SOP-8 Plastic-Encapsulate MOSFETS

4606

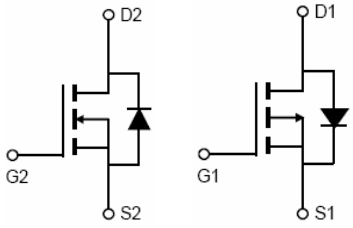
N and P-Channel Enhancement Mode Power MOSFET

Description

The 4606 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.

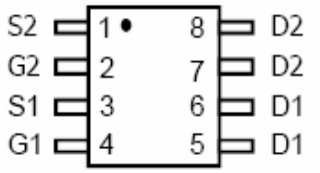
General Features

- **N-Channel**
  V_{DS} = 30V,I_D =6.9A
  $R_{DS(ON)}$ < 21mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ < 32mΩ @ V_{GS}=4.5V
- **P-Channel**
  V_{DS} = -30V,I_D = -6.0A
  $R_{DS(ON)}$ < 45mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$ < 60mΩ @ V_{GS}=-4.5V
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

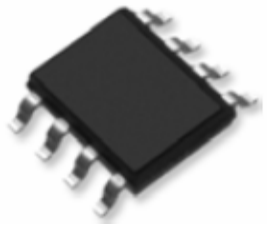


N-channel **P-channel**

Schematic diagram



Marking and pin assignment



SOP-8 top view

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	30	-30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current	T_A=25℃	I_D	6.9	-6.0	A
Pulsed Drain Current (Note 1)		I_{DM}	28	-26	A
Maximum Power Dissipation	T_A=25℃	P_D	2.0	2.0	W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note2)	$R_{\theta JA}$	N-Ch	63.5	℃/W
Thermal Resistance,Junction-to-Ambient (Note2)	$R_{\theta JA}$	P-Ch	63.5	℃/W

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4606

N-CH Electrical Characteristics (T_A=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=24V,V_{GS}=0V	-	-	50	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.2	1.6	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=6.9A	-	19	21	mΩ
		V_{GS}=4.5V, I_D=5A	-	29	32	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=5.0A	5	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	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 Ω V_{GS}=10V,R_{GEN}=6Ω 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

Notes:

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

Characteristics Curve(N-Channel)

