

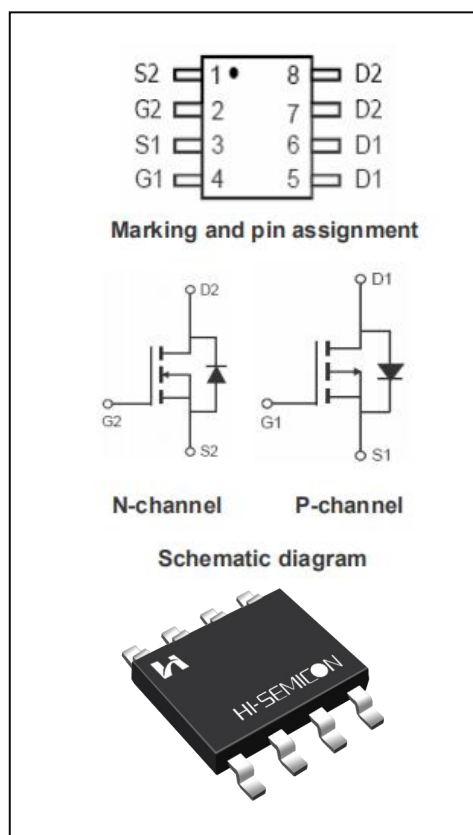
**N and P-CHANNEL POWER MOSFET**

**GENERAL DESCRIPTION**

The SFS0406T4 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

**FEATURES**

- ◆ N-CHANNEL
  - $V_{DS}=40V, I_D=7A$
  - $R_{DS(ON)}=22.2m\Omega(TYP@V_{GS}=10V)$
  - $R_{DS(ON)}=28.5m\Omega(TYP@V_{GS}=4.5V)$
- ◆ P-CHANNEL
  - $V_{DS}=-40V, I_D=-6A$
  - $R_{DS(ON)}=33.5m\Omega(TYP@V_{GS}=-10V)$
  - $R_{DS(ON)}=41.5m\Omega(TYP@V_{GS}=-4.5V)$
- ◆ High density cell design for ultra low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC Current capability



**ORDERING INFORMATION**

Part No.	Package	Marking	Material	Packing
SFS0406T4	SOP8-8L	SFS0406T4	Pb Free	Reel

## ABSOLUTE MAXIMUM RATINGS (T<sub>J</sub>=25°C unless otherwise noted)

Characteristics		Symbol	N-CHANNEL	P-CHANNEL	UNIT
Drain-Source Voltage		V <sub>DS</sub>	40	-40	V
Gate-Source Voltage		V <sub>GS</sub>	±20	±20	V
Drain Current	TC=25°C	I <sub>D</sub>	7	-6	A
	TC=70°C		5.8	-5.0	A
Pulsed Drain Current(note1)		I <sub>DM</sub>	28	-24	A
Power Dissipation	TC=25°C	P <sub>D</sub>	1.8		W
<b>Thermal Characteristics</b>					
Thermal Resistance, Junction-to-Ambient		R <sub>θJA</sub>	62.5		°C/W
Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150		°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		TL	300		°C

## N-CHANNEL ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain -Source Breakdown Voltage	B <sub>VDS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40	--	-	V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	-	--	1	uA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V	-	--	100	nA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V	-	--	-100	
<b>On Characteristics</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.0	V
Static Drain- Source On State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	-	28.5	33.5	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =6A	-	22.2	26.5	
<b>Dynamic Characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V	-	560	-	pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> =0V	-	55	-	
Reverse Transfer Capacitance	C <sub>rss</sub>	f=1.0MHZ	-	50	-	
<b>Switching Characteristics</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =20V, V <sub>GS</sub> =10V R <sub>G</sub> =3.3Ω, I <sub>D</sub> =3A (Note 2.3)	-	10.5	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	9.3	-	
Turn-off Delay Time	t <sub>d(off)</sub>		-	35.7	-	
Turn-off Fall Time	t <sub>f</sub>		-	4.9	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =3A V <sub>GS</sub> =10V (Note 2.3)	-	8.7	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	3.6	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	6.7	-	

## N-CHANNEL SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	$I_S$	Integral Reverse P-N Junction Diode in the MOSFET	-	-	7	A
Pulsed Source Current	$I_{SM}$		-	-	28	
Diode Forward Voltage	$V_{SD}$	$I_S=6A, V_{GS}=0V$	-	0.85	1.4	V

