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 ±4.5V. This device is suitable for use as a wide variety of applications.

Features

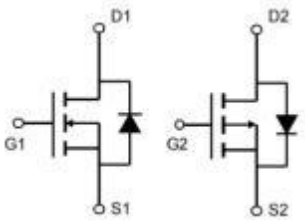
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

Application

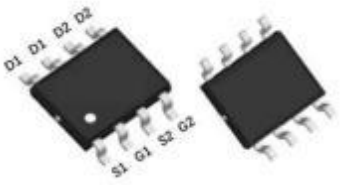
- Battery Protection
- Power Management
- Load Switch

Key Performance Parametes

Parameter	Value	Value	Unit
V_{DS}	40	-40	V
$R_{DS(ON)\_TYP}$	20	46	mΩ
I_D	6.3	-4.2	A
Q_G	10	11	nC



Schematic Diagram



SOP-8 top&bottom view

RoHS

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℃ 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℃)	6.3	-4.2	A
	Drain Current-Continuous(T_A =100℃)	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℃)	1.83	1.83	W
	Maximum Power Dissipation(T_A =100℃)	0.73	0.73	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150		℃

Table 2. Thermal Characteristic

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

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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	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.E_{AS} condition: T_J=25℃,V_{DD}=40V,V_G=10V, Rg=25Ω, L=0.5mH.
Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

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N-Channel Typical Electrical And Thermal Characteristics (Curves)

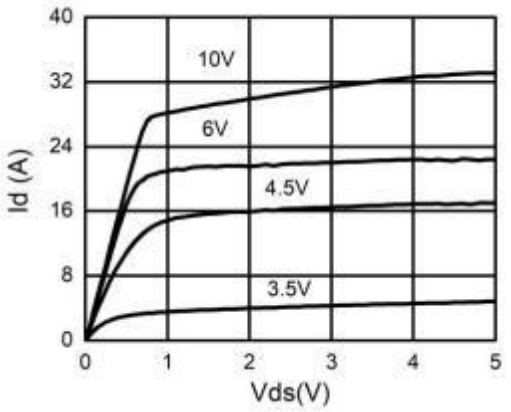
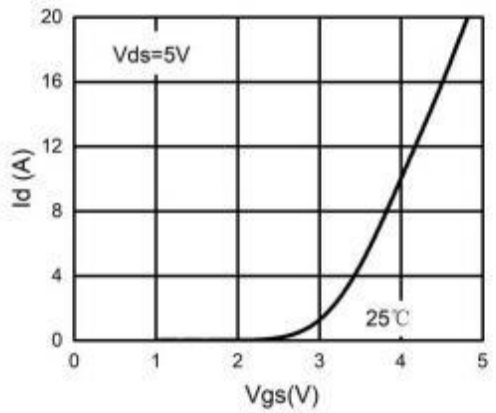
Figure 1. Output Characteristics	Figure 2. Transfer Characteristics
	

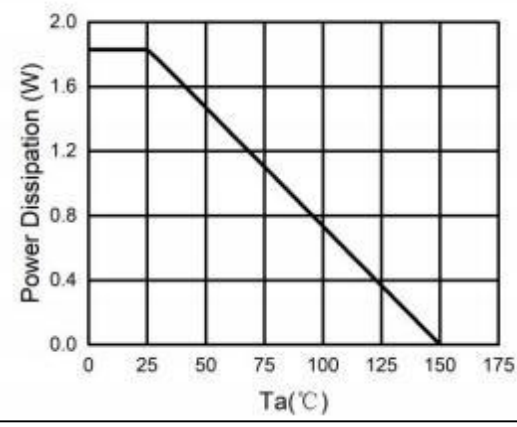
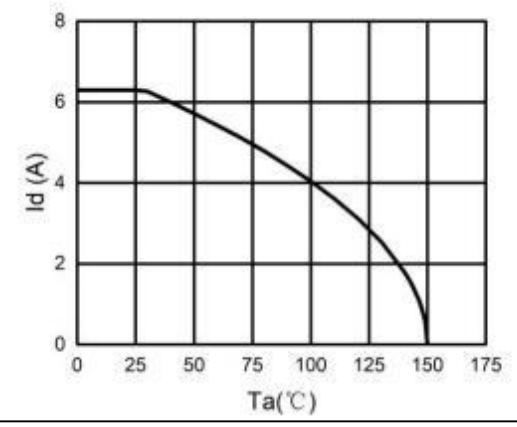
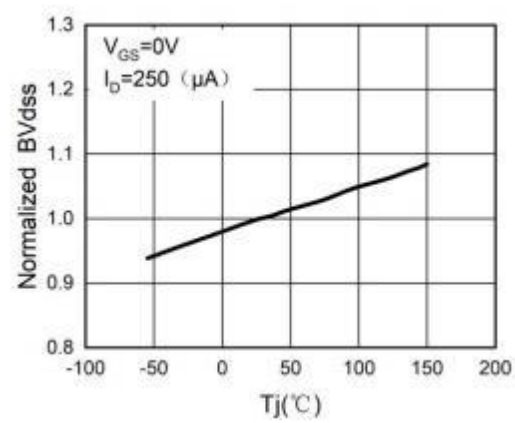
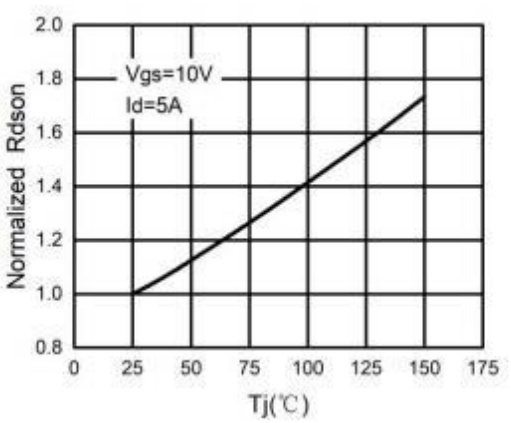
Figure 3. Power Dissipation	Figure 4. Drain Current
	

