

40V N&P-Channel Trench Power MOSFET

0405General Description

The LKS0405SCG uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as $\pm 4.5V$. This device is suitable for use as a wide variety of applications.

Features

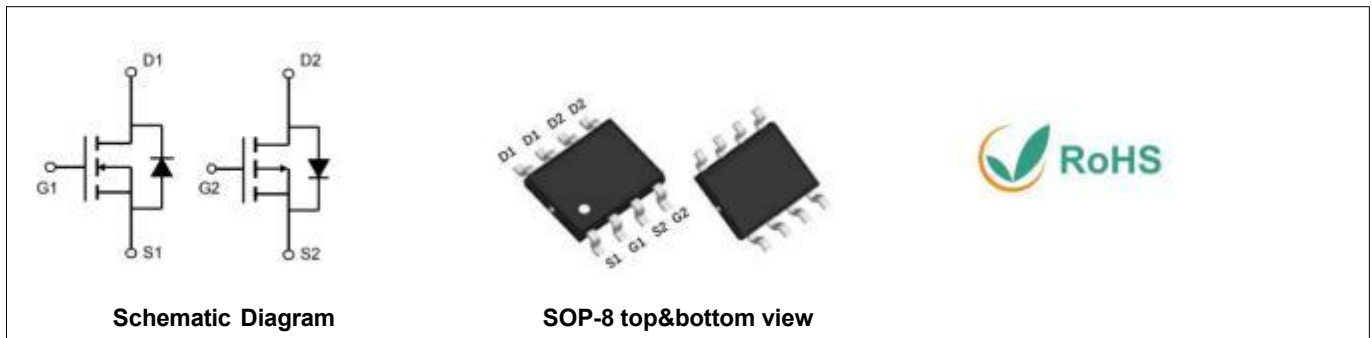
- Low Gate Charge
- High Power and current handling capability
- Lead free product is acquired

Application

- Battery Protection
- Power Management
- Load Switch

Key Performance Parametes

Parameter	Value	Value	Unit
V_{DS}	40	-40	V
$R_{DS(ON_TYP)}$	20	46	m Ω
I_D	6.3	-4.2	A
Q_G	10	11	nC



Package Marking and Ordering Information

Device/Ordering Code	Marking	Package	Reel Size	Tape width	Quantity
LKS0405SCG	LKS0405SCG	SOP-8	\	\	\

Table 1. Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	N Limit	P Limit	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	40	-40	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 20	± 20	V
I_D	Drain Current-Continuous($T_A=25^\circ\text{C}$)	6.3	-4.2	A
	Drain Current-Continuous($T_A = 100^\circ\text{C}$)	4	-2.7	A
I_{DM} (pluse)	Drain Current-Continuous@ Current-Pulsed (Note 1)	25.2	-16.8	A
P_D	Maximum Power Dissipation($T_A = 25^\circ\text{C}$)	1.83	1.83	W
	Maximum Power Dissipation($T_A = 100^\circ\text{C}$)	0.73	0.73	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150		$^\circ\text{C}$

Table 2. Thermal Characteristic

Symbol	Parameter	N Max	P Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient	68	68	$^\circ\text{C/W}$

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Table 3. N-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ 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	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V T _J =25℃			1	μA
		V _{DS} =40V, V _{GS} =0V T _J =125℃			100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0		2.5	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =5A		6		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =10V, I _D =5A T _J =25℃		20	26	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =4A T _J =25℃		24.5	33	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz		777		pF
C _{oss}	Output Capacitance			55		pF
C _{rss}	Reverse Transfer Capacitance			34		pF
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =10V, V _{DS} =20V, R _L =3.3Ω, R _{GEN} =3Ω		5		nS
t _r	Turn-on Rise Time			2.5		nS
t _{d(off)}	Turn-Off Delay Time			18		nS
t _f	Turn-Off Fall Time			2.6		nS
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =20V, I _D =5A		10		nC
Q _{gs}	Gate-Source Charge			2.7		nC
Q _{gd}	Gate-Drain Charge			2.6		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				6.3	A
V _{SD}	Forward on Voltage ^(Note 3)	V _{GS} =0V, I _S =5A			1.2	V

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2.EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=40V$, $V_G=10V$, $R_g=25\Omega$, $L=0.5\text{mH}$.

