

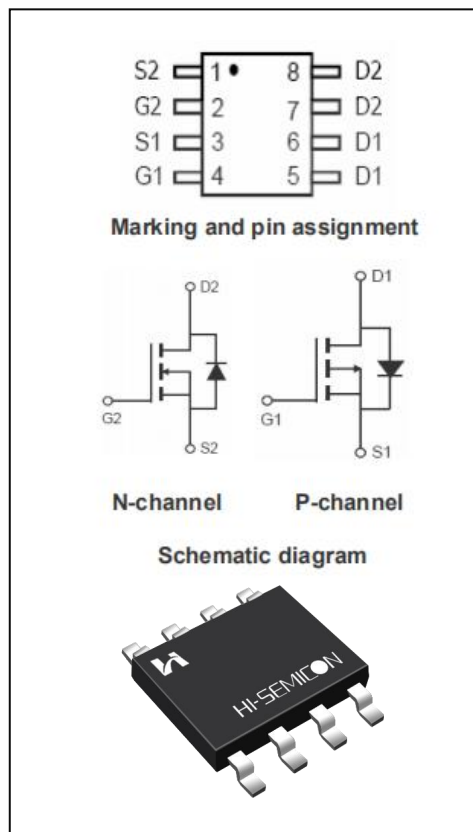
N and P-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

The SFS0405T4 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
 - $V_{DS}=40V, I_D=7A$
 - $R_{DS(ON)}=22m\Omega(TYP@V_{GS}=10V)$
 - $R_{DS(ON)}=28m\Omega(TYP@V_{GS}=4.5V)$
- ◆ P-CHANNEL
 - $V_{DS}=-40V, I_D=-5.5A$
 - $R_{DS(ON)}=45m\Omega(TYP@V_{GS}=-10V)$
 - $R_{DS(ON)}=57m\Omega(TYP@V_{GS}=-4.5V)$
- ◆ 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
SFS0405T4	SOP8-8L	SFS0405T4	Pb Free	Reel

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	N-CHANNEL	P-CHANNEL	UNIT
Drain-Source Voltage		V _{DS}	40	-40	V
Gate-Source Voltage		V _{GS}	±20	±20	V
Drain Current	TC=25°C	I _D	7	-5.5	A
	TC=70°C		5.8	-3.6	A
Pulsed Drain Current(note1)		I _{DM}	28	-22	A
Power Dissipation	TC=25°C	P _D	1.8		W
Thermal Characteristics					
Thermal Resistance, Junction-to-Ambient		R _{θJA}	62.5		°C/W
Junction and Storage Temperature Range		T _J , T _{stg}	-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
Off Characteristics						
Drain -Source Breakdown Voltage	B _{VDS}	V _{GS} =0V, I _D =250μA	40	--	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	-	--	1	uA
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	
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D =250μA	1.0	1.5	2.0	V
Static Drain- Source On State Resistance	R _{DS(on)}	V _{GS} =10V, I _D =5A	-	22	26	mΩ
		V _{GS} =4.5V, I _D =3A	-	28	33	
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V	-	560	-	pF
Output Capacitance	C _{oss}	V _{GS} =0V	-	40.6	-	
Reverse Transfer Capacitance	C _{rss}	f=1.0MHZ	-	30.9	-	
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, V _{GS} =10V R _G =3.3Ω, I _D =3A (Note 2.3)	-	10.5	-	ns
Turn-on Rise Time	t _r		-	9.3	-	
Turn-off Delay Time	t _{d(off)}		-	35.7	-	
Turn-off Fall Time	t _f		-	4.9	-	
Total Gate Charge	Q _g	V _{DS} =20V, I _D =3A V _{GS} =10V (Note 2.3)	-	8.7	-	nC
Gate-Source Charge	Q _{gs}		-	3.6	-	
Gate-Drain Charge	Q _{gd}		-	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}	$I_S=5A, V_{GS}=0V$	-	0.83	1.4	V

P-CHANNEL ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
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	μA
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	
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.5	-2.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-5A$	-	45	55	$m\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	-	57	70	
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-20V$ $V_{GS}=0V$ $f=1.0MHz$	-	966	-	pF
Output Capacitance	C_{oss}		-	38.5	-	
Reverse Transfer Capacitance	C_{rss}		-	25.1	-	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, V_{GS}=-10V$ $R_G=3\Omega, I_D=-4A$ (Note 2.3)	-	10.2	-	ns
Turn-on Rise Time	t_r		-	4.5	-	
Turn-off Delay Time	$t_{d(off)}$		-	39.8	-	
Turn-off Fall Time	t_f		-	45.9	-	
Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-3A$ $V_{GS}=-10V$ (Note 2.3)	-	17.1	-	nC
Gate-Source Charge	Q_{gs}		-	3.1	-	
Gate-Drain Charge	Q_{gd}		-	4.2	-	

