

## General Description

The Sanrise SRT15N090H 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 SRT15N090H break down voltage is 150V and it has a high rugged avalanche characteristics. The SRT15N090H is available in TO-220C and TO-263-2 and PDFN5\*6 packages.

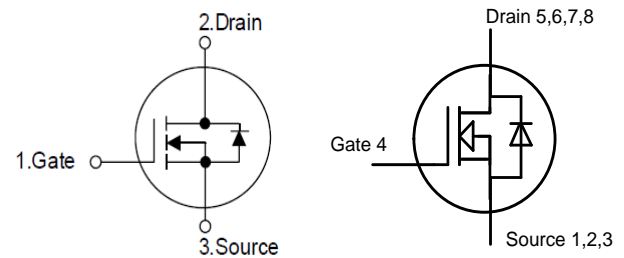
## Features

- Ultra Low  
 $R_{DS(ON\_TYP)} = 7.3m\Omega$ , TO-220C @  $V_{GS} = 10V$ .  
 $R_{DS(ON\_TYP)} = 7.2m\Omega$ , TO-263-2 @  $V_{GS} = 10V$ .  
 $R_{DS(ON\_TYP)} = 7.2m\Omega$ , PDFN5\*6 @  $V_{GS} = 10V$ .
- Ultra Low Gate Charge,  $Q_g = 32nC$  typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

## Application

- Server/Telecom
- High Power Supply
- Solar
- UPS

## Symbol

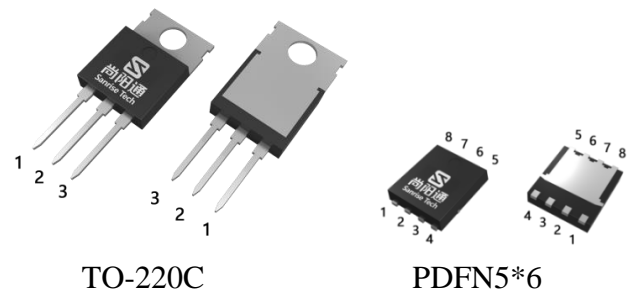


TO-220C, TO-263-2

PDFN5\*6

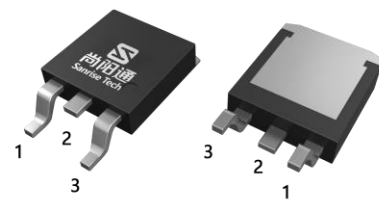
Figure 1 Symbol of SRT15N090H

## Package Type



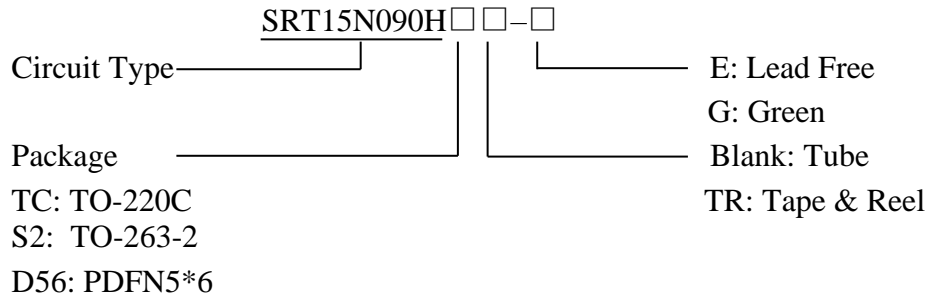
TO-220C

PDFN5\*6



TO-263-2

Figure 2 Package Type of SRT15N090H

**Ordering Information**


Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-220C	SRT15N090HTC-E	SRT15N090HTC-G	SRT15N090HTCE	SRT15N090HTCG	Tube
TO-263-2	SRT15N090HS2TR-E	SRT15N090HS2TR-G	SRT15N090HS2E	SRT15N090HS2G	Tape & Reel
PDFN5*6	SRT15N090HD56TR-E	SRT15N090HD56TR-G	SRT15N090HD56E	SRT15N090HD56G	Tape & Reel

**Absolute Maximum Ratings**

Parameter		Symbol	Rating	Unit	
Drain-Source Voltage		$V_{DSS}$	150	V	
Gate-Source Voltage		$V_{GSS}$	±20	V	
Continuous Drain Current, Package Limited	$T_C=25^{\circ}\text{C}$	$I_D$	TO-220C	105	A
			TO-263-2	105	
			PDFN56	105	
	$T_C=100^{\circ}\text{C}$		TO-220C	75	
			TO-263-2	75	
			PDFN56	75	
Continuous Drain Current, Silicon	$T_C=25^{\circ}\text{C}$	TO-220C	105		
		TO-263-2	105		
		PDFN56	105		
Pulsed Drain Current (Note 2)		$I_{DM}$	TO-220C	420	A
			TO-263-2	420	
			PDFN56	420	
Power Dissipation ( $T_C = 25^{\circ}\text{C}$ )		$P_D$	214	W	
Avalanche Destructive Energy, Single Pulse (Note 4)		$E_{AS\_Limit}$	552	mJ	
Avalanche Energy, Single Pulse (Note 3)		$E_{AS}$	81	mJ	
Avalanche Energy, Repetitive (Note 2)		$E_{AR}$	0.1	mJ	
Avalanche Current, Repetitive (Note 2)		$I_{AR}$	22	A	
Continuous Diode Forward Current		$I_S$	105	A	
Diode Pulse Current		$I_{S\_PULSE}$	420	A	
Operating Junction Temperature		$T_J$	175	$^{\circ}\text{C}$	
Storage Temperature		$T_{STG}$	-55 to 175	$^{\circ}\text{C}$	
Lead Temperature (Soldering, 10 sec)		$T_{LEAD}$	260	$^{\circ}\text{C}$	

Note:

- 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.
- Repetitive Rating: Pulse width limited by maximum junction temperature
- $I_{AS} = 18\text{A}$ ,  $V_{DD} = 60\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$
- $I_{AS\_Limit} = 47\text{A}$ ,  $V_{DD} = 60\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$

**Thermal Resistance**

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	TO-220C	$R_{thJC}$			0.7	°C/W
	TO-263-2				0.7	
	PDFN5*6				0.7	
Thermal Resistance, Junction-to-Ambient	TO-220C	$R_{thJA}$			62	
	TO-263-2				62	
	PDFN5*6				50	