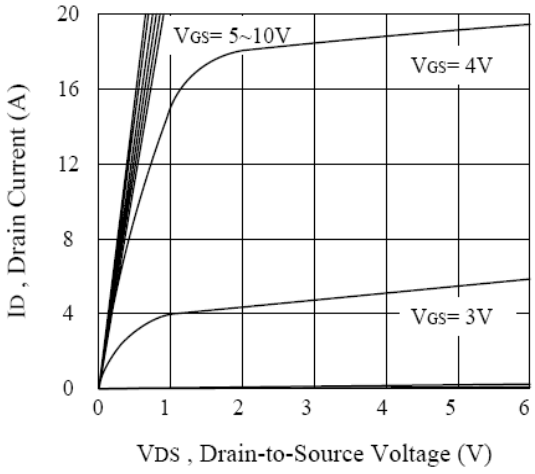


Figure 1. Output Characteristics

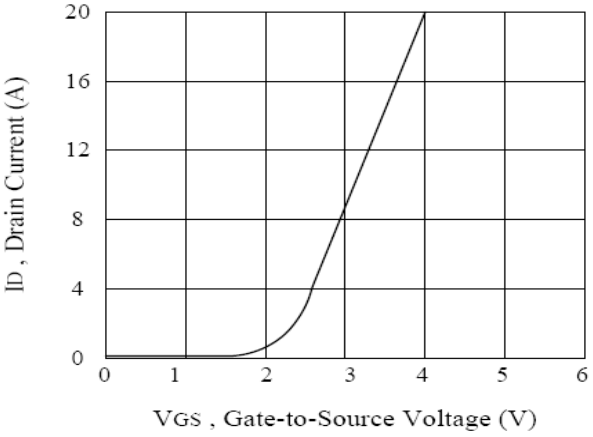


Figure 2. Transfer Characteristics

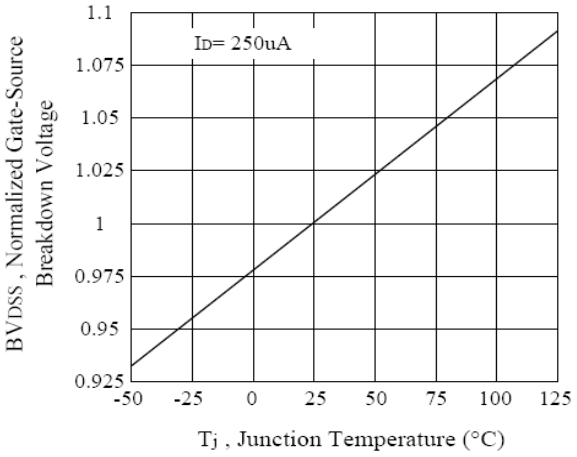


Figure 3. Breakdown Voltage Variation with Temperature

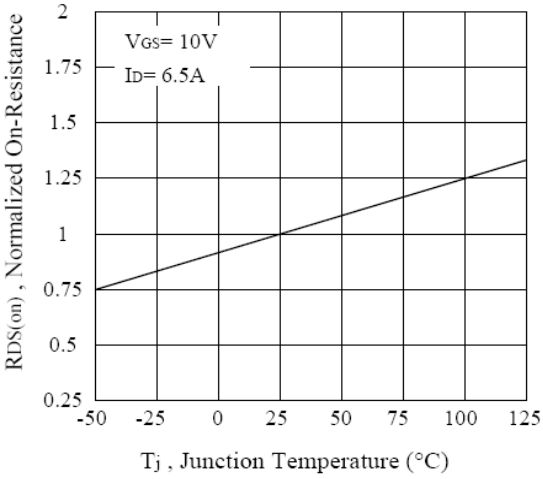


Figure 4. On-Resistance Variation with Temperature

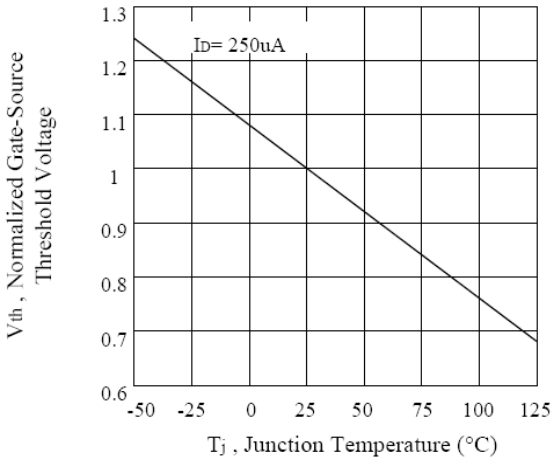
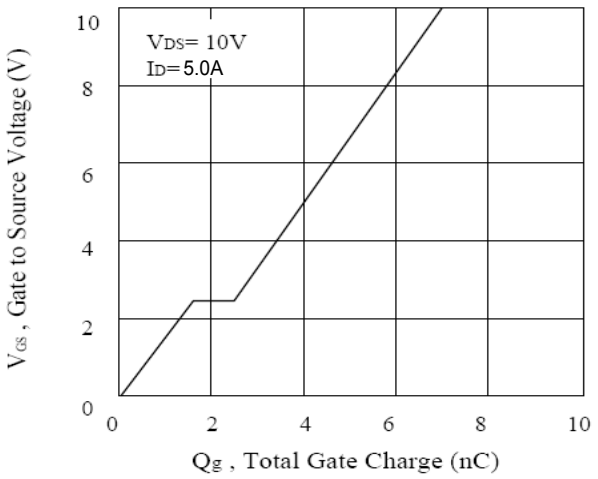
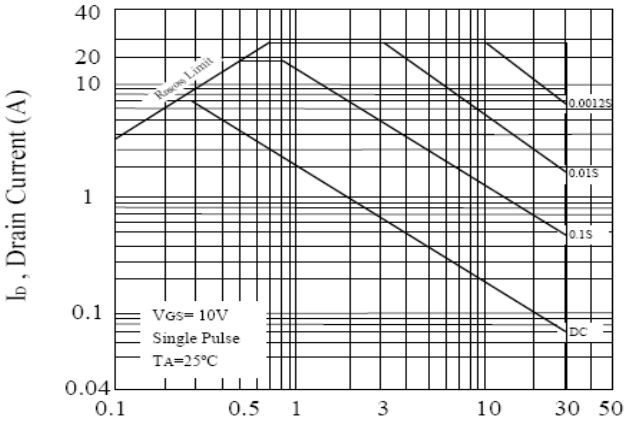