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	-	-	-5.5	A
Pulsed Source Current	I_{SM}		-	-	-22	
Diode Forward Voltage	V_{SD}	$I_S=-5A, V_{GS}=0V$	-	-0.89	-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

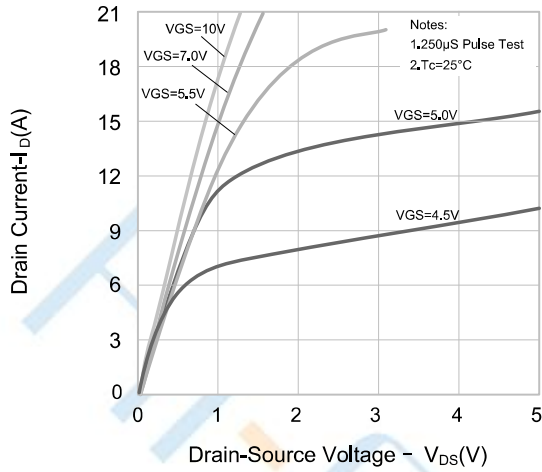


Figure 2. Transfer Characteristics

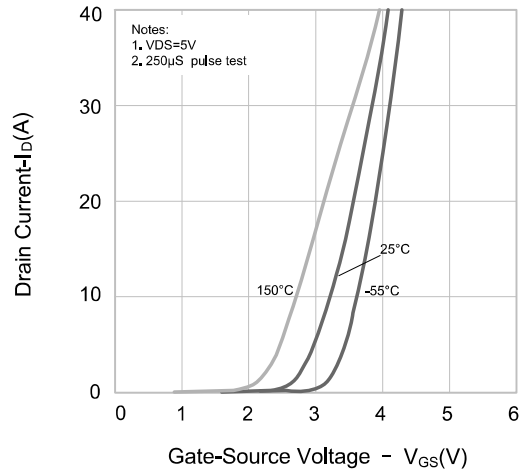


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

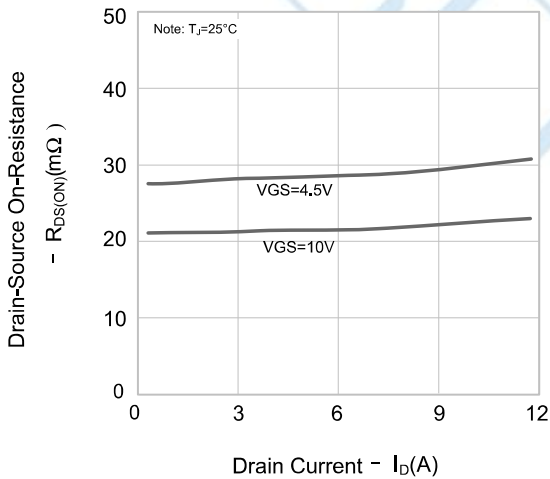


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

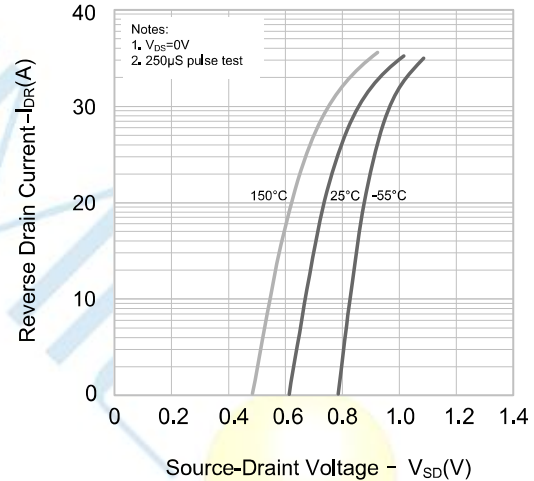


Figure 5. Capacitance Characteristics

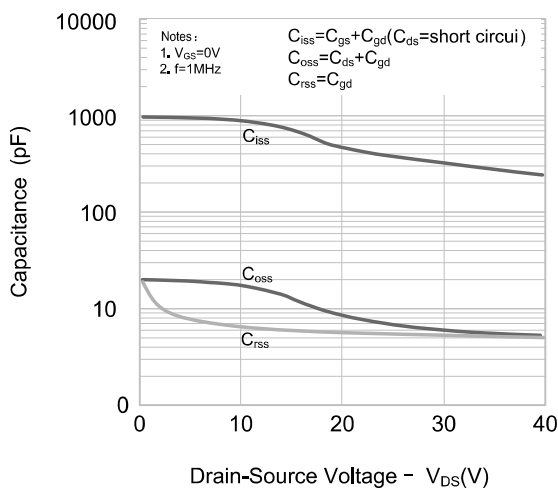
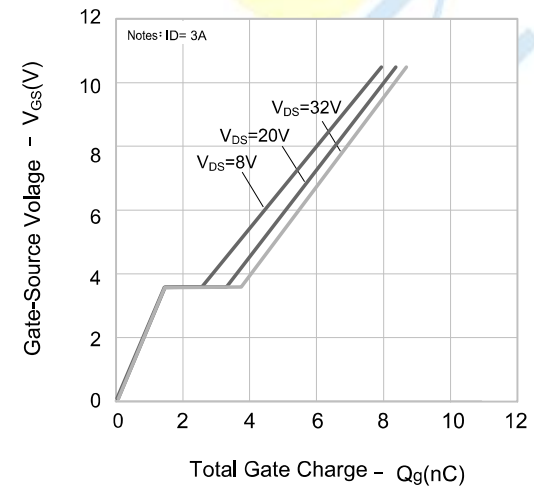