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

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N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 7. Gate Charge Waveforms

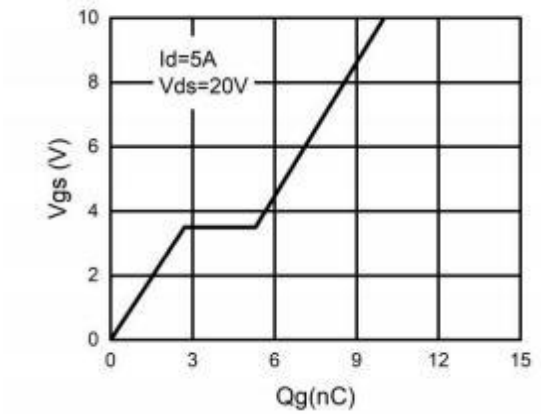

Figure 8. Capacitance

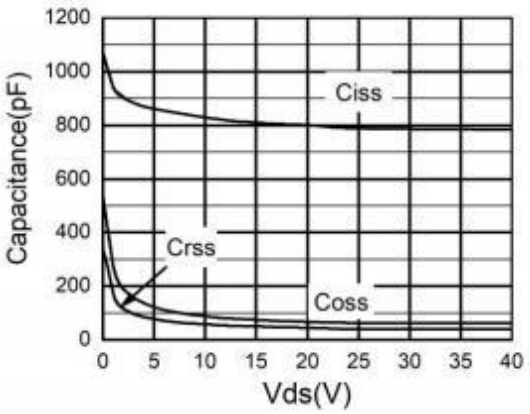

Figure 9. Body-Diode Characteristics

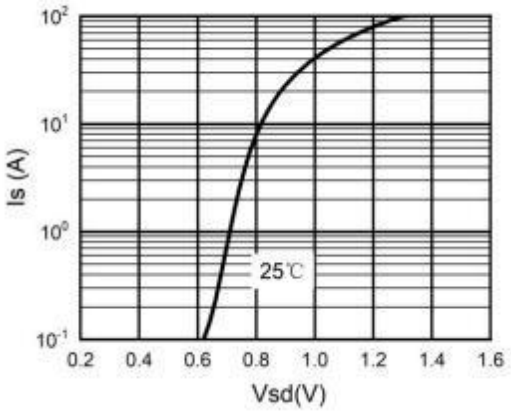

Figure 10. Maximum Safe Operating Area

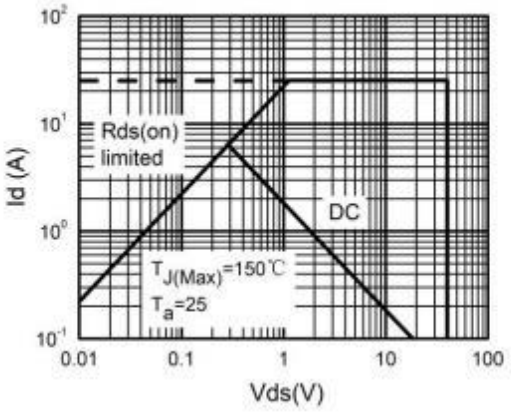

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Table 4. P-Channel Electrical Characteristics (T_J=25℃ unless otherwise noted)

