20V NP-Channel Trench Power MOSFET

General Description

The SJG20NP400 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a wide variety of applications.

Features

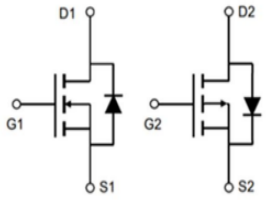
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

Application

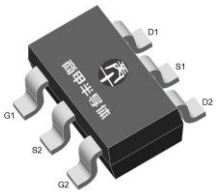
- PWM Applications
- Load Switch
- Power Management

Key Performance Parametes

Parameter	Value	Value	Unit
V_{DS}	20	-20	V
$R_{DS(ON)\_TYP}$	10.2	26.7	mΩ
I_D	8.2	-5.1	A
Q_G	8.5	8	nC



Schematic Diagram



SOT23-6L top view

RoHS

Package Marking and Ordering Information

Device/Ordering Code	Marking	Package	Packing	Reel Size	Tape width	Quantity
SJG20NP400	G20NP400	SOT23-6L	Tape	\	\	3000 Pcs

Table 1. Absolute Maximum Ratings (T_A=25℃ unless otherwise noted)

Symbol	Parameter	N Limit	P Limit	Unit
V_{DS}	Drain-Source Voltage (V_{GS}=0V)	20	-20	V
V_{GS}	Gate-Source Voltage (V_{DS}=0V)	±12	±12	V
I_D	Drain Current-Continuous(T_A=25℃)	8.2	-5.1	A
	Drain Current-Continuous(T_A=100℃)	5.2	-3.2	A
$I_{DM\ (pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	32.8	-20.4	A
P_D	Maximum Power Dissipation(T_A=25℃)	1.25	1.25	W
	Maximum Power Dissipation(T_A=100℃)	0.5	0.5	W
E_{AS}	Avalanche energy (Note 2)	30	25	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150		℃

Table 2. Thermal Characteristic

Symbol	Parameter	N Limit	P Limit	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient	100	100	℃/W

Table 3. N-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=-250μA	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V T_J=25℃			1	μA
		V_{DS}=20V, V_{GS}=0V T_J=125℃			100	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±12V, V_{DS}=0V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	0.4		1	V
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3A		13		S
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=4.5V, I_D=3A T_J=25℃		10.2	12.8	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=2.5V, I_D=2A T_J=25℃		16.3	21.7	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=10V,V_{GS}=0V, f=1.0MHz		805		pF
C_{oss}	Output Capacitance			88		pF
C_{rss}	Reverse Transfer Capacitance			75		pF
Rg	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1.0MHz		1.4		Ω
Switching Parameters						
$t_{d(on)}$	Turn-on Delay Time	V_{GS}=4.5V, V_{DS}=10V, R_L=3.3Ω, R_{GEN}=3Ω		6		nS
t_r	Turn-on Rise Time			20		nS
$t_{d(off)}$	Turn-Off Delay Time			28		nS
t_f	Turn-Off Fall Time			9		nS
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=3A		8.5		nC
Q_{gs}	Gate-Source Charge			1.4		nC
Q_{gd}	Gate-Drain Charge			1.5		nC
Source-Drain Diode Characteristics						
I_{SD}	Source-Drain Current (Body Diode)				8.2	A
V_{SD}	Forward on Voltage (Note 3)	V_{GS}=0V, I_S=4A			1.2	V
t_{rr}	Reverse Recovery Time	I_F=3A, dI/dt=100A/μs		4.3		ns
Q_{rr}	Reverse Recovery Charge	I_F=3A, dI/dt=100A/μs		0.6		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
Notes 2.E_{AS} condition: T_J=25℃,V_{DD}=20V,V_G=10V, Rg=25Ω, L=0.5mH.
Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