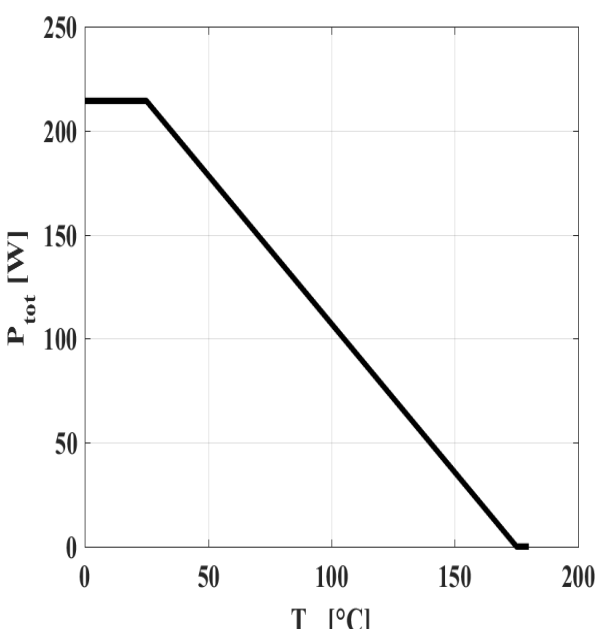
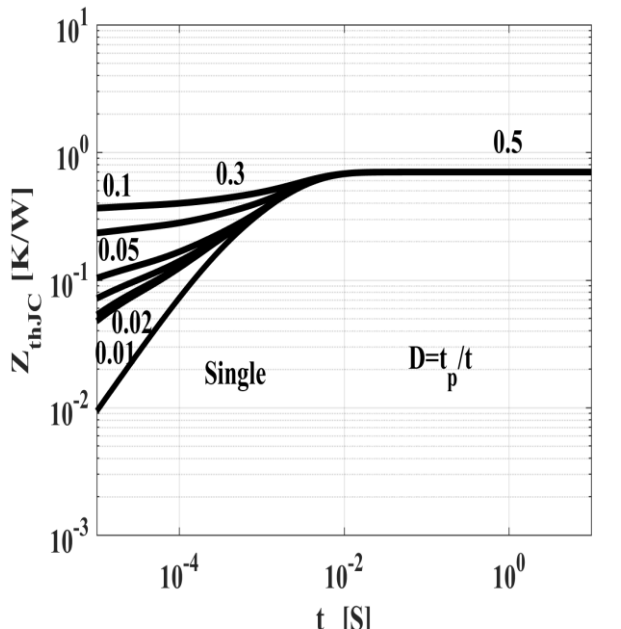
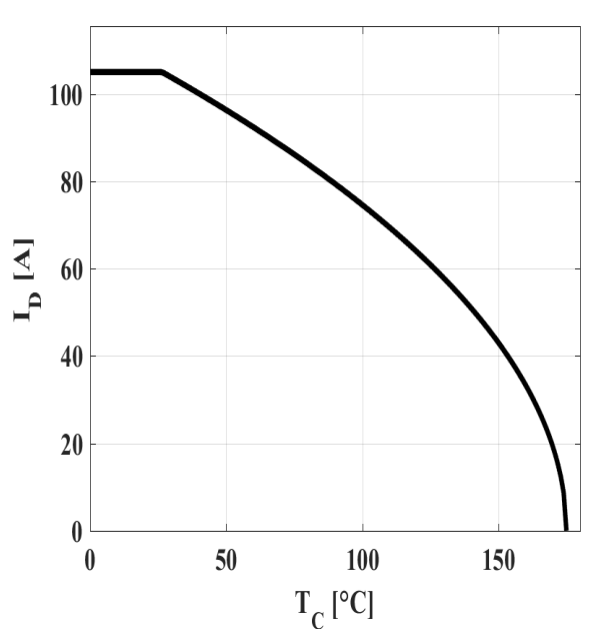
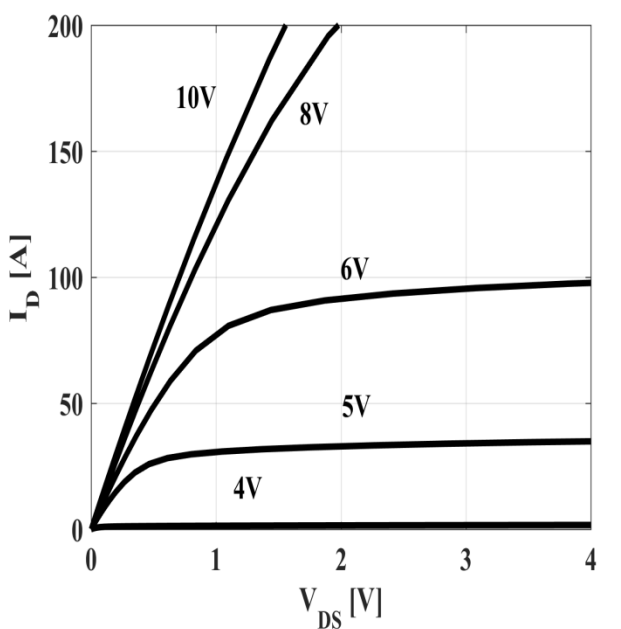
**9.0mΩ, 150V, N-Channel Power MOSFET**
**SRT15N090H**
**Electrical Characteristics**
 $T_J = 25^\circ\text{C}$ , unless otherwise specified.

