

## N and P-Channel Enhancement Mode Power MOSFET

### Description

The SLP240C03D uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

### General Features

- **N-Channel**

$$V_{DS} = 30V, I_D = 8.5A$$

$$R_{DS(ON)} < 21m\Omega @ V_{GS}=10V$$

$$R_{DS(ON)} < 32m\Omega @ V_{GS}=4.5V$$

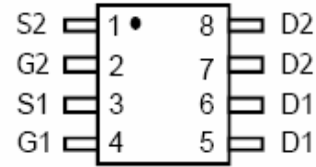
- **P-Channel**

$$V_{DS} = -30V, I_D = -7.0A$$

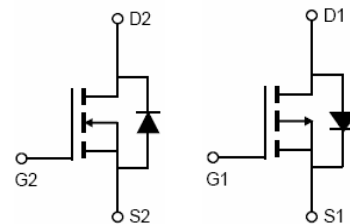
$$R_{DS(ON)} < 45m\Omega @ V_{GS}=-10V$$

$$R_{DS(ON)} < 60m\Omega @ V_{GS}=-4.5V$$

- High power and current handing capability
- Lead free product is acquired
- Surface mount package



Marking and pin assignment



N-channel

P-channel

Schematic diagram

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		$V_{DS}$	30	-30	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current	$T_A=25^\circ C$	$I_D$	8.5	-7.0	A
Pulsed Drain Current <sup>(Note 1)</sup>		$I_{DM}$	34	-26	A
Maximum Power Dissipation	$T_A=25^\circ C$	$P_D$	2.0	2.0	W
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 To 150	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note2)</sup>	$R_{\theta JA}$	N-Ch	63.5	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient <sup>(Note2)</sup>	$R_{\theta JA}$	P-Ch	63.5	$^\circ C/W$

**N-CH Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=24V, V_{GS}=0V$	-	-	50	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA

**On Characteristics (Note 3)**

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8.5A$	-	19	21	$m\Omega$
		$V_{GS}=4.5V, I_D=5A$	-	29	32	$m\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=5.0A$	5	-	-	S

**Dynamic Characteristics (Note 4)**

Input Capacitance	$C_{ISS}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	398	-	PF
Output Capacitance	$C_{OSS}$		-	67	-	PF
Reverse Transfer Capacitance	$C_{RSS}$		-	61	-	PF

**Switching Characteristics (Note 4)**

Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, R_L=15\Omega$ $V_{GS}=10V, R_{GEN}=6\Omega$ $I_D=1.0A$	-	8.0	-	nS
Turn-on Rise Time	$t_r$		-	11.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	17	-	nS
Turn-Off Fall Time	$t_f$		-	7.5	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=1.0A,$ $V_{GS}=10V$	-	7.5	-	nC
Gate-Source Charge	$Q_{gs}$		-	1.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	1.3	-	nC

**Drain-Source Diode Characteristics**

Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=2A$	-	0.75	1.0	V
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**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