## P-CHANNEL ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain -Source Breakdown Voltage	$B_{VDSS}$	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=20V, V_{DS}=0V$	-	-	100	nA
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=-20V, V_{DS}=0V$	-	-	-100	
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.3	-2.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-3A$	-	41.5	55	$m\Omega$
		$V_{GS}=-10V, I_D=-6A$	-	33.5	45	
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-20V$ $V_{GS}=0V$ $f=1.0MHz$	-	975	-	pF
Output Capacitance	$C_{oss}$		-	93	-	
Reverse Transfer Capacitance	$C_{rss}$		-	75	-	
<b>Switching Characteristics</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, V_{GS}=-10V$ $R_G=3\Omega, I_D=-4A$ (Note 2.3)	-	8.7	-	ns
Turn-on Rise Time	$t_r$		-	13.5	-	
Turn-off Delay Time	$t_{d(off)}$		-	39.8	-	
Turn-off Fall Time	$t_f$		-	15.9	-	
Total Gate Charge	$Q_g$	$V_{DS}=-20V, I_D=-3A$ $V_{GS}=-10V$ (Note 2.3)	-	18.1	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.1	-	
Gate-Drain Charge	$Q_{gd}$		-	5.2	-	

## P-CHANNEL SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	$I_S$	Integral Reverse P-N Junction Diode in the MOSFET	-	-	-6	A
Pulsed Source Current	$I_{SM}$		-	-	-24	
Diode Forward Voltage	$V_{SD}$	$I_S=-5A, V_{GS}=0V$	-	-0.87	-1.4	V

1. Pulse width limited by maximum junction temperature
2. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$
3. Essentially independent of operating temperature

