



Dual N-channel Enhancement-mode Power MOSFETs

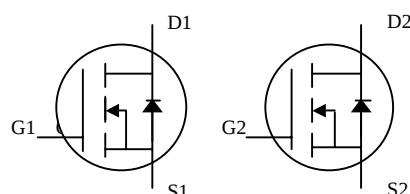
Simple Drive Requirement

Low On-resistance

Fast Switching Performance

RoHS-compliant, halogen-free SO-8 package

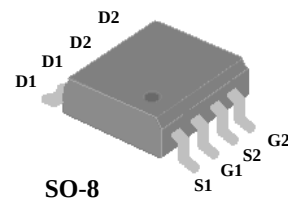
BV_{DSS}	60V
$R_{DS(ON)}$	50m Ω
I_D	5A



Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The AP9971GM-HF-3 is in the popular SO-8 surface-mount package and is well-suited for use in low-voltage DC/DC conversion and general load-switching applications.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 25	V
I_D at $T_A=25^\circ\text{C}$	Continuous Drain Current ³	5	A
I_D at $T_A=70^\circ\text{C}$	Continuous Drain Current ³	3.2	A
I_{DM}	Pulsed Drain Current ¹	30	A
P_D at $T_A=25^\circ\text{C}$	Total Power Dissipation	2	W
	Linear Derating Factor	0.016	W/ $^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Value	Unit
Rthj-a	Maximum Thermal Resistance, Junction-ambient ³	62.5	$^\circ\text{C/W}$

Ordering Information

AP9971GM-HF-3TR RoHS-compliant halogen-free SO-8, shipped on tape and reel, 3000pcs/reel



Electrical Characteristics at $T_j = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1mA$	-	0.06	-	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=5A$	-	-	50	m Ω
		$V_{GS}=4.5V, I_D=2.5A$	-	-	60	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=5A$	-	16	-	S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
	Drain-Source Leakage Current ($T_j=70^\circ\text{C}$)	$V_{DS}=48V, V_{GS}=0V$	-	-	25	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}= \pm 25V, V_{DS}=0V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=5A$	-	32.5	-	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=48V$	-	4.9	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	8.8	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=30V$	-	9.6	-	ns
t_r	Rise Time	$I_D=5A$	-	10	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	30	-	ns
t_f	Fall Time	$R_D=6\Omega$	-	5.5	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	1658	-	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	156	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	-	109	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=1.6A, V_{GS}=0V$	-	-	1.2	V
t_{rr}	Reverse Recovery Time ²	$I_S=5A, V_{GS}=0V,$	-	29.2	-	ns
Q_{rr}	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	48	-	nC

Notes:

1. Pulse width limited by maximum junction temperature.
2. Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. Surface-mounted on 1 in² copper pad of FR4 board; 135 $^\circ\text{C}/W$ when mounted on minimum copper pad.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

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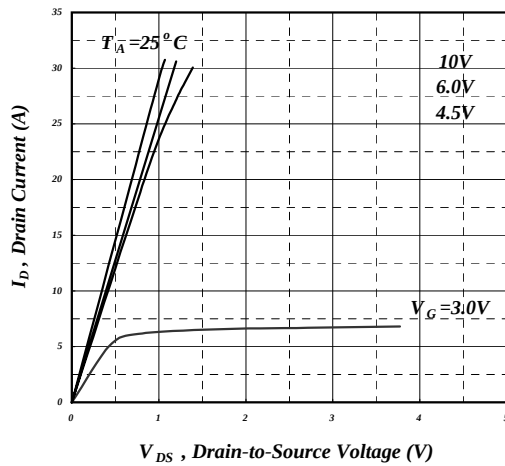


