



N-Channel Enhancement Mode Power MOSFET **MX6010**

DESCRIPTION

The MX6010 is the high cell density trench N-Channel MOSFETs, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

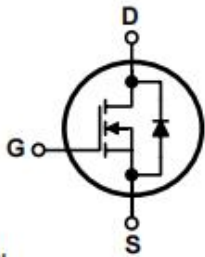
GENERAL FEATURES

- $V_{DS}=60V$, $I_D=10A$
 $R_{DS(ON)}(Typ.)=15m\Omega$ @ $V_{GS}=10V$
 $R_{DS(ON)}(Typ.)=18m\Omega$ @ $V_{GS}=4.5V$
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

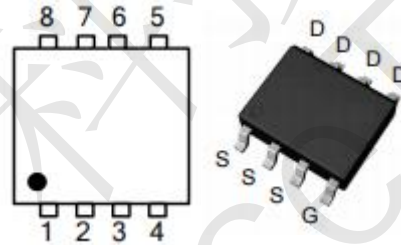
Applications

- SMPS Synchronous Rectification
- DC-DC Conversion
- Load Switch

PINOUT



Schematic diagram



SOP-8 top view

ORDERING INFORMATION

Part Number	Storage Temperature	Package	Devices Per Reel
MX6010	-55°C to 150°C	SOP-8	-

ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	10	A
Continuous Drain Current ($T_A=70^\circ C$)	I_D	8	A
Diode Continuous Forward Current	I_S	5	A
Pulsed Drain Current ^(Note1)	I_{DM}	38	A
Avalanche Current ^(Note2)	I_{AS}	27	A
Single Pulse Avalanche Energy ^(Note2)	E_{AS}	36	mJ
Maximum Power Dissipation	P_D	3.5	W
Maximum Power Dissipation ($T_A=70^\circ C$)	P_D	2.2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$
Thermal Resistance, Junction-to-Ambient ^(Note3)	$R_{\theta JA}$	35	$^\circ C/W$

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

Note 2. UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature $T_J=25^\circ C$)

Note 3. Surface Mounted on 1 in² pad area.



ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_{DS}=250\mu A$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=48V, V_{GS}=0V$	-	-	1	μA
		$V_{DS}=48V, V_{GS}=0V, T_J=85^\circ\text{C}$	-	-	30	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.4	-	2.4	V
Drain-Source On-Resistance ^(Note1)	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=10A$	-	15	22	m Ω
		$V_{GS}=4.5V, I_{DS}=7A$	-	18	28	m Ω
Gate Resistance	R_G	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	-	2.5	-	Ω
Dynamic Characteristics^(Note2)						
Input Capacitance	C_{iss}	$V_{DS}=30V, V_{GS}=0V, F=1.0\text{MHz}$	-	1378	1780	pF
Output Capacitance	C_{oss}		-	135	-	pF
Reverse Transfer Capacitance	C_{rss}		-	60	-	pF
Switching Characteristics^(Note2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_{DS}=1A, R_G=6\Omega, R_L=30\Omega, V_{GEN}=10V$	-	14	26	nS
Turn-on Rise Time	t_r		-	8	15	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	69	nS
Turn-Off Fall Time	t_f		-	12	22	nS
Total Gate Charge	Q_g	$V_{DS}=30V, I_{DS}=10A, V_{GS}=10V$	-	26	37	nC
Gate-Source Charge	Q_{gs}		-	5	-	nC
Gate-Drain Charge	Q_{gd}		-	5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note1)	V_{SD}	$V_{GS}=0V, I_{SD}=10A$	-	0.8	1.3	V
Reverse Recovery Time	t_{rr}	$I_{SD}=10A, dl_{SD}/dt=100A/\mu s$	-	21	-	nS
Reverse Recovery Charge	Q_{rr}		-	22	-	nC

Note 1. Pulse test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Note 2. Guaranteed by design, not subject to production testing



