2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

General Description

The Sanrise SRT06N022H 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 SRT06N022H break down voltage is 60V and it has a high rugged avalanche characteristics. The SRT06N022H is available in PDFN5*6 and TO-263-2 and TO-220C packages.

Features

- Ultra Low

$R_{DS(ON)\_TYP}$ = 1.65mΩ ,PDFN5*6 @V_{GS} = 10V.

$R_{DS(ON)\_TYP}$ = 2.2mΩ ,TO-263-2 @V_{GS} = 10V.

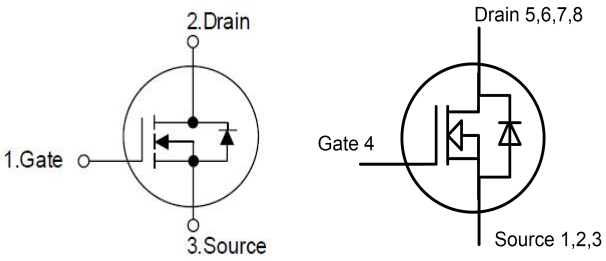
$R_{DS(ON)\_TYP}$ = 2.4mΩ, TO-220C @V_{GS} = 10V.

- Ultra Low Gate Charge, Qg=80nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

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

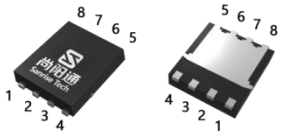
Symbol



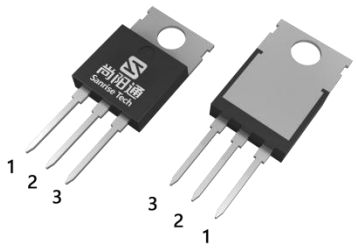
TO-220C,TO-263-2 PDFN5*6

Figure 1 Symbol of SRT06N022H

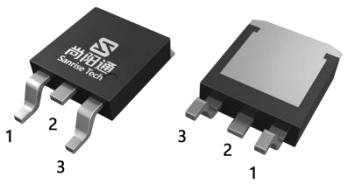
Package Type



PDFN5*6



TO-220C



TO-263-2

Figure 2 Package Type of SRT06N022H

2.2mΩ, 60V, N-Channel Power MOSFET **SRT06N022H**

Ordering Information

SRT06N022H□□–□

Circuit Type

Package
D56: PDFN5*6
S2: TO-263-2
TC: TO-220C

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
PDFN5*6	SRT06N022HD56TR-G	SRT06N022HD56G	Tape & Reel
TO-263-2	SRT06N022HS2TR-E	SRT06N022HS2E	Tape & Reel
TO-220C	SRT06N022HTC-G	SRT06N022HTCG	Tube

2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

Absolute Maximum Ratings

Parameter		Symbol	Rating		Unit
Drain-Source Voltage		V_{DSS}	60		V
Gate-Source Voltage		V_{GSS}	±20		V
Continuous Drain Current, Package Limited	T_C=25ºC	I_D	PDFN5*6	120	A
			TO-263-2	120	
			TO-220C	120	
Continuous Drain Current, Package Limited	T_C=125ºC		PDFN5*6	87	
			TO-263-2	84	
			TO-220C	84	
Continuous Drain Current, Package Limited	T_C=100ºC		PDFN5*6	120	
			TO-263-2	120	
			TO-220C	120	
Continuous Drain Current, Silicon	T_C=25ºC		PDFN5*6	194	
			TO-263-2	189	
			TO-220C	170	
Pulsed Drain Current (Note 2)		I_{DM}	PDFN5*6	600	
			TO-263-2	600	
			TO-220C	600	
Power Dissipation (T_C = 25°C)		P_D	147		W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	506		mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	110		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.1		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	21		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}= 21.0A, V_{DD}= 30V, R_G= 25Ω, Starting T_J= 25°C
4. I_{AS_Limit}= 45A, V_{DD} = 30V, 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}			0.85	ºC/W
Thermal Resistance，Junction-to-Ambient		R_{thJA}			50	
Thermal Resistance，Junction-to-Case	TO-263-2	R_{thJC}			0.75	ºC/W
Thermal Resistance，Junction-to-Ambient		R_{thJA}			62	
Thermal Resistance，Junction-to-Case	TO-220C	R_{thJC}			0.75	ºC/W
Thermal Resistance，Junction-to-Ambient		R_{thJA}			62	

Electrical Characteristics

T_J = 25℃, unless otherwise specified.

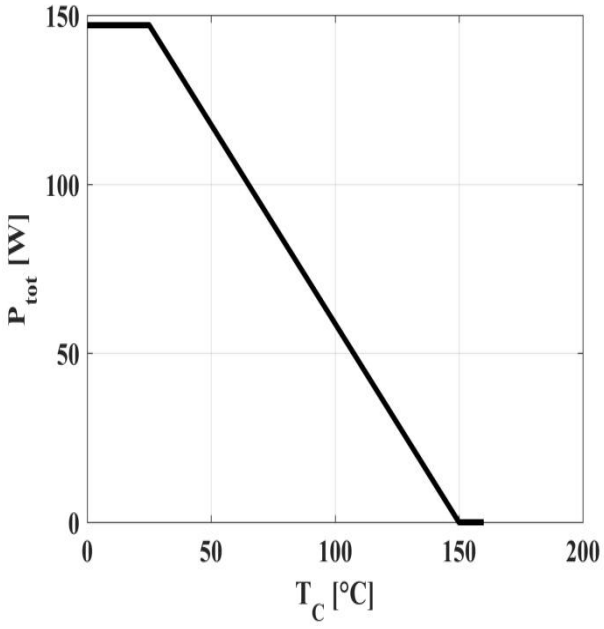
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	60			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=60V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			200	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-200	
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	PDFN5*6	$R_{DS(ON)}$	V_{GS}=10V, I_D=30A		1.65	2.0	mΩ
	TO-263-2		V_{GS}=10V, I_D=30A		2.2	2.4	mΩ
	TO-220C		V_{GS}=10V, I_D=30A		2.4	3.0	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=30V, V_{GS}=0V, f=1MHz		5.7		nF
Output Capacitance		C_{OSS}			1.9		nF
Reverse Transfer Capacitance		C_{RSS}			110		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…48V		1.9		nF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			2.4		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=30V, I_D=30A R_G=1.6Ω, V_{GS}=10V		17		ns
Rise Time		t_r			10		
Turn-off Delay Time		$t_{d(off)}$			36		
Fall Time		t_f			8		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=30V, I_D=30A V_{GS}=0 to 10V		27		nC
Gate to Drain Charge		Q_{gd}			16		
Gate Charge Total		Q_g			80		
Gate Plateau Voltage		$V_{plateau}$			4.7		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		69		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=30A		0.79	1.0	V
Reverse Recovery Time		t_{rr}	V_R=30V, I_F=30A dI$_F$/dt=100A/us		53		ns
Reverse Recovery Charge		Q_{rr}			61		nC
Peak Reverse Recovery Current		I_{rrm}			2.3		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 48V
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 48V

