5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

General Description

The Sanrise SRT15N050H 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 SRT15N050H break down voltage is 150V and it has a high rugged avalanche characteristics. The SRT15N050H is available in TO-220C and TO-263-2 and TO-247 and TOLL packages.

Features

- Ultra Low

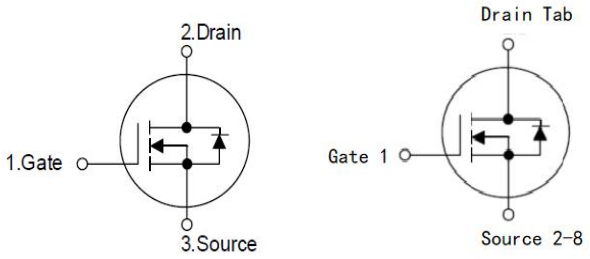
$R_{DS(ON)\_TYP}$ = 3.9mΩ, TO-220C @V_{GS} = 10V.
$R_{DS(ON)\_TYP}$ = 3.8mΩ, TO-263-2@V_{GS} = 10V.
$R_{DS(ON)\_TYP}$ = 3.9mΩ, TO-247 @V_{GS} = 10V.
$R_{DS(ON)\_TYP}$ = 2.9mΩ, TOLL @V_{GS} = 10V.

- Ultra Low Gate Charge, Qg=107nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- Server/Telecom
- High Power Supply
- E-Tools
- BMS

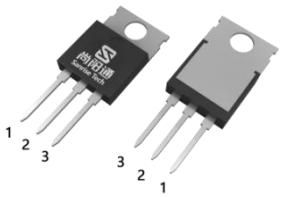
Symbol



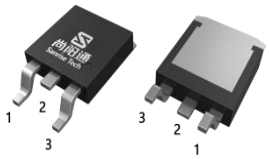
TO-263-2/TO-220C/TO-247 TOLL

Figure 1 Symbol of SRT15N050H

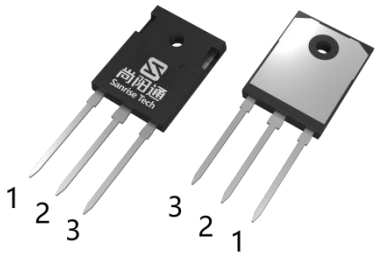
Package Type



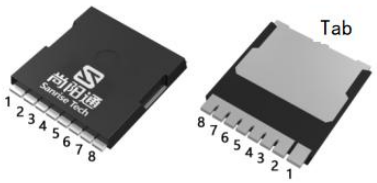
TO-220C



TO-263-2



TO-247

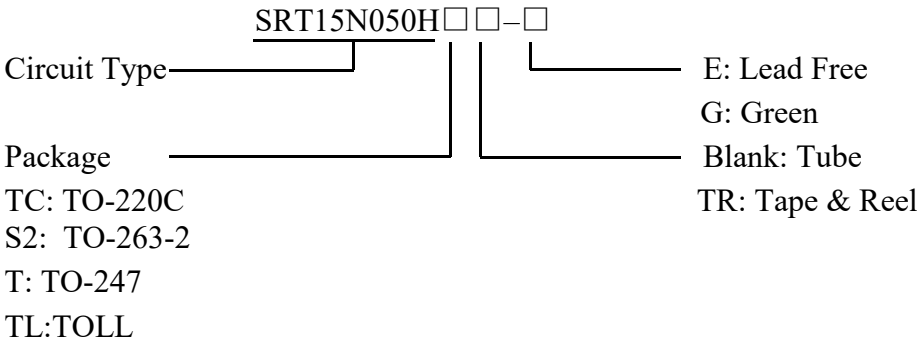


TOLL

Figure 2 Package Type of SRT15N050H

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Ordering Information



Package	Part Number	Marking ID	Packing Type
TO-220C	SRT15N050HTC-E	SRT15N050HTCE	Tube
TO-263-2	SRT15N050HS2TR-E	SRT15N050HS2E	Tape &Reel
TO-247	SRT15N050HT-G	SRT15N050HTG	Tube
TOLL	SRT15N050HTLTR-G	SRT15N050HTLG	Tape &Reel

5.0mΩ, 150V, N-Channel Power MOSFET **SRT15N050H**

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=25ºC	I_D	TO-220C	120	A
			TO-263-2	120	
			TO-247	120	
			TOLL	200	
	T_C=100ºC		TO-220C	120	
			TO-263-2	120	
			TO-247	120	
			TOLL	180	
Continuous Drain Current,Silicon	T_C=25ºC		TO-220C	169	
			TO-263-2	169	
			TO-247	169	
			TOLL	200	
Pulsed Drain Current (Note 2)		I_{DM}	TO-220C	480	A
			TO-263-2	480	
			TO-247	480	
			TOLL	800	
Power Dissipation (T_C = 25°C)		P_D	319		W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	900		mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	183		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.4		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	40.0		A
Continuous Diode Forward Current		I_S	120		A
Diode Pulse Current		$I_{S.PULSE}$	360		A
Operating Junction Temperature		T_J	175		ºC
Storage Temperature		T_{STG}	-55 to 175		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}= 27A, V_{DD}= 75V, R_G= 25Ω, Starting T_J= 25°C
4. I_{AS_Limit}= 60A, V_{DD} = 75V, R_G = 25Ω, Starting T_J = 25°C

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance， Junction-to-Case	TO-220C	R_{thJC}			0.47	ºC/W
	TO-263-2				0.47	
	TO-247				0.47	
	TOLL				0.40	
Thermal Resistance， Junction-to-Ambient		R_{thJA}			62	

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Electrical Characteristics

T_J = 25℃, unless otherwise specified.

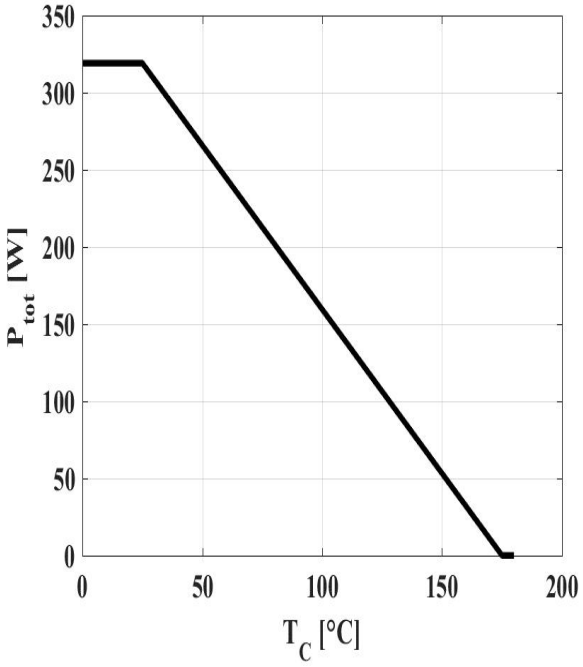
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	150			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=150V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			100	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-100	
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=0.25mA	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	TO-220C	$R_{DS(ON)}$	V_{GS}=10V, I_D=60A		3.9	5.0	mΩ
	TO-263-2				3.8	4.9	mΩ
	TO-247				3.9	5.0	mΩ
	TOLL				2.9	3.8	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		7.1		nF
Output Capacitance		C_{OSS}			2.4		nF
Reverse Transfer Capacitance		C_{RSS}			78		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…90V		2.3		nF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			2.8		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=75V, I_D=60A R_G=1.6Ω, V_{GS}=10V		21		Ns
Rise Time		t_r			6		
Turn-off Delay Time		$t_{d(off)}$			27		
Fall Time		t_f			5		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=75V, I_D=60A V_{GS}=0 to 10V		32.8		nC
Gate to Drain Charge		Q_{gd}			24.8		
Gate Charge Total		Q_g			107		
Gate Plateau Voltage		$V_{plateau}$			4.6		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		89.7		nC
Reverse Diode Characteristics							
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/us		52		ns
Reverse Recovery Charge		Q_{rr}			86		nC
Peak Reverse Recovery Current		I_{rrm}			3.3		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