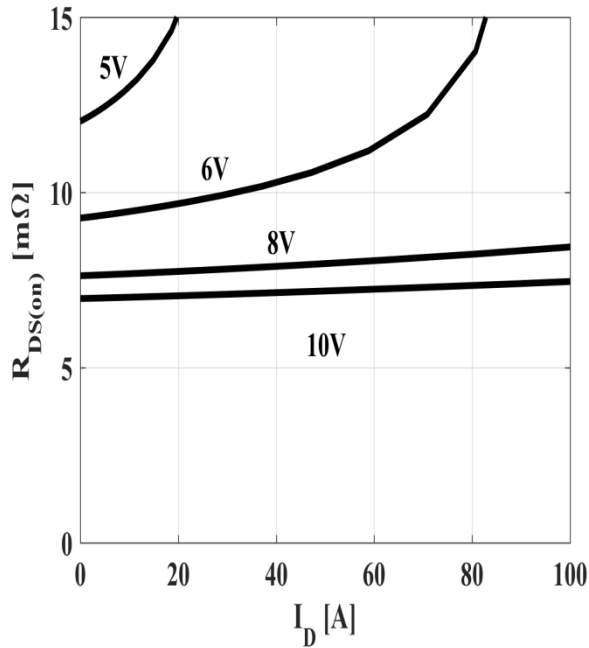
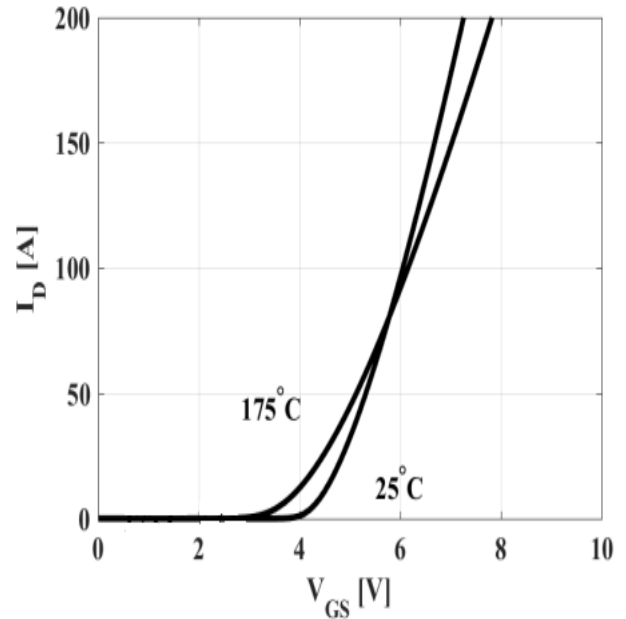
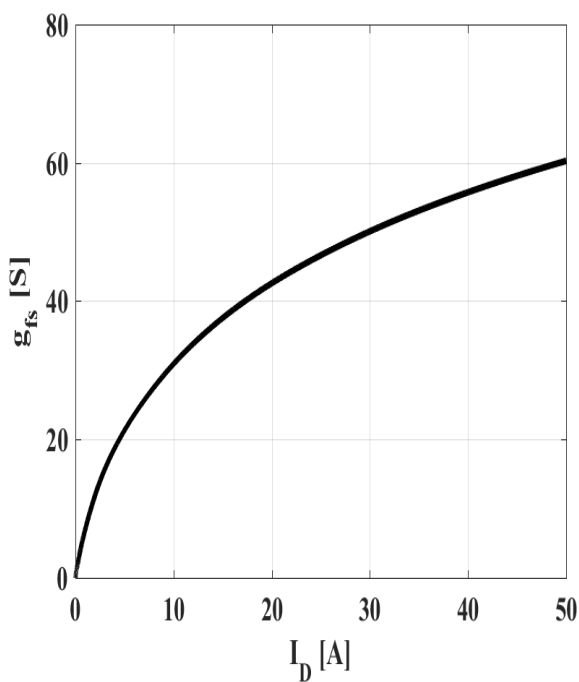
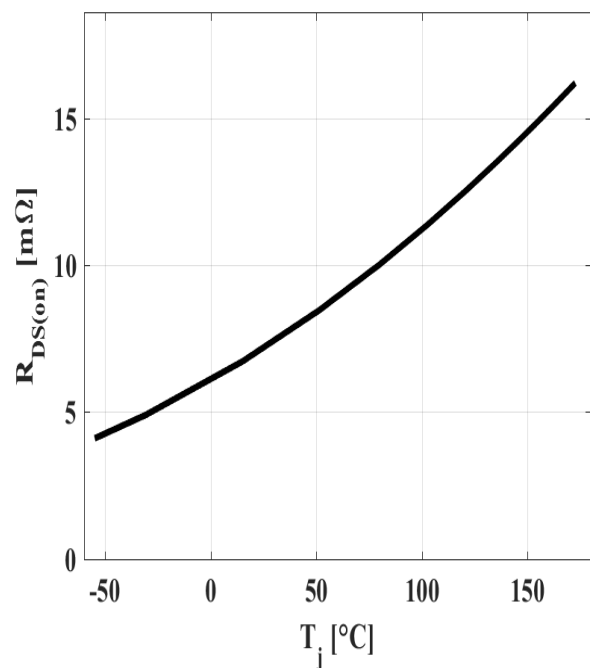
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Statistic Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	150			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=150V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=20V, V_{DS}=0V$			100	nA
	Reverse	$I_{GSSR}, V_{GS}=-20V, V_{DS}=0V$			-100	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=0.25mA$	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	TO-220C	$R_{DS(ON)}, V_{GS}=10V, I_D=60A$		7.3	9.0	$m\Omega$
	TO-263-2			7.2	9.0	$m\Omega$
	PDFN5*6			7.1	9.0	$m\Omega$
Gate Resistance	$R_G$	$f=1MHz, \text{Open Drain}$		1.2		$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=50V, V_{GS}=0V, f=1MHz$		2.2		nF
Output Capacitance	$C_{OSS}$			1.5		nF
Reverse Transfer Capacitance	$C_{RSS}$			23		pF
Effective output capacitance, energy related <small>NOTE5</small>	$C_{O(er)}$	$V_{GS}=0V, V_{DS}=0\dots 90V$		1.4		nF
Effective output capacitance, time related <small>NOTE6</small>	$C_{O(tr)}$			1.7		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=75V, I_D=60A, R_G=1.6\Omega, V_{GS}=10V$		8		nS
Rise Time	$t_r$			4		
Turn-off Delay Time	$t_{d(off)}$			13		
Fall Time	$t_f$			4		
<b>Gate Charge Characteristics</b>						
Gate to Source Charge	$Q_{gs}$	$V_{DD}=75V, I_D=60A, V_{GS}=0 \text{ to } 10V$		11.7		nC
Gate to Drain Charge	$Q_{gd}$			7.6		
Gate Charge Total	$Q_g$			32.0		
Gate Plateau Voltage	$V_{plateau}$			5.4		V
Gate Charge Total, sync FET	$Q_g$	$V_{DD}=0.1V, V_{GS}=0 \text{ to } 10V$		26.9		nC
<b>Reverse Diode Characteristics</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=60A$		0.87	1.1	V
Reverse Recovery Time	$t_{rr}$	$V_R=75V, I_F=60A, dI_F/dt=100A/\mu s$		28		nS
Reverse Recovery Charge	$Q_{rr}$			27		nC
Peak Reverse Recovery Current	$I_{rrm}$			1.9		A

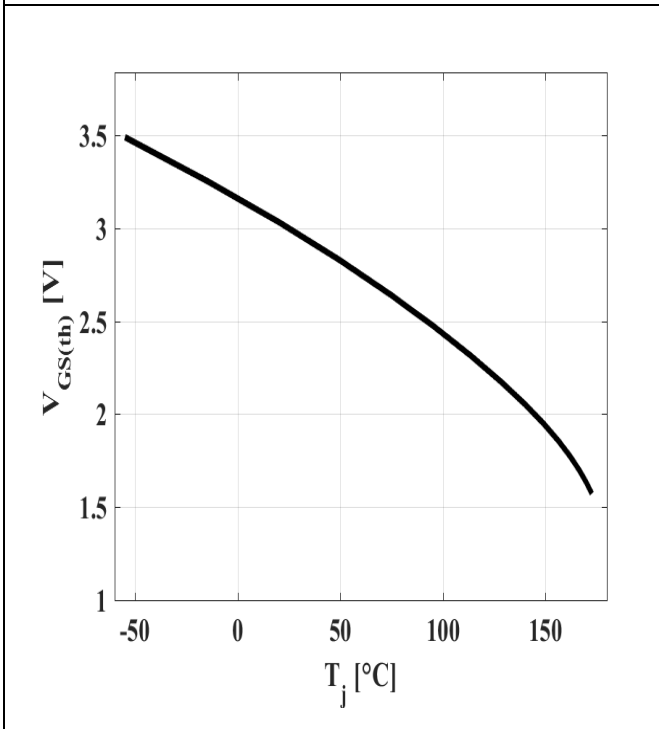
Note:

- $C_{O(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 90V
- $C_{O(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 90V