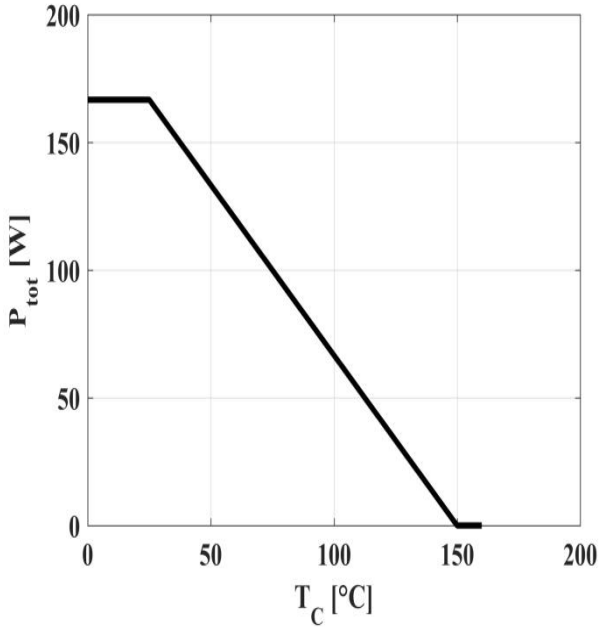
Typical Performance Characteristics

Figure 3A: Power Dissipation (PDFN5*6)



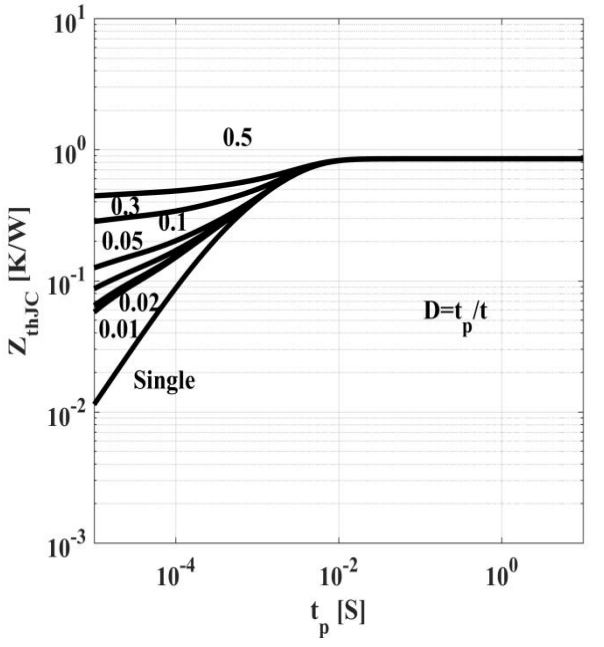
$P_{tot}=f(T_c)$

Figure 3B: Power Dissipation (TO-263-2&TO-220C)



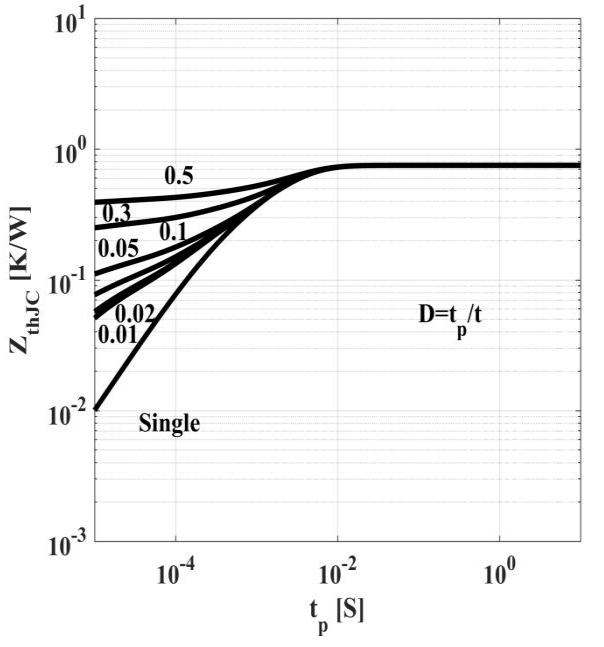
$P_{tot}=f(T_c)$

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



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

Figure 4B: Max. Transient Thermal Impedance(TO-263-2&TO-220C)



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

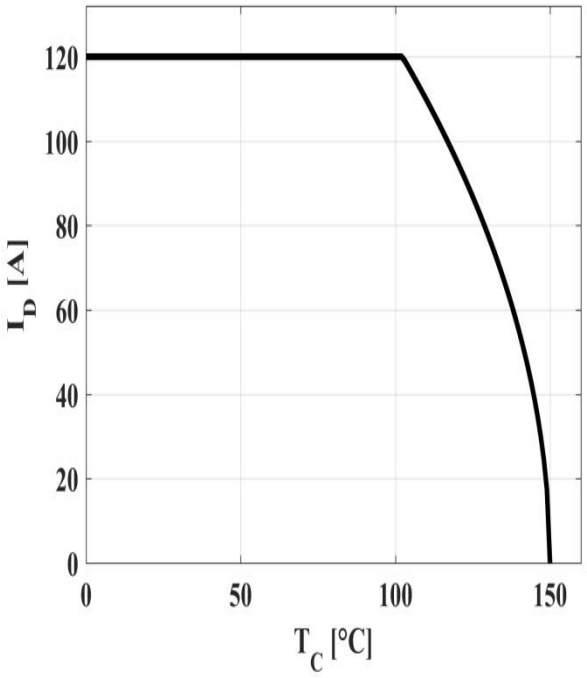
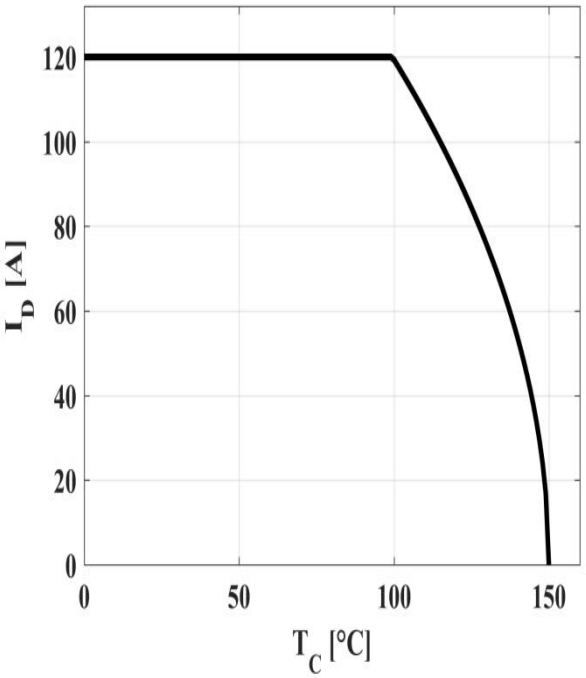
Figure5A: Drain Current(PDFN5*6)	Figure5B: Drain Current(TO-263-2&TO-220C)
	