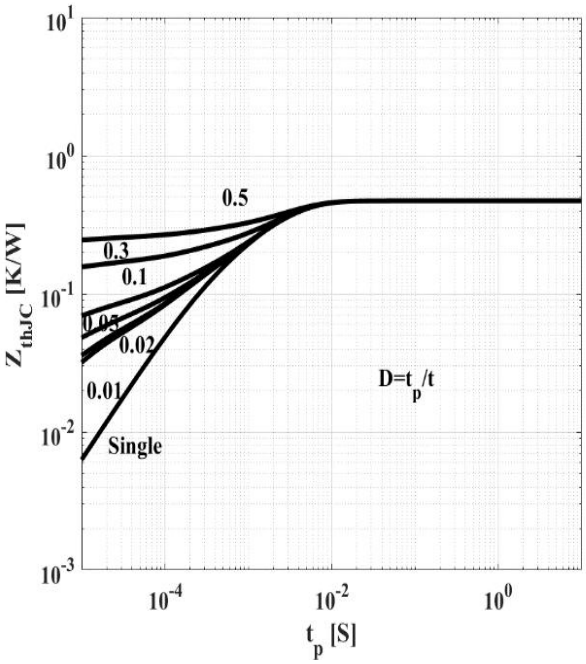
Typical Performance Characteristics

Figure 3: Power Dissipation



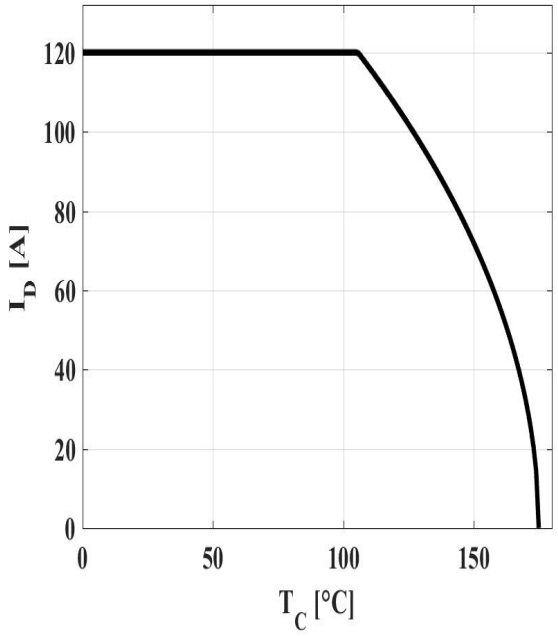
$P_{tot}=f(T_c)$

Figure 4: Max. Transient Thermal Impedance



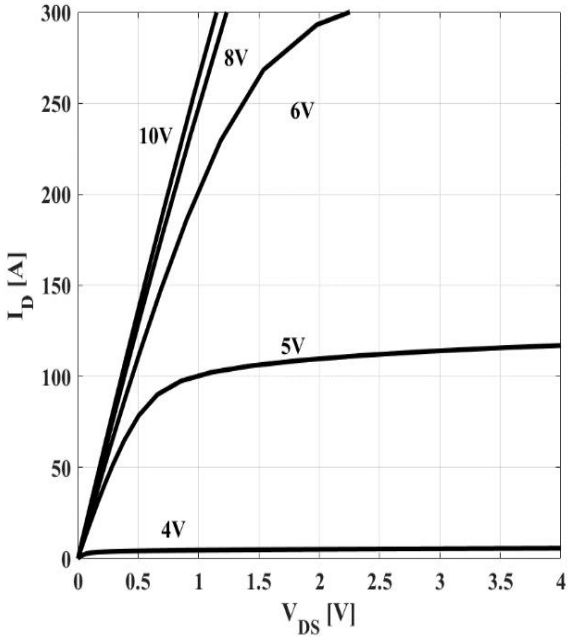
$Z_{(thJC)}=f(t_p)$;parameter:$D=t_p/T$

Figure5: Drain Current



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

Figure6: Typ. Output Characteristics



$I_D=f(V_{DS})$;Tj=25°C; parameter:V_{GS}

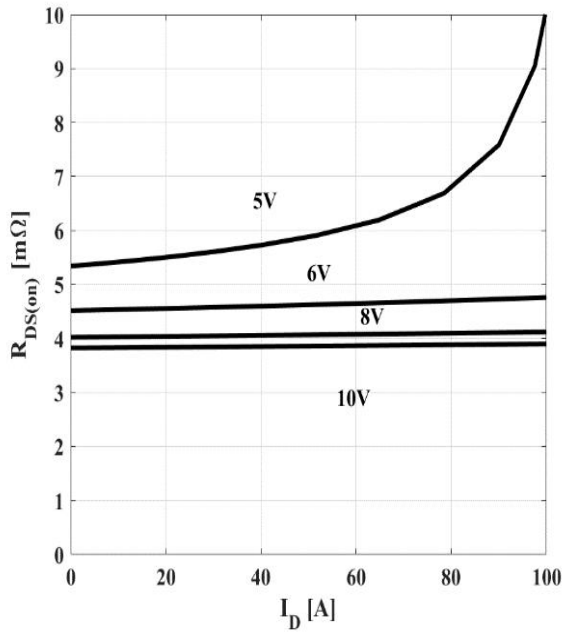
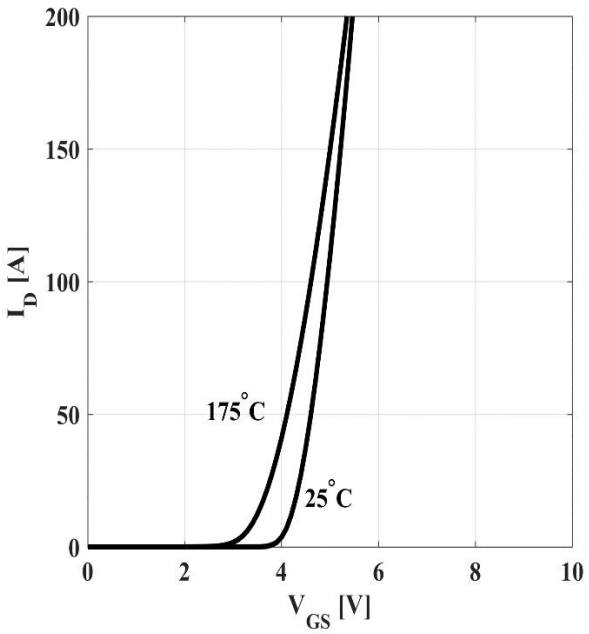
Figure7: Typ. Drain-Source On-State Resistance	Figure8: Typ. Transfer Characteristics
	
$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter: V_{GS}	I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