Figure 6. Gate Charge Characteristics



P-CHANNEL Typical Performance Characteristics

Figure 1: Output Characteristics

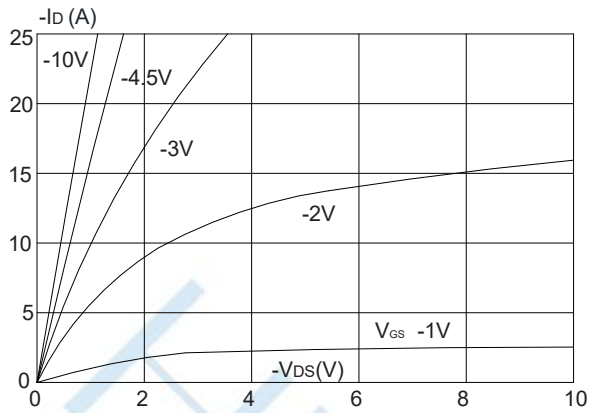


Figure 2: Typical Transfer Characteristics

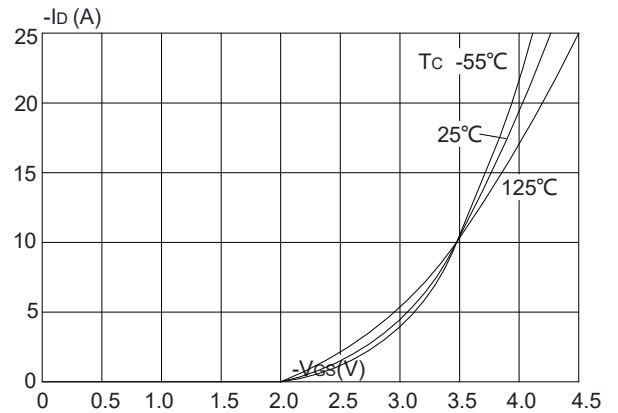


Figure 3: On-resistance vs. Drain Current

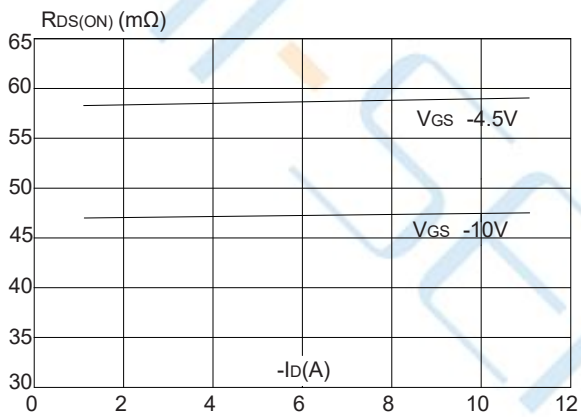


Figure 4: Body Diode Characteristics

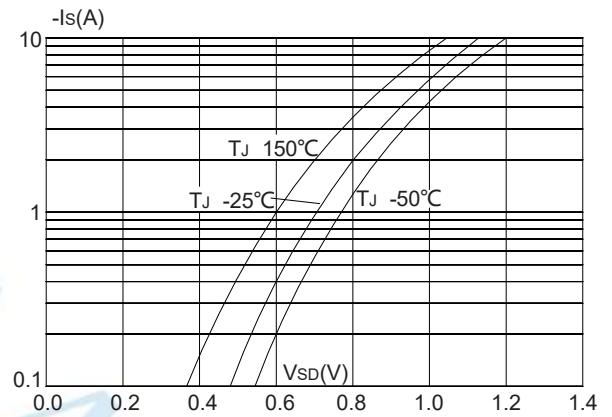


Figure 5: Gate Charge Characteristics

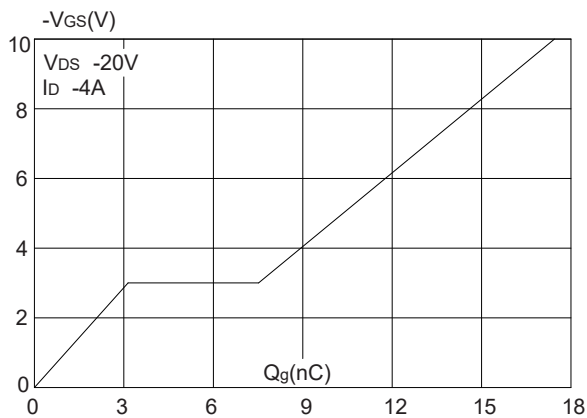
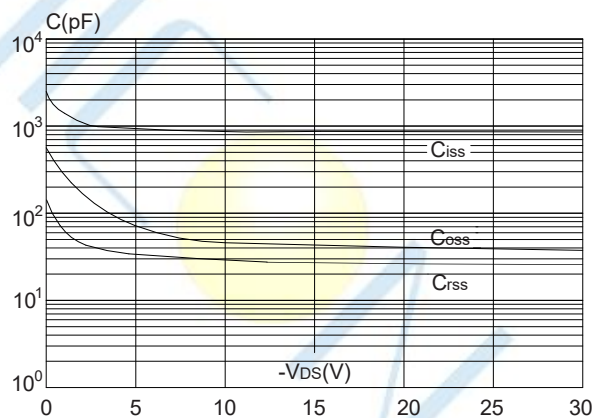