I_D=f(T_C);V_{GS}≥10V	I_D=f(T_C);V_{GS}≥10V

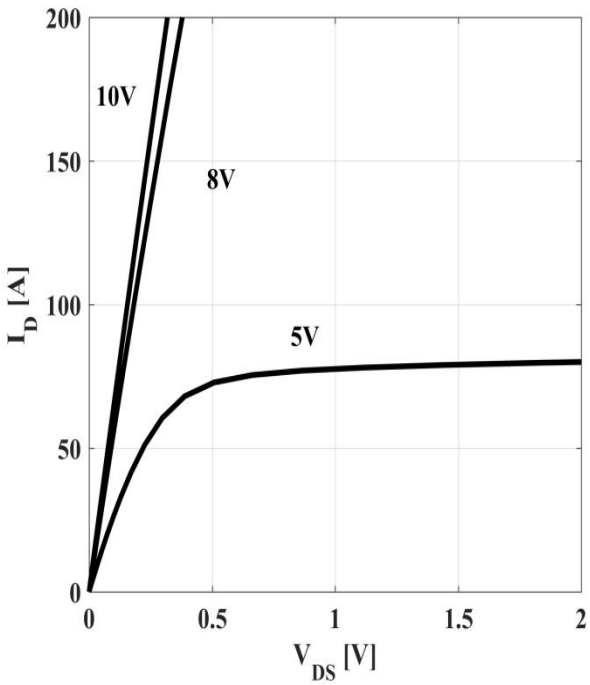
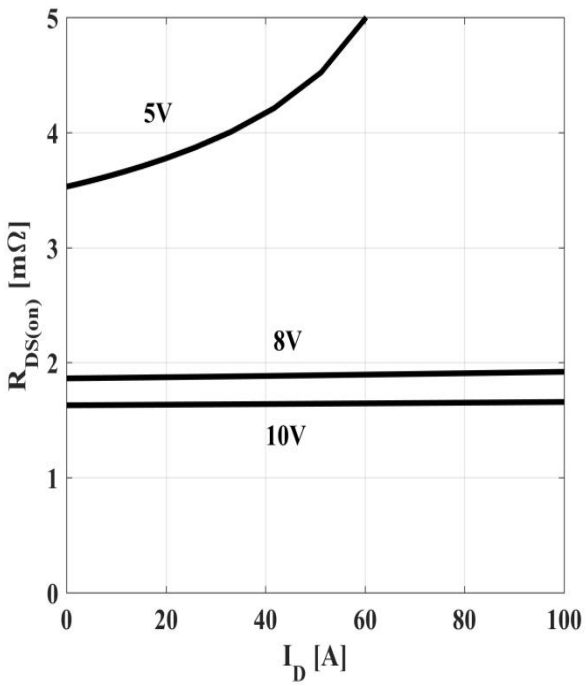
Figure6: Typ. Output Characteristics	Figure7: Typ. Drain-Source On-State Resistance (PDFN5*6)
	
I_D=f(V_{DS});Tj=25ºC; parameter: V_{GS}	$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter: V_{GS}

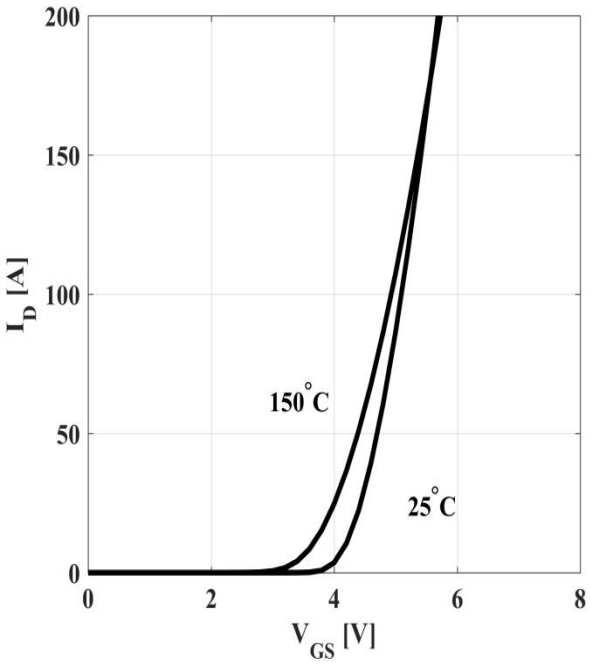
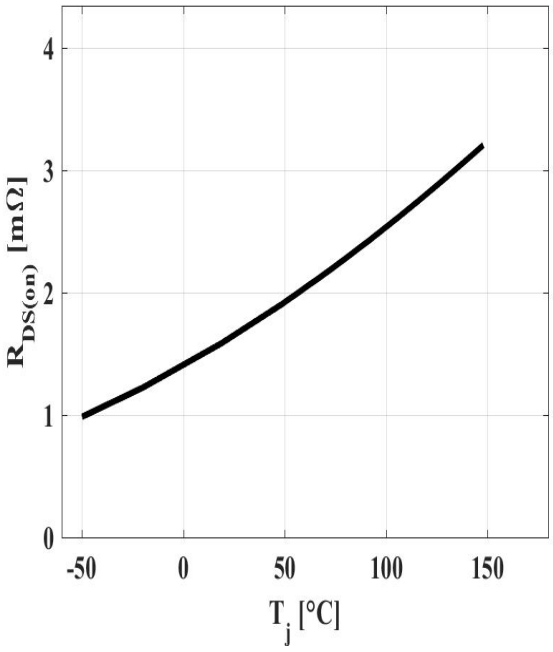
Figure8: Typ. Transfer Characteristics	Figure9: Typ. Drain-Source On-State Resistance (PDFN5*6)
	
$I_D=f(V_{GS})$; $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$; parameter: T_j	$R_{DS(ON)}=f(T_j)$;I_D=30A;V_{GS}=10V