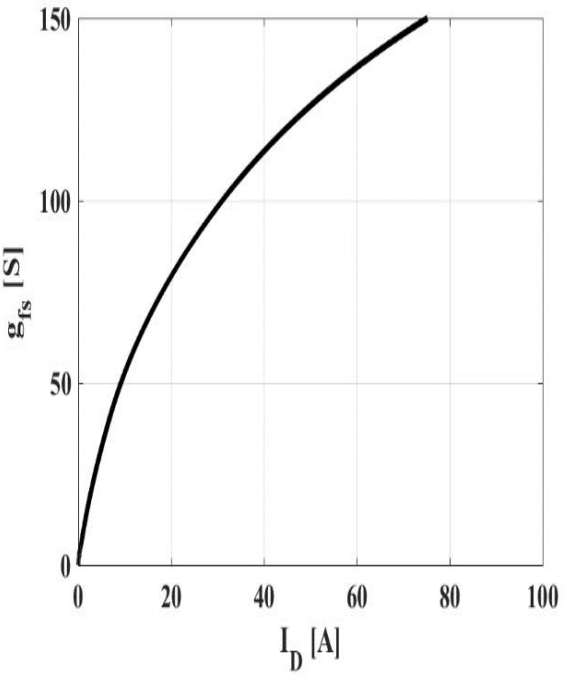
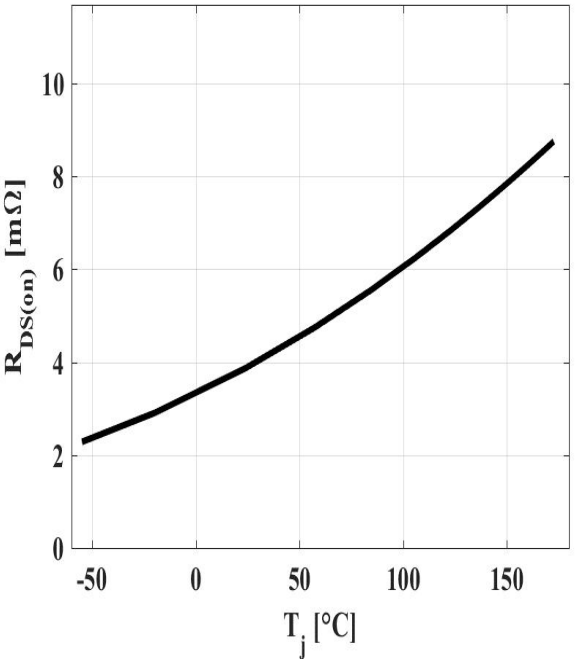
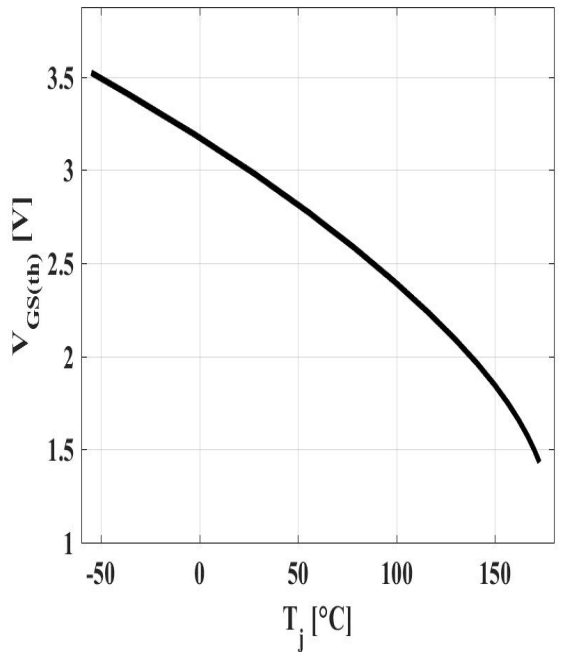
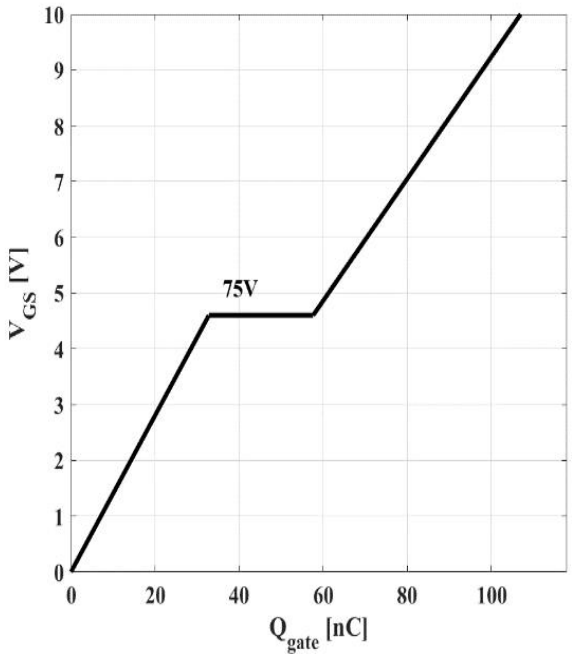
Figure9: Typ. Forward Transconductance	Figure10: Typ. Drain-Source On-State Resistance
	
g_{fs}=f(I_D); T_j=25°C	$R_{DS(ON)}$=f(T_j);I_D=60A;V_{GS}=10V

Figure11: Typ.Gate Threshold Voltage



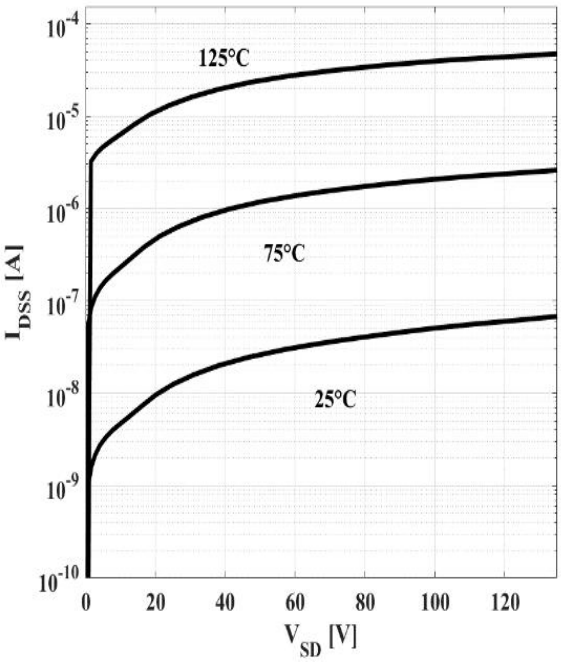
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$

Figure 12: Typ. Gate Charge



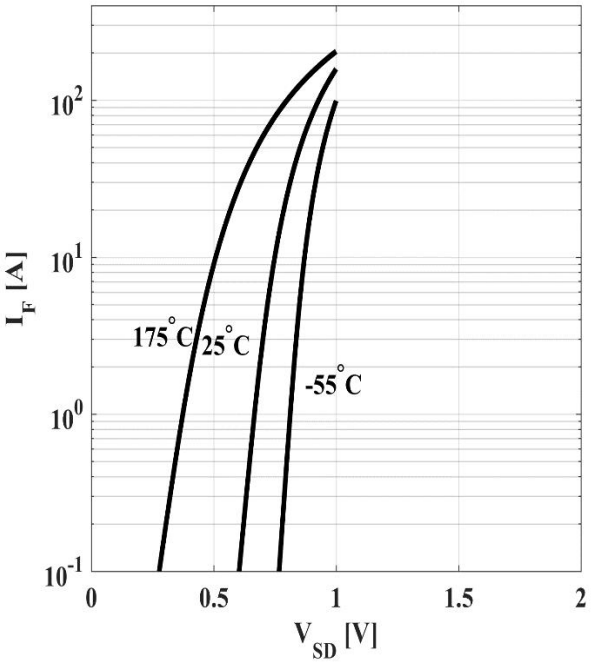
$V_{GS}= f(Q_{gate})$, $I_D=60A$ pulsed

Figure 13: Drain-Source Leakage Current



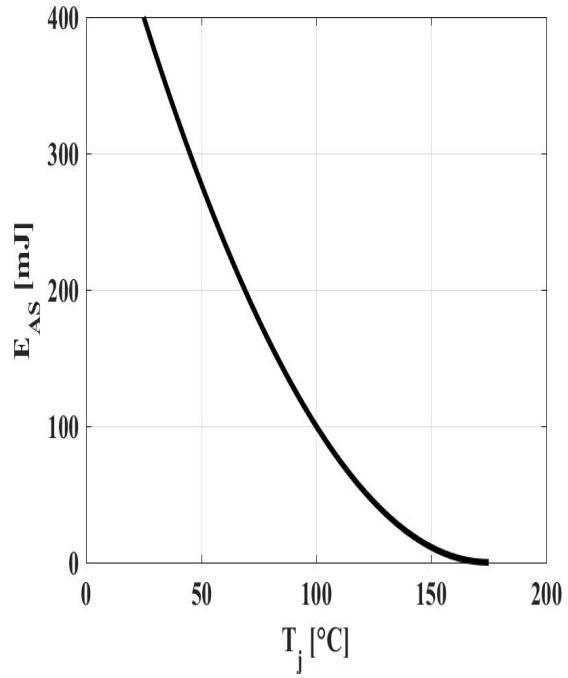
$I_{DSS}=f(V_{DS})$; $V_{GS}=0V$; parameter: T_j