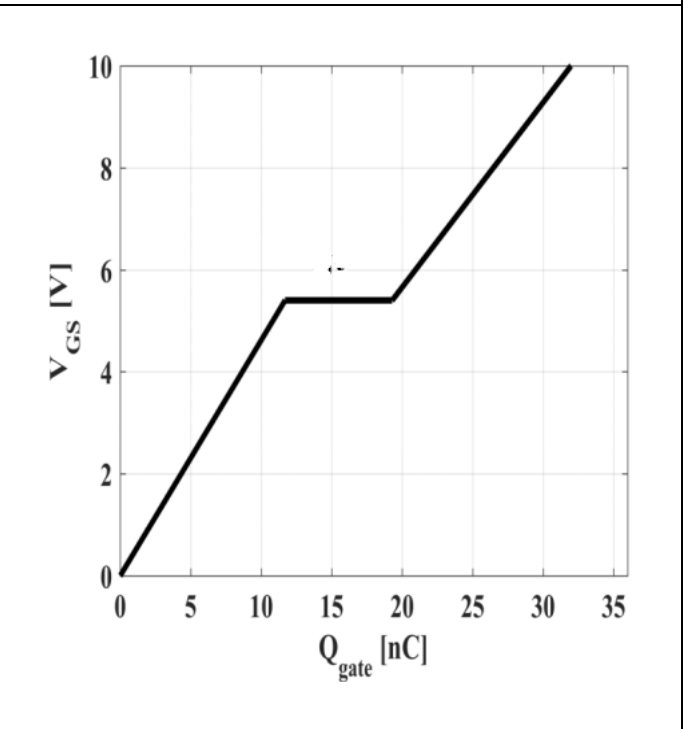
**Typical Performance Characteristics**

<p>Figure 3: Power Dissipation</p>  <p><math>P_{tot}=f(T_c)</math></p>	<p>Figure 4: Max. Transient Thermal Impedance</p>  <p><math>Z_{(th)JC}=f(t_p)</math>; parameter: <math>D=t_p/T</math></p>
<p>Figure 5: Drain Current</p>  <p><math>I_D=f(T_c); V_{GS} \geq 10V</math></p>	<p>Figure 6: Typ. Output Characteristics</p>  <p><math>I_D=f(V_{DS}); T_j=25^\circ C</math>; parameter: <math>V_{GS}</math></p>

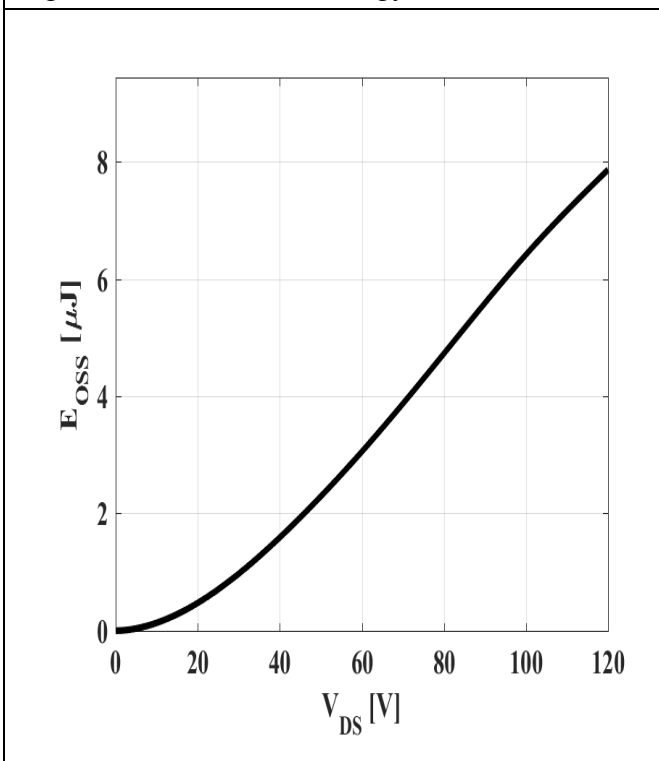
**Figure7: Typ. Drain-Source On-State Resistance**

 $R_{DS(ON)}=f(I_D); T_j=25^{\circ}C$ ; 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**

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

 $R_{DS(ON)}=f(T_j); I_D=60A; V_{GS}=10V$

**Figure 11: Typ. Gate Threshold Voltage**


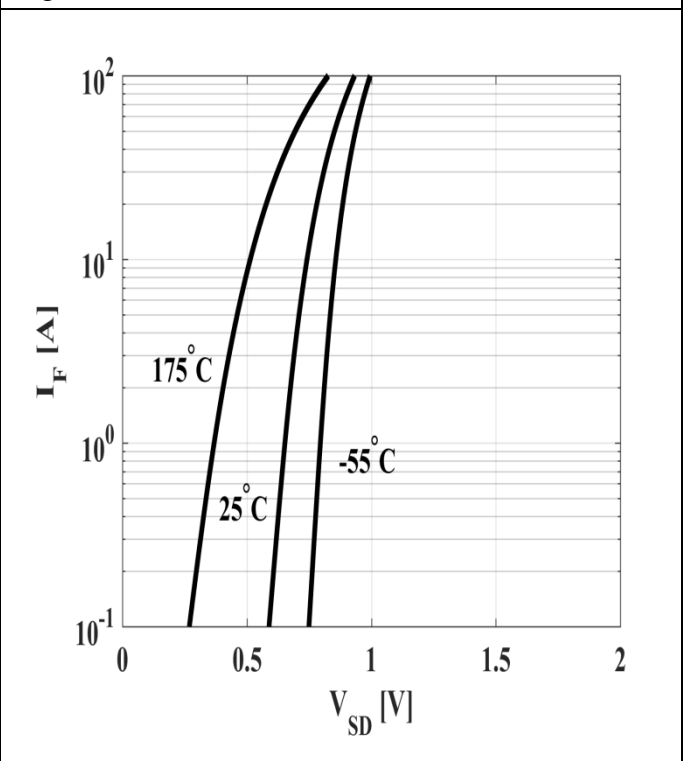
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_{DS} = 250\mu A$$

**Figure 12: Typ. Gate Charge**


$$V_{GS} = f(Q_{gate}), I_D = 60A \text{ pulsed}$$

**Figure 13: C<sub>oss</sub> Stored Energy**


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

**Figure 14: Forward Characteristics of Reverse Diode**


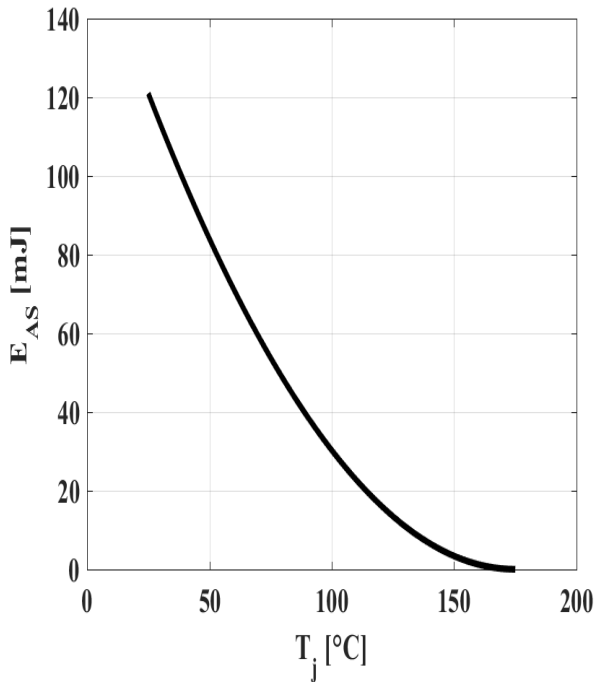
$$I_F = f(V_{SD}); \text{parameter: } T_j$$