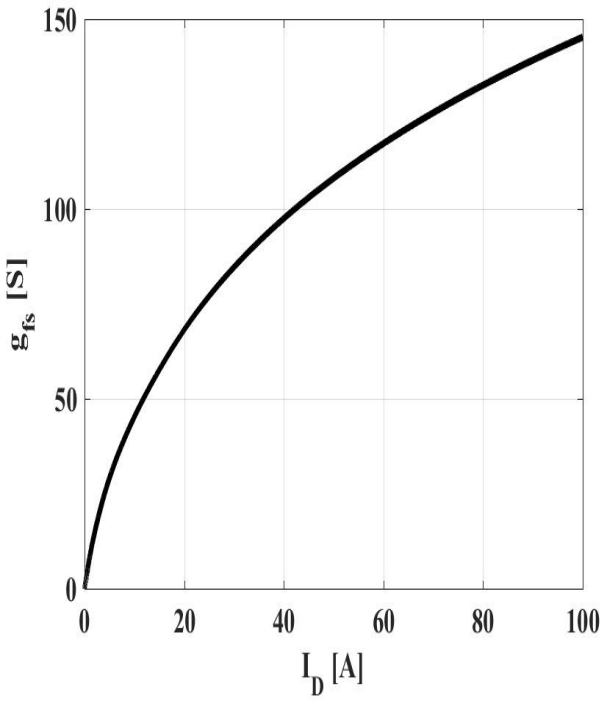
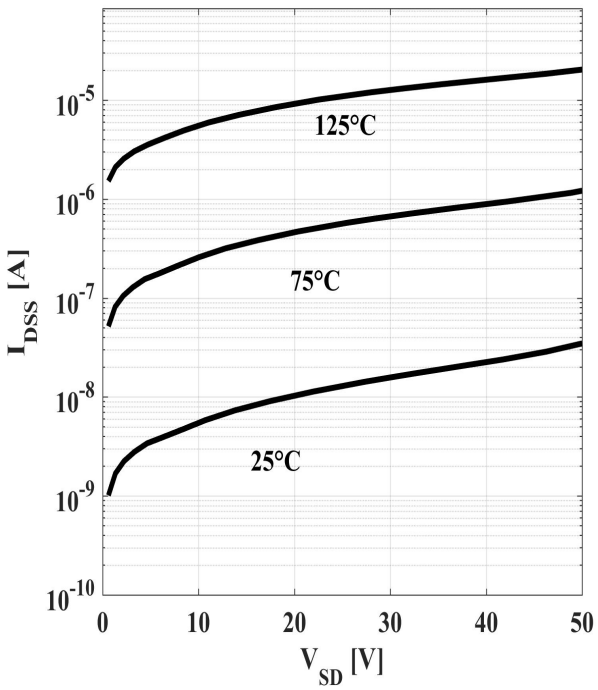
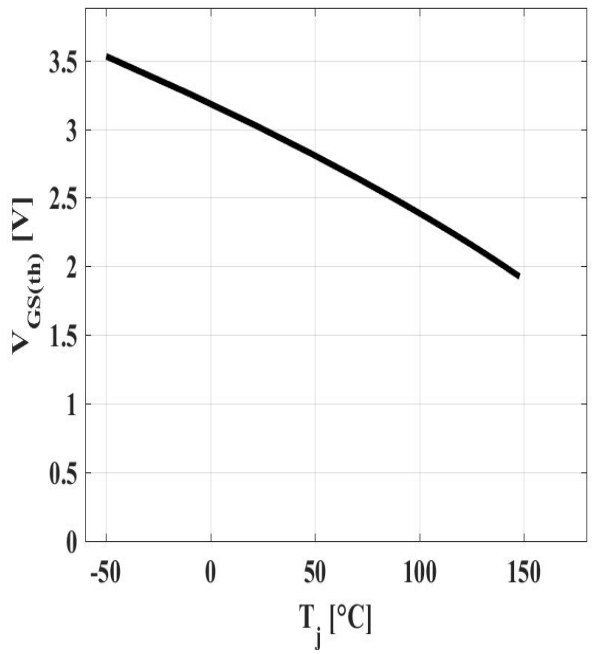
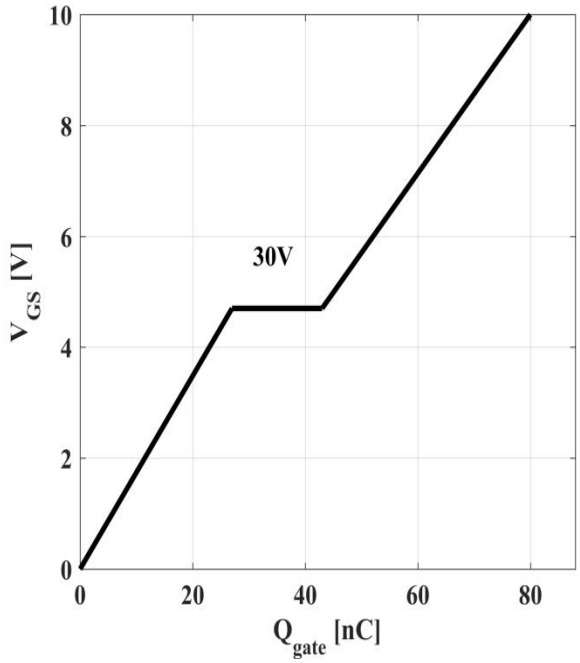
Figure10: Typ. Forward Transconductance	Figure 11: Drain-Source Leakage Current
	
$g_{fs}=f(I_D)$; T_j=25°C	$I_{DSS}=f(V_{DS})$; V_{GS}=0V; parameter: T_j

Figure12: Typ. Gate Threshold Voltage



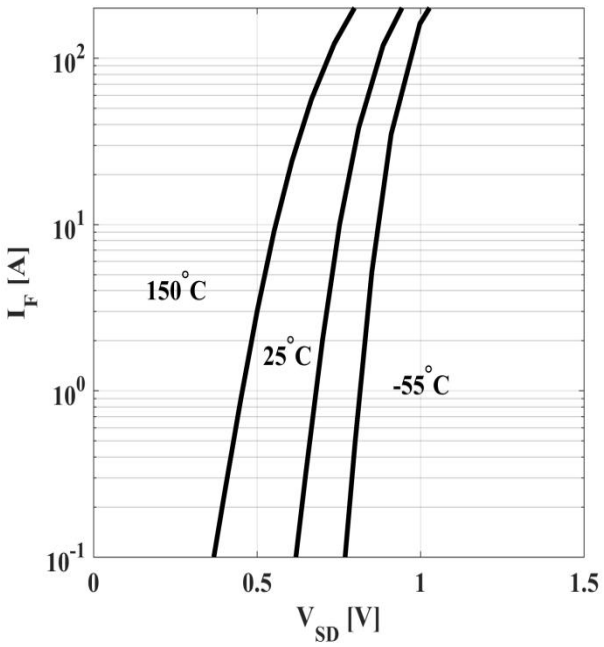
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$