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

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N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

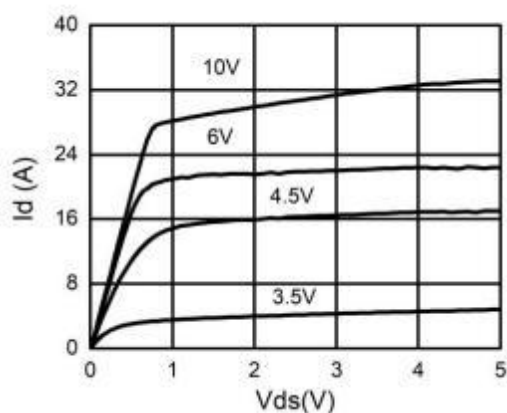


Figure 2. Transfer Characteristics

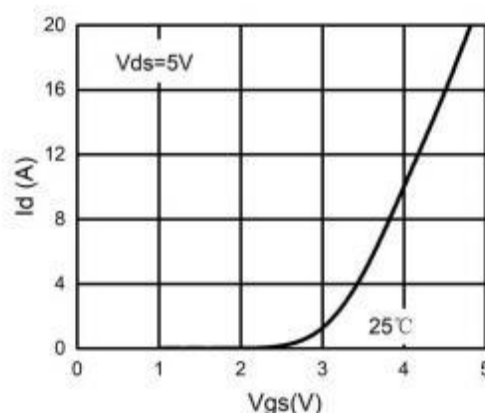


Figure 3. Power Dissipation

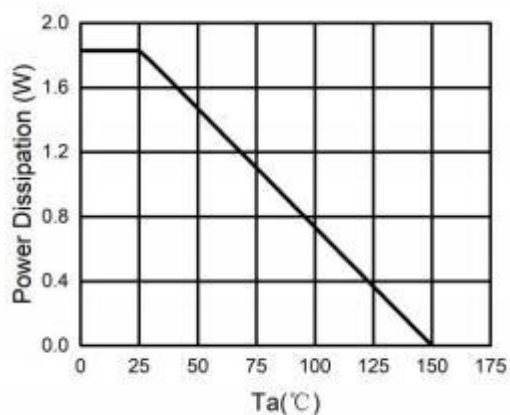
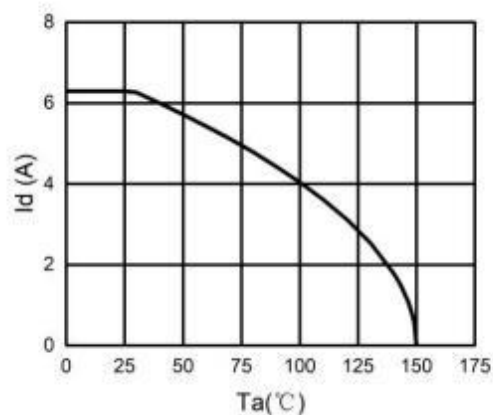
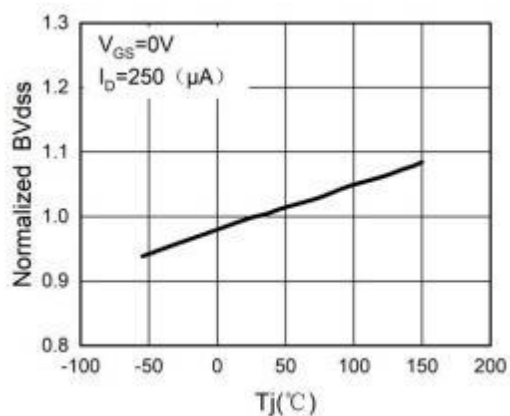
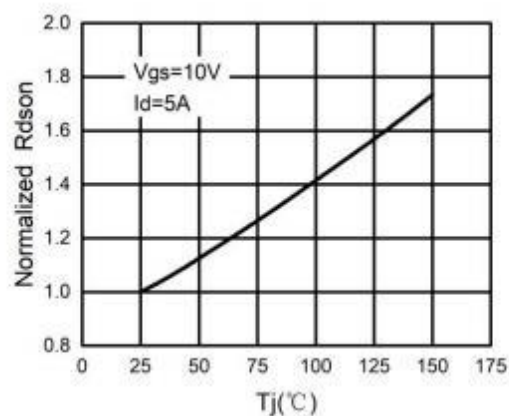