N-CHANNEL Typical Performance Characteristics

Figure 1. On-Region Characteristics

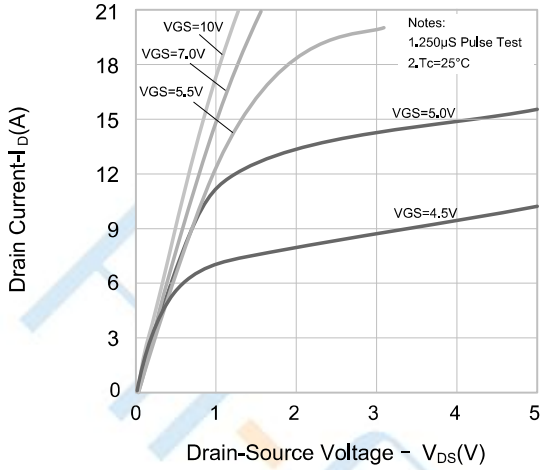


Figure 2. Transfer Characteristics

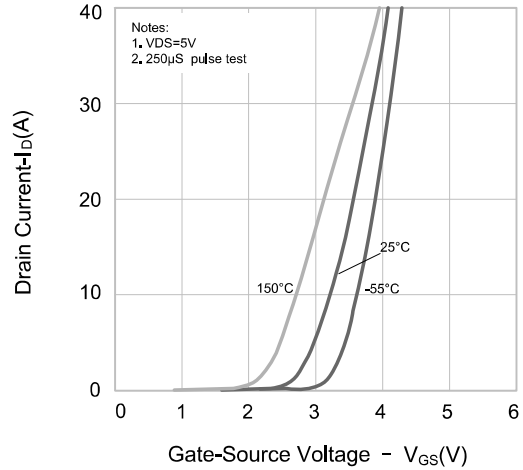


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

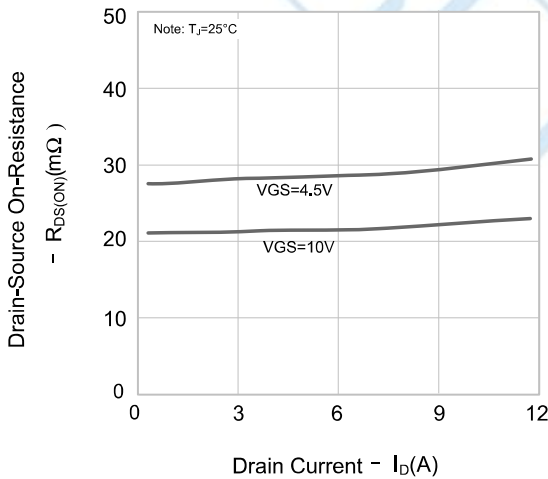


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

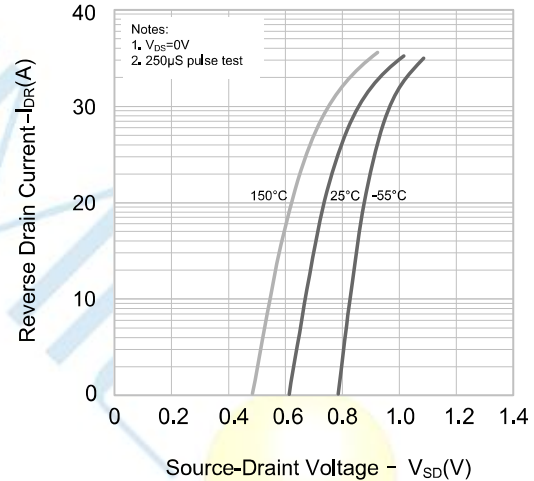


Figure 5. Capacitance Characteristics

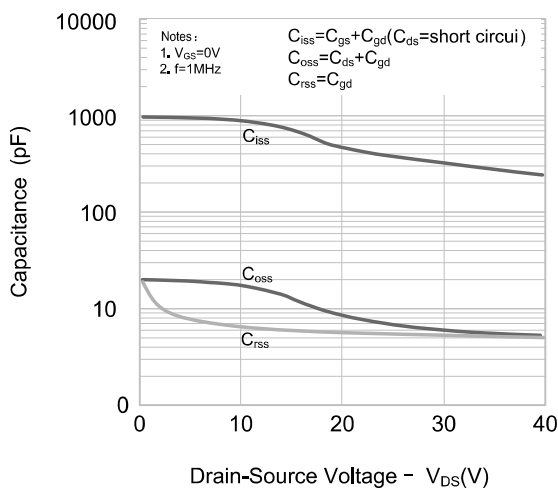
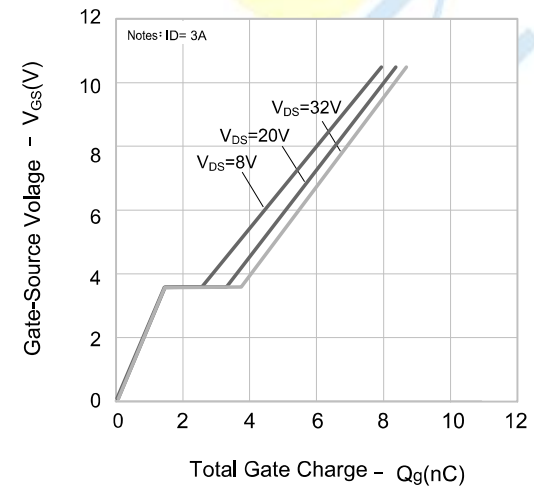