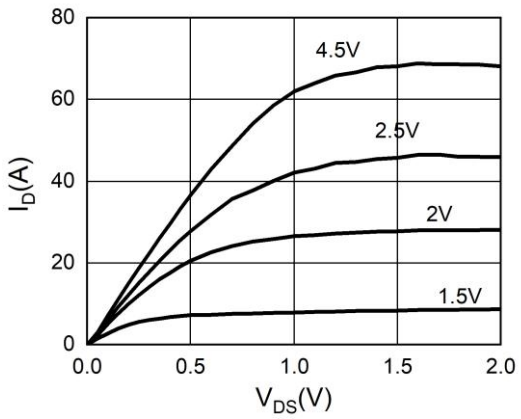


Figure 2. Transfer Characteristics

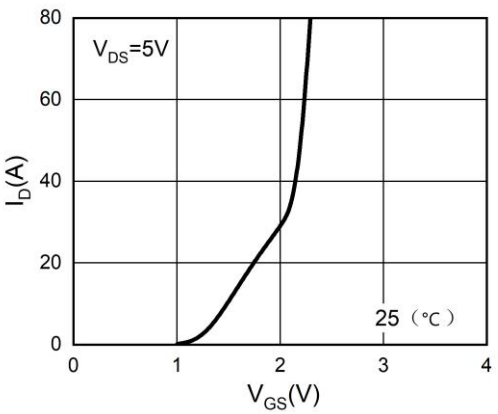


Figure 3. Power Dissipation

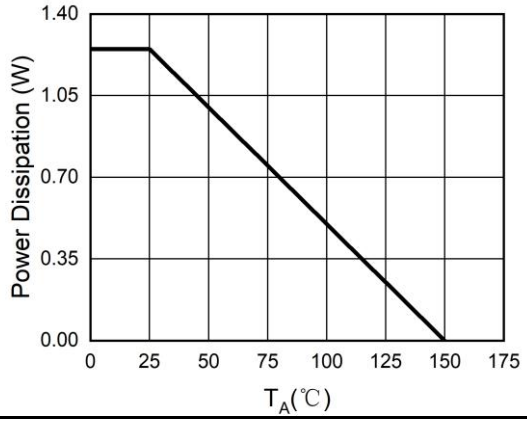


Figure 4. Drain Current

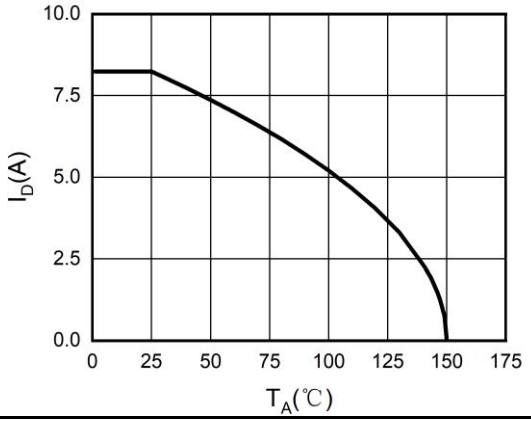


Figure 5. BV_{DSS} vs Junction Temperature

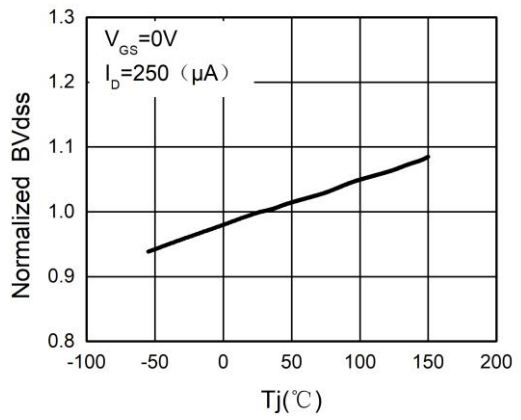
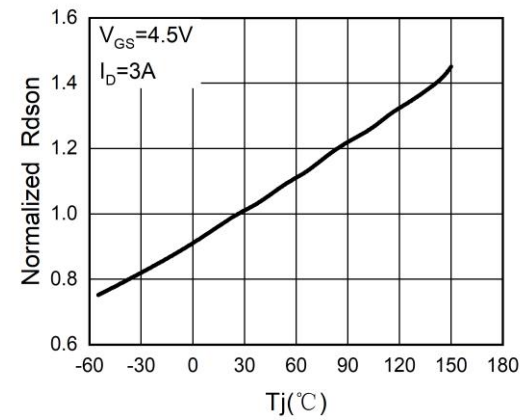