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 1. Power Dissipation

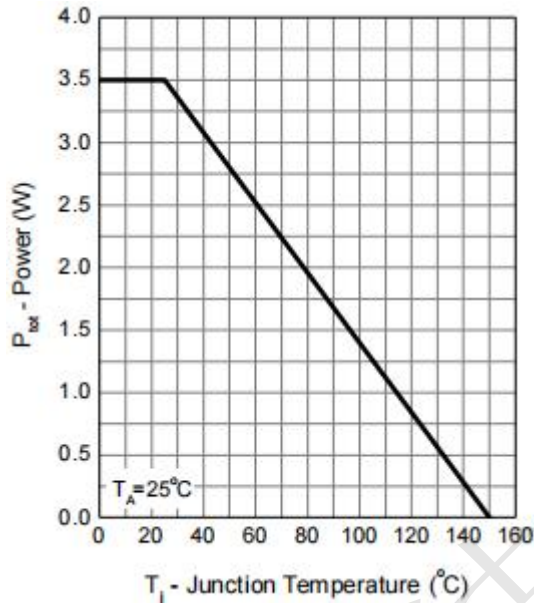


Figure 2. Drain Current

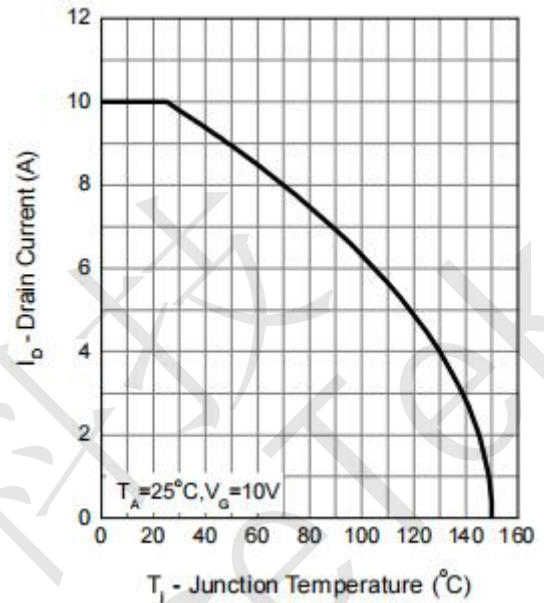


Figure 3. Safe Operation Area

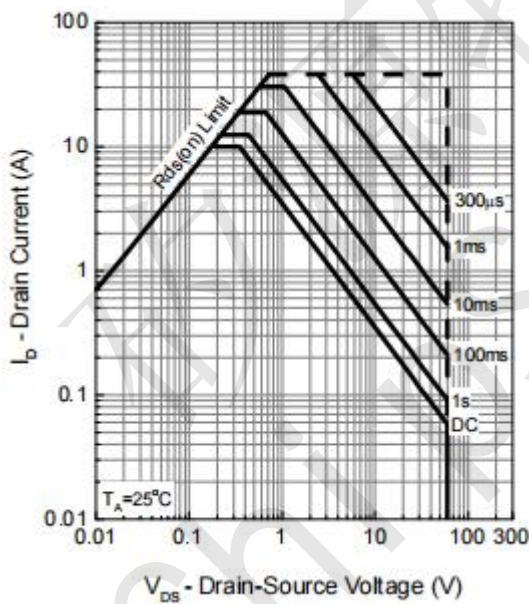
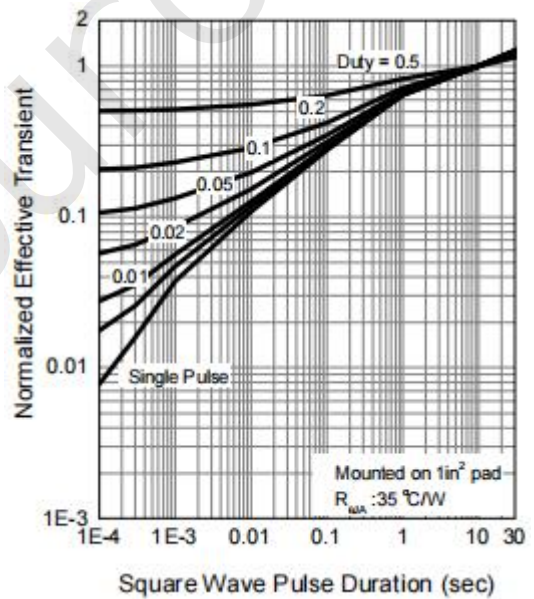