**9.0mΩ, 150V, N-Channel Power MOSFET**

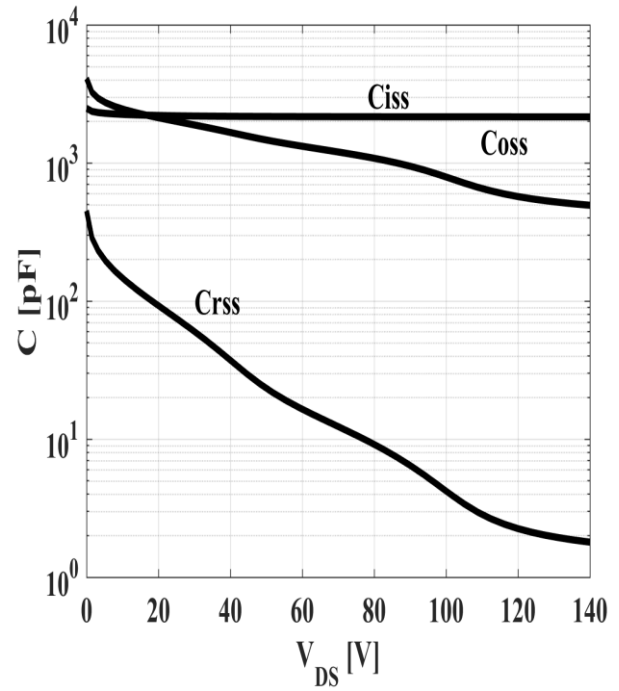
**SRT15N090H**

Figure 15: Avalanche Energy



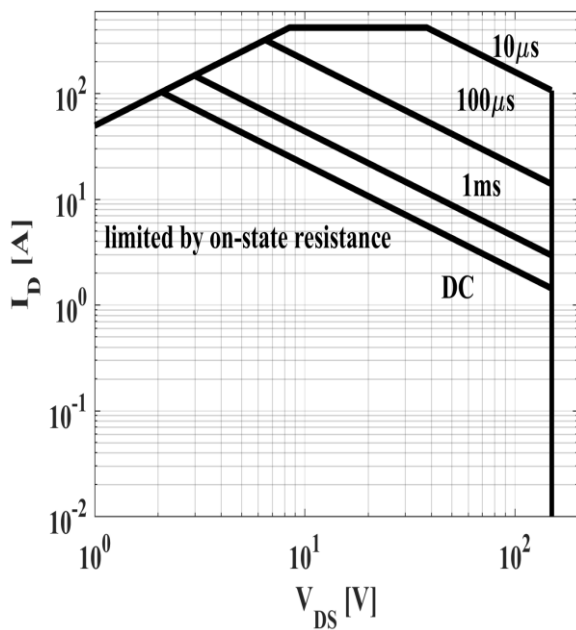
$E_{AS}=f(T_j)$ ;  $I_D=40.0A$ ;  $V_{DD}=75V$

Figure 16: Typ. Capacitances

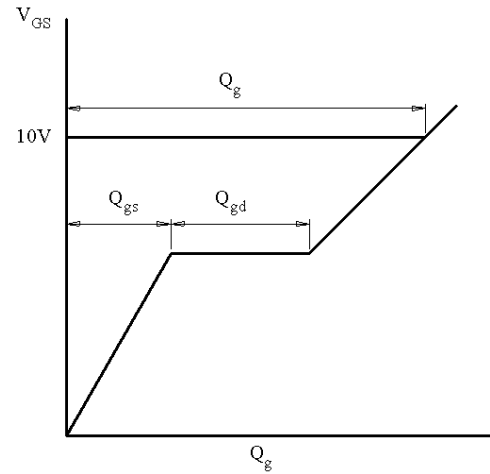
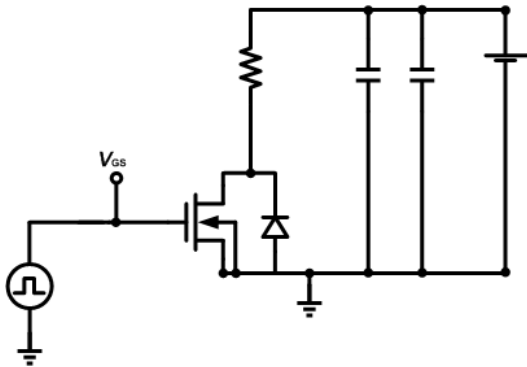
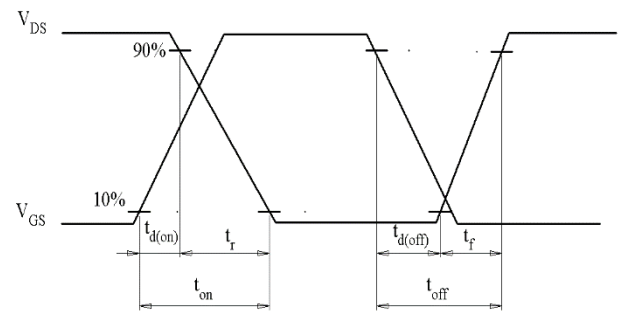
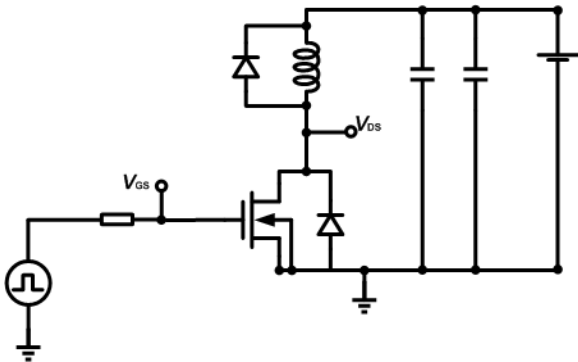
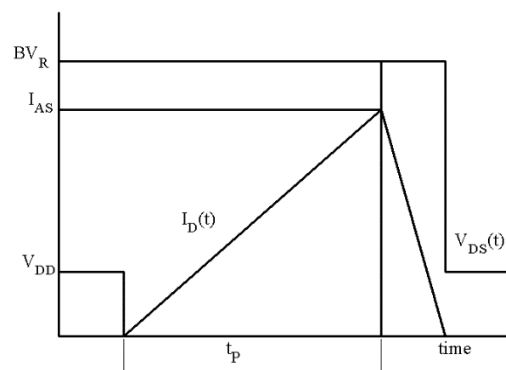
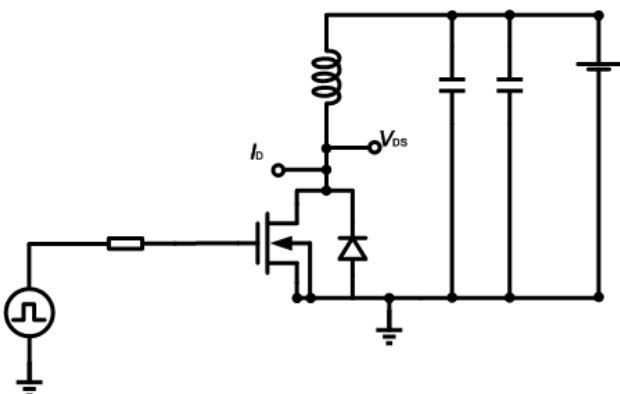