Figure 4. Drain Current

Figure 5. BV_{DSS} vs Junction TemperatureFigure 6. $R_{DS(ON)}$ vs Junction Temperature

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N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 7. Gate Charge Waveforms

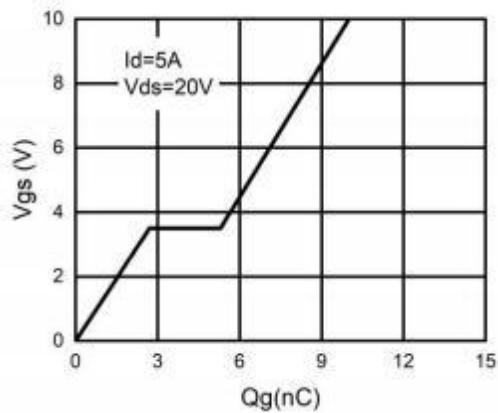


Figure 8. Capacitance

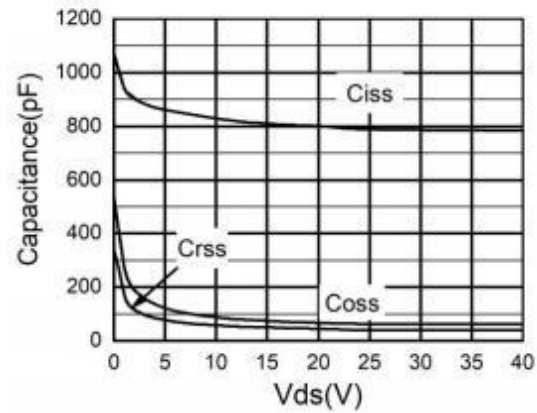


Figure 9. Body-Diode Characteristics

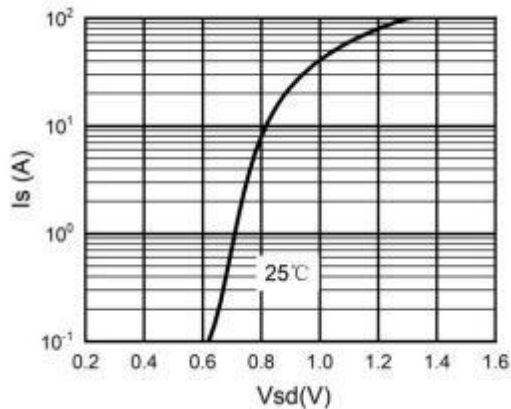
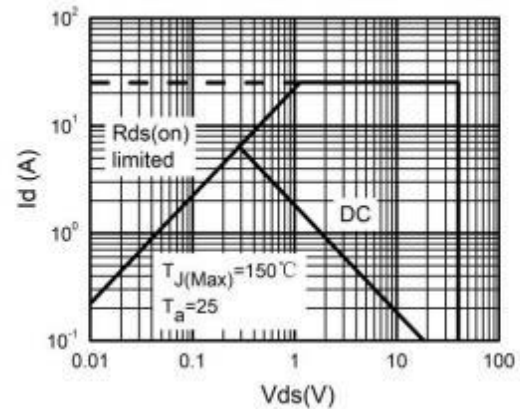