Figure 4. Thermal Transient Impedance





TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 5. Output Characteristics

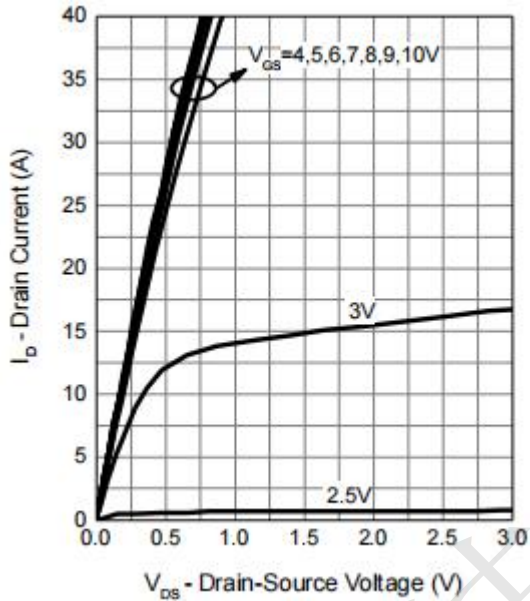


Figure 6. Drain-Source On Resistance

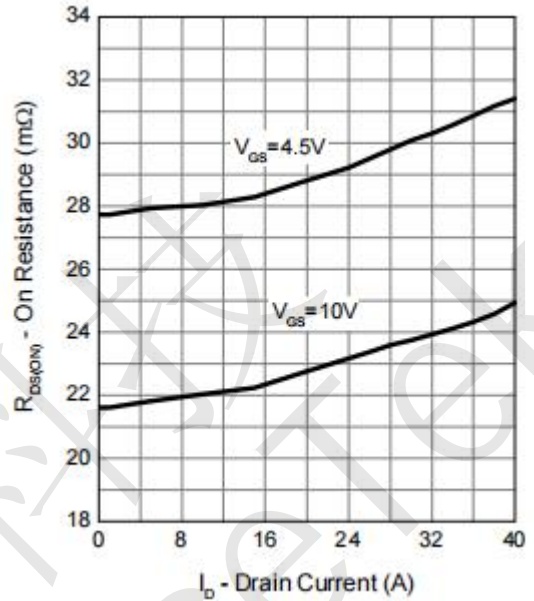


Figure 7. Gate-Source On Resistance

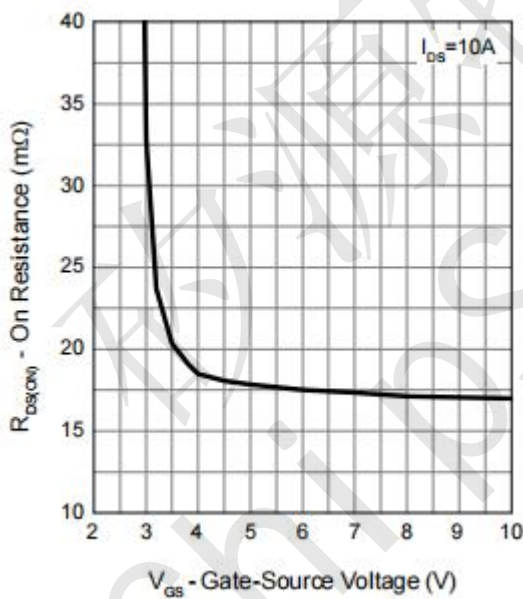
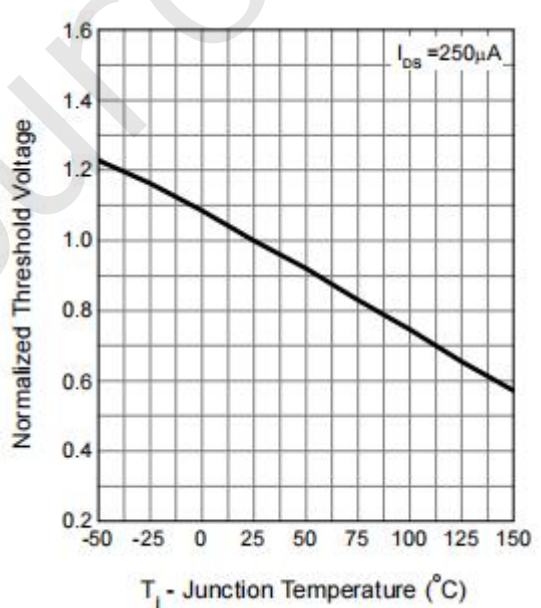