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

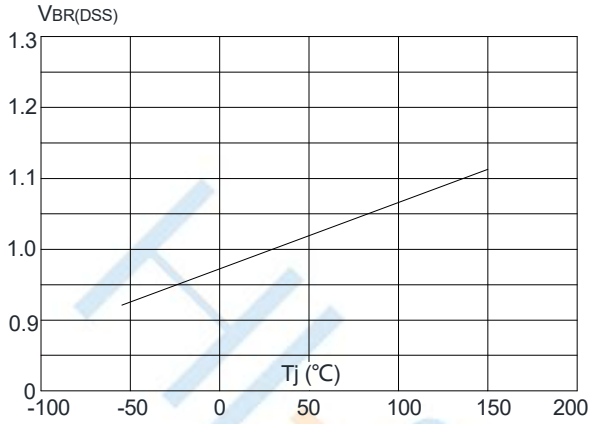


Figure 8: Normalized on Resistance vs. Junction Temperature

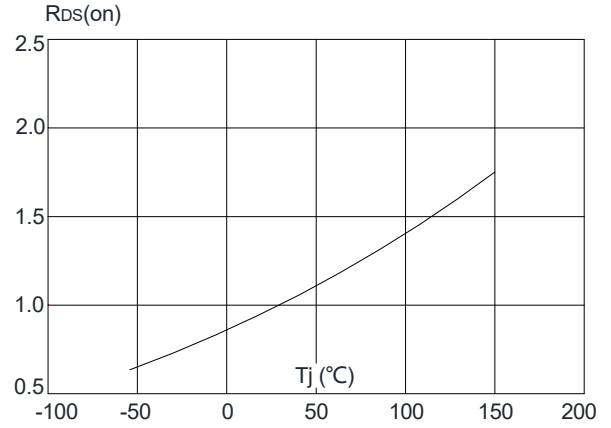


Figure 9: Maximum Safe Operating Area