Figure 14: Forward Characteristics of Reverse Diode



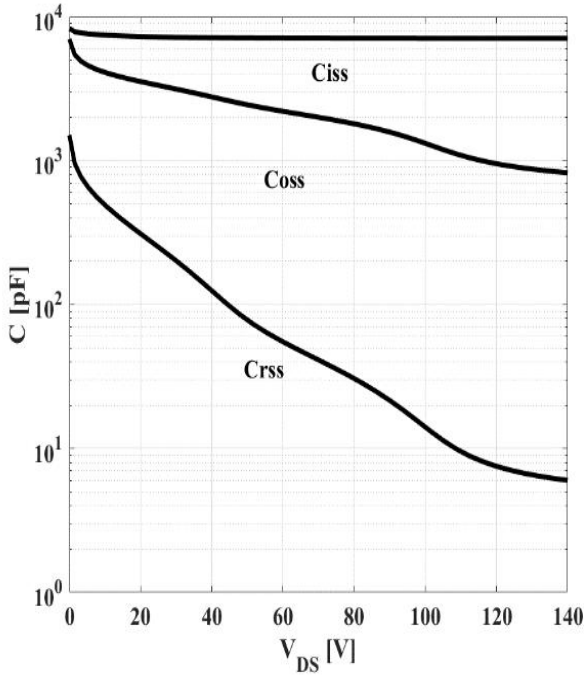
$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