$C=f(V_{DS})$ ;  $V_{GS}=0$ ;  $f=1MHz$

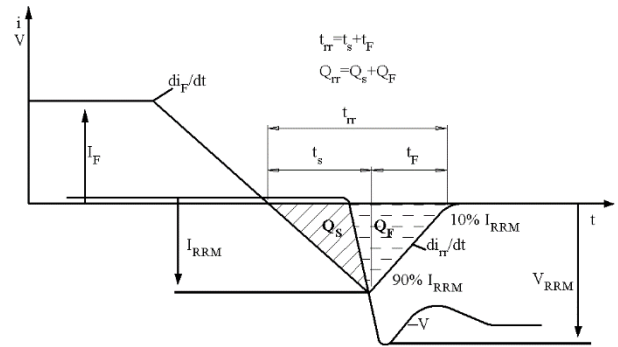
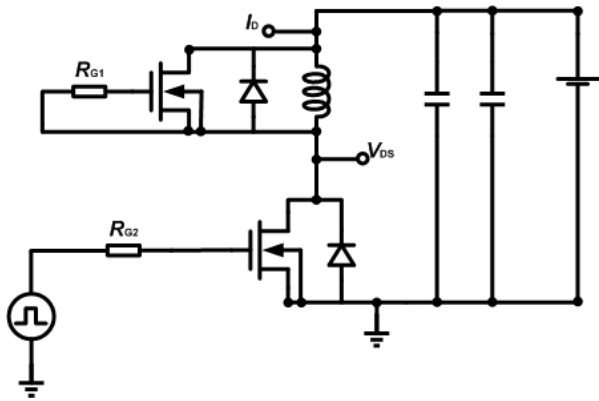
Figure 17: Safe Operating Area