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.E_{AS} condition: T_J=25℃,V_{DD}=-40V,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)

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Figure 1. Output Characteristics

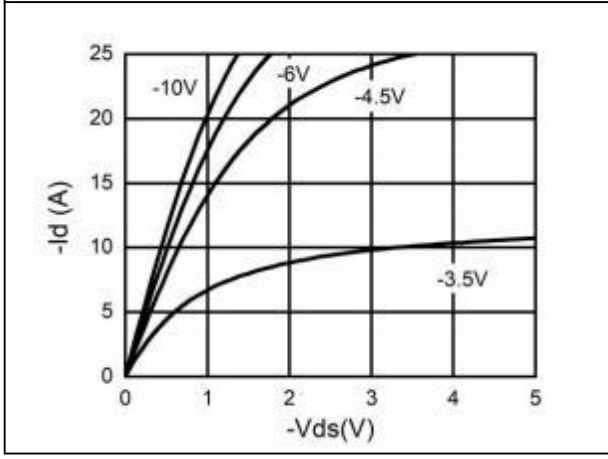


Figure 2. Transfer Characteristics

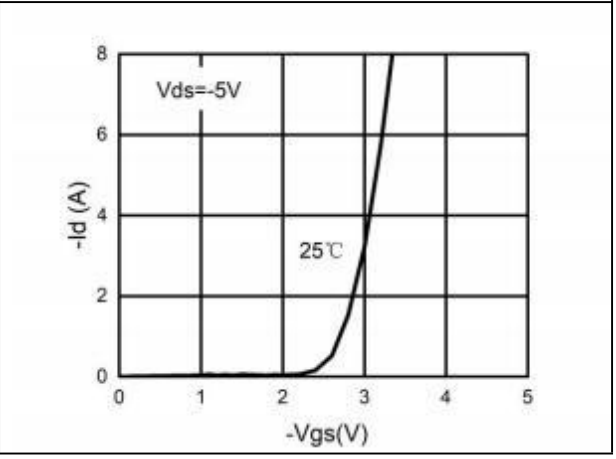


Figure 3. Power Dissipation

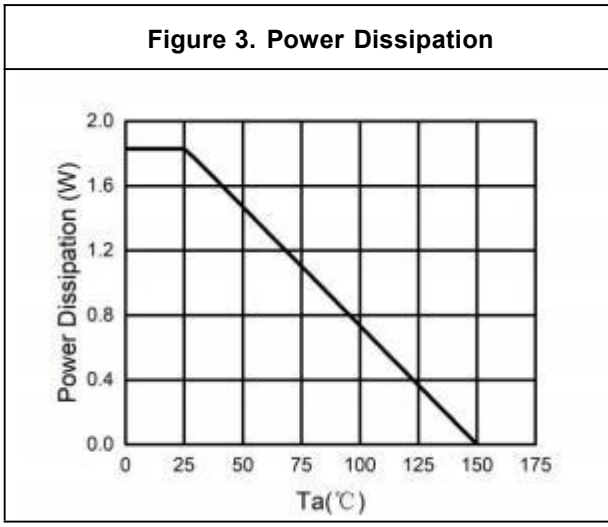


Figure 4. Drain Current

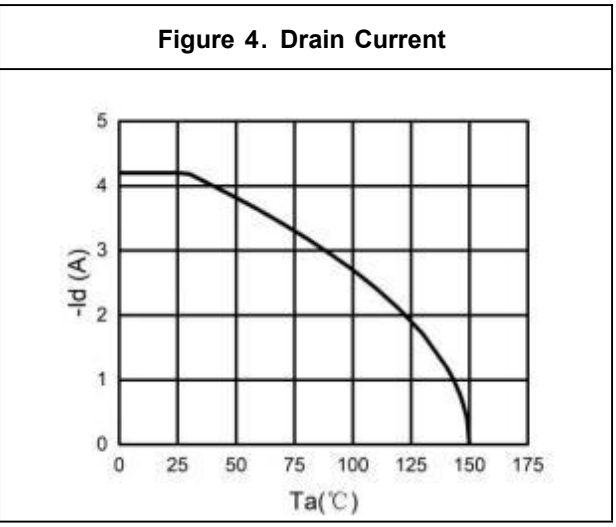


