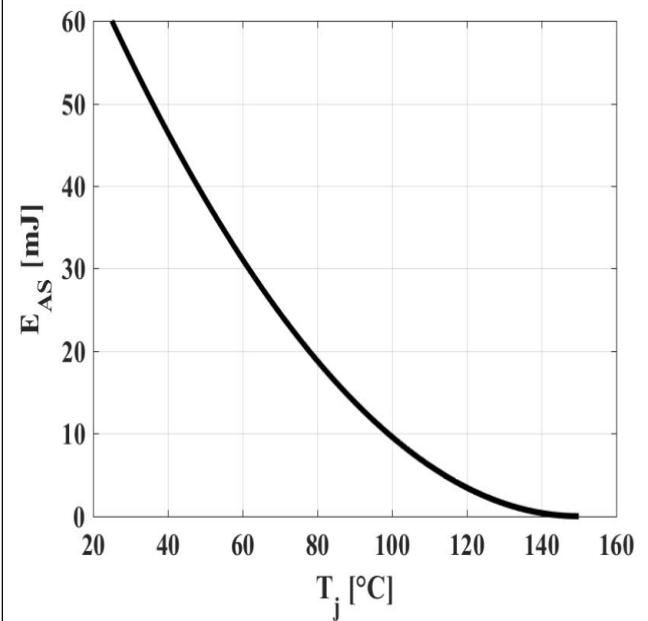
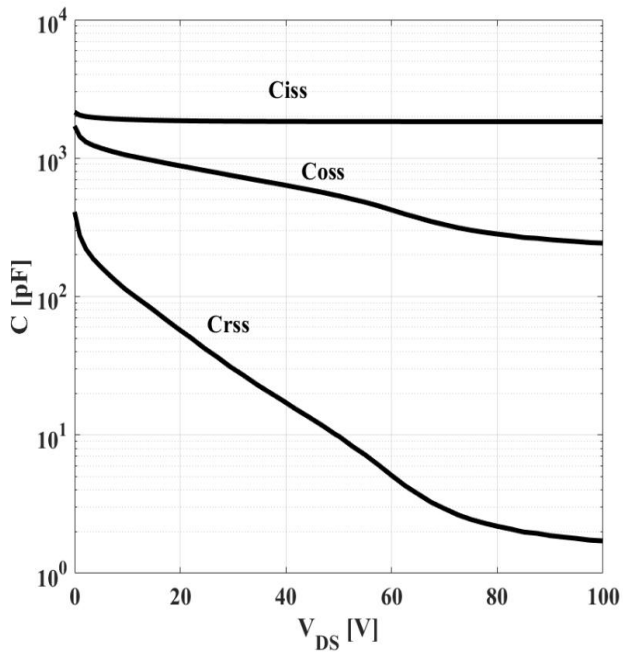
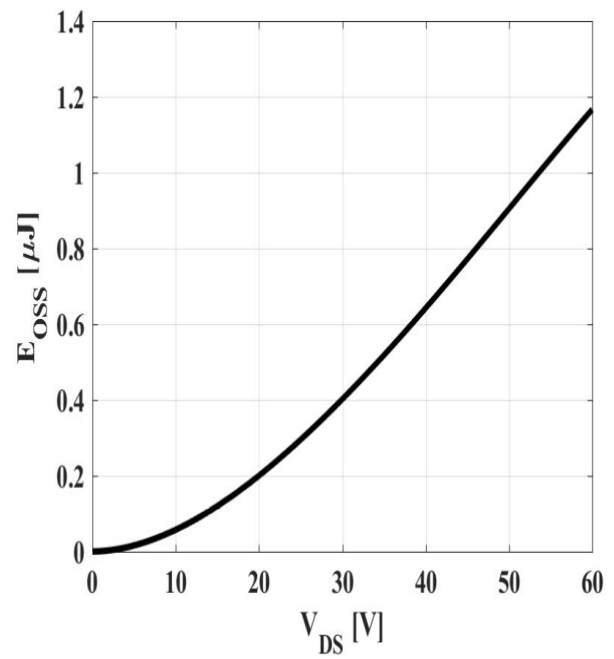
Figure 13: Drain-Source Leakage Current