Fig 1. Typical Output Characteristics

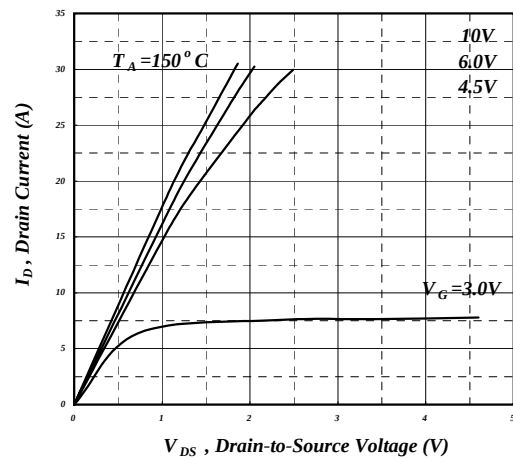


Fig 2. Typical Output Characteristics

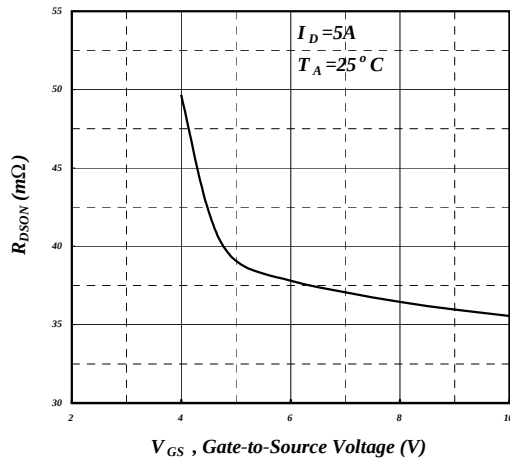


Fig 3. On-Resistance vs. Gate Voltage

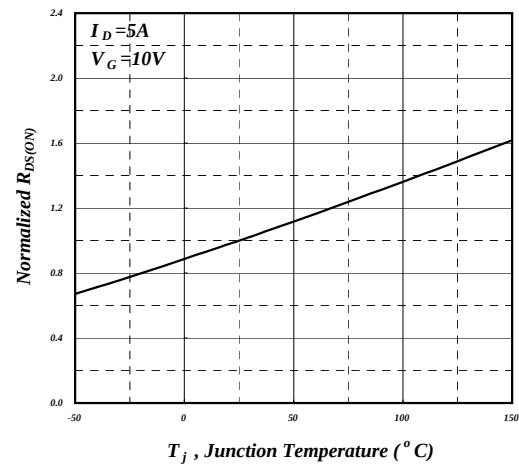


Fig 4. Normalized On-Resistance
vs. Junction Temperature

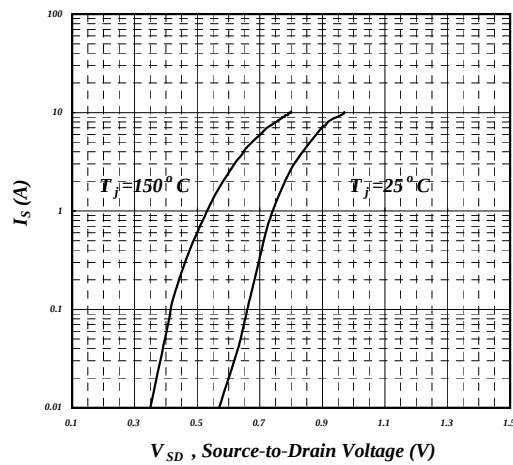


Fig 5. Forward Characteristic of
Reverse Diode

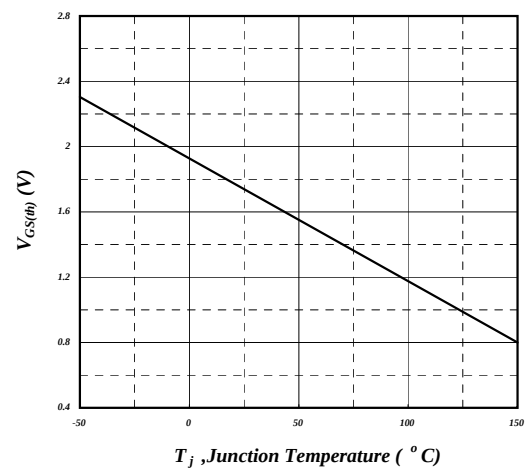


Fig 6. Gate Threshold Voltage vs.
Junction Temperature

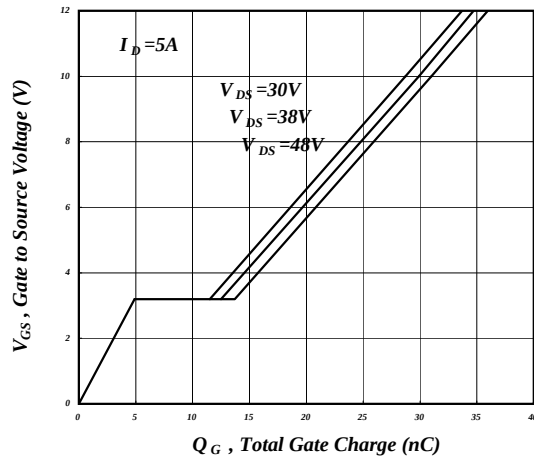


