

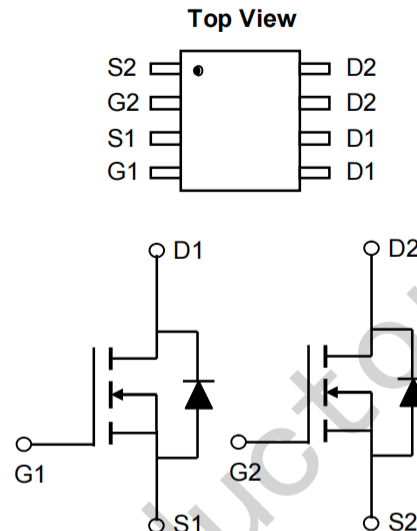
DESCRIPTION

The 9971 is the N-Channel logic enhancement mode power field effect transistor, is produced using high cell density advanced trench technology.

This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage application, notebook computer power management and other battery powered circuits.

FEATURE

- ◆ 60V/6.3A, $R_{DS(ON)}=30m\Omega$ (typ.)@VGS= 10V
- ◆ 60V/5.0A, $R_{DS(ON)}=37m\Omega$ (typ.)@VGS= 4.5V
- ◆ Super high design for extremely low $R_{DS(ON)}$
- ◆ Exceptional on-resistance and Maximum DC current capability
- ◆ Full RoHS compliance
- ◆ SOP8 package design



APPLICATIONS

- ◆ Power Management
- ◆ Portable Equipment
- ◆ DC/DC Converter
- ◆ Load Switch
- ◆ DSC
- ◆ LCD Display inverter

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ Unless otherwise noted)

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ\text{C}$	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current ^B	I_{DM}	40	
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	W
		$T_A=70^\circ\text{C}$	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics					
Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	50	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		73	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	31	40	$^\circ\text{C/W}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress rating only and functional device operation is not implied

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

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Parameters						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.8	3.0	V
I_{GSS}	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$			± 100	nA
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=48V, V_{GS}=0$			1	uA
		$V_{DS}=48V, V_{GS}=0$ $T_J=55^\circ\text{C}$			5	
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS}=10V, I_D=6.3A$		30	45	m Ω
		$V_{GS}=4.5V, I_D=5.0A$		37	55	
Source-Drain Diode						
V_{SD}	Diode Forward Voltage	$I_S=1.0A, V_{GS}=0V$		0.8	1.3	V
Dynamic Parameters						
Q_g	Total Gate Charge	$V_{DS}=30V$ $V_{GS}=10V$ $I_D=5.0A$		15.6	16	nC
Q_{gs}	Gate-Source Charge			1.3		
Q_{gd}	Gate-Drain Charge			4.5		
C_{iss}	Input Capacitance	$V_{DS}=25V$ $V_{GS}=0V$ $f=1\text{MHz}$		520		pF
C_{oss}	Output Capacitance			105		
C_{riss}	Reverse Transfer Capacitance			60		
$T_{d(on)}$	Turn-On Time	$V_{DS}=30V$ $I_D=1A$ $V_{GEN}=10V$ $R_G=6\Omega$		8	16	nS
T_r				6	12	
$T_{d(off)}$	Turn-Off Time			25	46	
T_f				4	8	