 $I_{DSS} = f(V_{DS}); V_{GS} = 0V$; parameter: T_j
Figure 14: Forward Characteristics of Reverse Diode

 $I_F = f(V_{SD})$; parameter: T_j
Figure 15: Avalanche Energy

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

Figure 16: Typ. Capacitances



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

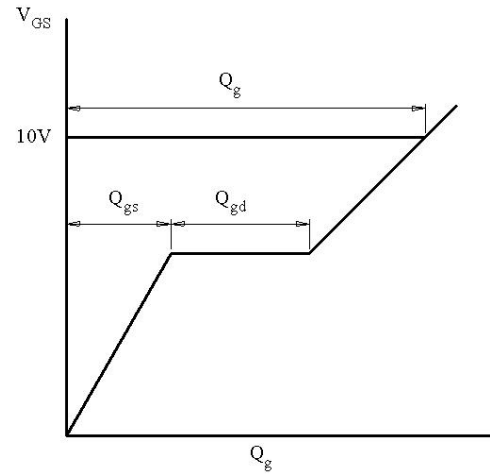
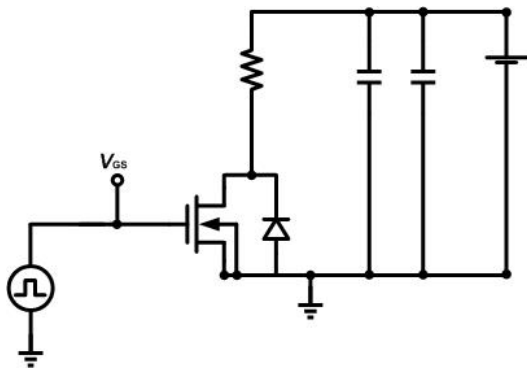
Figure 17: Coss Stored Energy



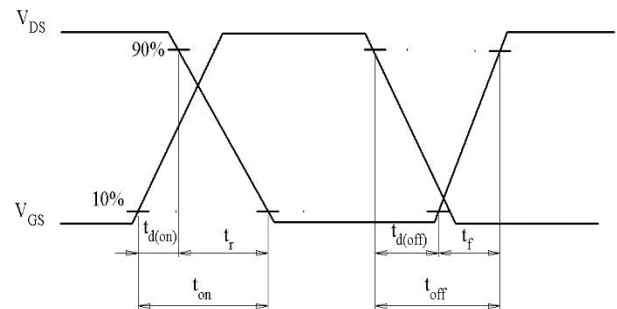
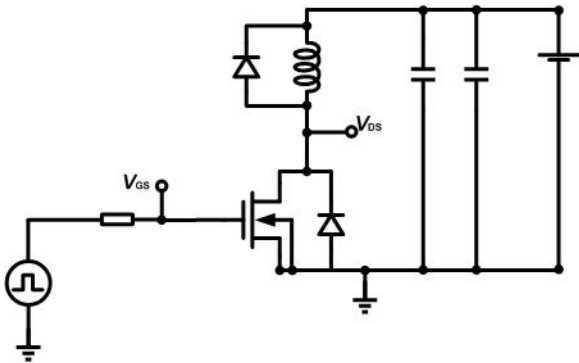
$$E_{OSS}=f(V_{DS})$$