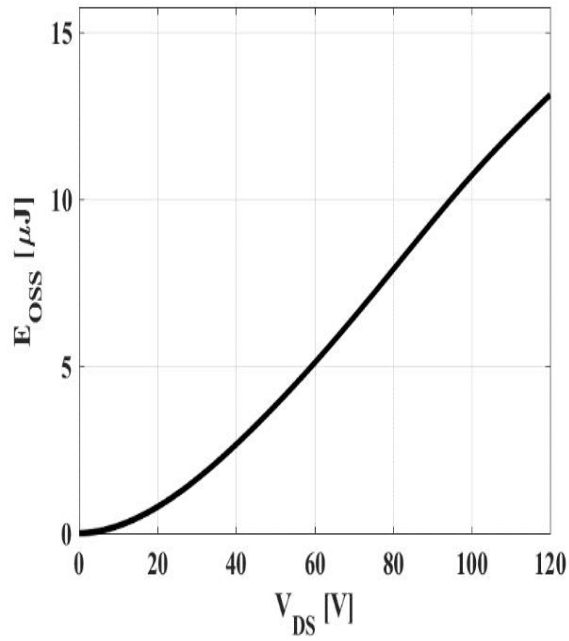
$E_{AS}=f(T_j)$;I_D=40.0A; V_{DD}=75V

Figure 16: Typ. Capacitances



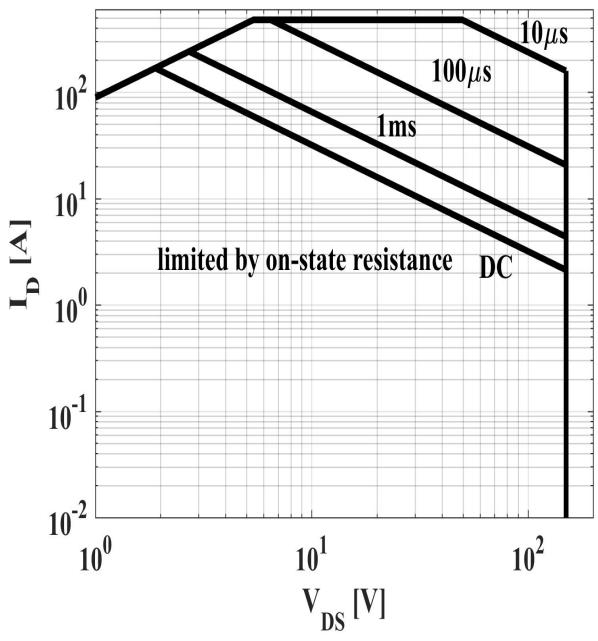
C=f(V_{DS}); V_{GS}=0; f=1MHz

Figure 17: C_{OSS} Stored Energy



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

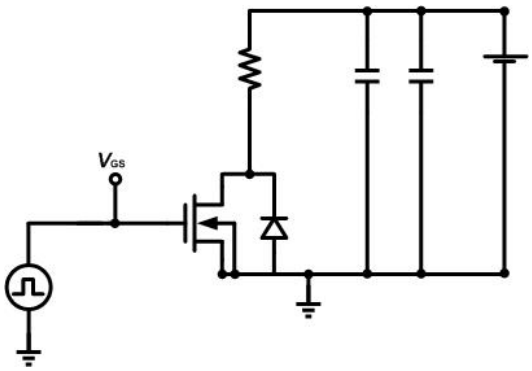
Figure 18: Safe Operating Area

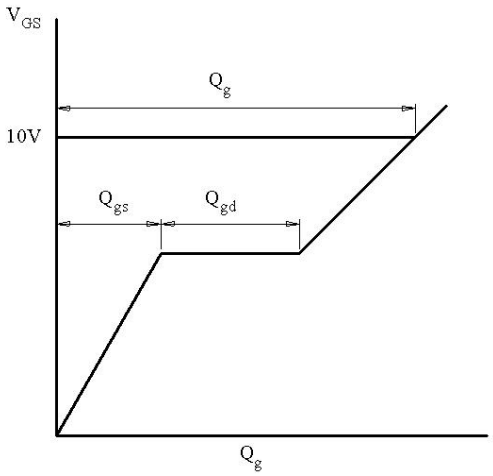


$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

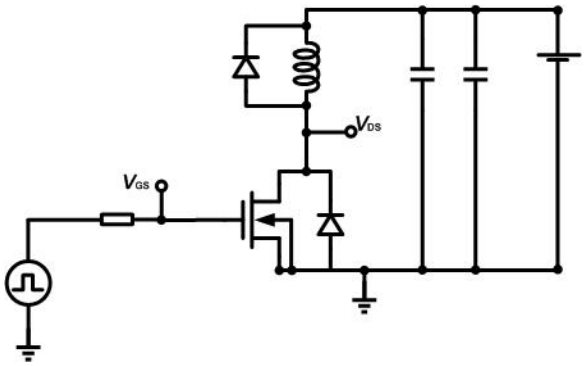
Test Circuits

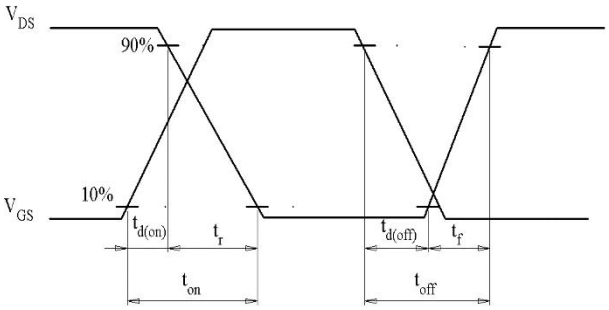
1. Gate Charge Test Circuit & Waveform



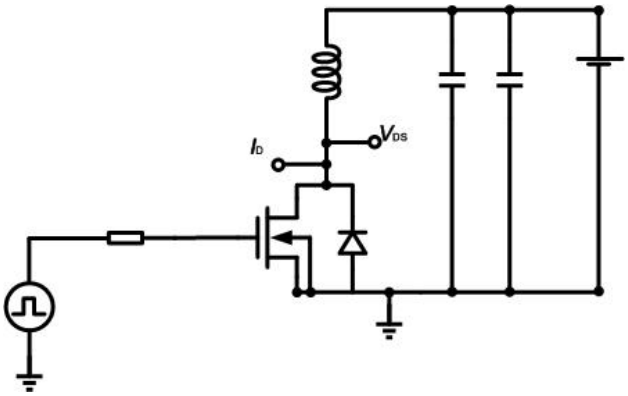


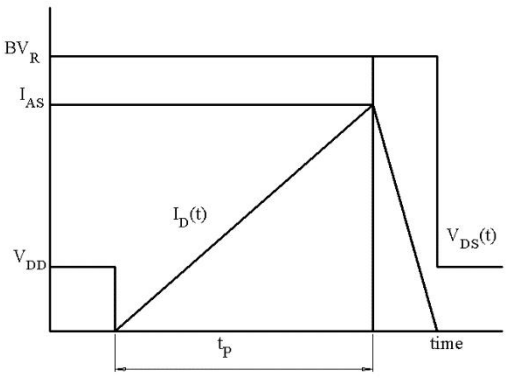
2. Switch Time Test Circuit



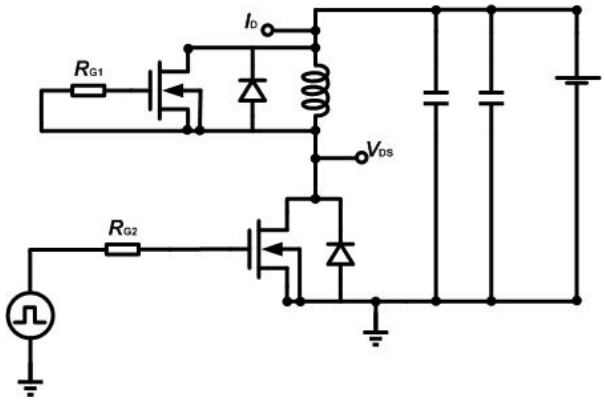


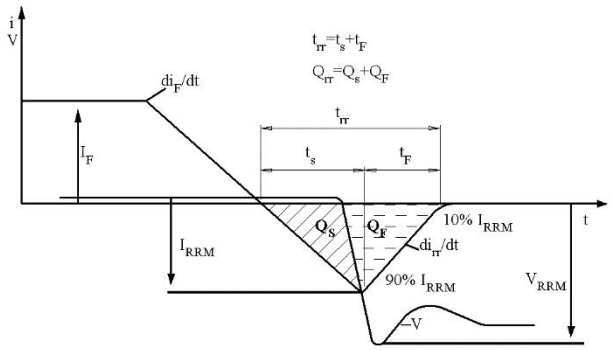
3. Unclamped Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics



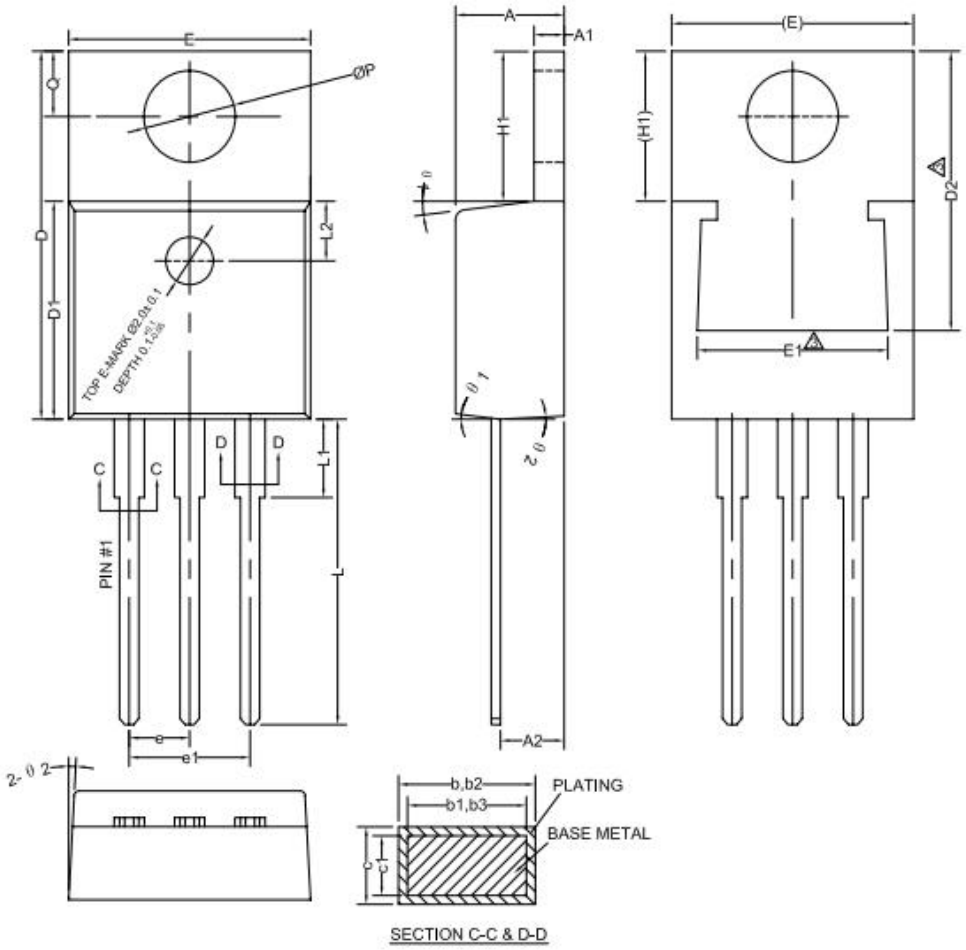


5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimensions

TO-220C(Package1)

Unit: mm



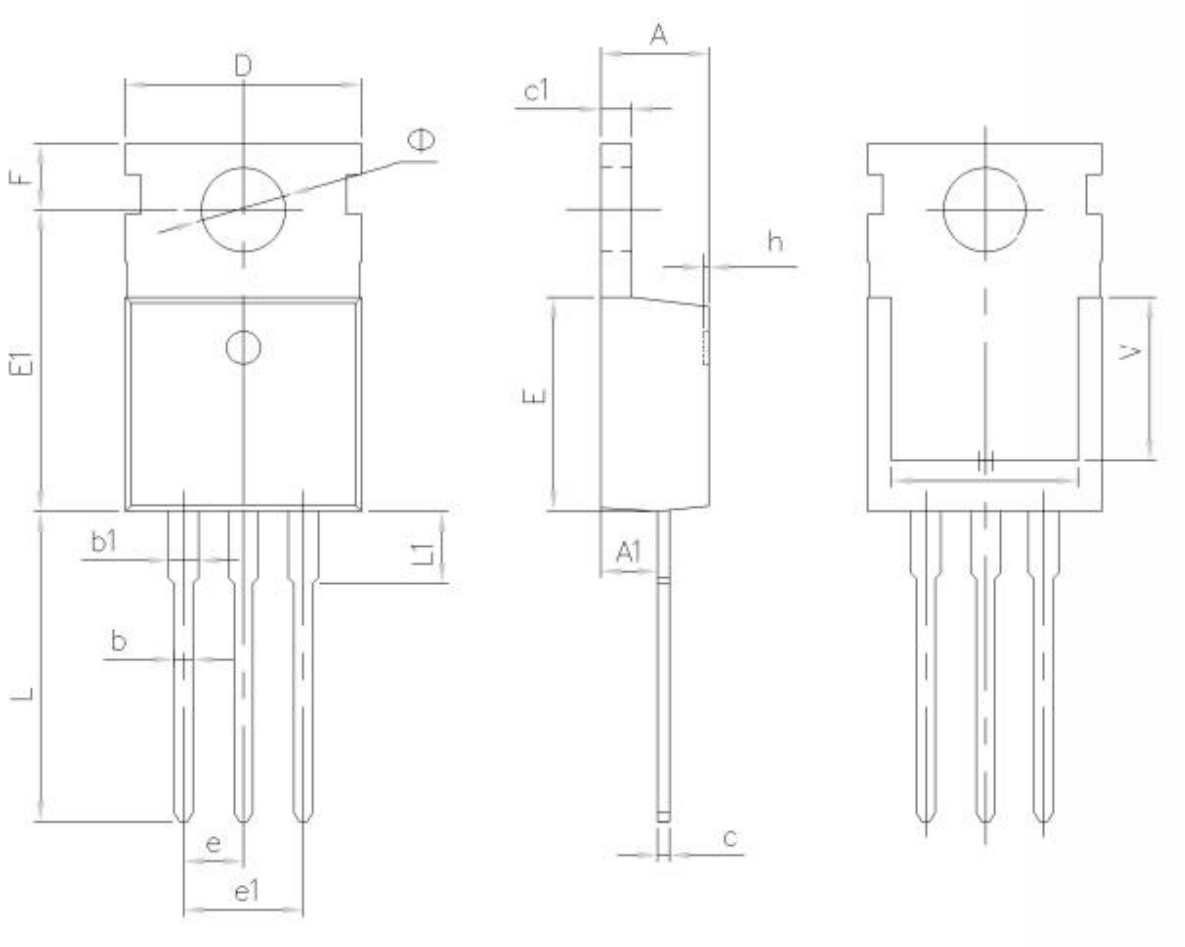
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	9.96	10.16	10.36
A1	1.22	-	1.32	E1	6.86	-	8.89
A2	2.59	2.69	2.79	e	2.44	2.54	2.64
b	0.77	-	0.90	e1	4.98	5.08	5.18
b1	0.76	0.81	0.86	H1	6.10	6.30	6.50
b2	1.23	-	1.36	L	12.70	-	13.12
b3	1.22	1.27	1.32	L1	-	-	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	θ1	5°	7°	9°
D2	11.40	-	12.88	θ2	1°	3°	5°