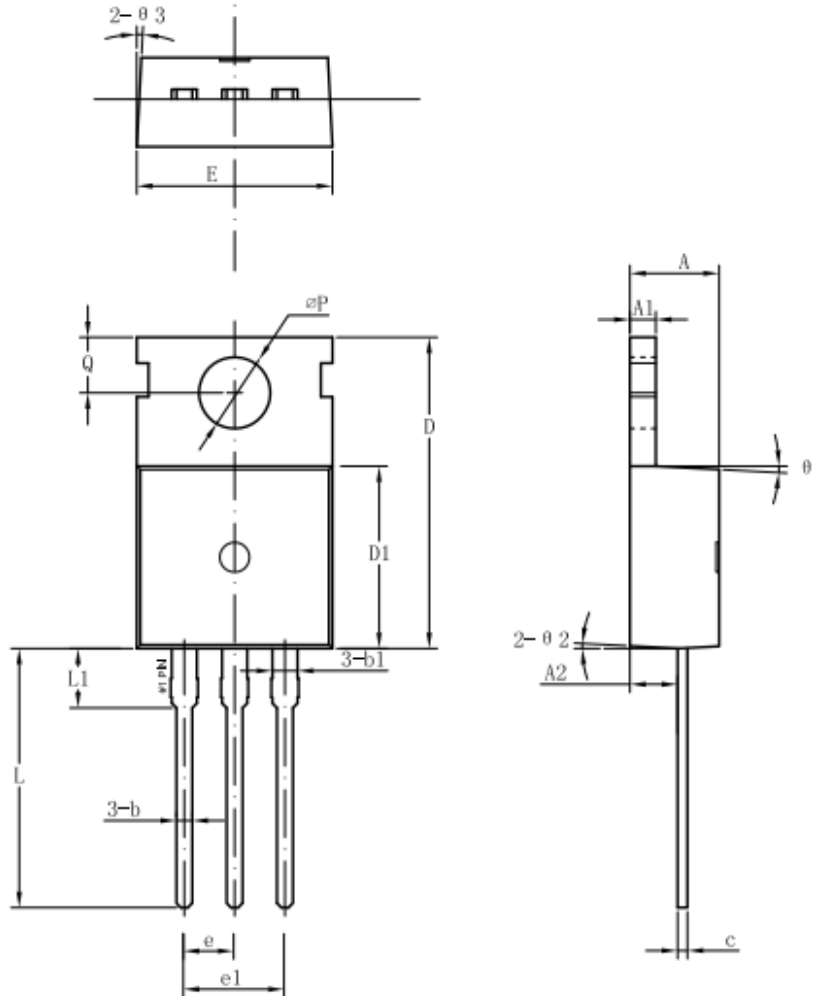


$I_D = f(V_{DS})$ ;  $T_c = 25^\circ C$ ;  $V_{GS} > 7V$ ; parameter  $t_p$

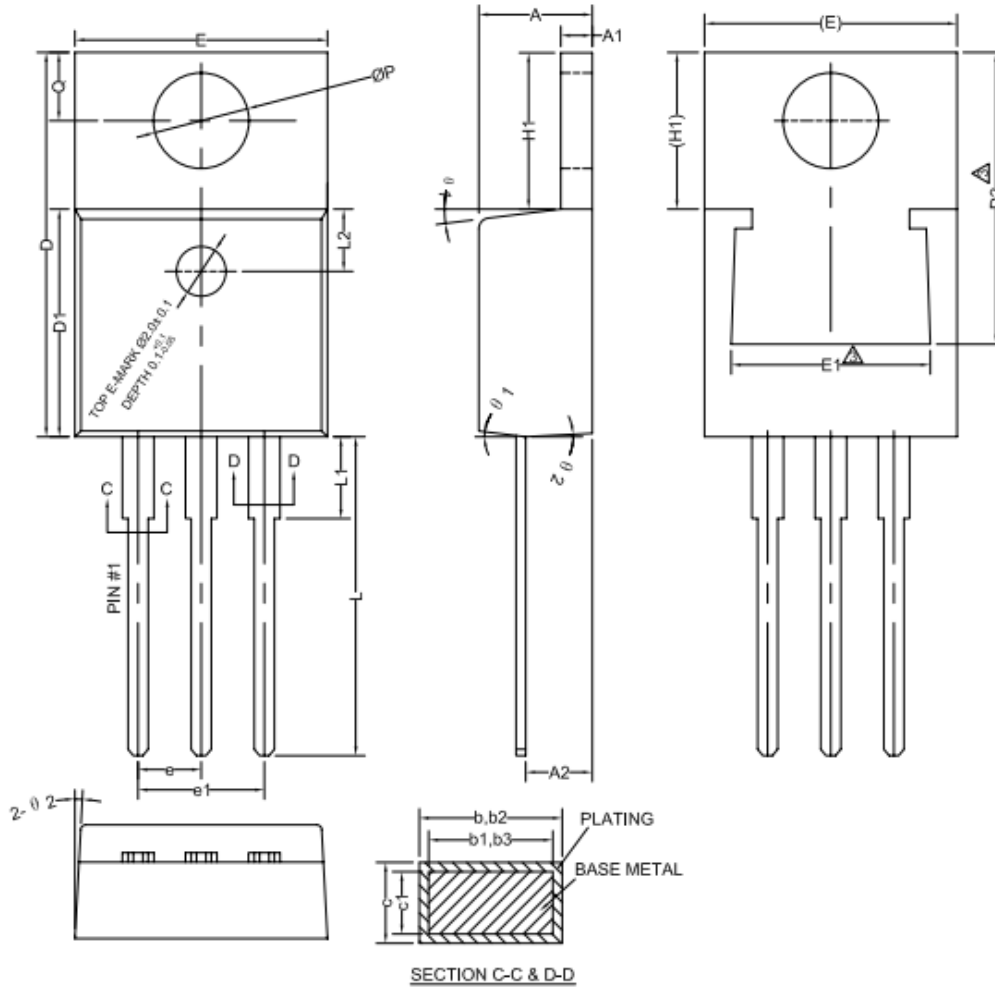
**Test Circuits**
**1. Gate Charge Test Circuit & Waveform**

**2. Switch Time Test Circuit**

**3. Unclamped Inductive Switching Test Circuit & Waveforms**


**4. Test Circuit and Waveform for Diode Characteristics**

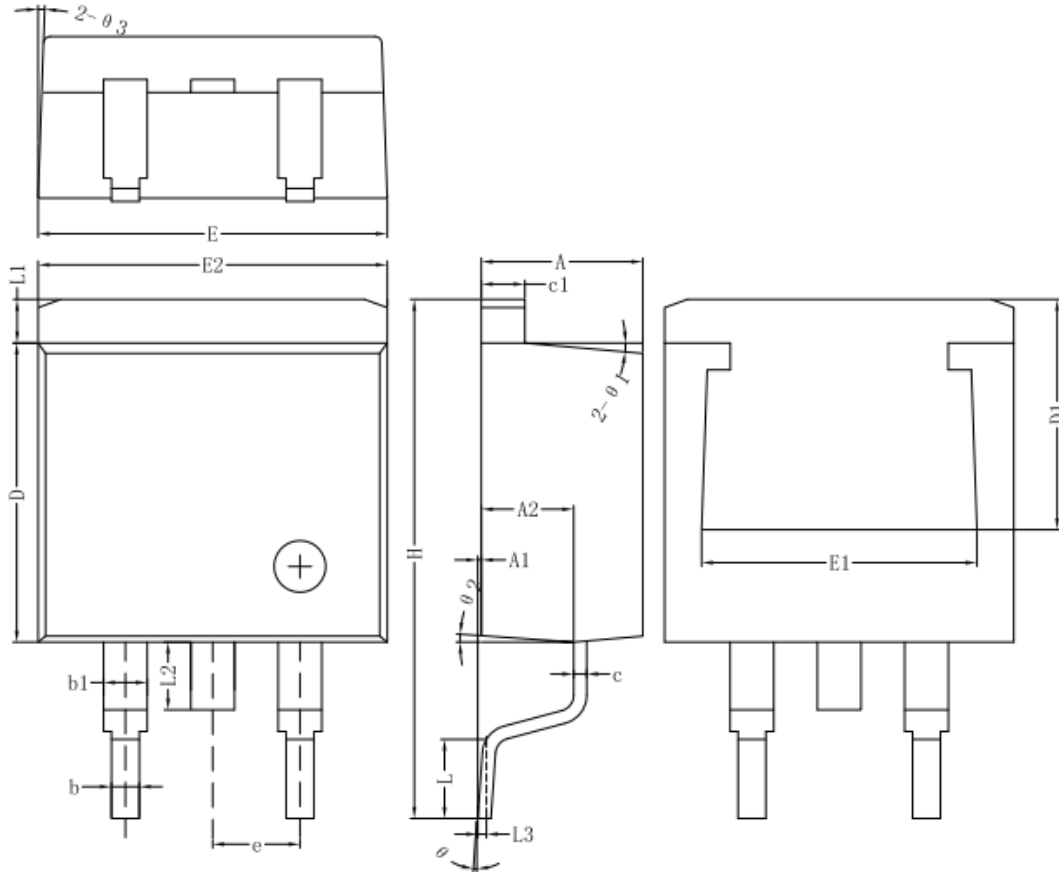


**Mechanical Dimensions**
**TO-220C(Package1)**
**Unit: mm**


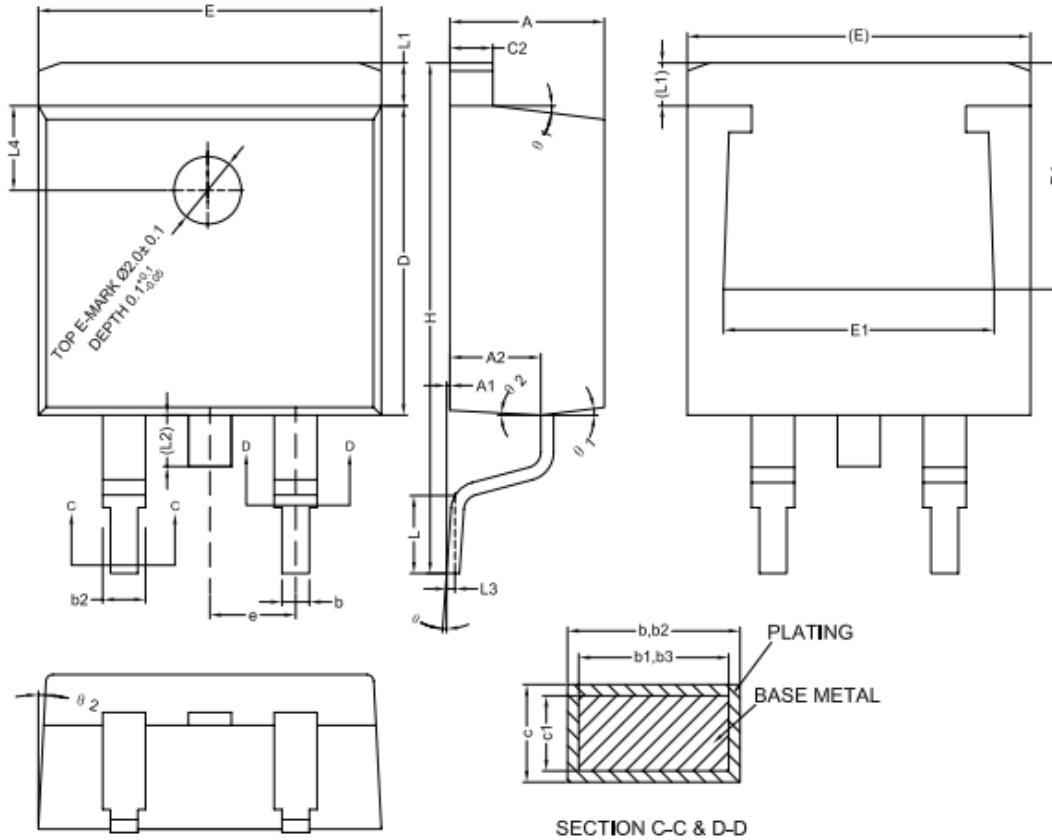
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.30	4.50	4.70	e	-	2.54	-
A1	1.25	1.30	1.40	e1	-	5.08	-
A2	2.20	2.40	2.60	L	12.60	13.08	13.60
b	0.70	0.80	0.95	L1	-	3.00	-
b1	-	1.27	-	φP	3.50	3.60	3.80
c	0.40	0.50	0.65	Q	2.60	2.80	3.00
D	15.20	15.70	16.20	θ1	-	3°	-
D1	9.00	9.20	9.40	θ2	-	3°	-
E	9.70	10.00	10.10	θ3	-	3°	-