Figure 5. Gate Threshold Variation with Temperature

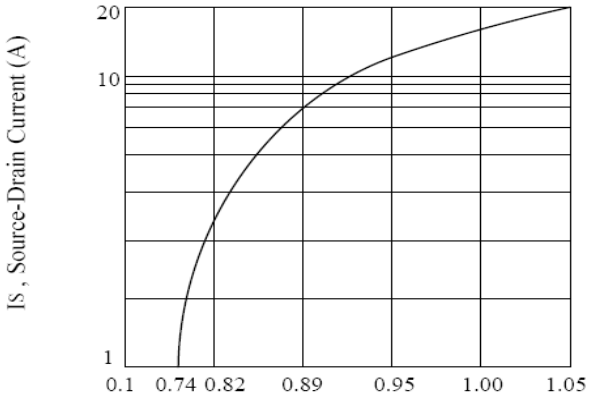


Characteristics Curve(N-Channel)



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

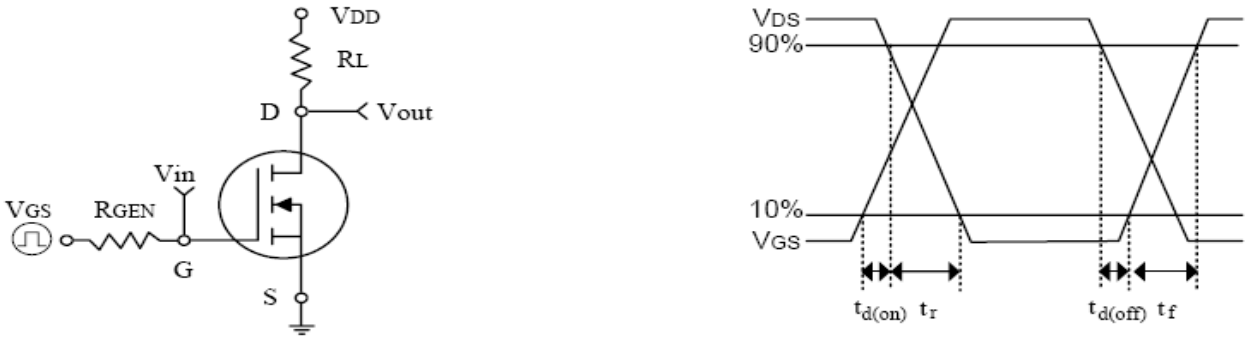


Figure 9. Switching Test Circuit and Switching Waveforms

P-CH Electrical Characteristics (T_A=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-24V,V_{GS}=0V	-	-	-50	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.0	-1.3	-2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-6.0A V_{GS}=-4.5V, I_D=-5.0A	- -	42 55	45 60	mΩ mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-5.0A	10	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-15V,V_{GS}=0V, F=1.0MHz	-	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=5.0Ω V_{GS}=-10V,R_{GEN}=6Ω 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

Notes:

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

Characteristics Curve(P-Channel)