Fig 7. Gate Charge Characteristics

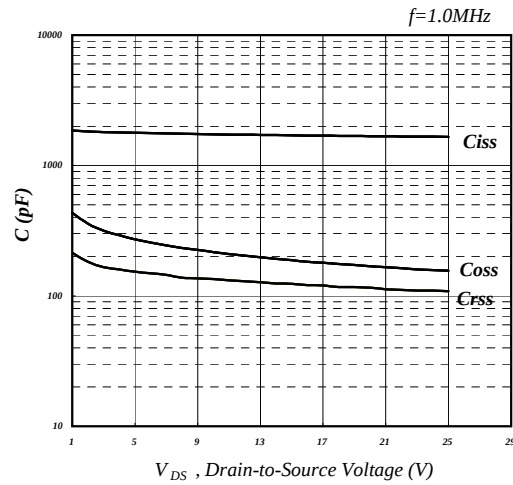


Fig 8. Typical Capacitance Characteristics

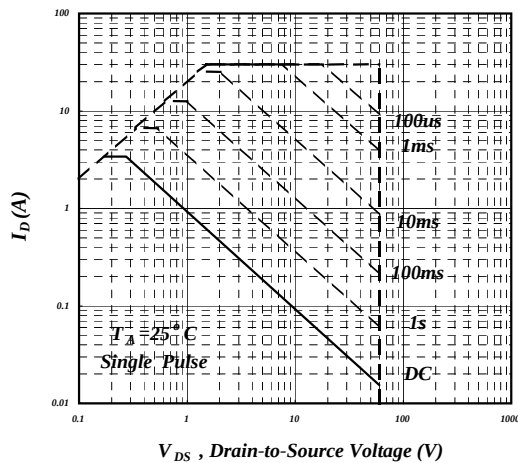


Fig 9. Maximum Safe Operating Area

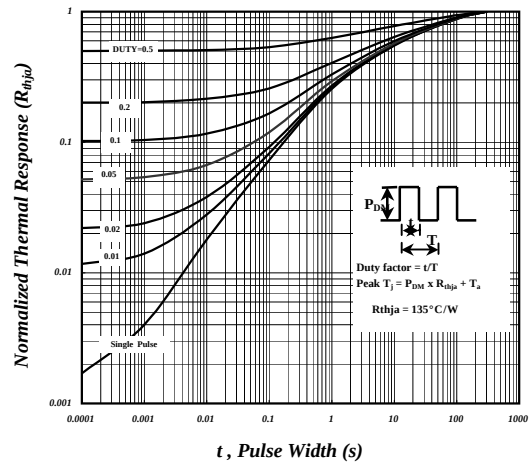


Fig 10. Effective Transient Thermal Impedance

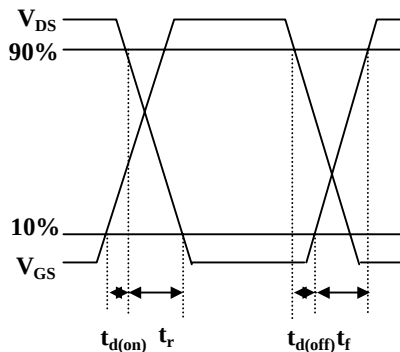


Fig 11. Switching Time Waveform

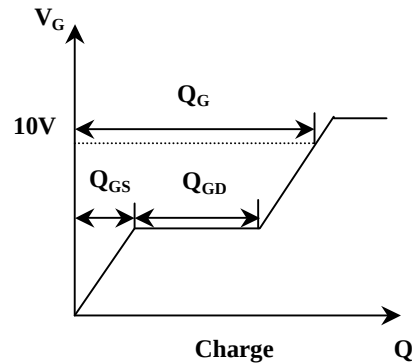
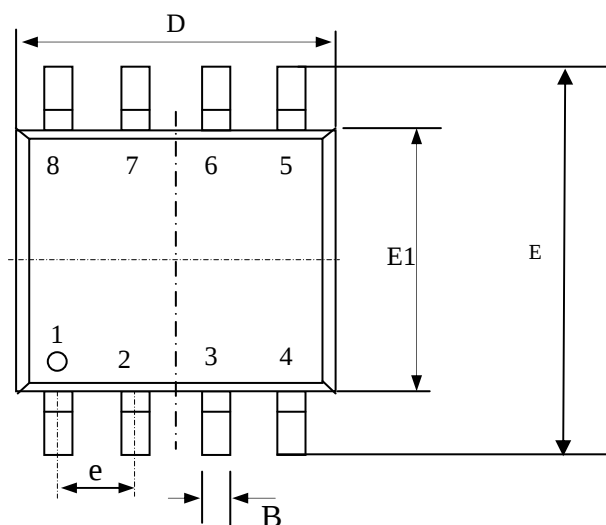


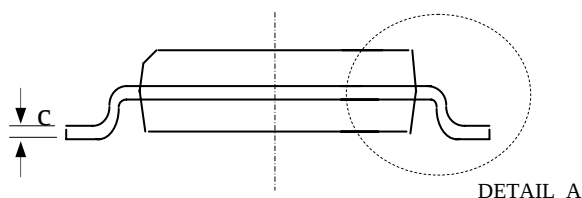
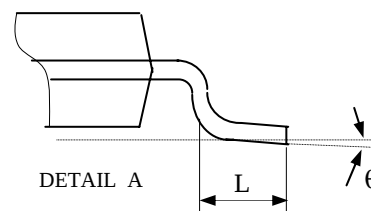
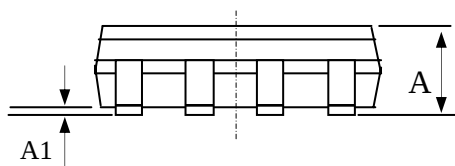
Fig 12. Gate Charge Waveform



Package Dimensions: SO-8

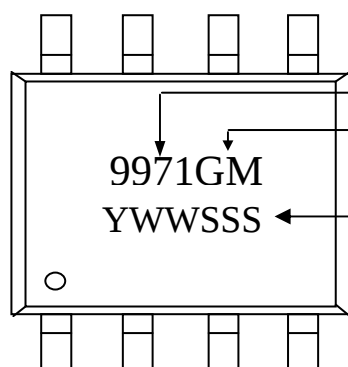


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
B	0.33	0.41	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E1	3.80	3.90	4.00
E	5.80	6.15	6.50
L	0.38	0.71	1.27
θ	0	4.00	8.00
e	1.27 TYP		



1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information: SO-8



Product: AP9971

Package:

GM = RoHS-compliant halogen-free SO-8

Date/lot code (YWWSSS)

Y: Last digit of the year

WW: Work week

SSS: Lot code sequence