Figure 6. $R_{DS(ON)}$ vs Junction Temperature



N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 7. Gate Charge Waveforms

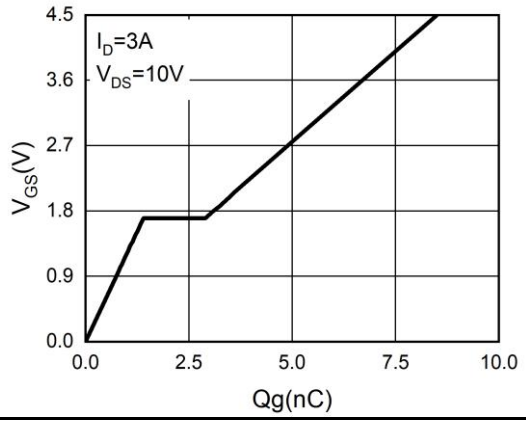


Figure 8. Capacitance

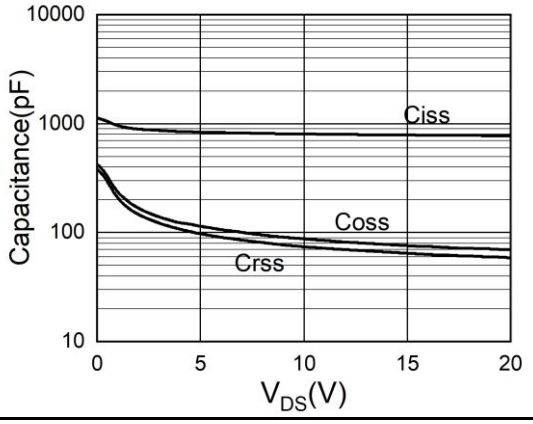


Figure 9. Body-Diode Characteristics

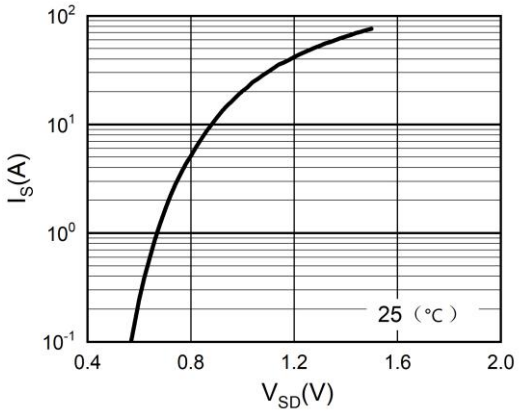


Figure 10. Maximum Safe Operating Area

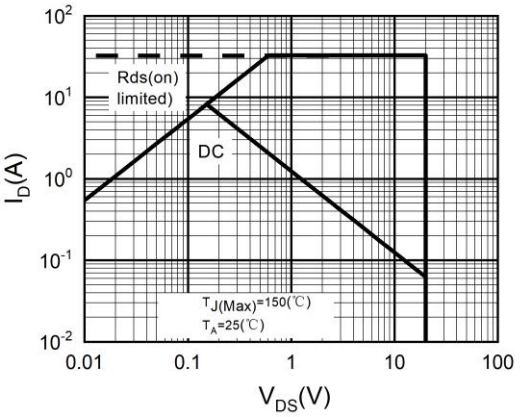


Table 4. P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=-250μA	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V T_J=25℃			-1	μA
		V_{DS}=-20V, V_{GS}=0V T_J=125℃			-100	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±12V, V_{DS}=0V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250μA	-0.5		-1	V
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3A		11		S
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=-4.5V, I_D=-3A T_J=25℃		26.7	33.4	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=-2.5V, I_D=-2A T_J=25℃		37	49.2	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=-10V,V_{GS}=0V, f=1.0MHz		872		pF
C_{oss}	Output Capacitance			103		pF
C_{rss}	Reverse Transfer Capacitance			87		pF
Rg	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1.0MHz		6		Ω
Switching Parameters						
$t_{d(on)}$	Turn-on Delay Time	V_{GS}=-4.5V, V_{DS}=-10V, R_L=3.3Ω, R_{GEN}=3Ω		26		nS
t_r	Turn-on Rise Time			45		nS
$t_{d(off)}$	Turn-Off Delay Time			70		nS
t_f	Turn-Off Fall Time			58		nS
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-1V, I_D=-3A		8		nC
Q_{gs}	Gate-Source Charge			1.4		nC
Q_{gd}	Gate-Drain Charge			1.6		nC
Source-Drain Diode Characteristics						
I_{SD}	Source-Drain Current (Body Diode)				-5.1	A
V_{SD}	Forward on Voltage (Note 3)	V_{GS}=0V, I_S=-5A			-1.2	V
t_{rr}	Reverse Recovery Time	I_F=-3A, dI/dt=100A/μs		17		ns
Q_{rr}	Reverse Recovery Charge	I_F=-3A, dI/dt=100A/μs		7		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
Notes 2.E_{AS} condition: T_J=25℃,V_{DD}=-20V,V_G=-10V, Rg=25Ω, L=0.5mH.
Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