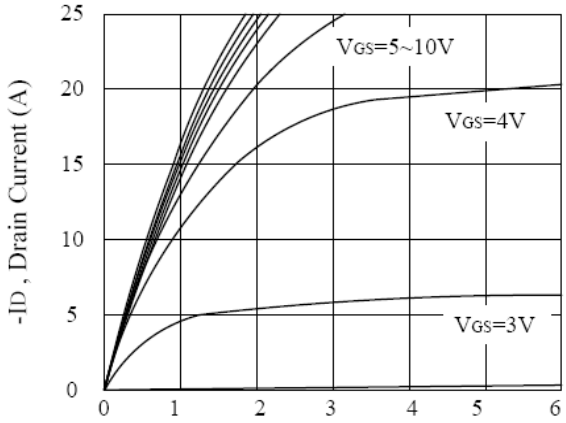


Figure 11. Output Characteristics

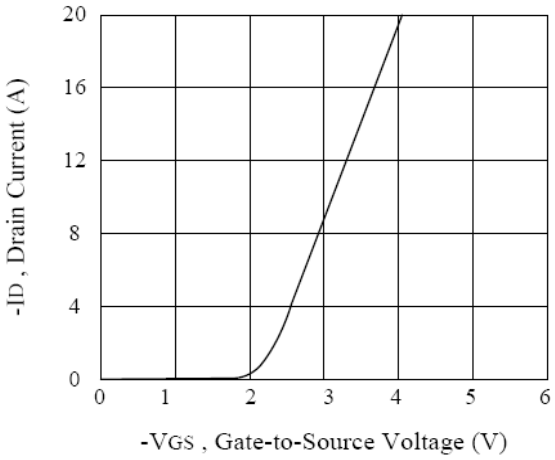


Figure 12. Transfer Characteristics

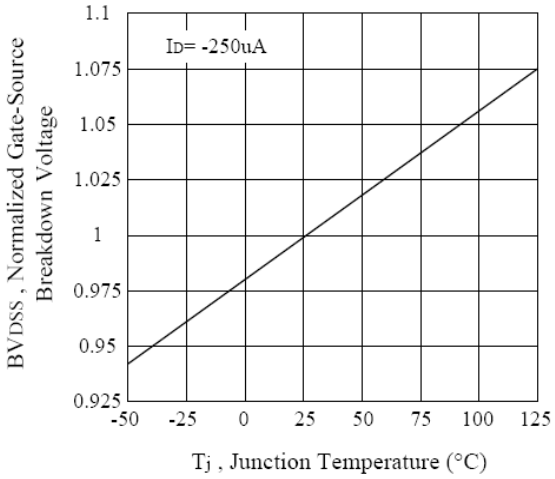


Figure 13. Breakdown Voltage Variation with

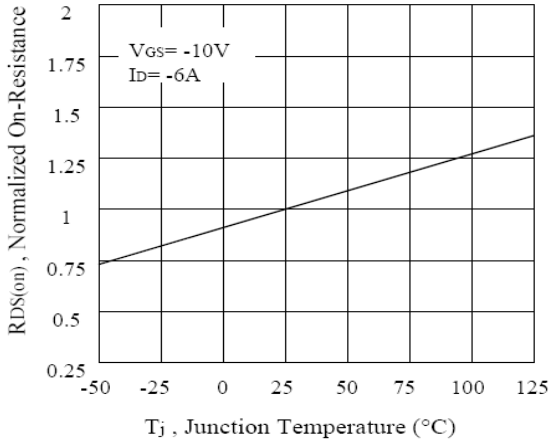


Figure 13. On-Resistance Variation with Temperature

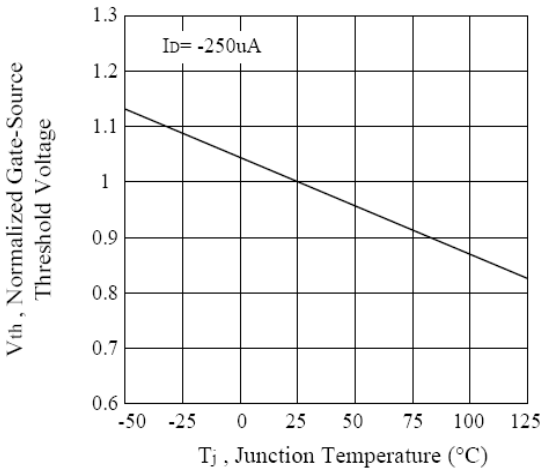


Figure 15. Gate Threshold Variation with Temperature

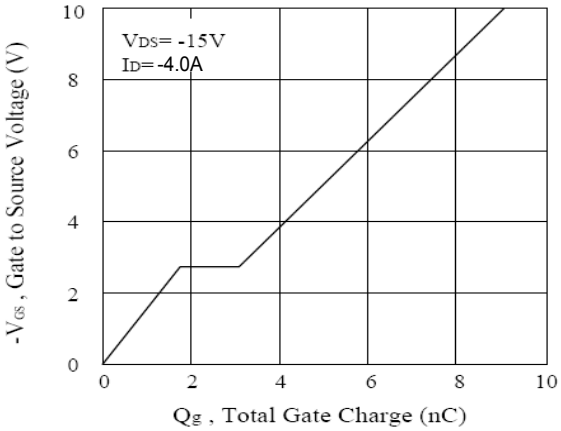
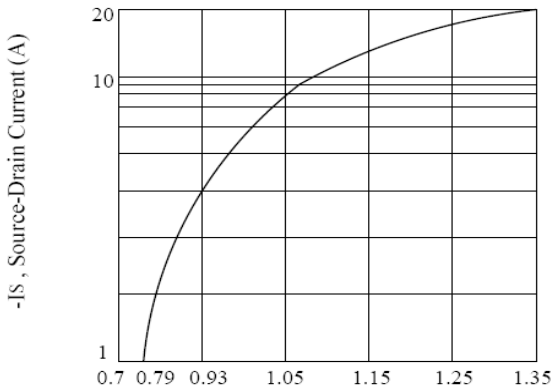