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimensions

TO-220C(Package2)

Unit: mm



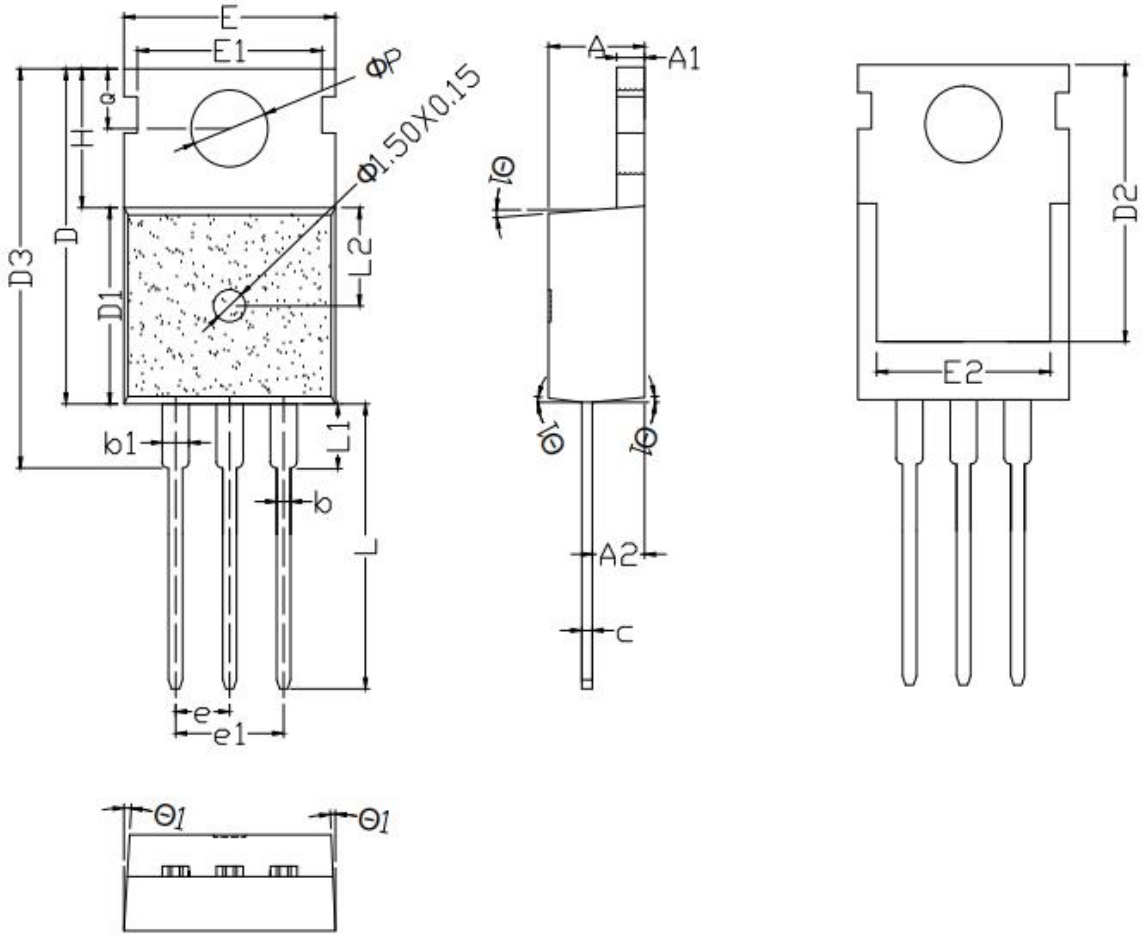
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.50	4.60	e	-	2.54	-
A1	2.25	2.40	2.55	e1	4.98	5.08	5.18
b	0.71	0.81	0.91	F	2.65	2.80	2.95
b1	1.17	1.27	1.37	H	7.90	8.00	8.10
c	0.33	0.50	0.65	h	0.00	-	0.30
c1	1.20	1.30	1.40	L	12.90	13.15	13.40
D	9.91	-	10.25	L1	2.85	3.05	3.25
E	8.95	-	9.75	V	-	6.90REF	-
E1	12.65	12.85	13.05	Φ	3.40	3.60	3.80

5.0mΩ, 150V, N-Channel Power MOSFET **SRT15N050H**

Mechanical Dimensions

TO-220C(Package3)

Unit: mm



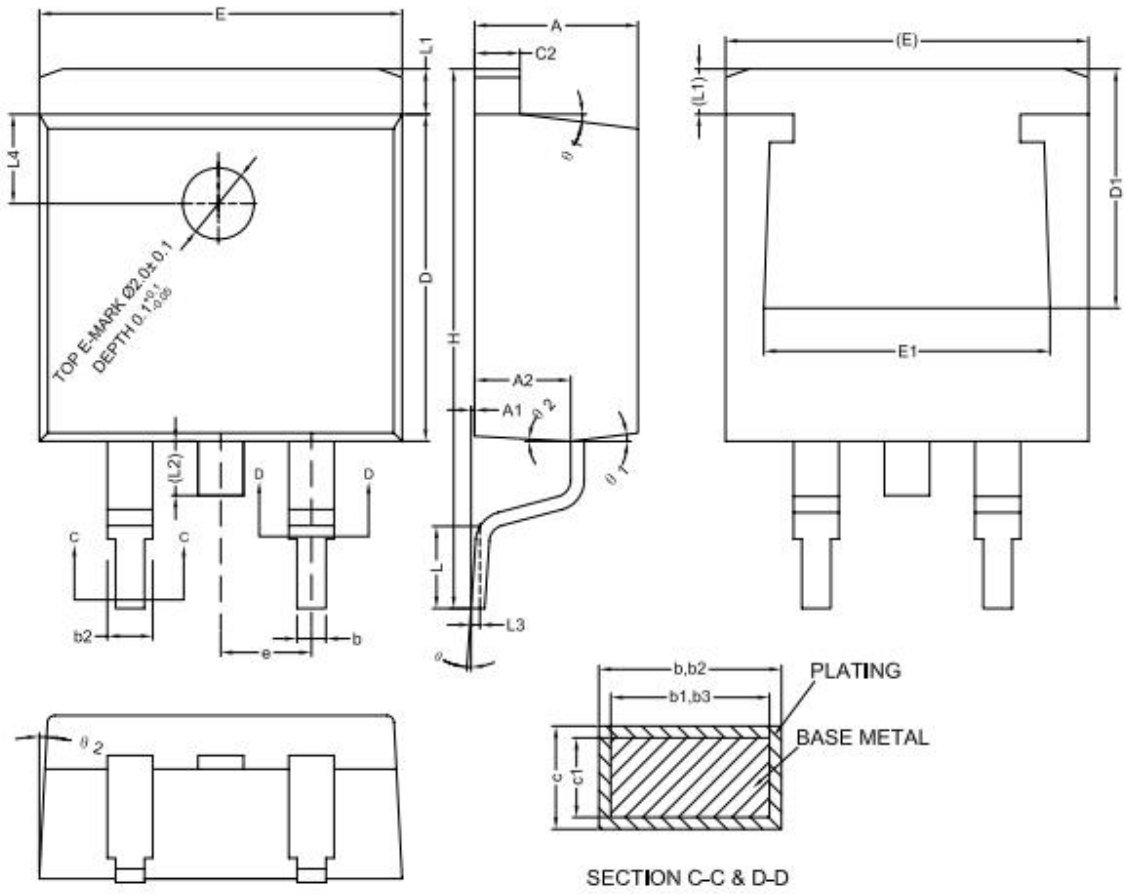
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.50	4.60	E2	7.40	7.60	7.80
A1	1.25	1.30	1.35	e	-	2.54BSC	-
A2	2.30	2.40	2.50	e1	-	5.08BSC	-
b	0.70	0.80	0.90	H	6.40	6.50	6.60
b1	1.25	1.33	1.42	L	13.00	13.28	13.45
c	0.45	0.50	0.55	L1	-	-	3.40
D	15.50	15.75	16.00	L2	4.50	4.65	4.80
D1	9.10	9.20	9.30	L3	1.10	1.30	1.50
D2	12.90	13.10	13.30	ΦP	3.55	3.65	3.75
D3	15.45	15.80	16.15	Q	2.65	2.75	2.85
E	9.80	10.02	10.15	θ1	2°	-	7°
E1	8.55	8.70	8.85				