P-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

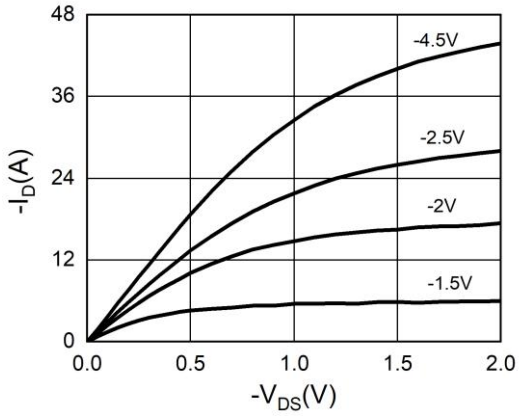


Figure 2. Transfer Characteristics

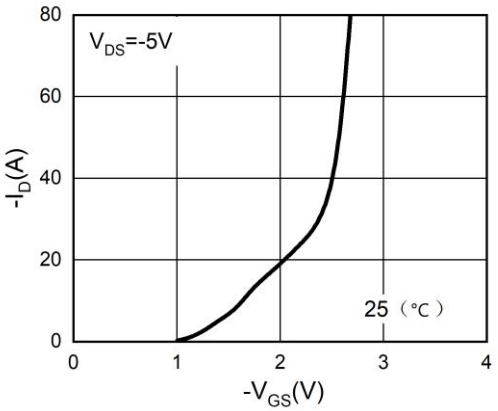


Figure 3. Power Dissipation

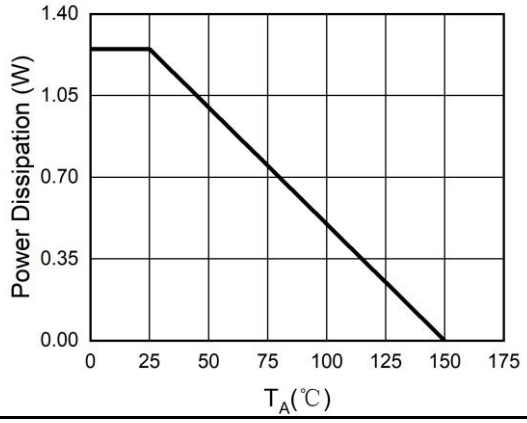


Figure 4. Drain Current

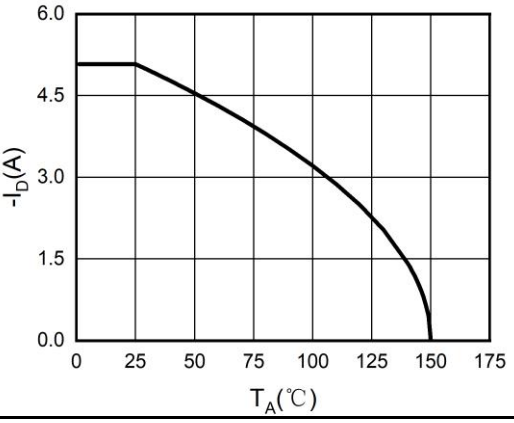


Figure 5. BV_{DSS} vs Junction Temperature

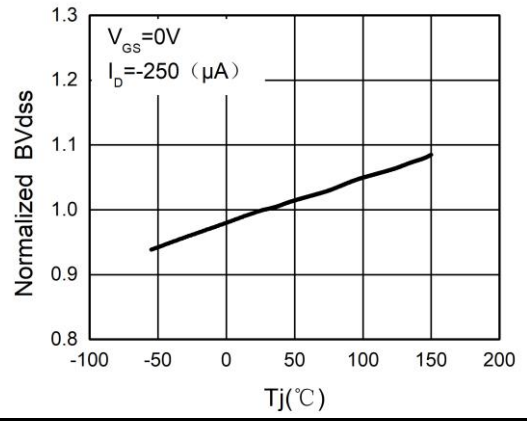
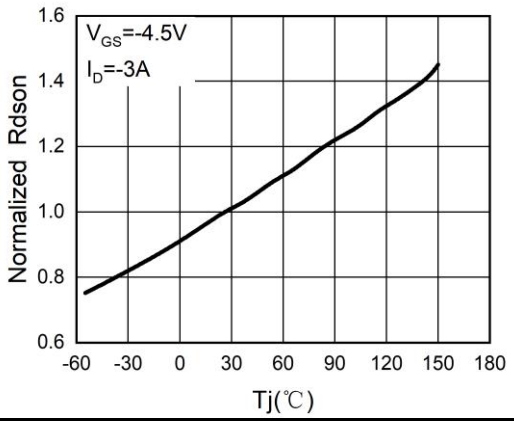