Figure 8. Gate Threshold Voltage





TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 9. Drain-Source On Resistance

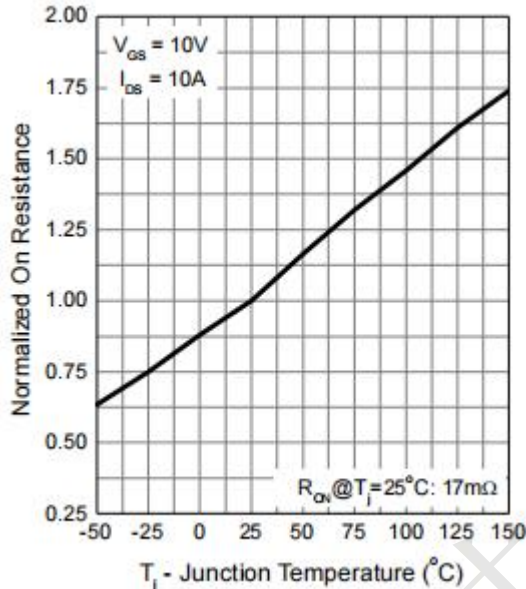


Figure 10. Source-Drain Diode Forward

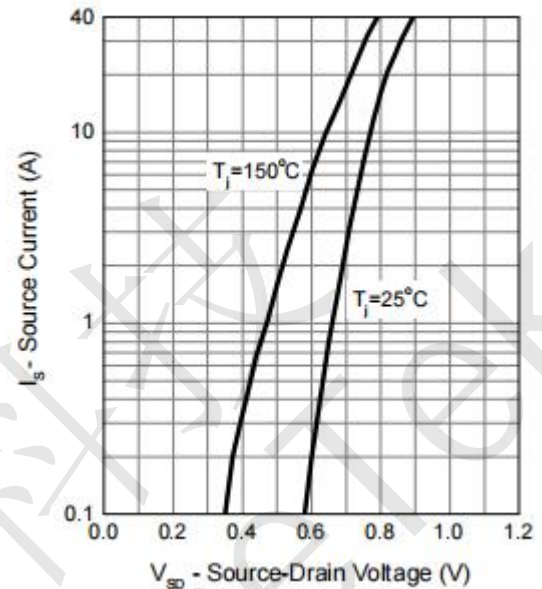


Figure 11. Capacitance

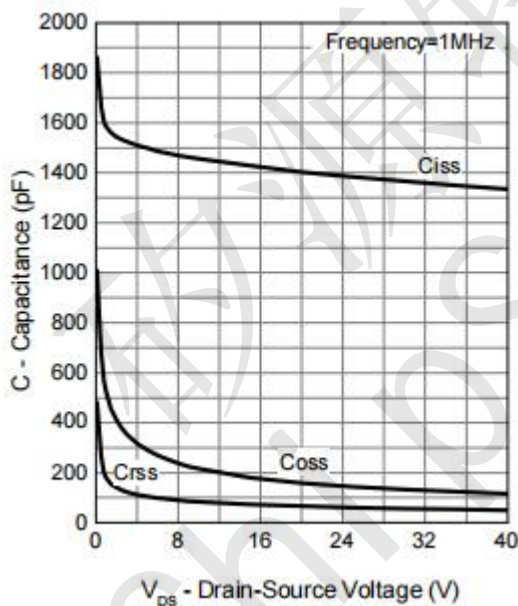
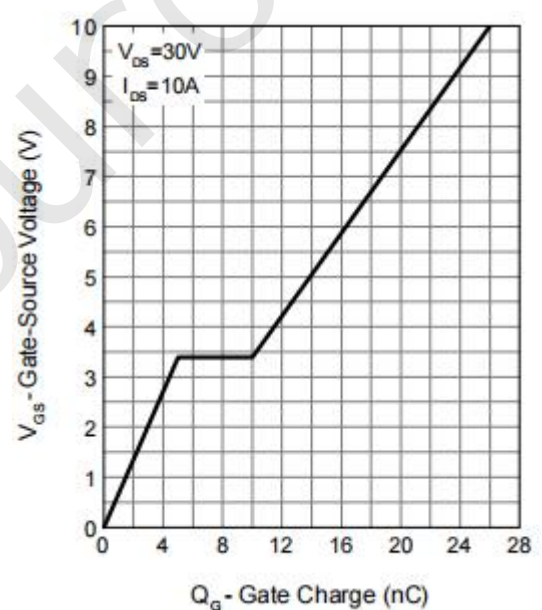