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


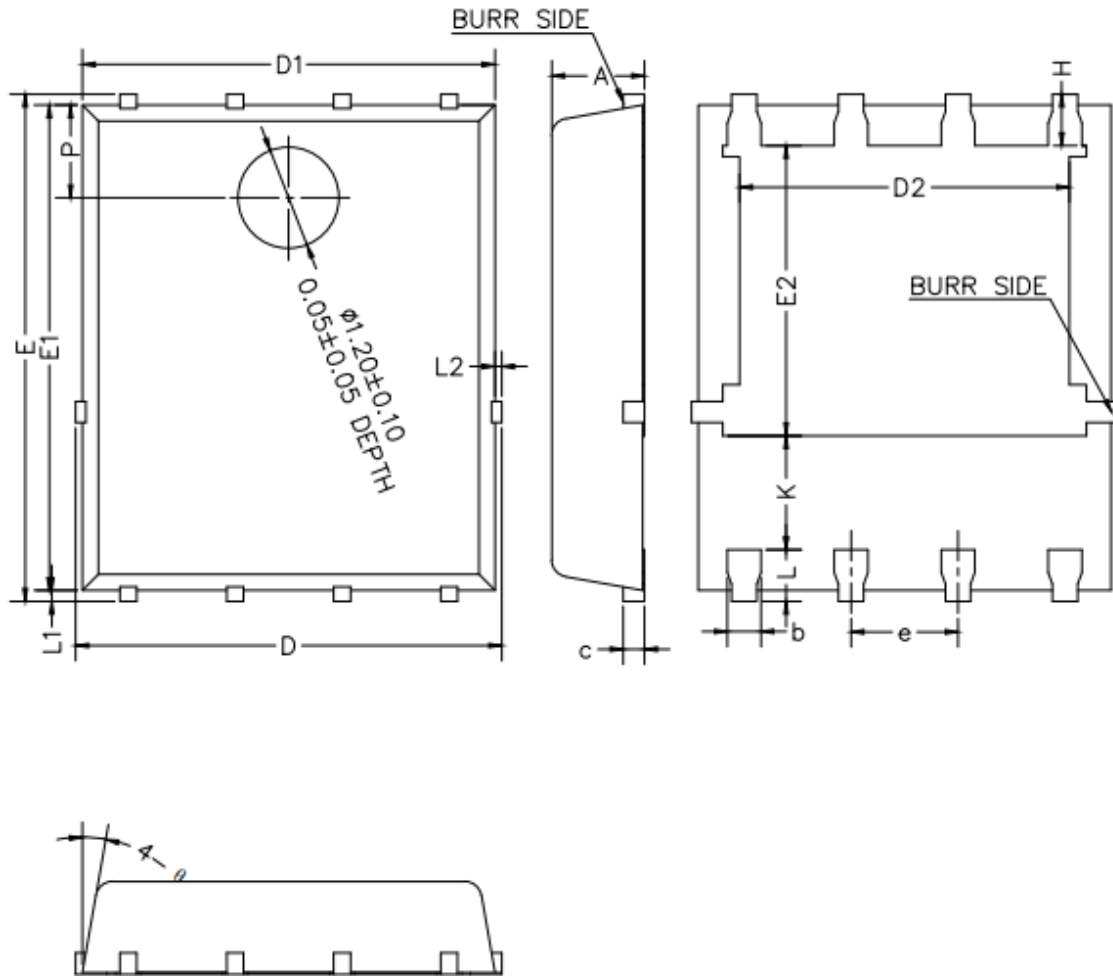
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	9.96	10.16	10.36
A1	1.22	-	1.32	E1	6.86	-	8.89
A2	2.59	2.69	2.79	e	2.44	2.54	2.64
b	0.77	-	0.90	e1	4.98	5.08	5.18
b1	0.76	0.81	0.86	H1	6.10	6.30	6.50
b2	1.23	-	1.36	L	12.70	-	13.12
b3	1.22	1.27	1.32	L1	-	-	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 (Continued)**
**TO-263-2(Package1)**
**Unit: mm**


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.55	4.70	4.85	E2	9.98	10.08	10.18
A1	0.00	0.10	0.25	e	-	2.54	-
A2	2.59	2.69	2.89	H	14.70	15.10	15.50
b	0.71	0.81	0.96	L	2.00	2.30	2.70
b1	-	1.27	-	L1	1.17	1.27	1.40
c	0.36	0.38	0.61	L2	-	-	2.20
c1	1.17	1.27	1.37	L3	-	0.25BSC	-
D	8.55	8.70	8.85	⊙	0°	-	8°
D1	-	7.20	-	⊙1	-	5°	-
E	10.01	10.16	10.31	⊙2	-	4°	-
E1	-	7.8	-	⊙3	-	4°	-

**Mechanical Dimensions (Continued)**
**TO-263-2(Package2)**
**Unit: mm**


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	10.06	10.16	10.26
A1	0.00	0.10	0.25	E1	7.80	-	8.20
A2	2.59	2.69	2.79	e	-	2.54BSC	-
b	0.77	-	0.90	H	14.70	15.10	15.50
b1	0.76	0.81	0.86	L	2.00	2.30	2.60
b2	1.23	-	1.36	L1	1.17	1.27	1.40
b3	1.22	1.27	1.32	L2	-	-	1.75
c	0.34	-	0.47	L3	-	0.25BSC	-
c1	0.33	0.38	0.43	L4	-	2.00REF	-
c2	1.22	-	1.32	⊕	0°	-	8°
D	9.05	9.15	9.25	⊕1	5°	7°	9°
D1	6.60	-	-	⊕2	1°	3°	5°

**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				





Sanrise Technology Limited Company

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

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