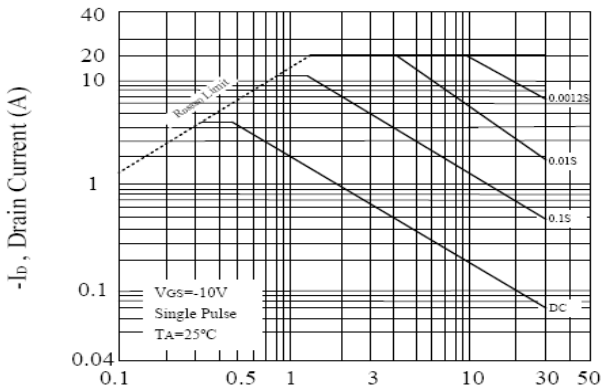
Figure 15. Gate Charge

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

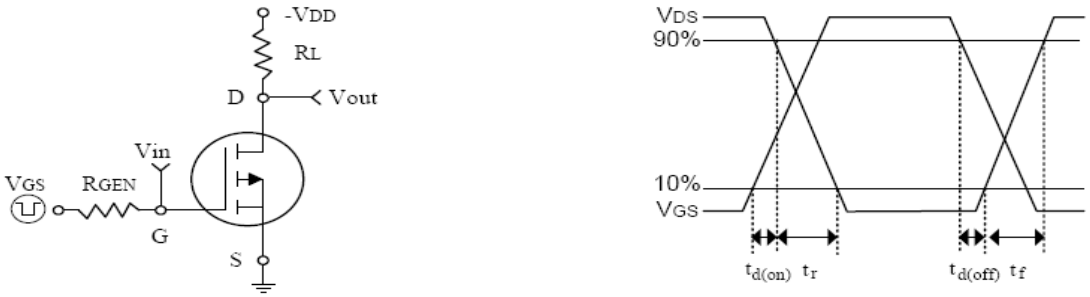
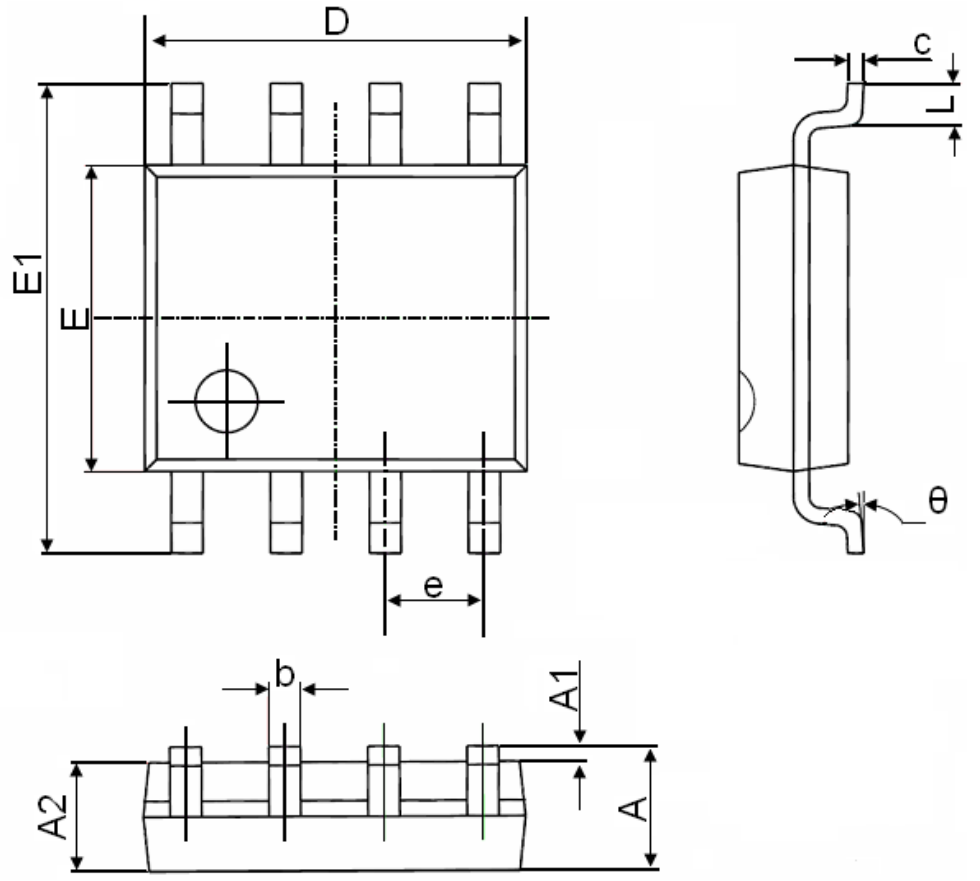


Figure 18 Switching Test Circuit and Switching Waveforms

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
θ	0°	8°	0°	8°