5.0mΩ, 150V, N-Channel Power MOSFET **SRT15N050H**

Mechanical Dimensions

TO-263-2(Package1)

Unit: mm



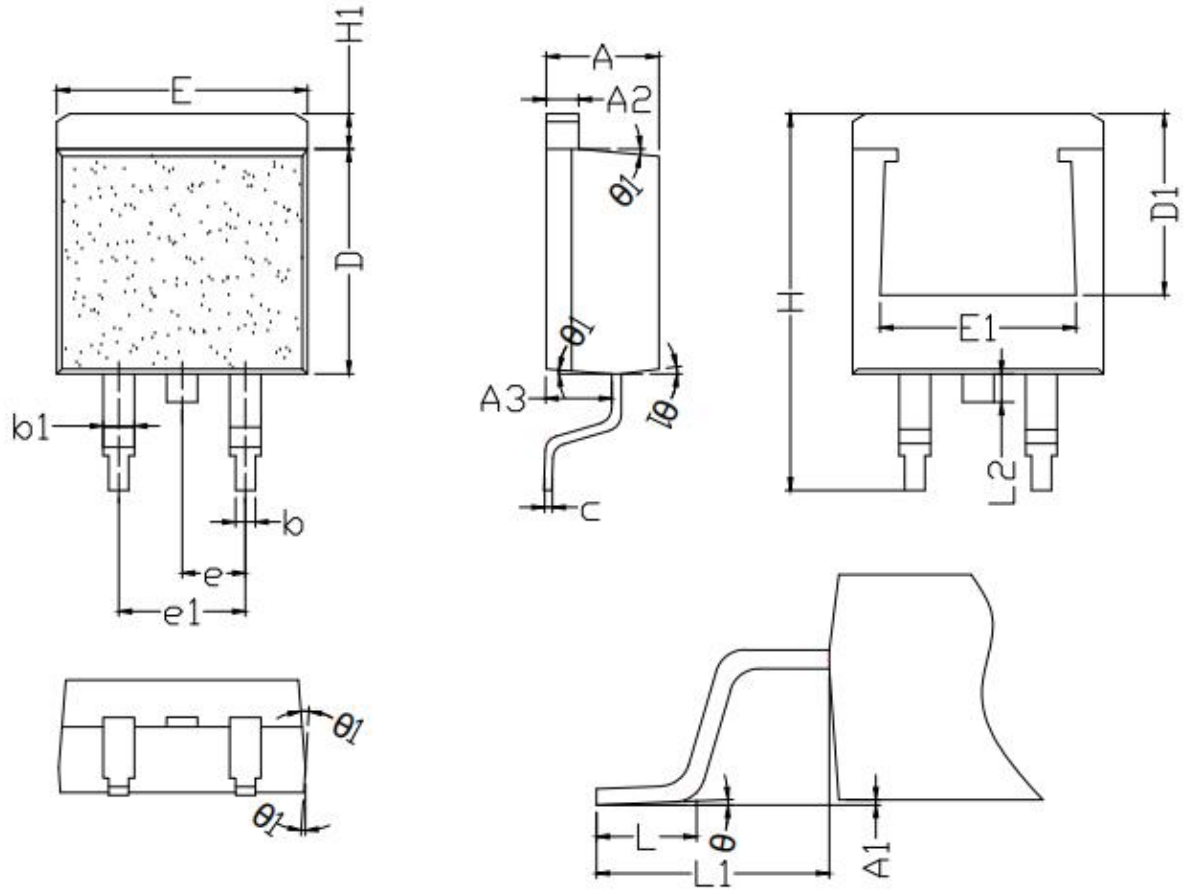
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	10.06	10.16	10.26
A1	0.00	0.10	0.25	E1	7.80	-	8.20
A2	2.59	2.69	2.79	e	-	2.54BSC	-
b	0.77	-	0.90	H	14.70	15.10	15.50
b1	0.76	0.81	0.86	L	2.00	2.30	2.60
b2	1.23	-	1.36	L1	1.17	1.27	1.40
b3	1.22	1.27	1.32	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	Θ	0°	-	8°
D	9.05	9.15	9.25	Θ1	5°	7°	9°
D1	6.60	-	-	Θ2	1°	3°	5°

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimensions

TO-263-2(Package2)

Unit: mm



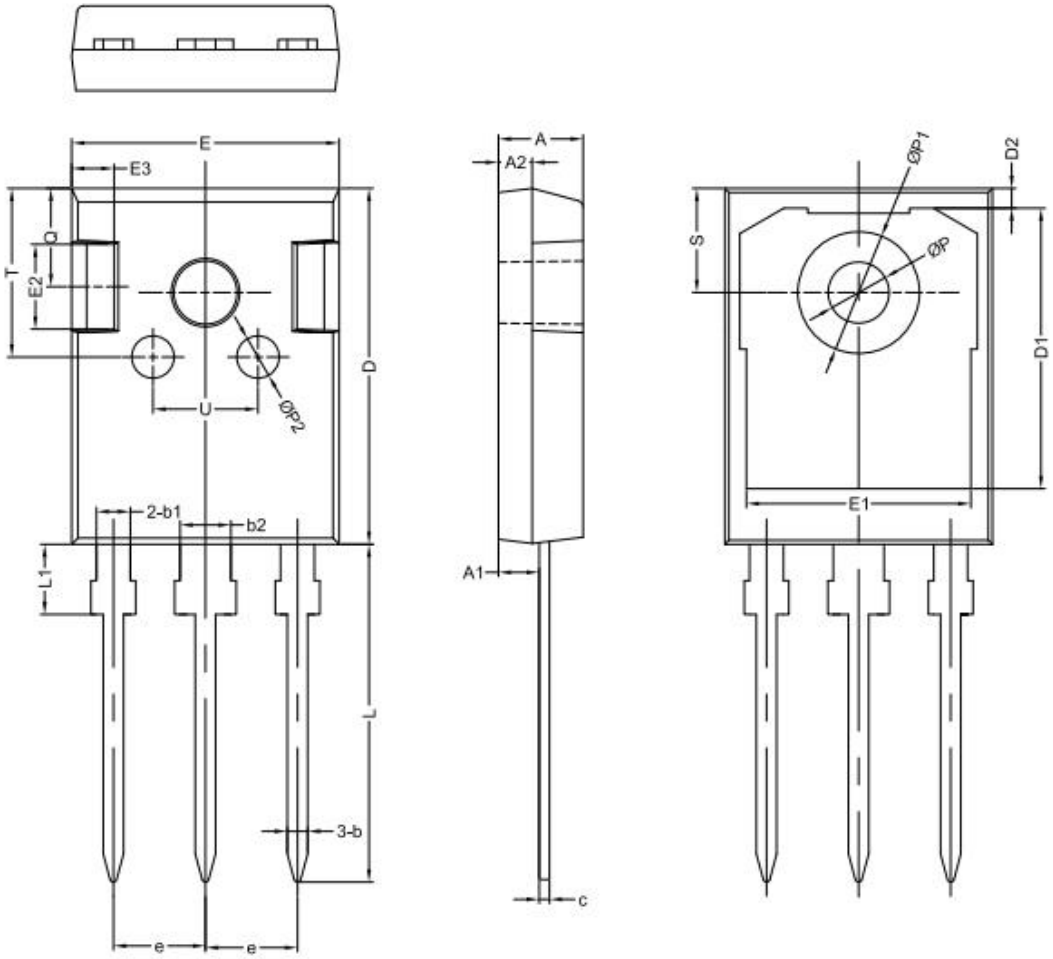
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.42	4.52	4.62	E1	-	7.85REF	-
A1	0.00	0.10	0.20	e	2.50	2.54	2.58
A2	1.24	1.27	1.32	e1	-	5.08REF	-
A3	2.50	2.60	2.70	H	14.80	15.10	15.30
b	0.77	0.81	0.84	H1	1.12	1.28	1.42
b1	1.23	1.28	1.41	L	2.10	2.23	2.36
c	0.33	0.38	0.43	L1	4.55	4.75	4.95
D	8.80	8.95	9.10	L2	1.10	1.30	1.50
D1	-	7.25REF	-	Θ	0°	2°	5°
E	9.92	10.07	10.22	Θ1	3°	-	9°