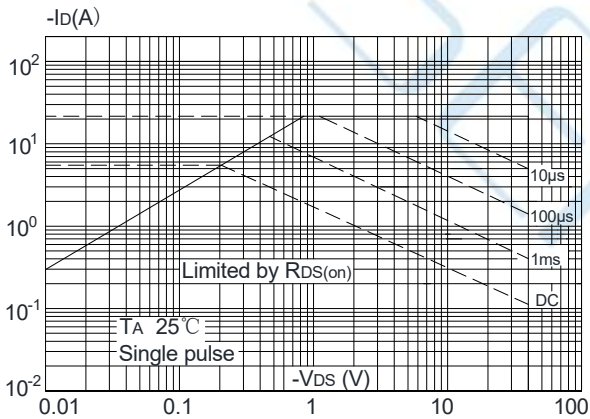


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

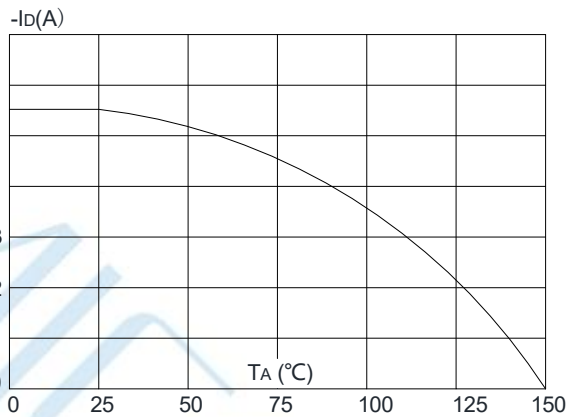
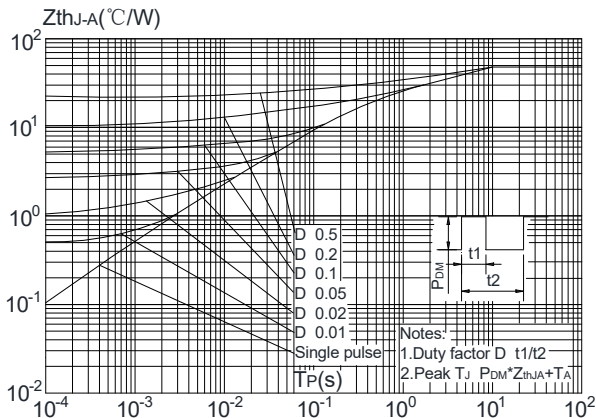
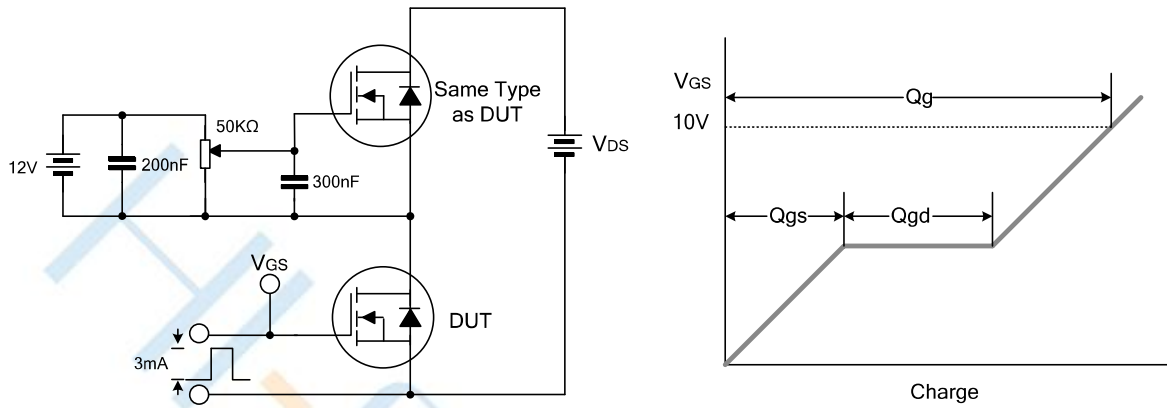