Figure 6. $R_{DS(ON)}$ vs Junction Temperature



P-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 7. Gate Charge Waveforms

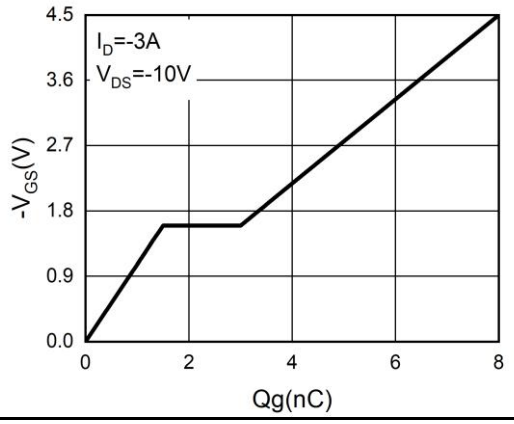


Figure 8. Capacitance

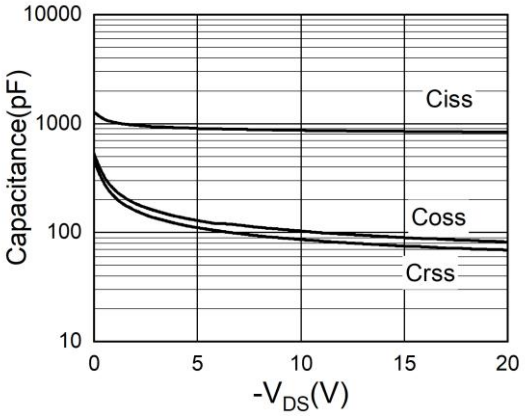


Figure 9. Body-Diode Characteristics

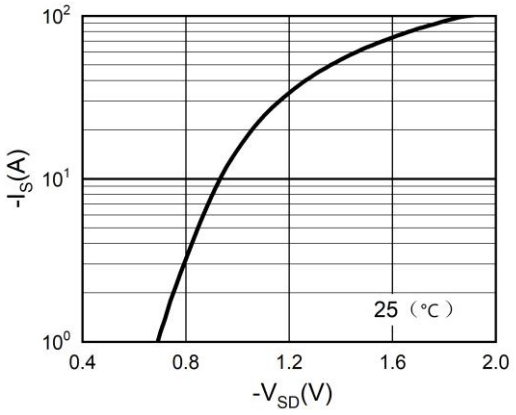
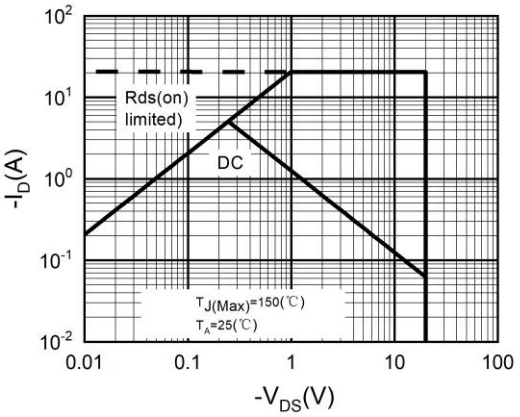
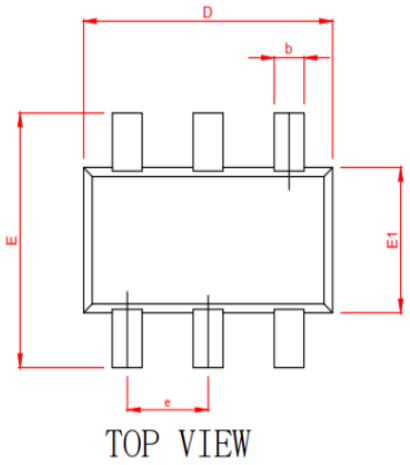
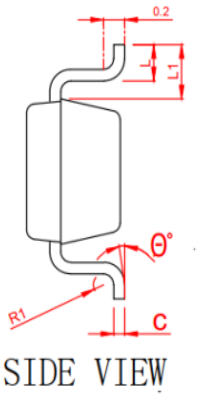


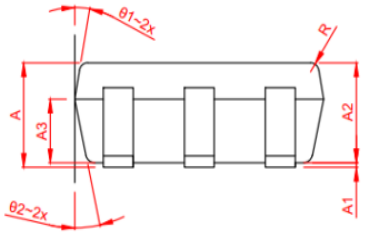
Figure 10. Maximum Safe Operating Area



SOT23-6L Package Information







SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.06	1.15	1.24
* A1	0.01	0.05	0.09
* A2	1.05	1.10	1.15
A3	0.65	0.70	0.75
* b	0.30	0.35	0.45
* c	0.127REF		
* D	2.87	2.92	2.97
* E	2.72	2.80	2.88
* E1	1.55	1.60	1.65
* e	0.95BSC		
* L	0.32	0.40	0.48
* L1	0.55	0.60	0.65
R	0.10 REF		
R1	0.12 REF		
* θ	0	--	8°
θ1	8°	10°	12°
θ2	10°	12°	14°

Attention

This product described in this document can not be used in life support devices or systems, aircraft's control systems, and other applications whose failure can be reasonably expected to result in serious physical and/or material damage，apart from that when an application agreement is signed between customer and Wuxi Shangjia Semiconductor.

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