Figure 12. Gate Charge





TEST CIRCUIT AND WAVEFORMS

Figure 1. Avalanche Test Circuit and Waveforms

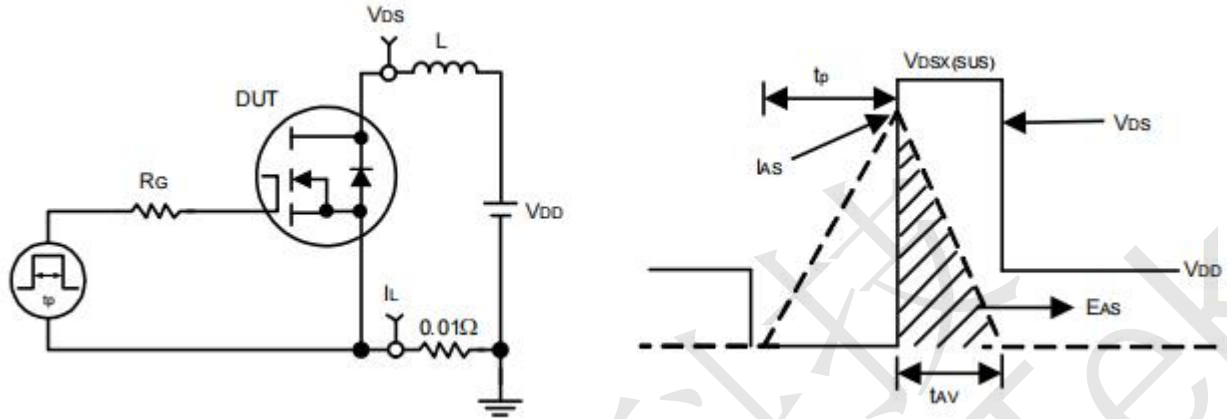
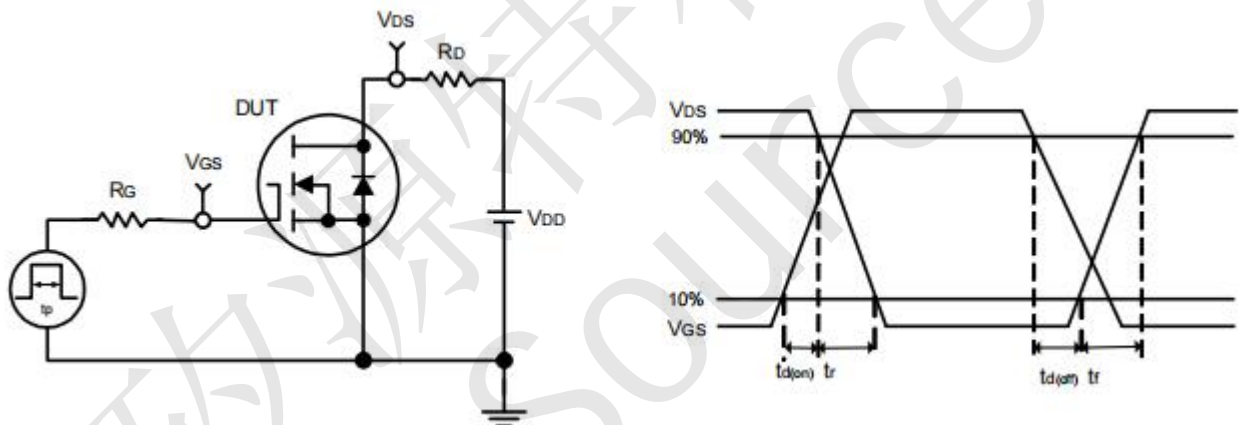