Figure 13: Typ. Gate Charge



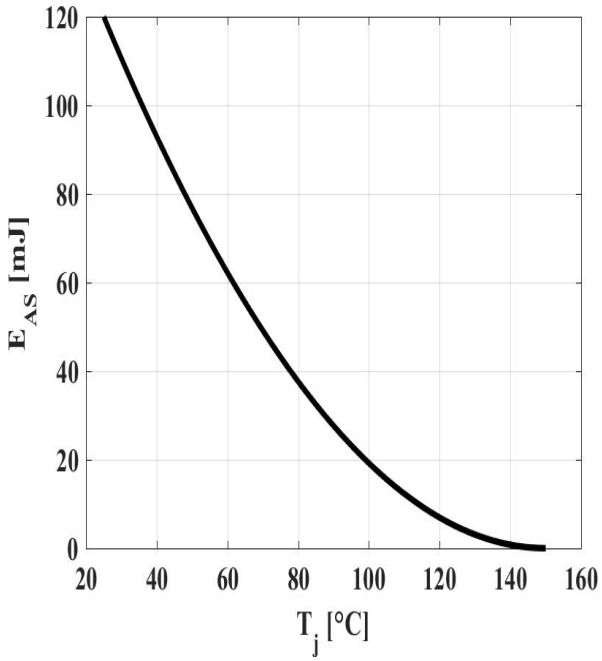
$V_{GS}= f(Q_{gate})$, $I_D=30A$ pulsed

Figure 14: Forward Characteristics of Reverse Diode



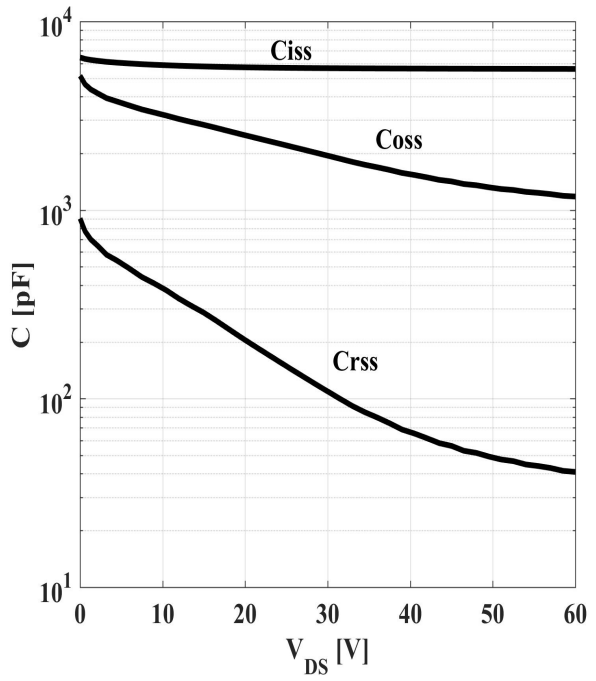
$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