Test Circuits

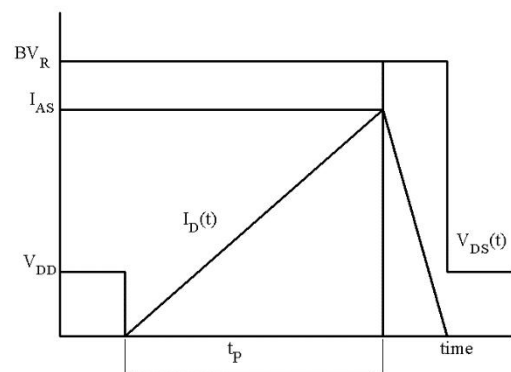
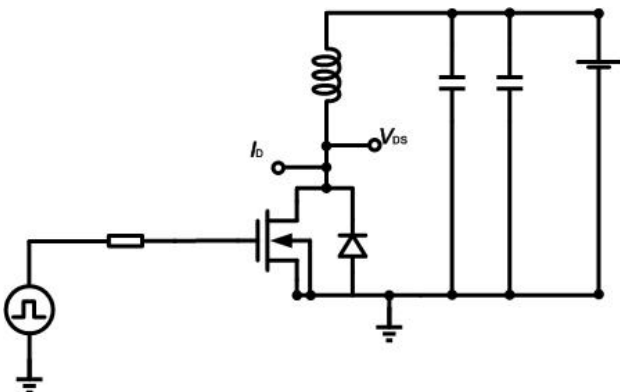
1. Gate Charge Test Circuit & Waveform



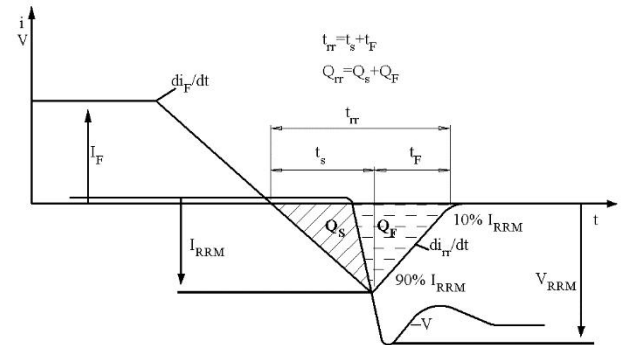
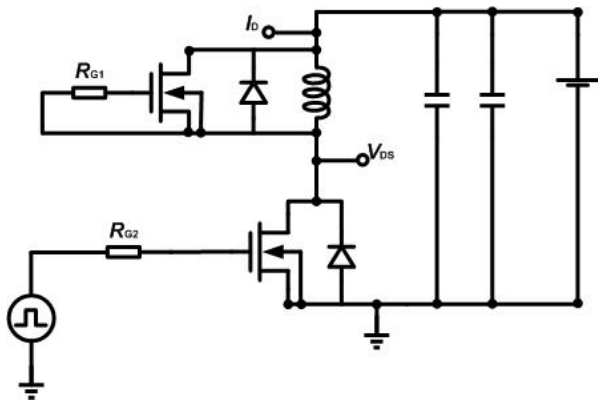
2. Switch Time Test Circuit