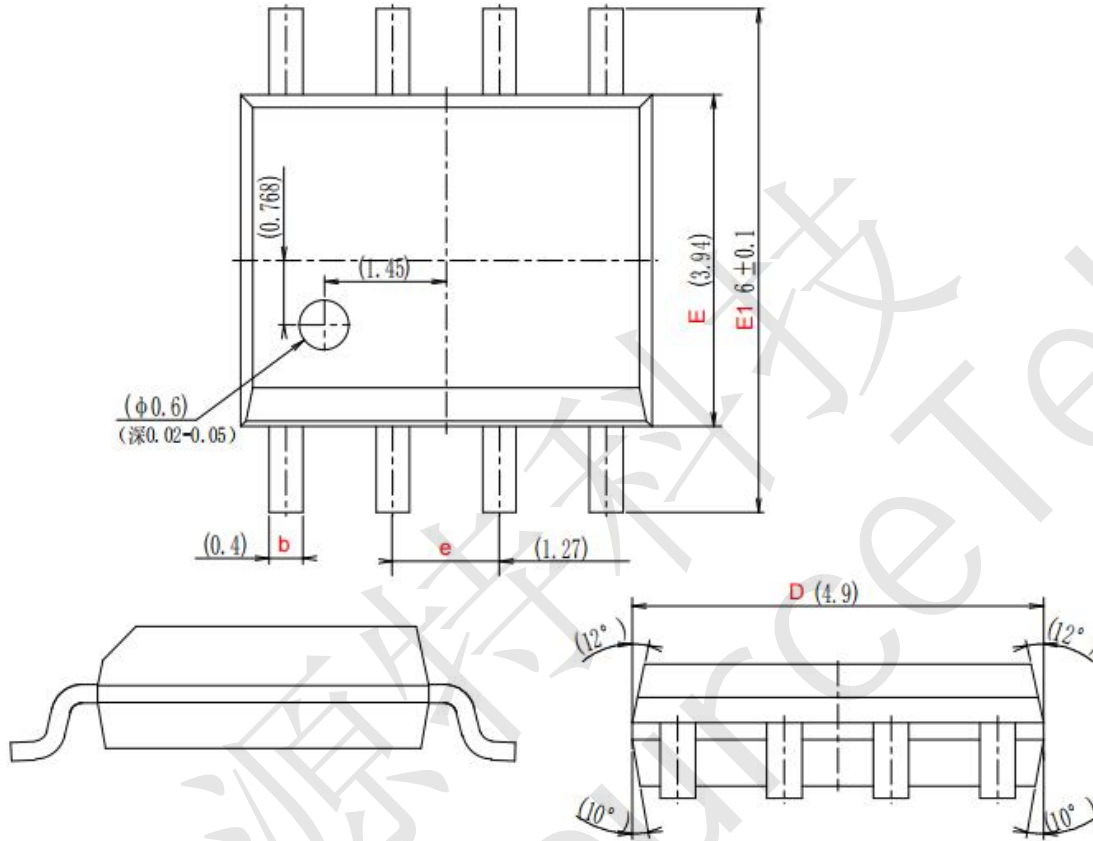
Figure 2. Switching Time Test Circuit and Waveforms





PACKAGE INFORMATION

SOP8



Symbol	Dimensions in Millimeters		
	Min.	Nom.	Max.
A	1.500	1.600	1.700
A1	0.050	-	-
A2	1.350	1.450	1.550
b	0.300	0.400	0.500
c	0.220	0.254	0.280
D	4.800	4.900	5.000
E	3.840	3.940	4.040
E1	5.900	6.000	6.100
e	1.27 (BSC)		
L	0.520	0.620	0.720
θ	0°	-	8°