**Characteristics Curve(N-Channel)**

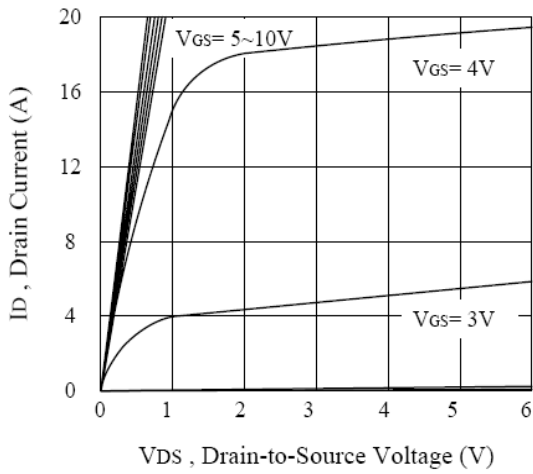


Figure 1. Output Characteristics

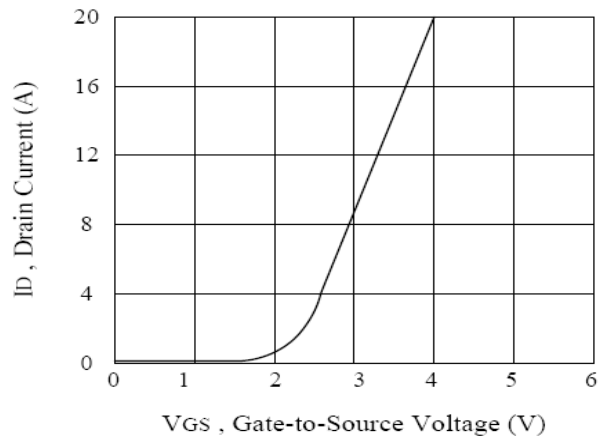


Figure 2. Transfer Characteristics

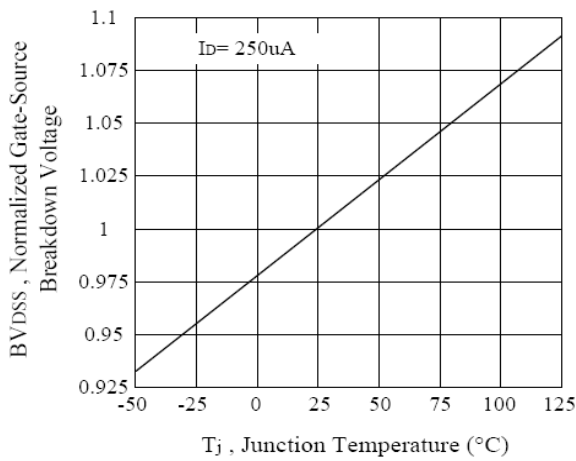


Figure 3. Breakdown Voltage Variation with Temperature

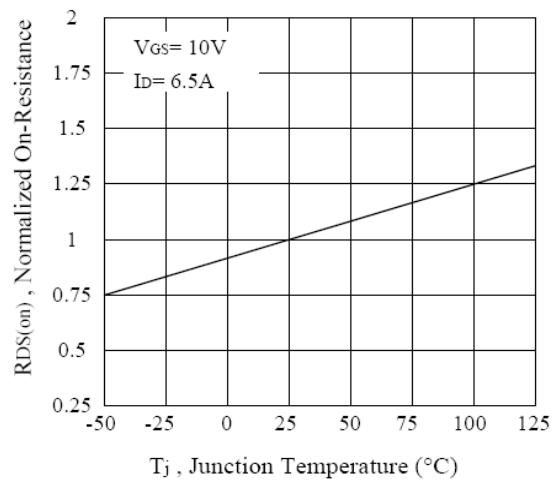


Figure 4. On-Resistance Variation with Temperature

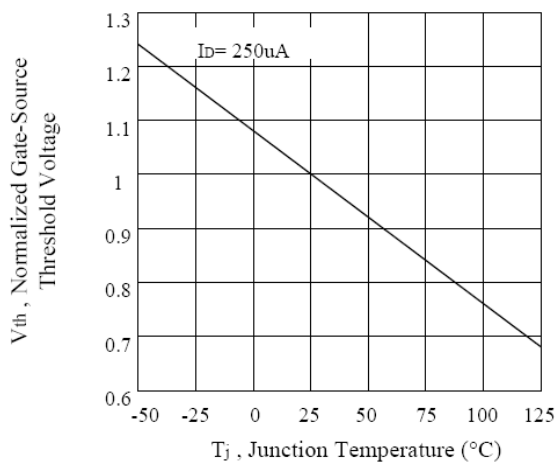
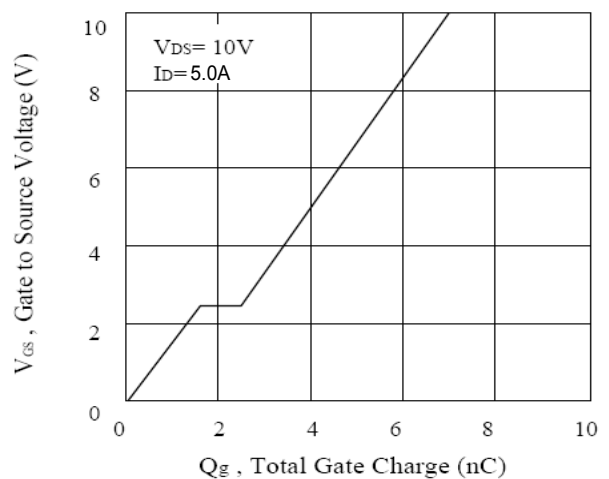
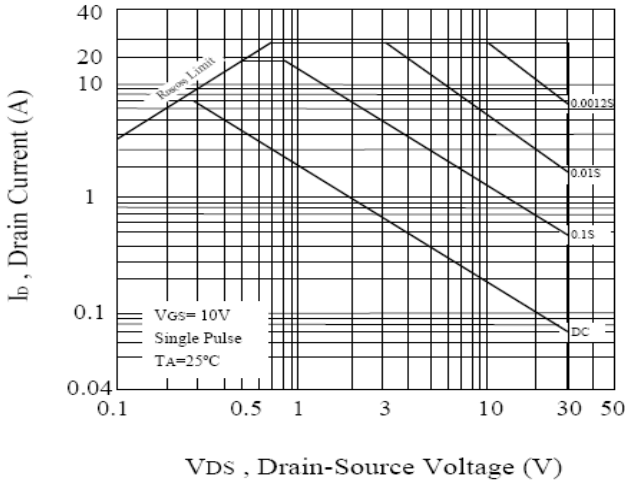


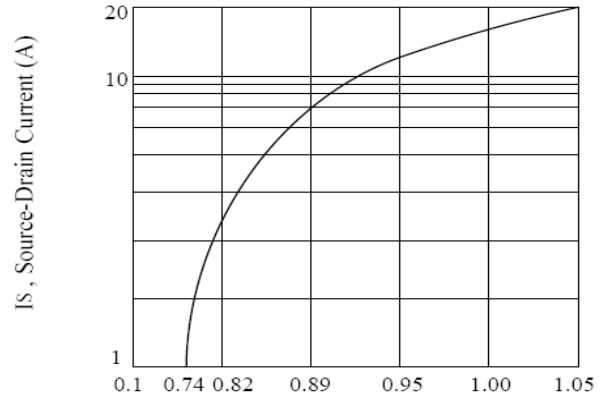