Figure 10. Maximum Safe Operating Area



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Table 4. P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ 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	-40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-40V, V _{GS} =0V T _J =25℃			-1	μA
		V _{DS} =-40V, V _{GS} =0V T _J =125℃			-100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1		-2.5	V
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-4A		8		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-10V, I _D =-4A T _J =25℃		46	60	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =-4.5V, I _D =-3A T _J =25℃		59	78	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-20V,V _{GS} =0V, f=1.0MHz		900		pF
C _{oss}	Output Capacitance			61		pF
C _{rss}	Reverse Transfer Capacitance			45		pF
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =-10V, V _{DS} =-20V, R _L =5Ω, R _{GEN} =3Ω		7.5		nS
t _r	Turn-on Rise Time			3.5		nS
t _{d(off)}	Turn-Off Delay Time			18		nS
t _f	Turn-Off Fall Time			4.5		nS
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-20V, I _D =-4A		11		nC
Q _{gs}	Gate-Source Charge			3.3		nC
Q _{gd}	Gate-Drain Charge			2.7		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				-4.2	A
V _{SD}	Forward on Voltage (Note 3)	V _{GS} =0V, I _S =-4A			-1.2	V

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2.EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=-40V$, $V_G=-10V$, $R_g=25\Omega$, $L=0.5\text{mH}$.

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

P-Channel Typical Electrical And Thermal Characteristics (Curves)



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Figure 1. Output Characteristics

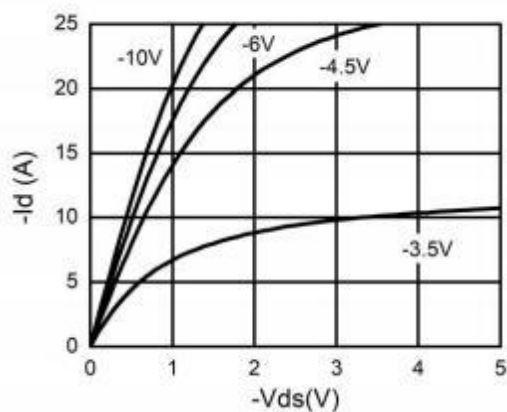


Figure 2. Transfer Characteristics

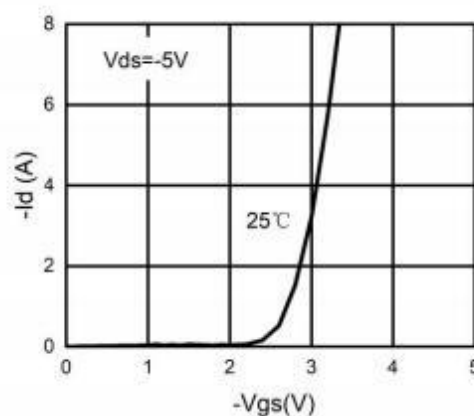


Figure 3. Power Dissipation

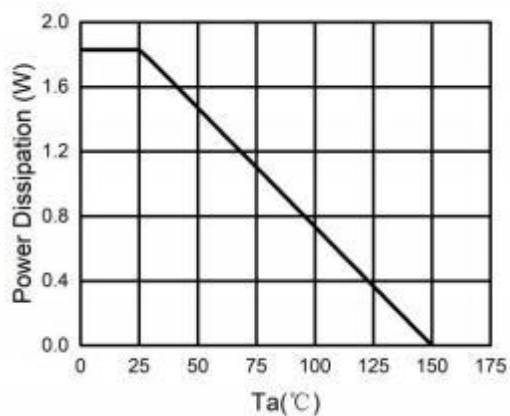
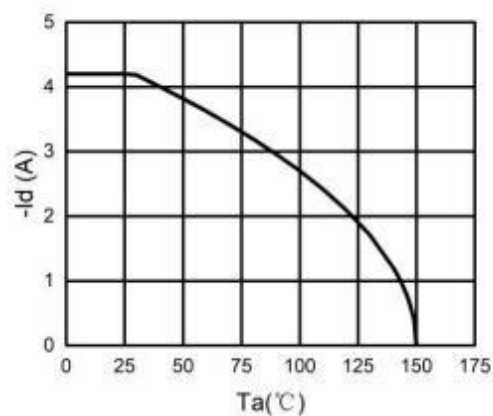
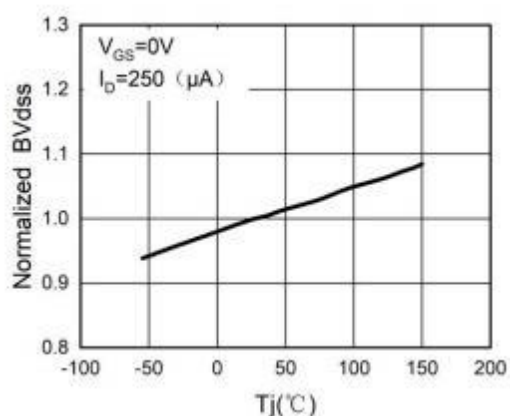
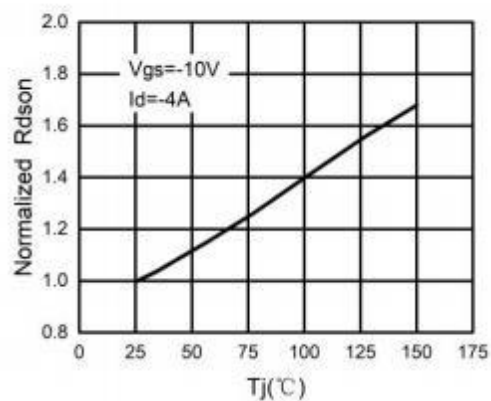