Figure 6. Gate Charge Characteristics



P-CHANNEL Typical Performance Characteristics

Figure 1. On-Region Characteristics

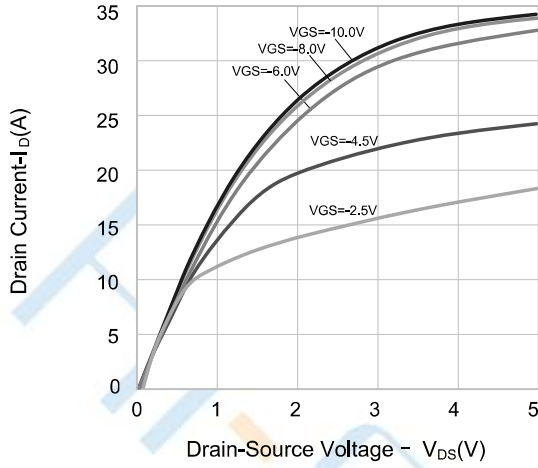


Figure 2. Transfer Characteristics

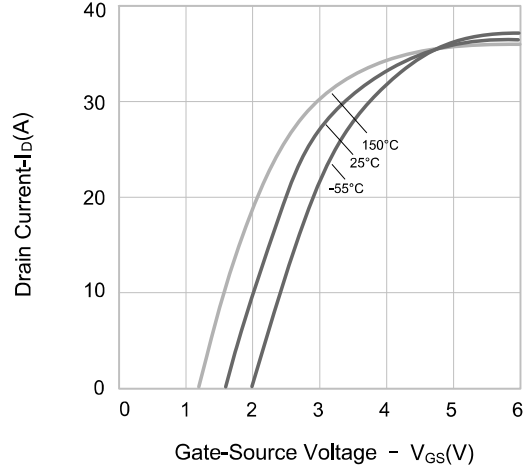


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

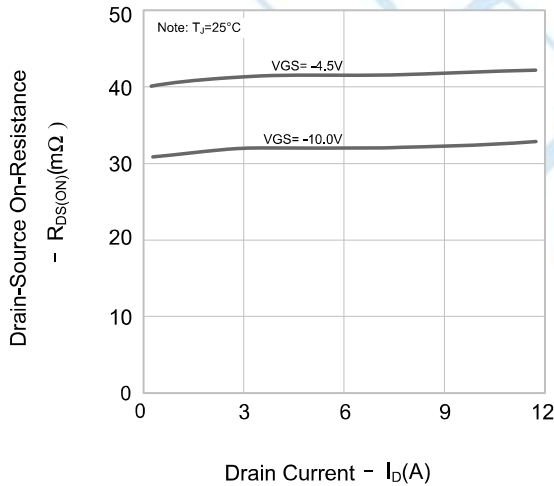


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

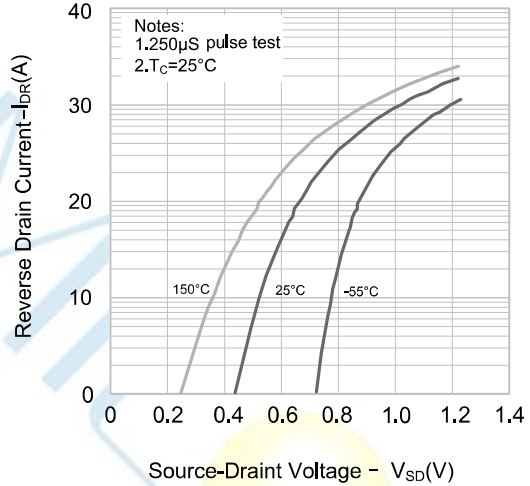


Figure 5. Capacitance Characteristics

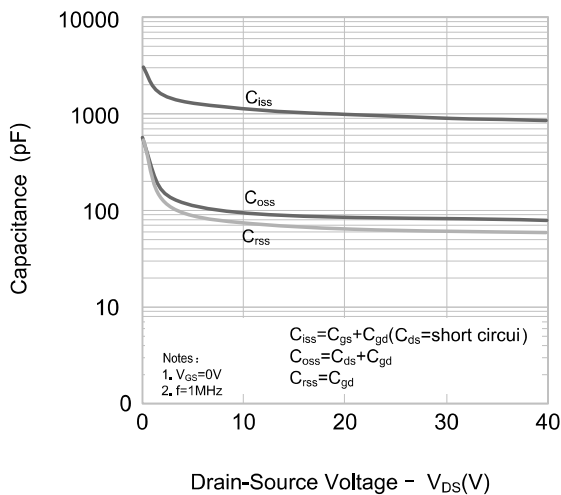
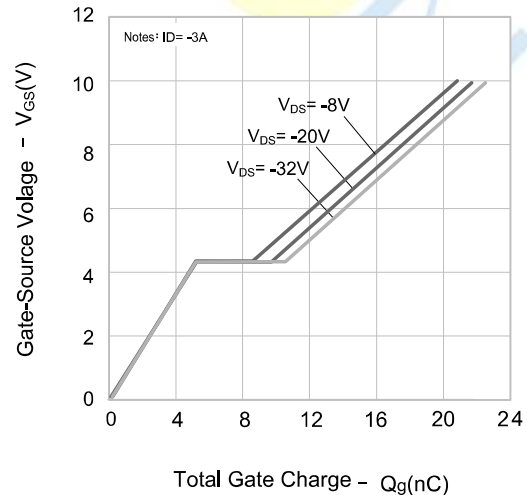