Figure 5. Gate Threshold Variation with Temperature



**Characteristics Curve(N-Channel)**



VDS , Drain-Source Voltage (V)  
 Figure 7. Maximum Safe Operating Area



VSD , Body Diode Forward Voltage (V)  
 Figure 8. Body Diode Forward Voltage Variation with Source Current

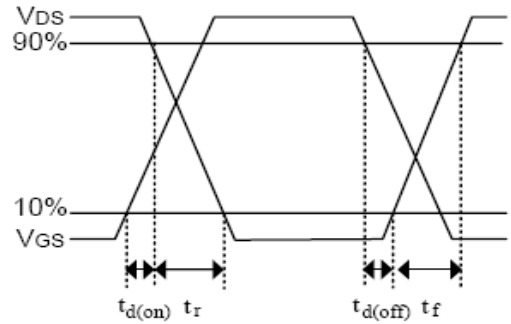
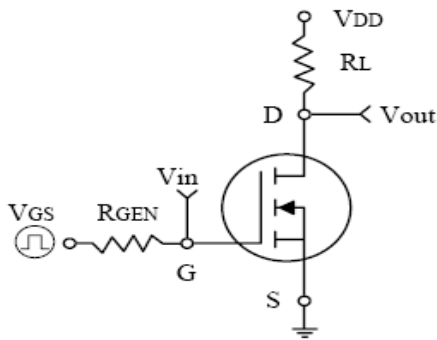


Figure 9. Switching Test Circuit and Switching Waveforms

**P-CH Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-24V, V_{GS}=0V$	-	-	-50	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA

**On Characteristics (Note 3)**

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.3	-2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-7.0A$	-	42	45	m $\Omega$
		$V_{GS}=-4.5V, I_D=-5.0A$	-	55	60	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-5.0A$	10	-	-	S

**Dynamic Characteristics (Note 4)**

Input Capacitance	$C_{iss}$	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	930	-	PF
Output Capacitance	$C_{oss}$		-	121	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	102	-	PF

**Switching Characteristics (Note 4)**

Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, R_L=5.0\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$ $I_D=-3.0A$	-	9.5	-	nS
Turn-on Rise Time	$t_r$		-	5.4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	42.5	-	nS
Turn-Off Fall Time	$t_f$		-	13.6	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-15V, I_D=-3.0A$ $V_{GS}=-10V$	-	20	-	nC
Gate-Source Charge	$Q_{gs}$		-	4.1	-	nC
Gate-Drain Charge	$Q_{gd}$		-	2.6	-	nC

**Drain-Source Diode Characteristics**

Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-2.0A$	-	0.75	-1.0	V
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**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

**Characteristics Curve(P-Channel)**

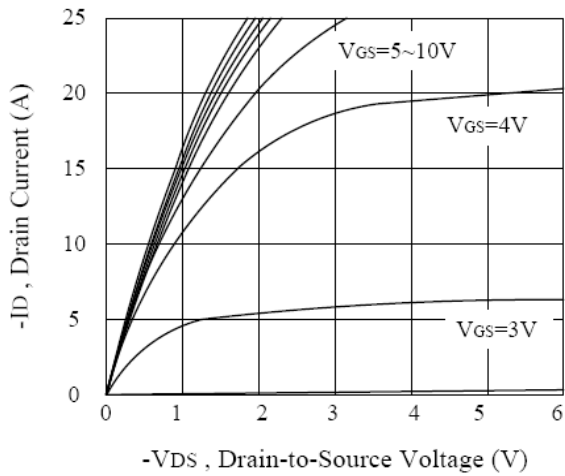


Figure 11. Output Characteristics

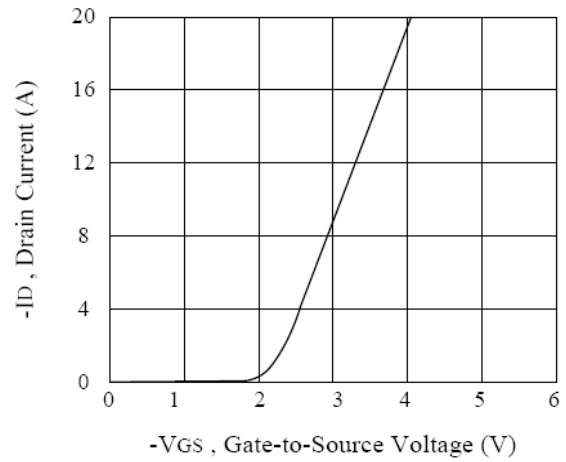


Figure 12. Transfer Characteristics

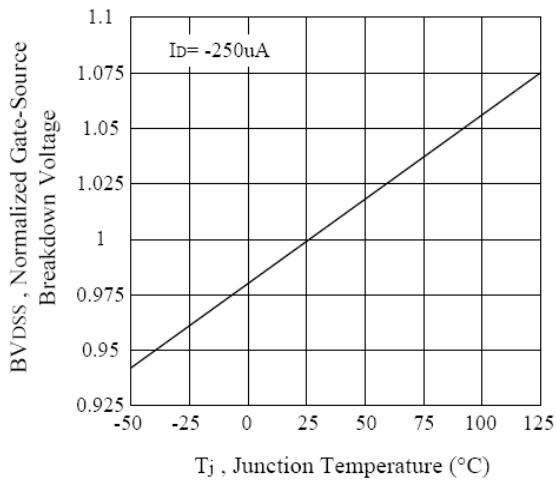


Figure 13. Breakdown Voltage Variation with

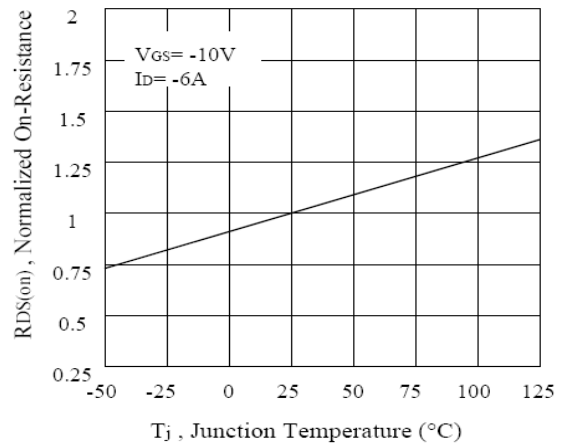


Figure 13. On-Resistance Variation with Temperature

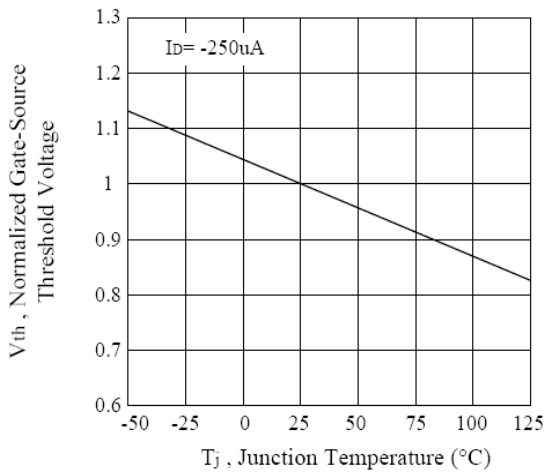


Figure 15. Gate Threshold Variation with Temperature

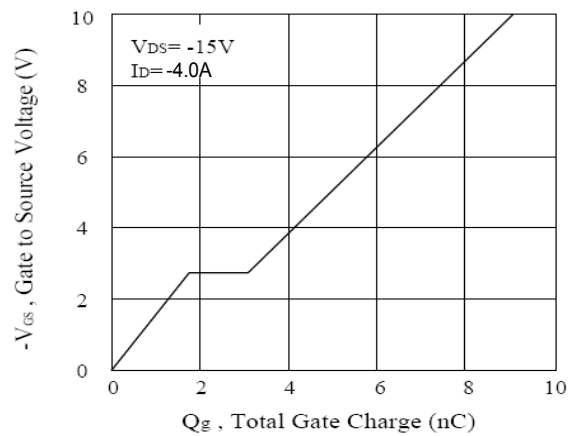
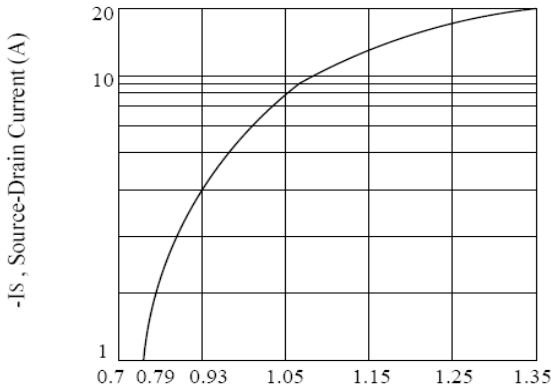
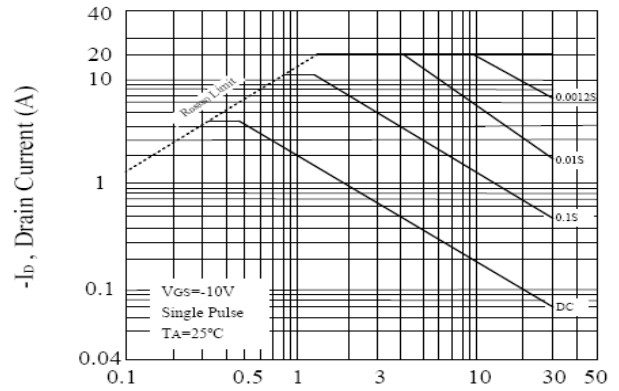