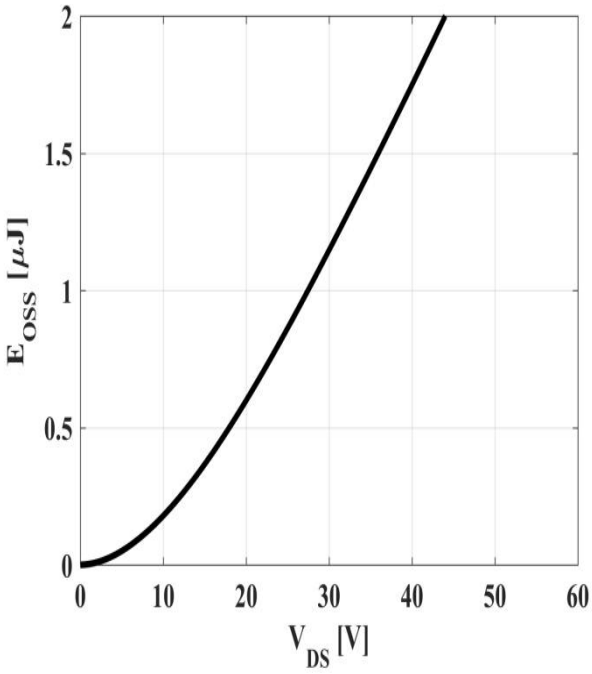
$E_{AS}=f(T_j)$;$I_D=21A$; $V_{DD}=20V$

Figure 16: Typ. Capacitances



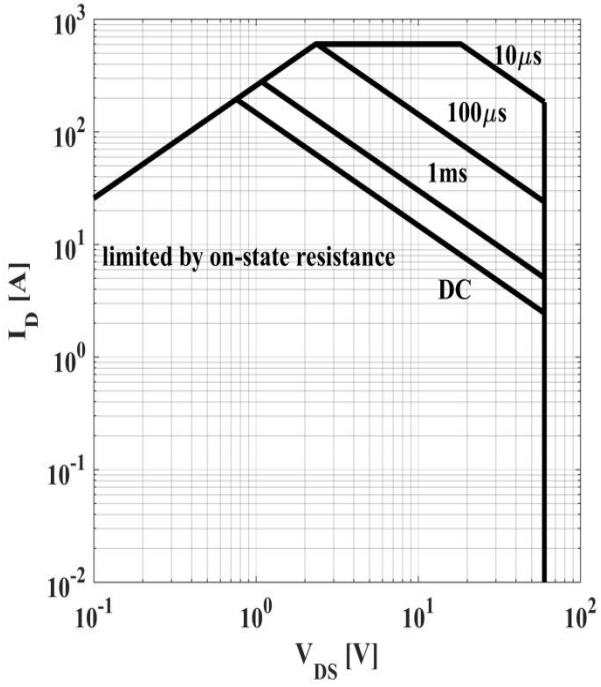
$C=f(V_{DS})$; $V_{GS}=0$; f=1MHz

Figure 17: C_{OSS} Stored Energy



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

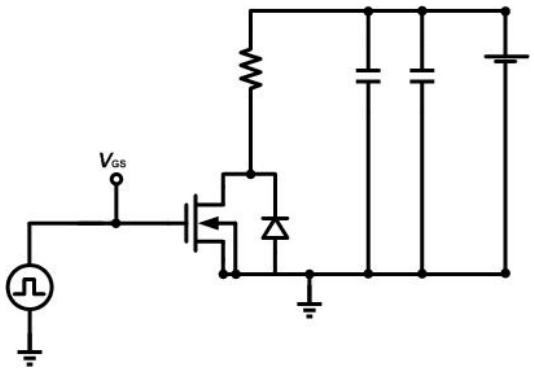
Figure 18: Safe Operating Area

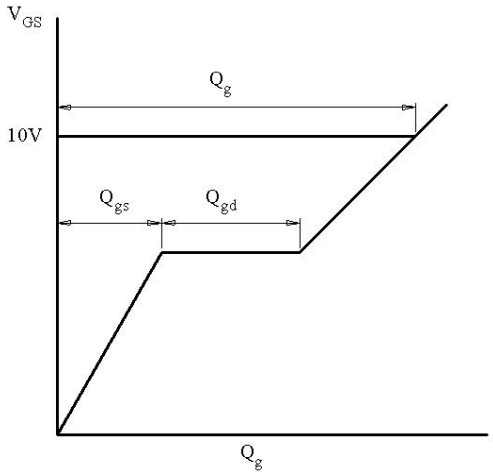


$I_D = f(V_{DS})$; T_c= 25°C; V_{GS}>7V; parameter t_p

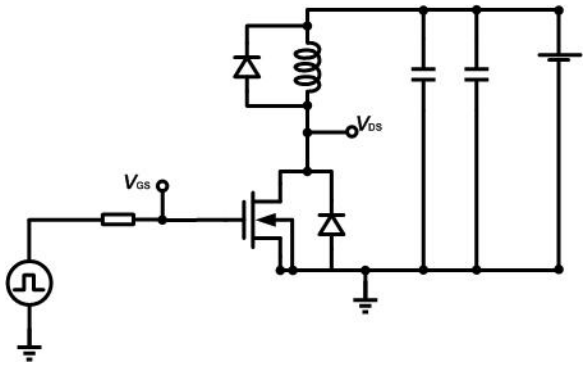
Test Circuits

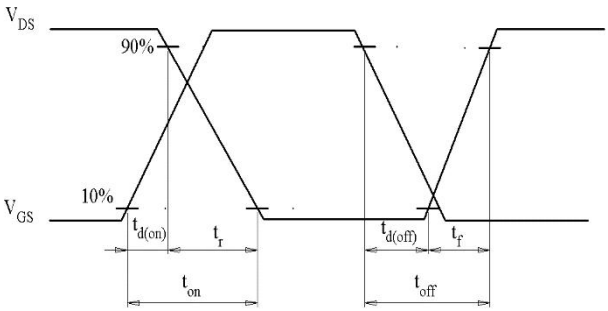
1. Gate Charge Test Circuit & Waveform



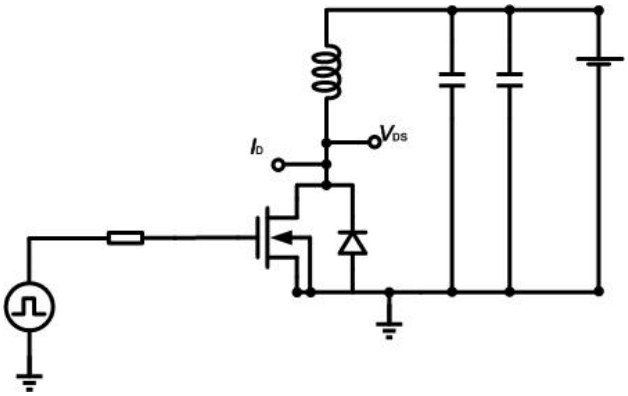


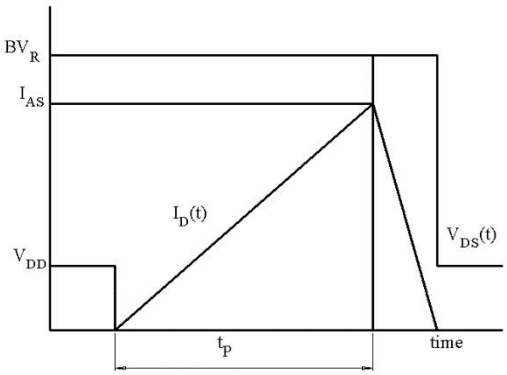
2. Switch Time Test Circuit



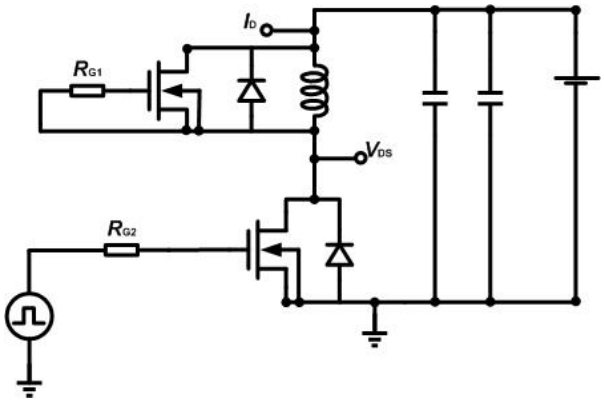


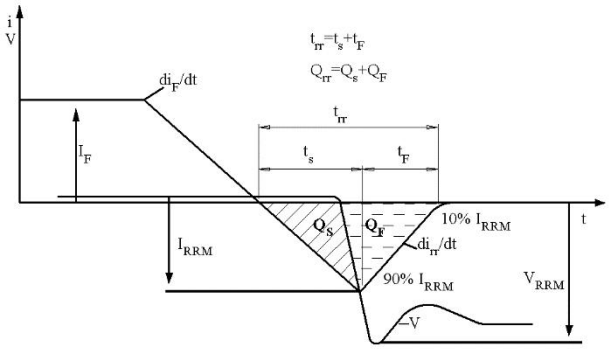
3. Unclamped Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