Note: 1. Pulse test: pulse width \leq 300uS, duty cycle \leq 2%

2.Static parameters are based on package level with recommended wire bonding

■ **TYPICAL CHARACTERISTICS (25 °C Unless Note)**

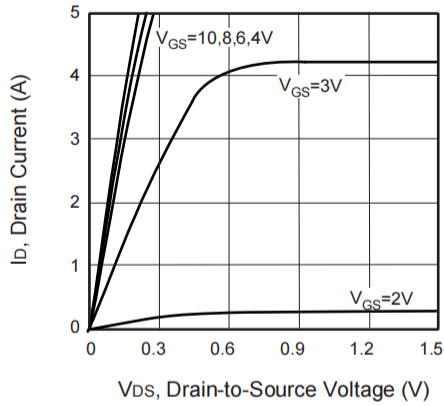


Figure 1. Output Characteristics

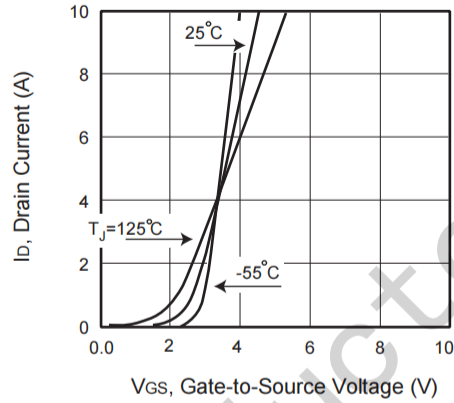


Figure 2. Transfer Characteristics

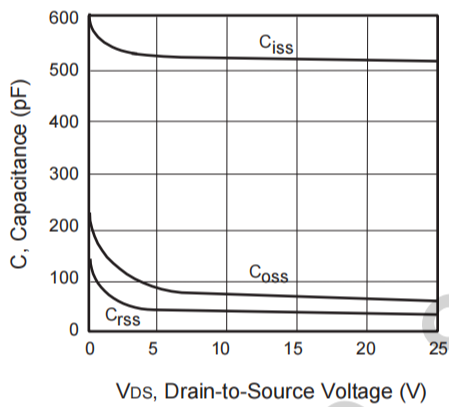


Figure 3. Capacitance

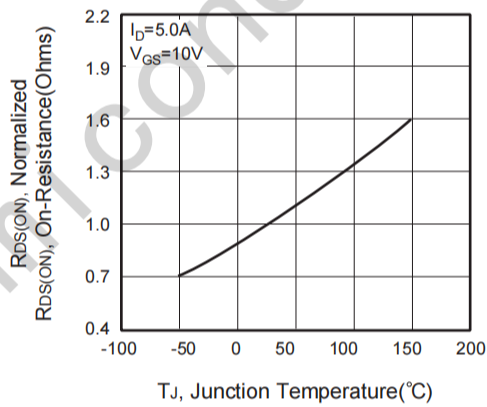


Figure 4. On-Resistance Variation with Temperature

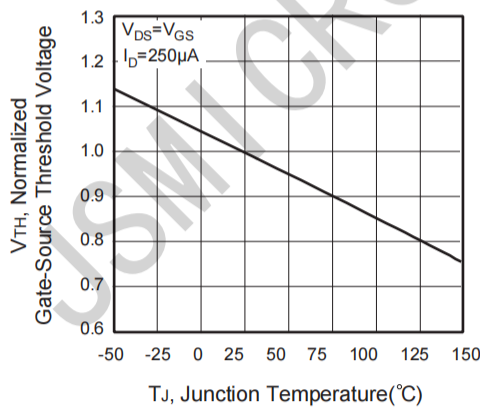


Figure 5. Gate Threshold Variation with Temperature

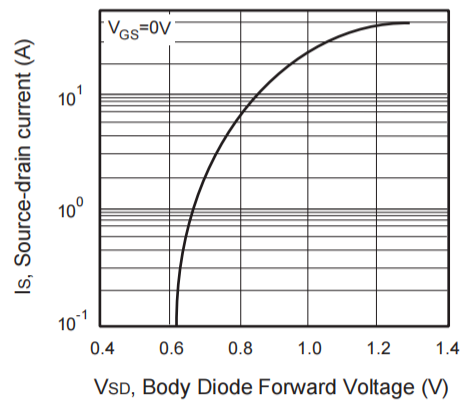


Figure 6. Body Diode Forward Voltage Variation with Source Current

■ **TYPICAL CHARACTERISTICS** (continuous)