Figure 15. Gate Charge

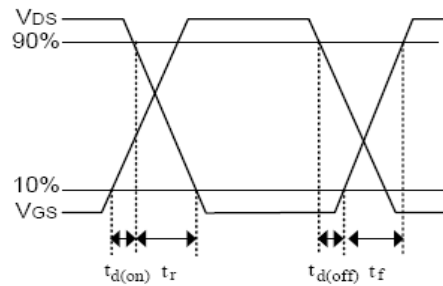
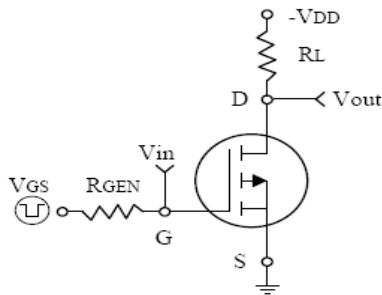
**Characteristics Curve(P-Channel)**



-VSD , Body Diode Forward Voltage (V)  
**Figure 16** Body Diode Forward Voltage Variation with Source Current

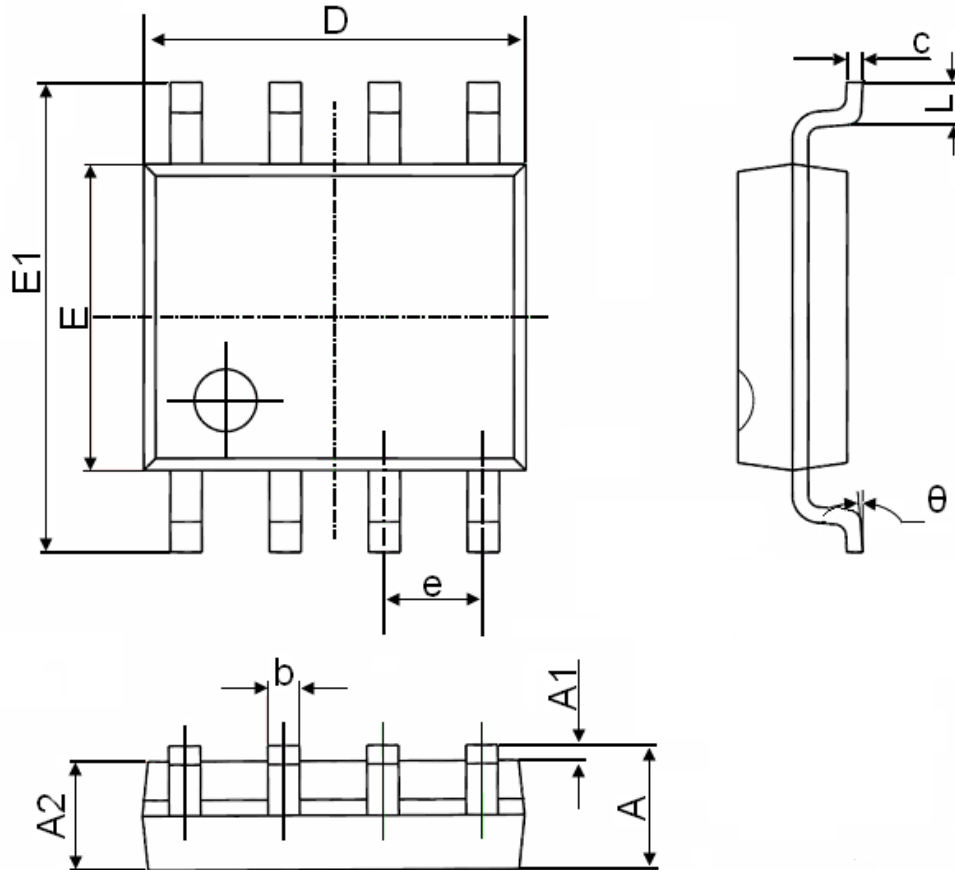


-VDS , Drain-Source Voltage (V)  
**Figure 17.** Maximum Safe Operating Area



**Figure 18** Switching Test Circuit and Switching Waveforms

SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°