Figure 5. BV_{DSS} vs Junction Temperature

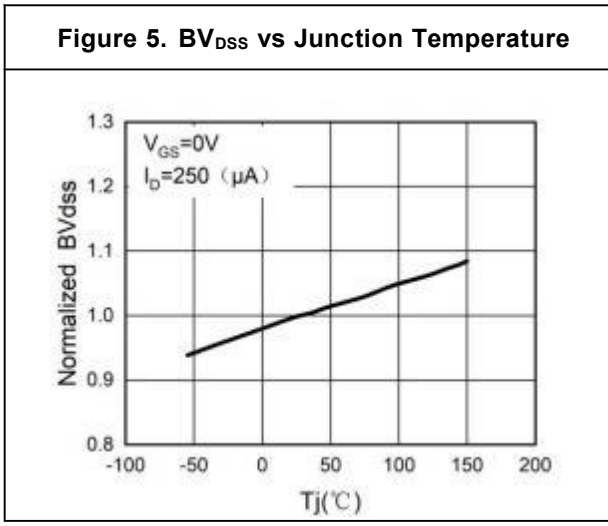
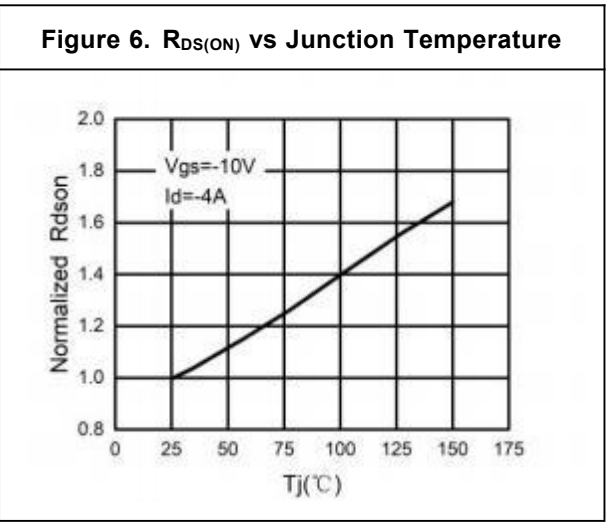


Figure 6. $R_{DS(ON)}$ vs Junction Temperature



P-Channel Typical Electrical And Thermal Characteristics (Curves)

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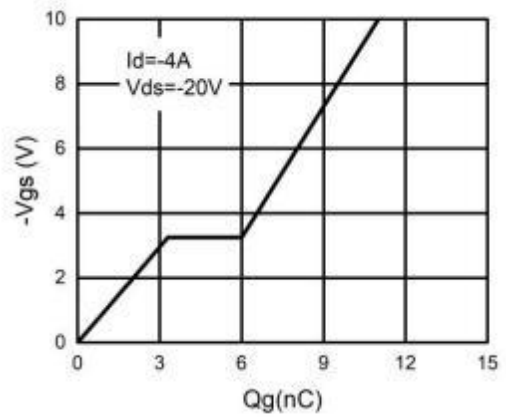
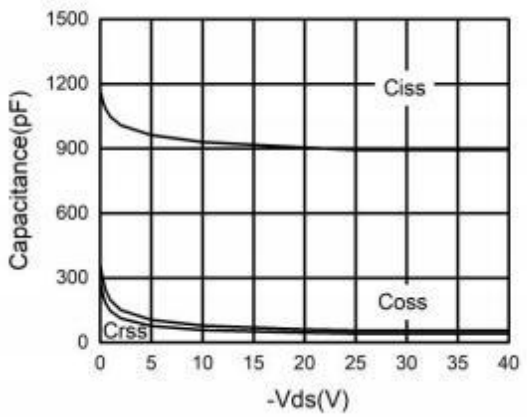
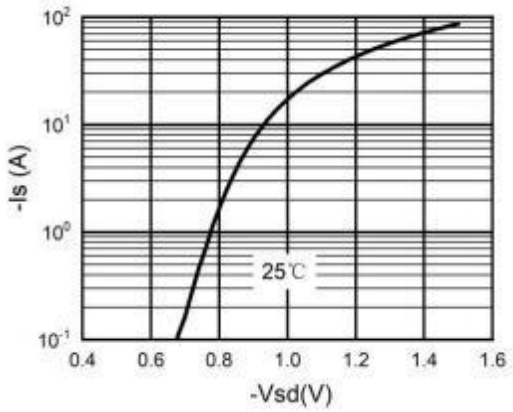
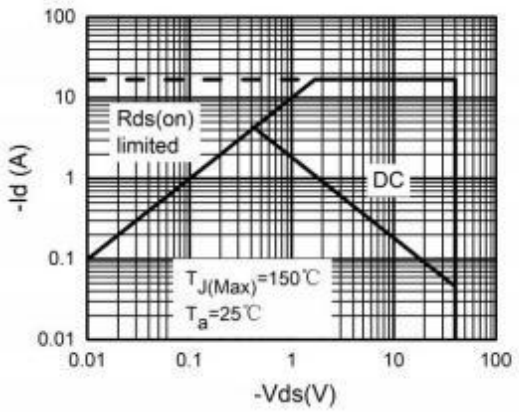
Figure 7. Gate Charge Waveforms	Figure 8. Capacitance
	