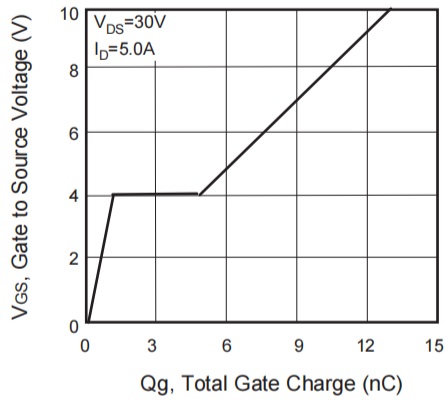


Figure 7. Gate Charge

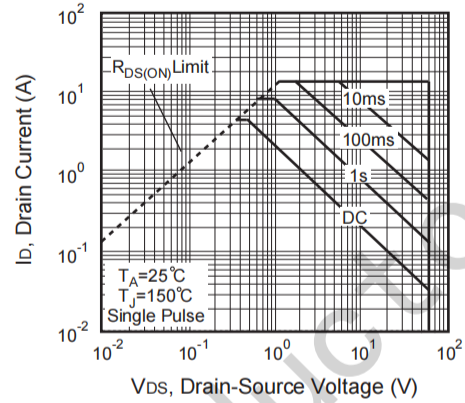


Figure 8. Maximum Safe Operating Area

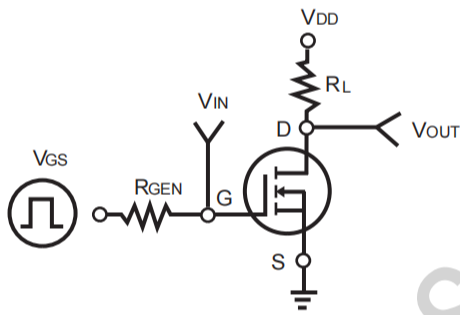


Figure 9. Switching Test Circuit

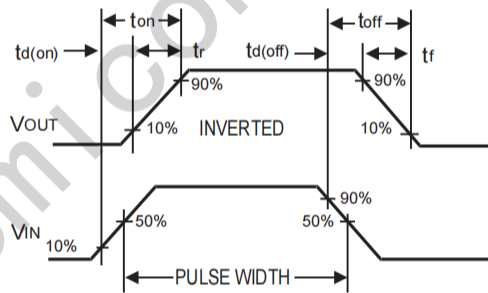


Figure 10. Switching Waveforms

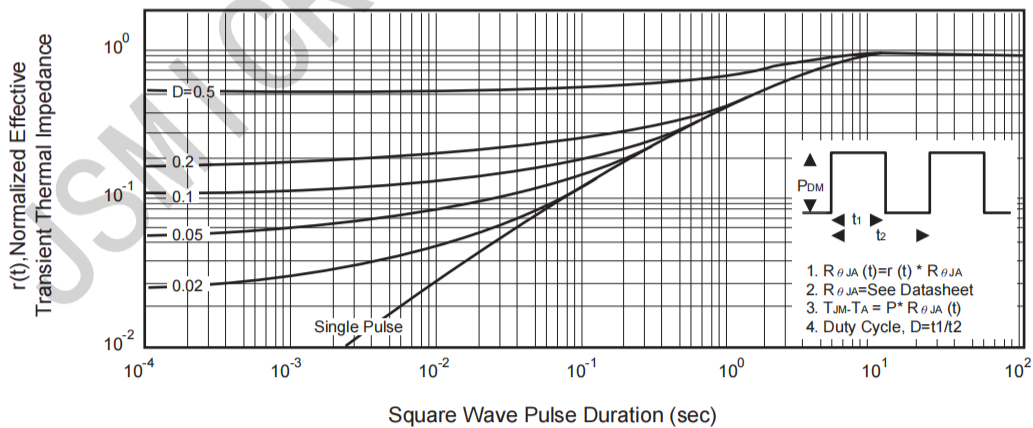
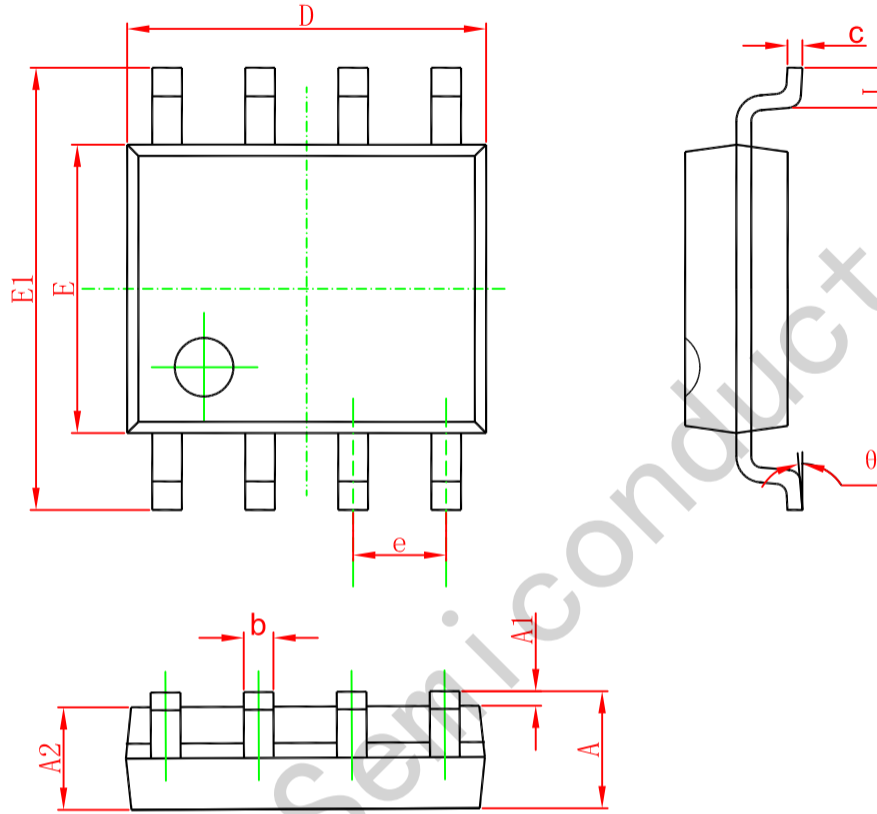


Figure 11. Normalized Thermal Transient Impedance Curve

■ SOP8 PACKAGE OUTLINE DIMENSIONS


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°