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

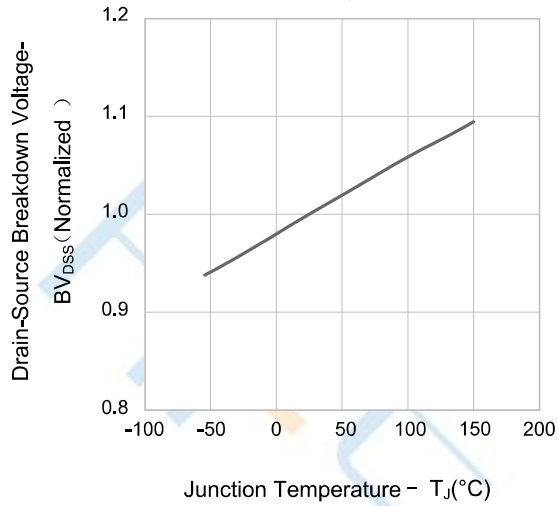


Figure 8. On-resistance Variation vs. Temperature

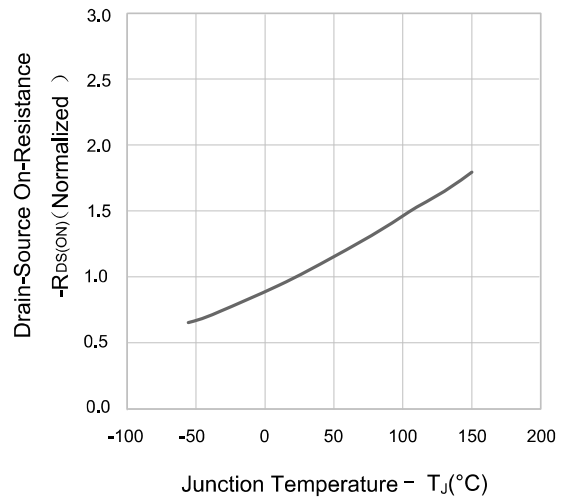
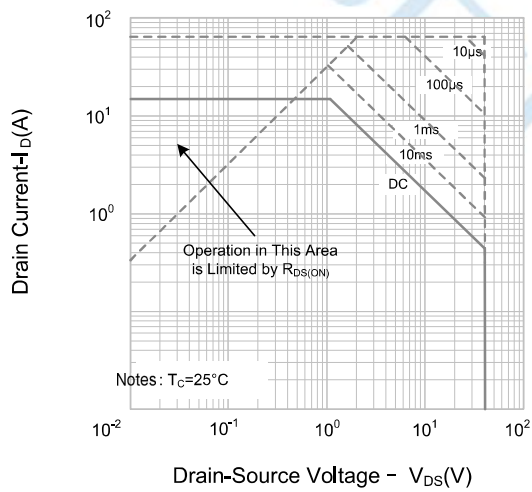
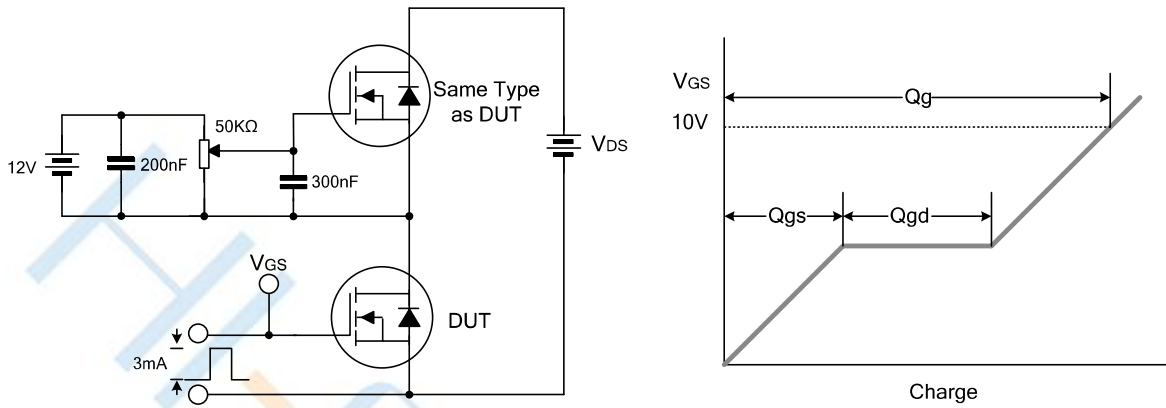