3. Unclamped Inductive Switching Test Circuit & Waveforms



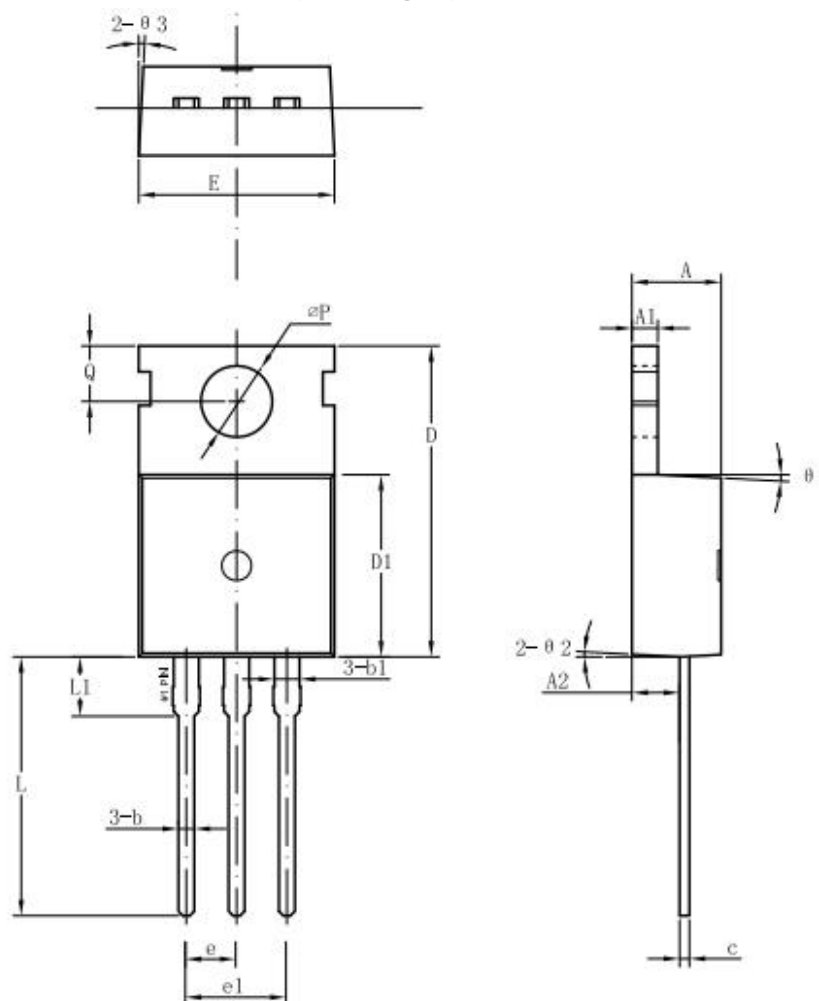
4. Test Circuit and Waveform for Diode Characteristics