Figure 4. Drain Current

Figure 5. BV_{DSS} vs Junction TemperatureFigure 6. $R_{DS(ON)}$ vs Junction Temperature

P-Channel Typical Electrical And Thermal Characteristics (Curves)



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Figure 7. Gate Charge Waveforms

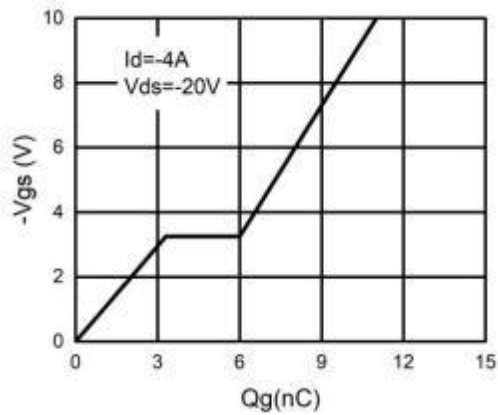


Figure 8. Capacitance

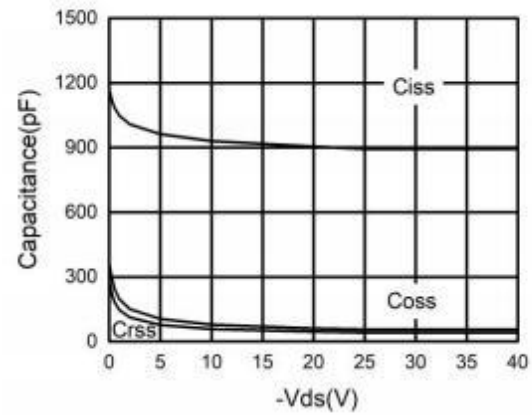


Figure 9. Body-Diode Characteristics

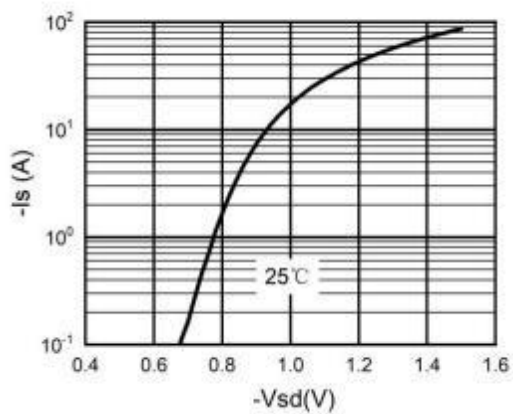
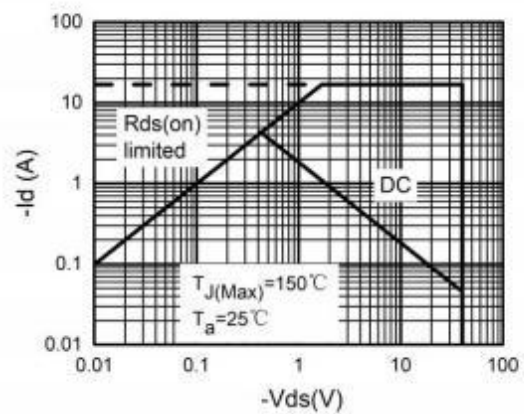