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

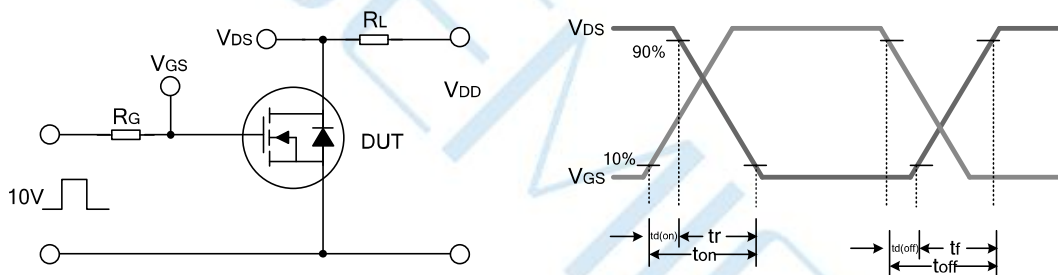


Test Circuit

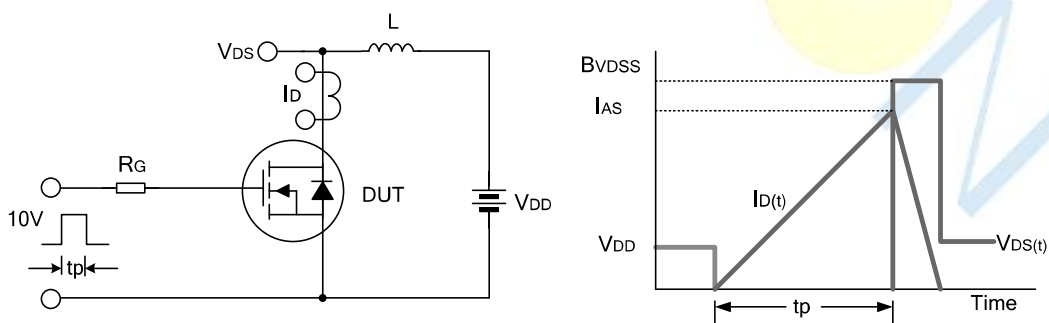
Gate Charge Test Circuit & Waveform



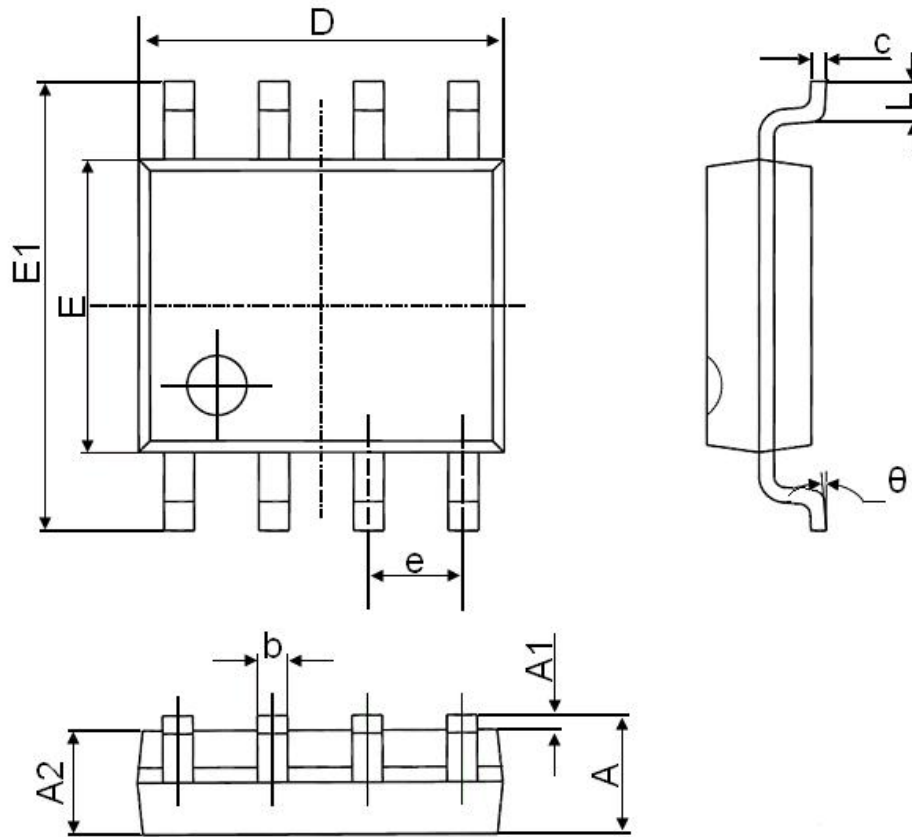
Resistive Switching Test Circuit & Waveform



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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