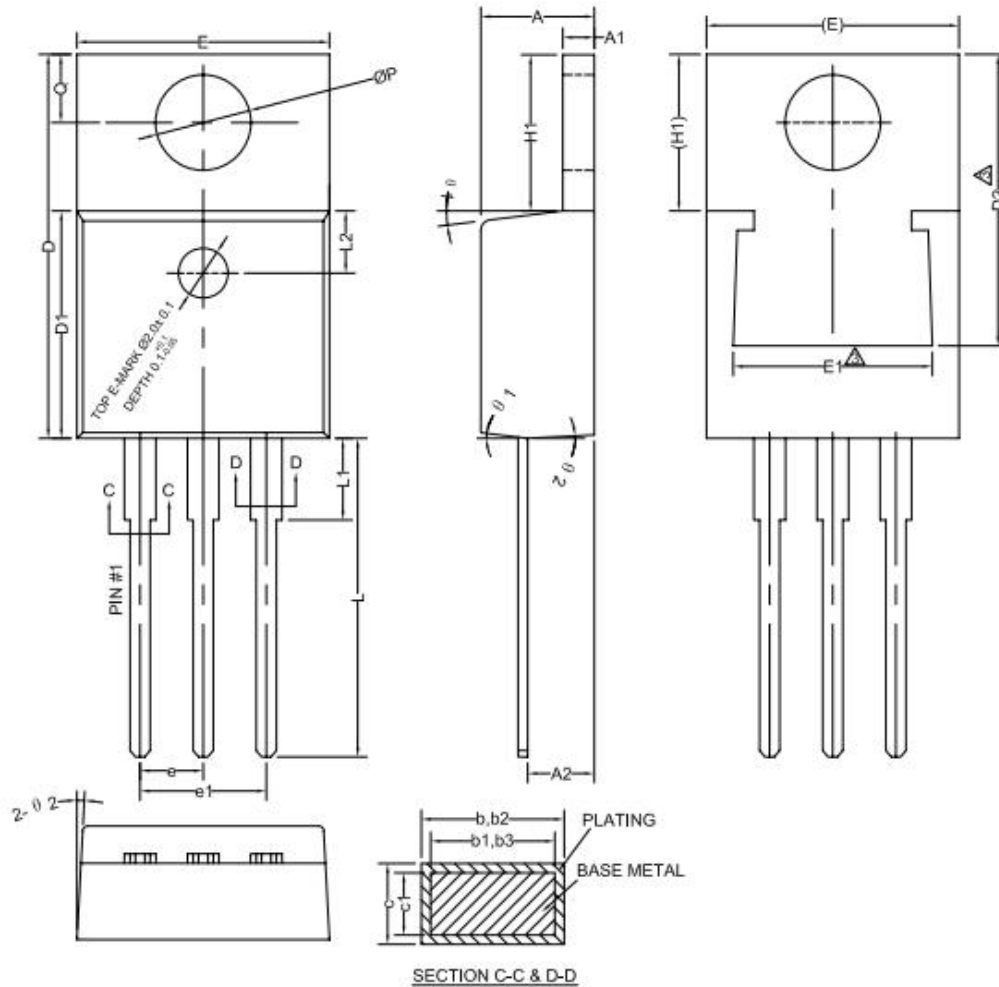
Mechanical Dimensions

TO-220C(Package1)