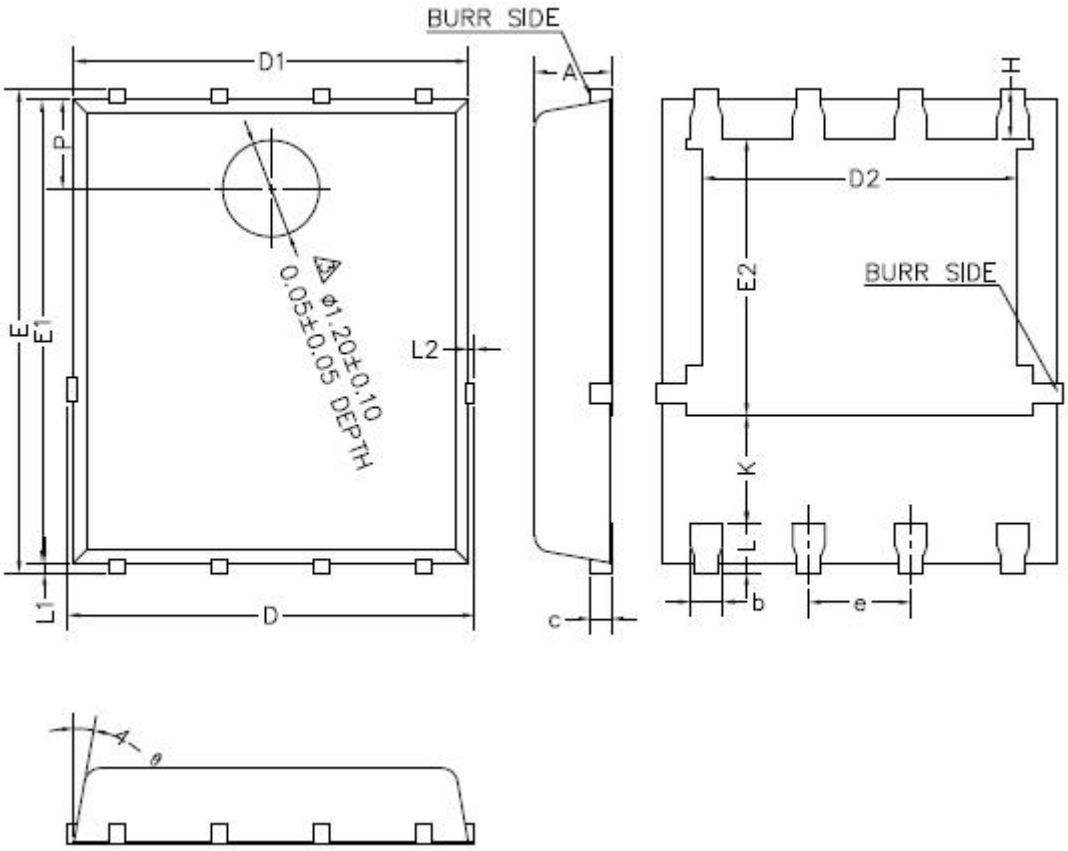




2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

Mechanical Dimensions

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



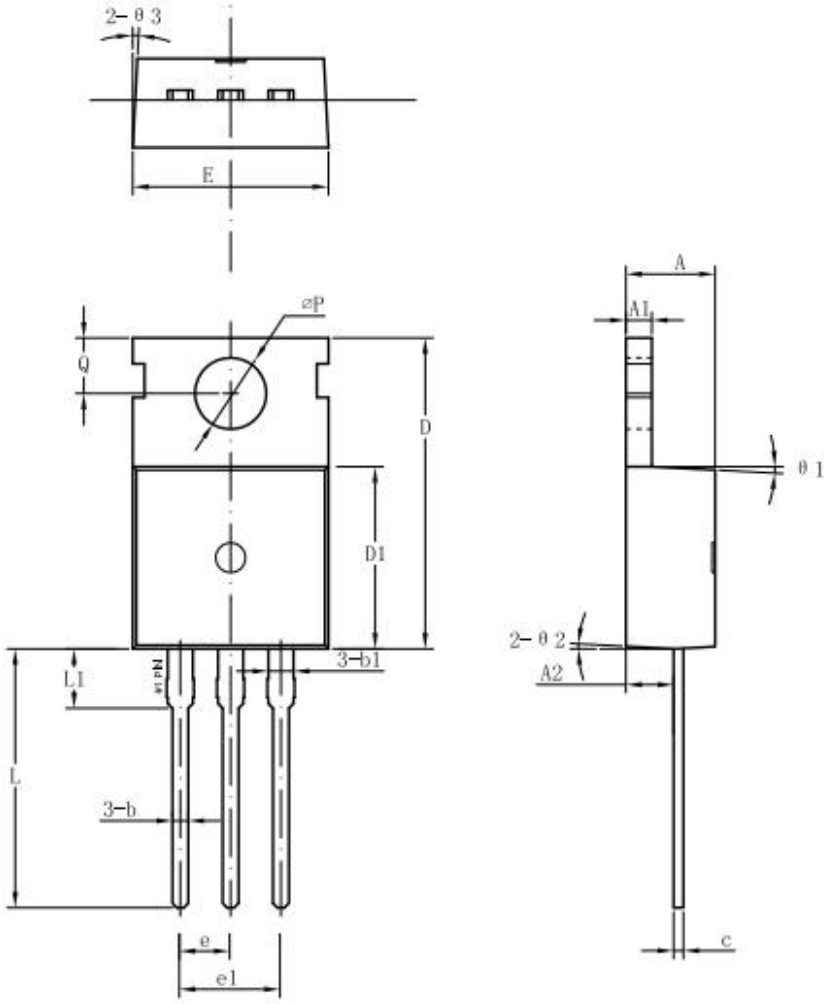
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	0.90	1.10	1.20
b	0.35	0.40	0.45
c	0.21	0.25	0.34
D			5.10
D1	4,80	4.90	5.00
D2	3.91	4.01	4.11
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.34	3.44	3.54
H	0.51	0.61	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2			0.10
P	1.00	1.10	1.20
θ	8°	10°	12°

2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

Mechanical Dimensions

TO-220C(Package1)

Unit: mm



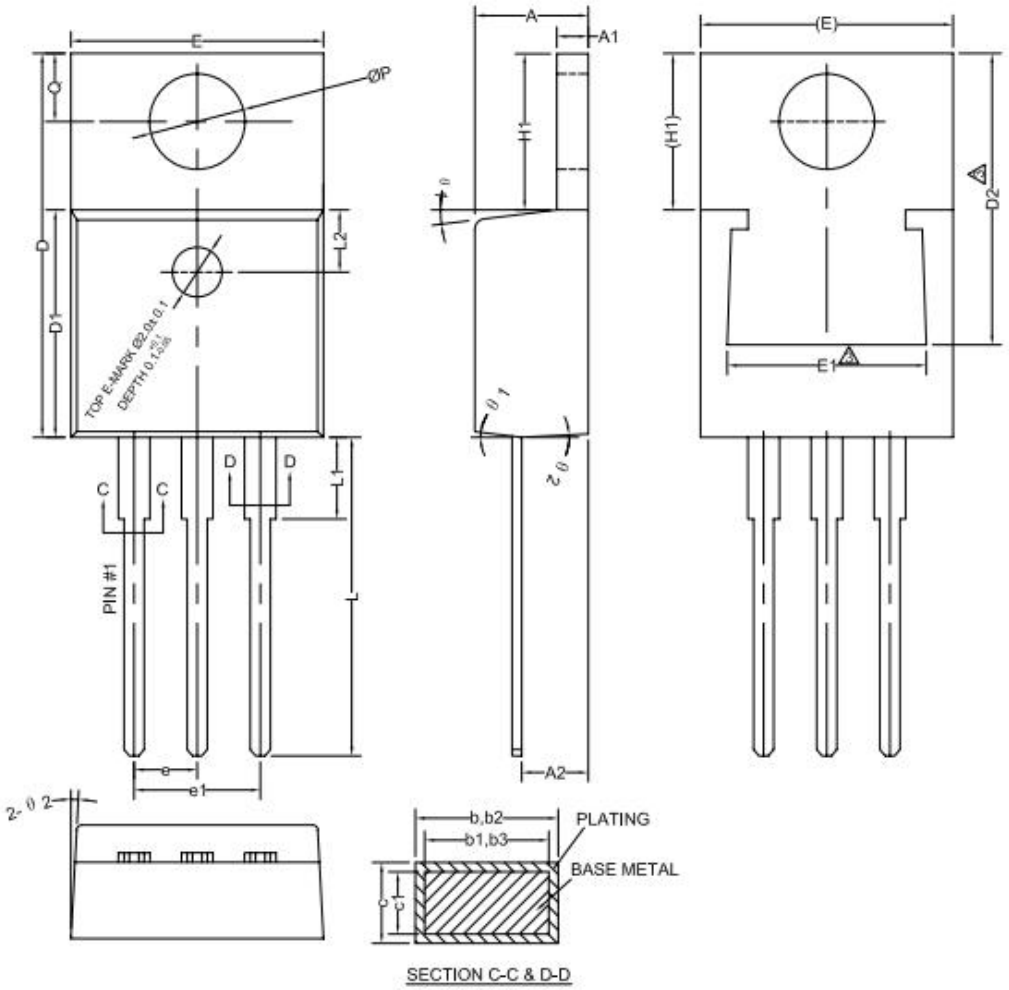
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.30	4.50	4.70	e	-	2.54	-
A1	1.25	1.30	1.40	e1	-	5.08	-
A2	2.20	2.40	2.60	L	12.60	13.08	13.60
b	0.70	0.80	0.95	L1	-	3.00	-
b1	-	1.27	-	ΦP	3.50	3.60	3.80
c	0.40	0.50	0.65	Q	2.60	2.80	3.00
D	15.20	15.70	16.20	Θ1	-	3°	-
D1	9.00	9.20	9.40	Θ2	-	3°	-
E	9.70	10.00	10.10	Θ3	-	3°	-

2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

Mechanical Dimensions

TO-220C(Package2)