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimensions

TO-247 (Package1)

Unit: mm



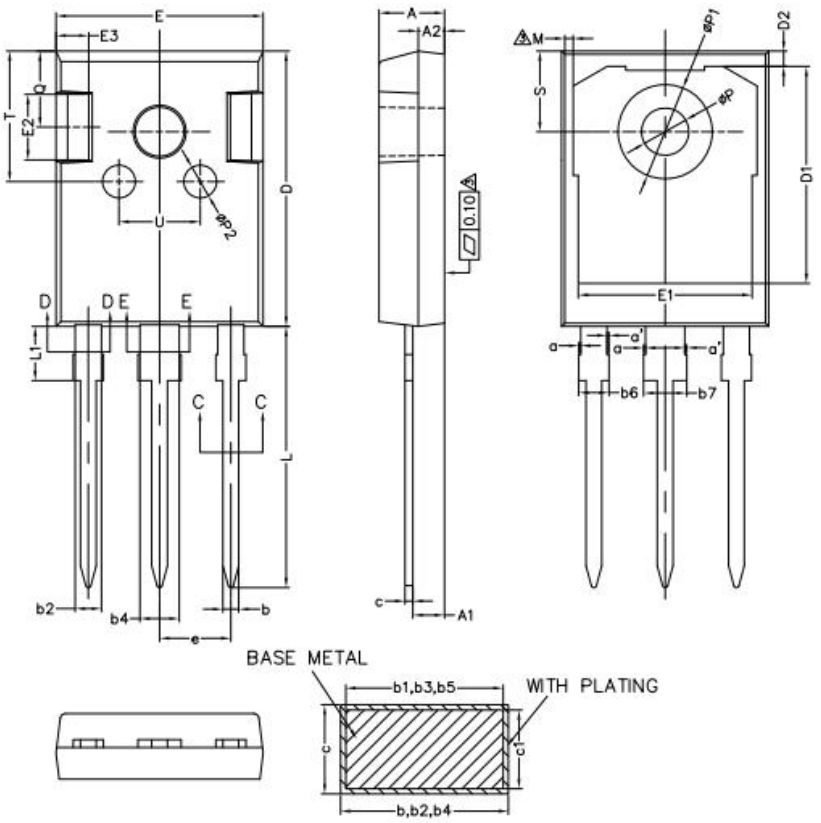
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	-	5.00	-
A1	2.21	2.41	2.61	E3	-	2.50	-
A2	1.90	2.00	2.10	e	-	5.44	-
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	7.19	-
D	20.80	21.00	21.20	P2	-	2.50	-
D1	-	16.55	-	Q	-	5.80	-
D2	-	1.20	-	S	6.05	6.15	6.25
E	15.60	15.80	16.00	T	-	10.00	-
E1	-	13.30	-	U	-	6.20	-

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimensions

TO-247 (Package2)

Unit: mm

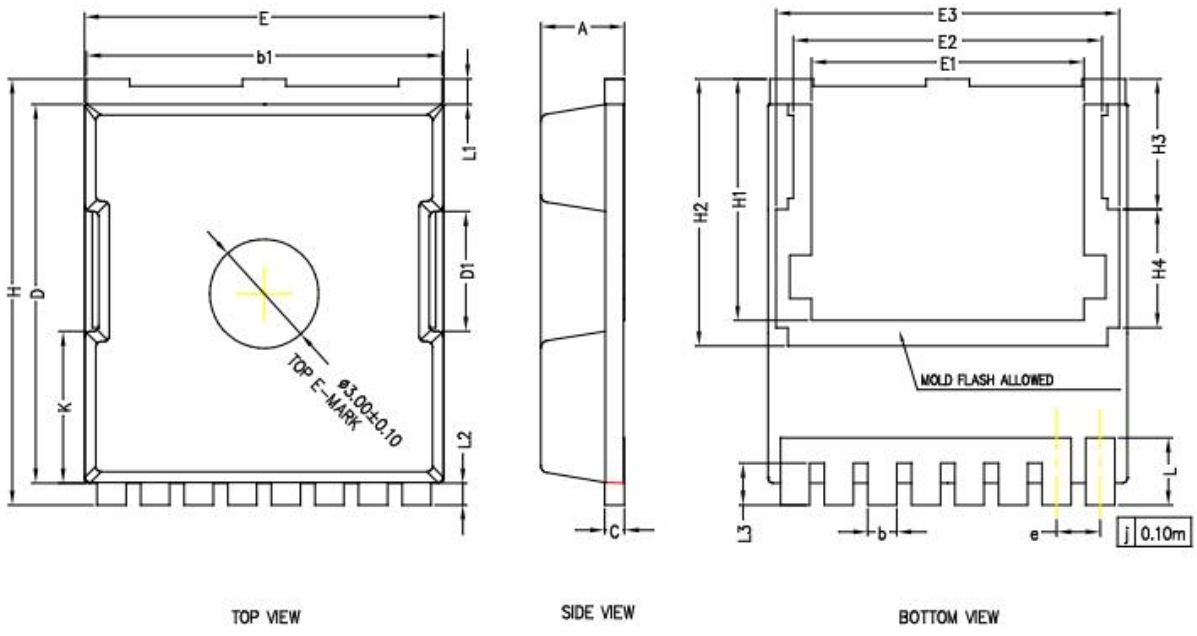


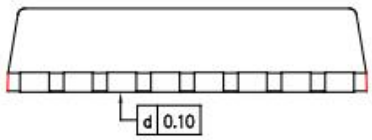
Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	D2	1.05	1.20	1.35
A1	2.31	2.41	2.51	E	15.70	15.80	15.90
A2	1.90	2.00	2.10	E1	13.10	13.30	13.50
a	0	-	0.15	E2	4.90	5.00	5.10
a′	0	-	0.15	E3	2.40	2.50	2.60
b	1.16	-	1.26	e	5.34	5.44	5.54
b1	1.15	1.20	1.22	L	19.80	19.92	20.10
b2	1.96	-	2.06	L1	3.95	4.13	4.30
b3	1.95	2.00	2.02	M	0.35	-	0.95
b4	2.96	-	3.06	P	3.50	3.60	3.70
b5	2.95	3.00	3.02	P1	7.00	-	7.40
b6	-	-	2.25	P2	2.40	2.50	2.60
b7	-	-	3.25	Q	5.60	-	6.00
c	0.59	-	0.66	S	6.05	6.15	6.25
c1	0.58	0.60	0.62	T	9.80	-	10.20
D	20.90	21.00	21.10	U	6.00	-	6.40
D1	16.25	16.55	16.85				

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

Mechanical Dimension

TOLL **Unit: mm**





Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	2.20	2.30	2.40	H	11.48	11.73	11.88
b	0.70	0.80	0.90	H1	6.55	6.65	6.75
b1	9.70	9.80	9.90	H2	7.20	7.35	7.50
c	0.40	0.50	0.60	H3	3.44	3.59	3.74
D	10.28	10.43	10.58	H4	3.11	3.26	3.41
D1	3.15	3.30	3.45	K	4.03	4.18	4.33
E	9.70	9.90	10.10	L	1.60	1.85	2.10
E1	7.35	7.50	7.65	L1	0.55	0.70	0.85
E2	8.35	8.50	8.65	L2	0.45	0.60	0.75
E3	9.31	9.46	9.61	L3	1.00	1.15	1.30
e	1.10	1.20	1.30				

5.0mΩ, 150V, N-Channel Power MOSFET SRT15N050H

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