Figure 9. Body-Diode Characteristics	Figure 10. Maximum Safe Operating Area
	

SOP-8 Package Information

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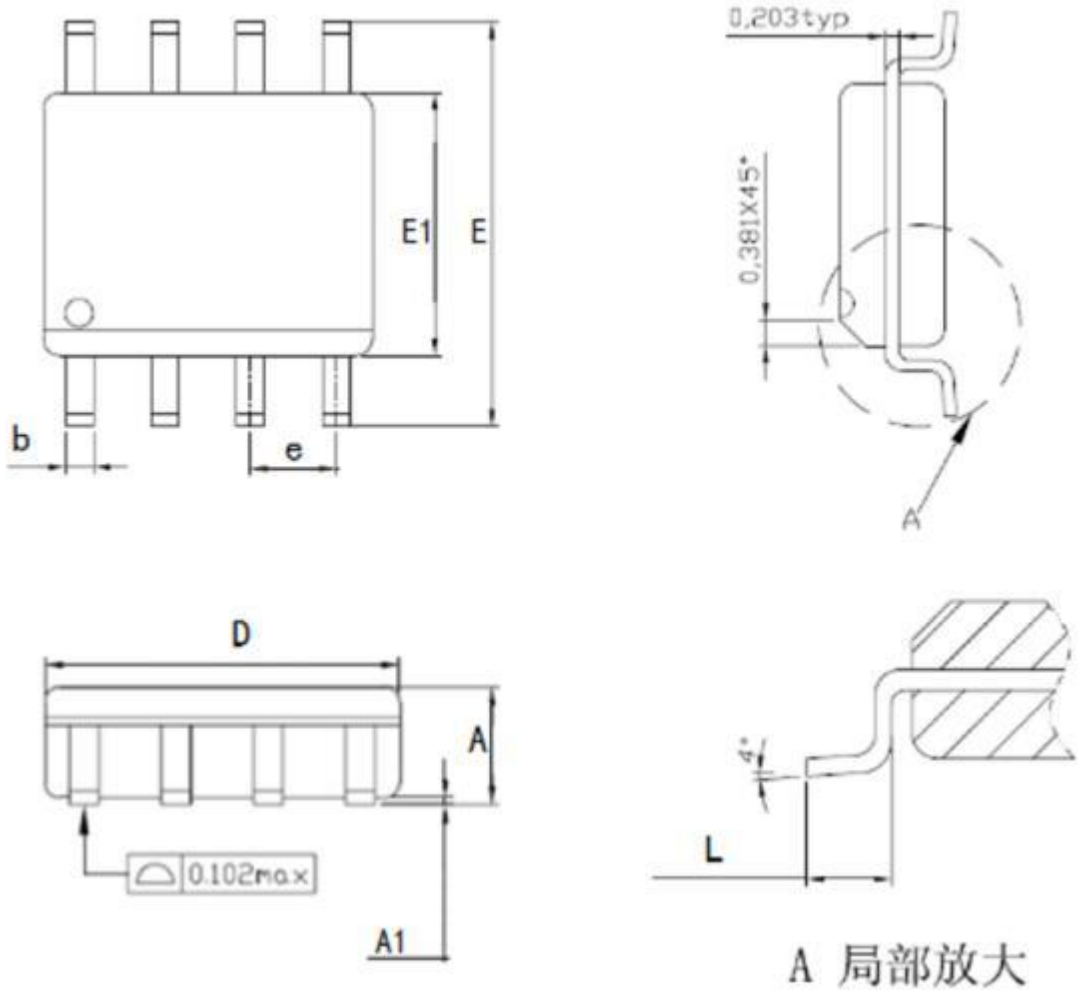

Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max
A	1.35	1.55	1.75
A1	0.1	0.15	0.2
b	0.346	0.406	0.466
D	4.8	4.89	4.98
E	5.75	6.00	6.25
E1	3.81	3.90	3.99
e	1.27TYP		
L	0.406	0.838	1.27

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