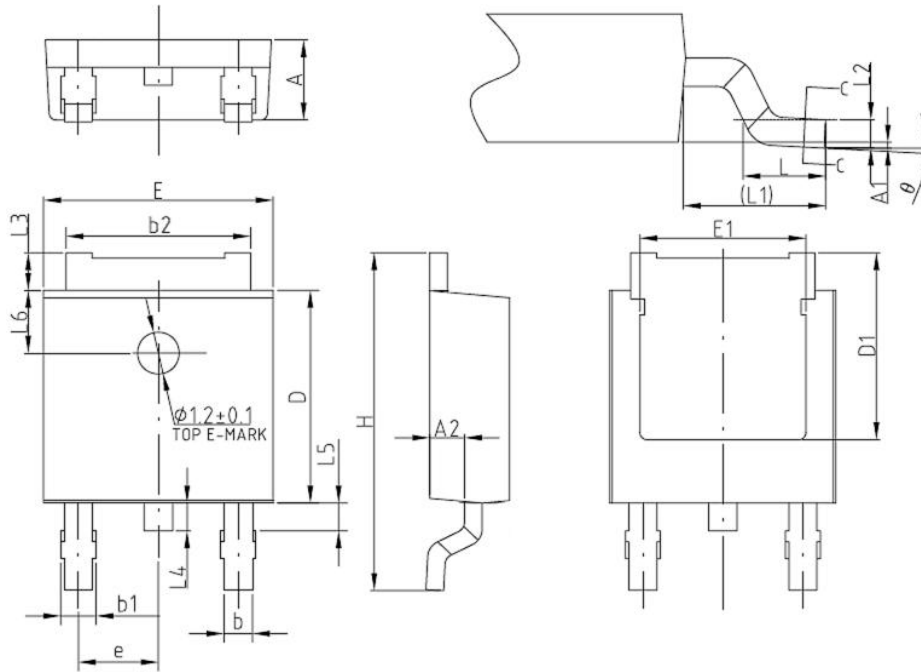
Unit: mm



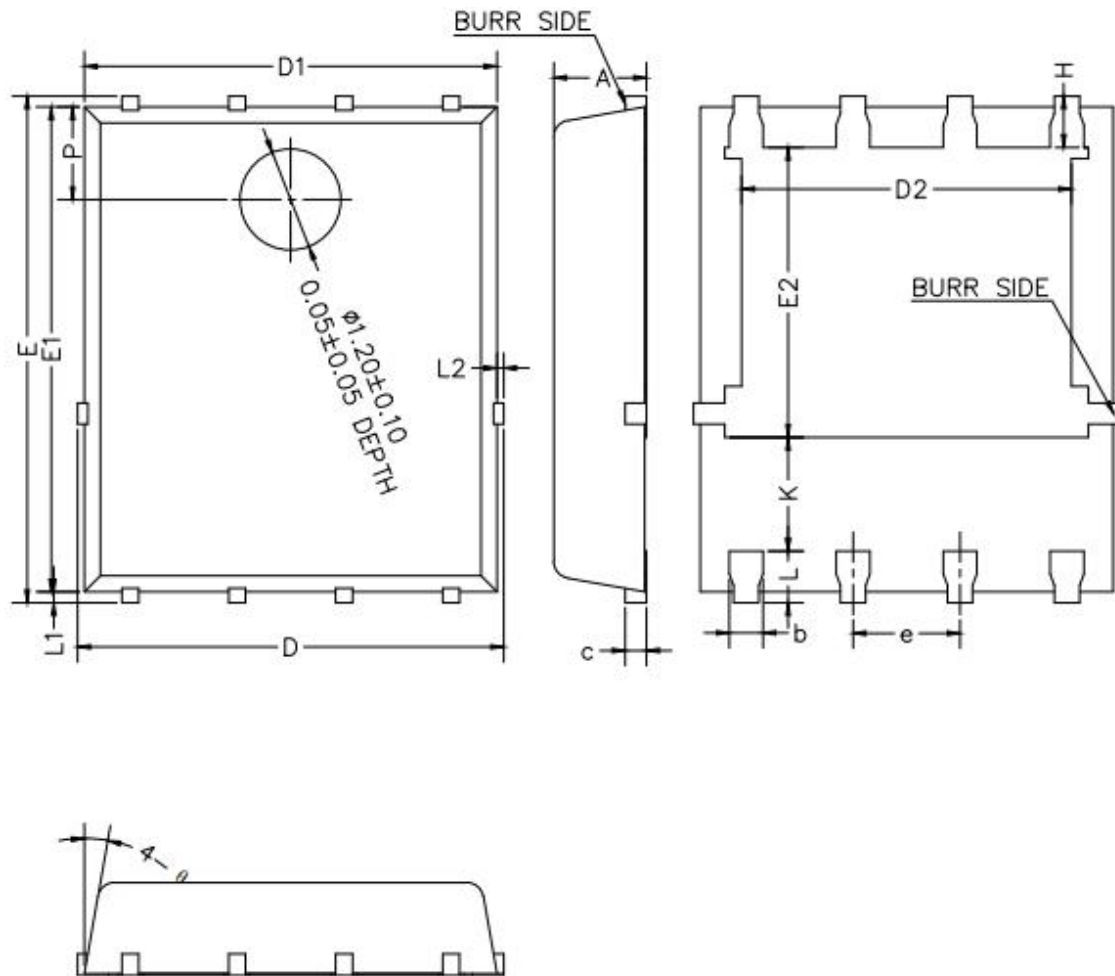
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.30	4.50	4.70	e	—	2.54	—
A1	1.25	1.30	1.40	e1	—	5.08	—
A2	2.20	2.40	2.60	L	12.60	13.08	13.60
b	0.70	0.80	0.95	L1	—	3.00	—
b1	—	1.27	—	ΦP	3.50	3.60	3.80
c	0.40	0.50	0.65	Q	2.60	2.80	3.00
D	15.20	15.70	16.20	⊖ 1	—	3°	—
D1	9.00	9.20	9.40	⊖ 2	—	3°	—
E	9.70	10.00	10.10	⊖ 3	—	3°	—

Mechanical Dimensions
TO-220C(Package2)
Unit: mm


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	9.96	10.16	10.36
A1	1.22	—	1.32	E1	6.86	—	8.89
A2	2.59	2.69	2.79	e	2.44	2.54	2.64
b	0.77	—	0.90	e1	4.98	5.08	5.18
b1	0.76	0.81	0.86	H1	6.10	6.30	6.50
b2	1.23	—	1.36	L	12.70	—	13.12
b3	1.22	1.27	1.32	L1	—	—	3.90
c	0.34	—	0.47	L2	—	2.50REF	—
c1	0.33	0.38	0.43	ΦP	3.80	3.84	3.88
D	15.15	15.45	15.75	Q	2.60	—	2.90
D1	9.05	9.15	9.25	θ 1	5°	7°	9°
D2	11.40	—	12.88	θ 2	1°	3°	5°