Unit: mm



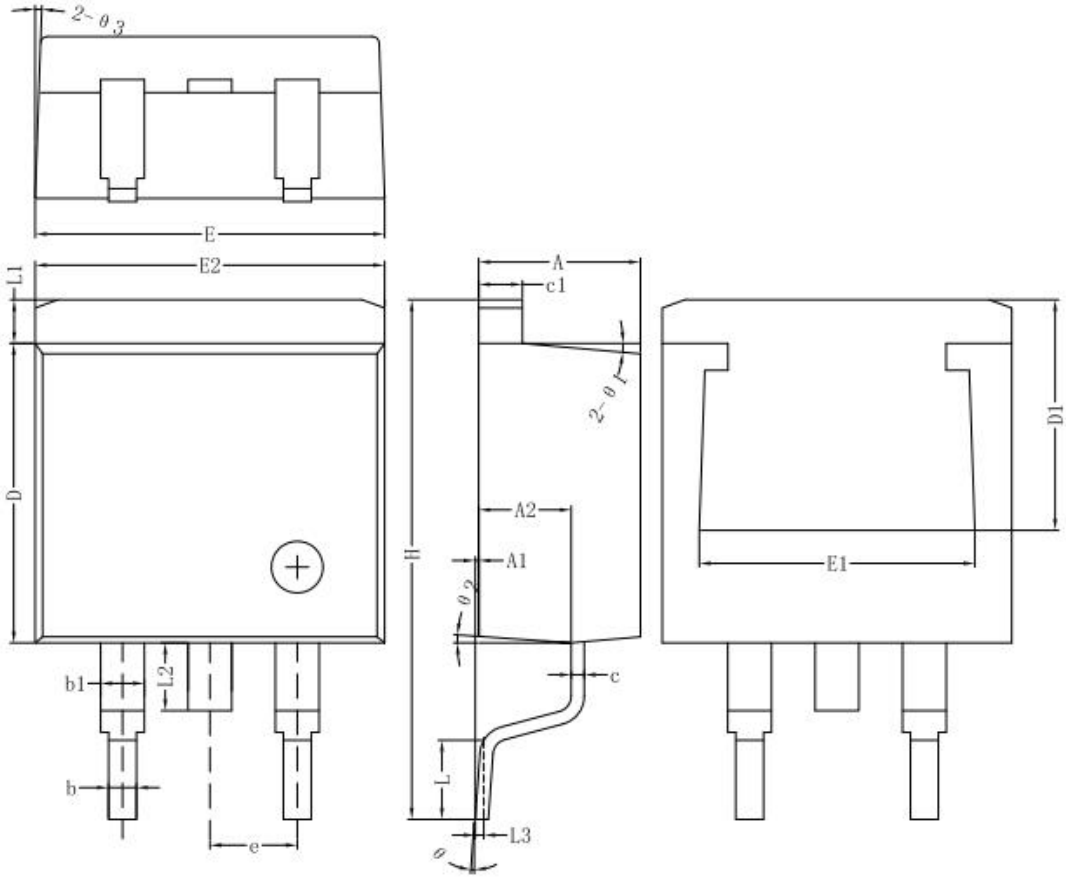
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	9.96	10.16	10.36
A1	1.22	-	1.32	E1	6.86	-	8.89
A2	2.59	2.69	2.79	e	2.44	2.54	2.64
b	0.77	-	0.90	e1	4.98	5.08	5.18
b1	0.76	0.81	0.86	H1	6.10	6.30	6.50
b2	1.23	-	1.36	L	12.70	-	13.12
b3	1.22	1.27	1.32	L1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

2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

Mechanical Dimensions (Continued)

TO-263-2(Package1)

Unit: mm

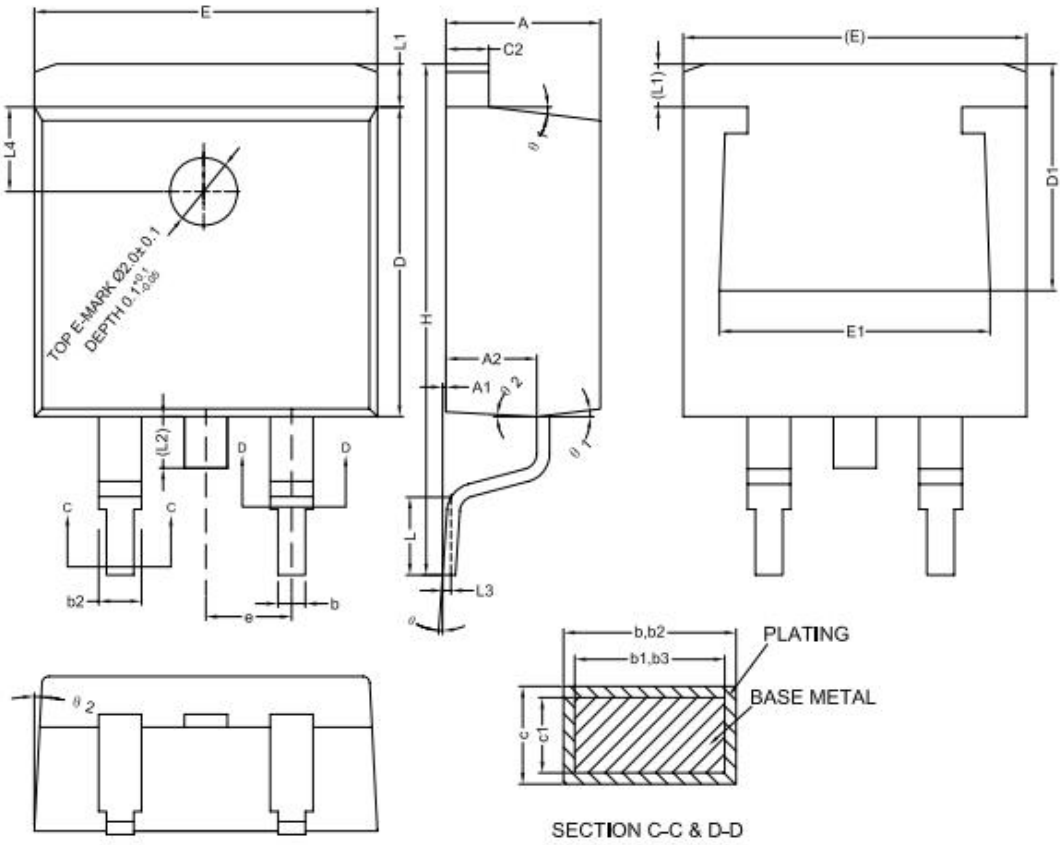


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.55	4.70	4.85	E2	9.98	10.08	10.18
A1	0.00	0.10	0.25	e	-	2.54	-
A2	2.59	2.69	2.89	H	14.70	15.10	15.50
b	0.71	0.81	0.96	L	2.00	2.30	2.70
b1	-	1.27	-	L1	1.17	1.27	1.40
c	0.36	0.38	0.61	L2	-	-	2.20
c1	1.17	1.27	1.37	L3	-	0.25BSC	-
D	8.55	8.70	8.85	Θ	0°	-	8°
D1	-	7.20	-	Θ1	-	5°	-
E	10.01	10.16	10.31	Θ2	-	4°	-
E1	-	7.8	-	Θ3	-	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	Θ	0°	-	8°
D	9.05	9.15	9.25	Θ1	5°	7°	9°
D1	6.60	-	-	Θ2	1°	3°	5°

2.2mΩ, 60V, N-Channel Power MOSFET SRT06N022H

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