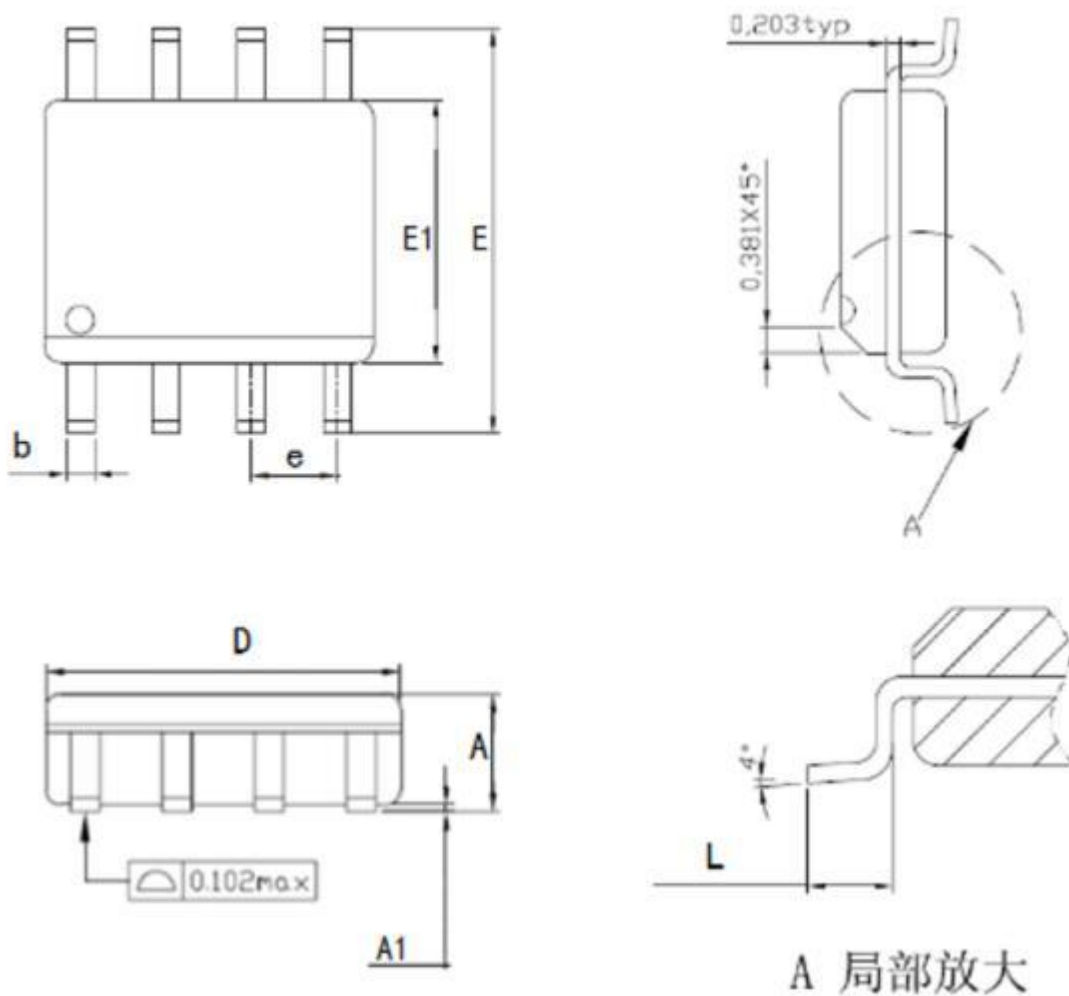
Figure 10. Maximum Safe Operating Area



SOP-8 Package Information



40V N&P-Channel Trench Power MOSFET



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max
A	1.35	1.55	1.75
A1	0.1	0.15	0.2
b	0.346	0.406	0.466
D	4.8	4.89	4.98
E	5.75	6.00	6.25
E1	3.81	3.90	3.99
e	1.27TYP		
L	0.406	0.838	1.27

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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 Linko Nanjing Semiconductor.

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