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°

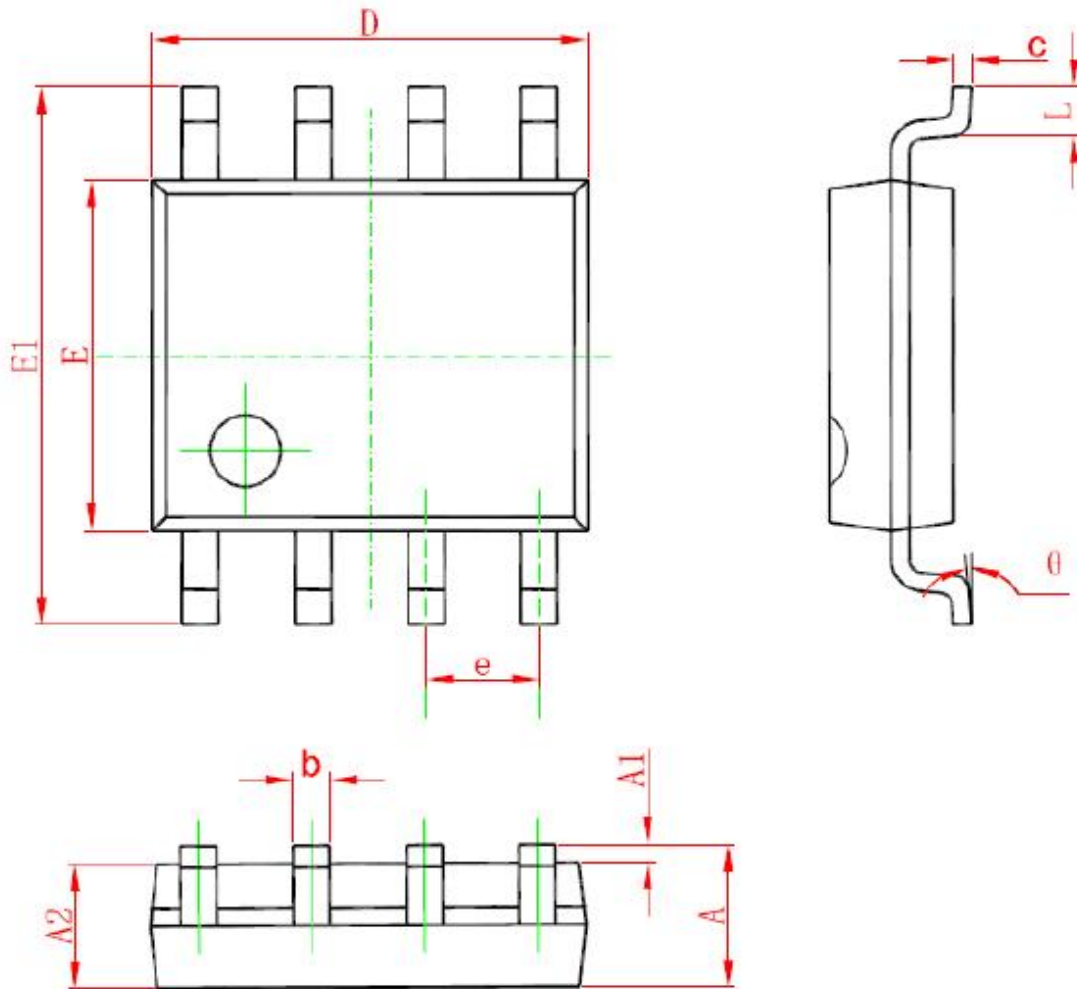
Mechanical Dimensions
PDFN5*6-8 Unit: mm


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	0.90	1.10	1.20	E2	3.62	—	3.82
b	0.35	0.40	0.45	H	0.38	0.48	0.58
c	0.21	0.25	0.34	K	1.10	—	—
D	—	—	5.10	L	0.51	0.61	0.71
D1	4.80	4.90	5.00	L1	0.06	0.13	0.20
D2	4.11	—	4.31	L2	—	—	0.15
e	1.17	1.27	1.37	P	1.00	1.10	1.20
E	5.90	6.00	6.10	θ	8°	10°	12°
E1	5.70	5.75	5.80				

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°



Sanrise Technology Limited Company

<http://www.sanrise-tech.com>

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