Figure 9. Max. Safe Operating Area

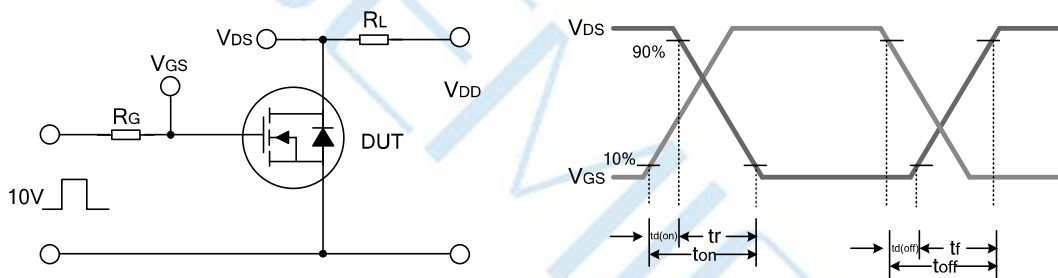


Test Circuit

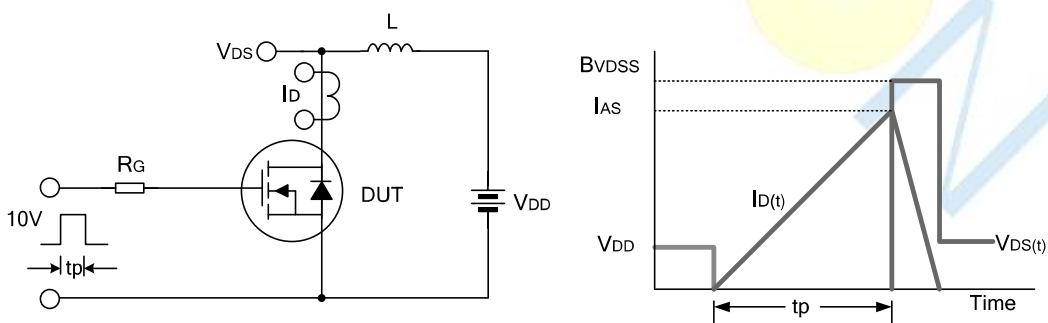
Gate Charge Test Circuit & Waveform



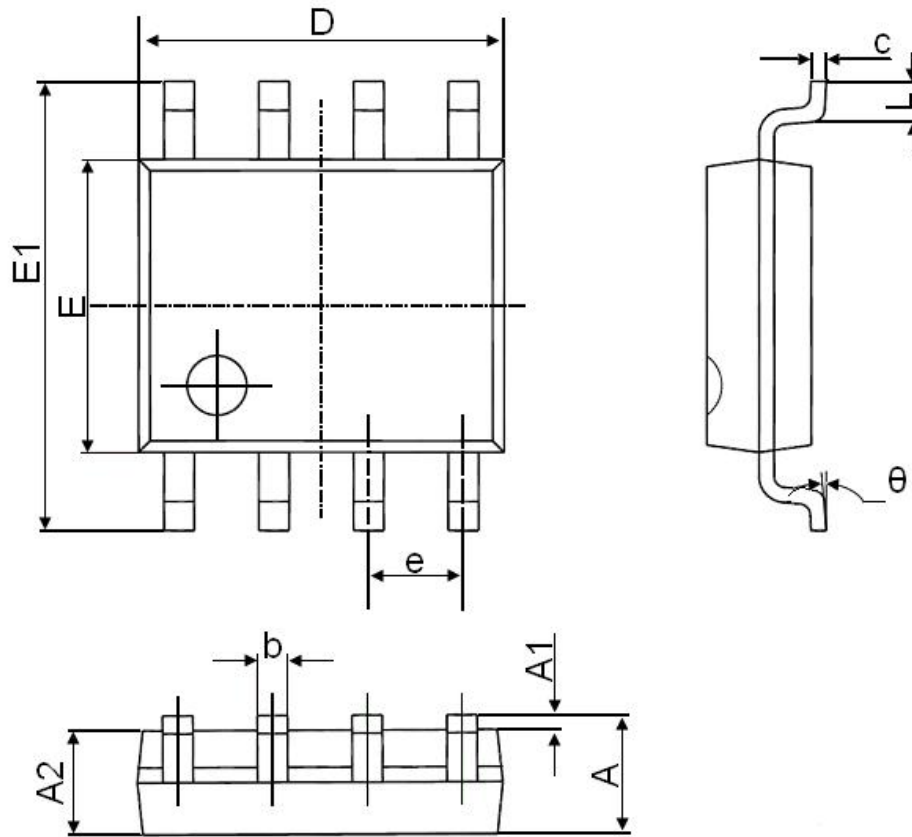
Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Package Dimensions of SOP8-8L



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°



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