

## AP9938GEO-HF-VB Datasheet

### Dual N-Channel 25-V (D-S) MOSFET

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
25	0.022 at $V_{GS} = 4.5$ V	6.6
	0.032 at $V_{GS} = 2.5$ V	5.5

#### FEATURES

- Halogen-free Option Available
- Trench Power MOSFETs



**RoHS\***  
COMPLIANT



#### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	10 s	Steady State	Unit
Drain-Source Voltage	$V_{DS}$	25		V
Gate-Source Voltage	$V_{GS}$	$\pm 12$		
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>	$I_D$	6.6	5.2	A
		5.5	3.5	
Pulsed Drain Current	$I_{DM}$	30		
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	1.5	1.0	
Maximum Power Dissipation <sup>a</sup>	$P_D$	1.5	1.0	W
		0.96	0.64	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150		$^\circ\text{C}$

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	72	83	$^\circ\text{C/W}$
		100	120	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	55	70	

Notes:

a. Surface Mounted on FR4 board,  $t \leq 10$  s.

\* Pb containing terminations are not RoHS compliant, exemptions may apply.

**SPECIFICATIONS**  $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

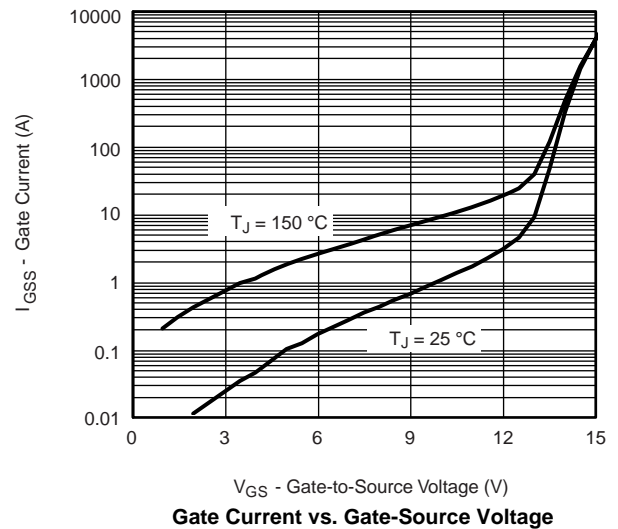
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	0.5		1.0	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 4.5\text{ V}$			$\pm 200$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 70\text{ }^{\circ}\text{C}$			25	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}$ , $V_{GS} = 4.5\text{ V}$	30			A
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$ , $I_D = 6.5\text{ A}$		0.022		$\Omega$
		$V_{GS} = 2.5\text{ V}$ , $I_D = 5.5\text{ A}$		0.032		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$		30		S
Diode Forward Voltage <sup>b</sup>	$V_{SD}$	$I_S = 1.5\text{ A}$ , $V_{GS} = 0\text{ V}$		0.71	1.2	V
<b>Dynamic<sup>a</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 6.5\text{ A}$		12	18	nC
Gate-Source Charge	$Q_{gs}$			2.2		
Gate-Drain Charge	$Q_{gd}$			3.6		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}$ , $R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_G = 6\text{ }\Omega$		245	365	ns
Rise Time	$t_r$			330	495	
Turn-Off Delay Time	$t_{d(off)}$			860	1300	
Fall Time	$t_f$			510	765	

Notes:

a. For design aid only; not subject to production testing.

b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$ , unless otherwise noted

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



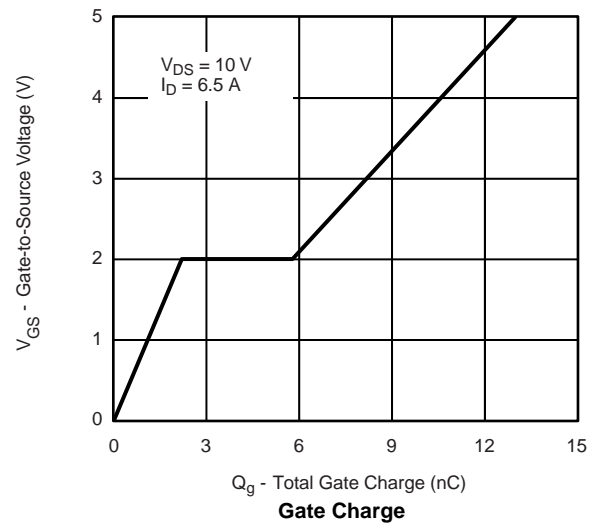
**Output Characteristics**



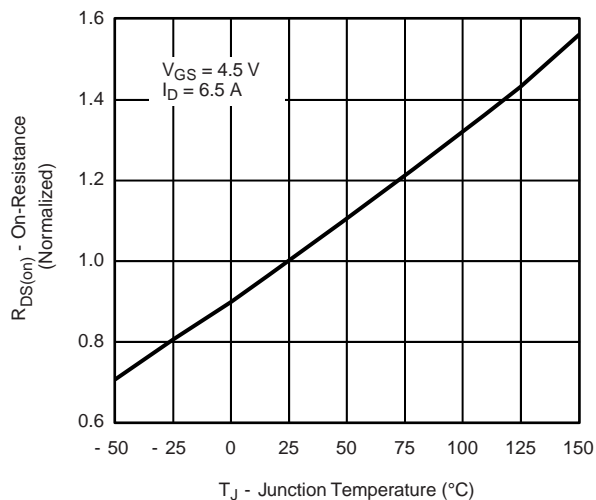
**Transfer Characteristics**



**On-Resistance vs. Drain Current**



**Gate Charge**



**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

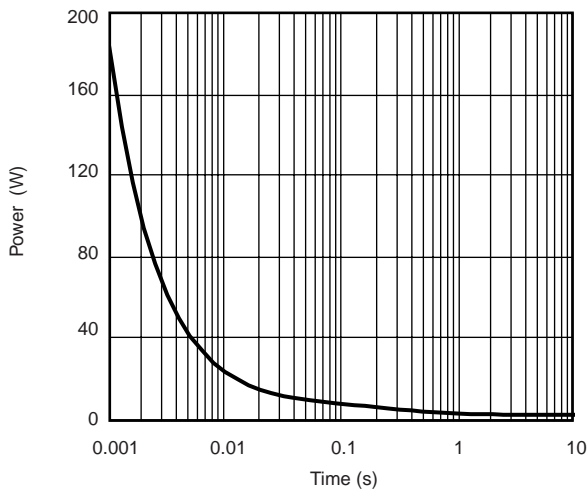
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



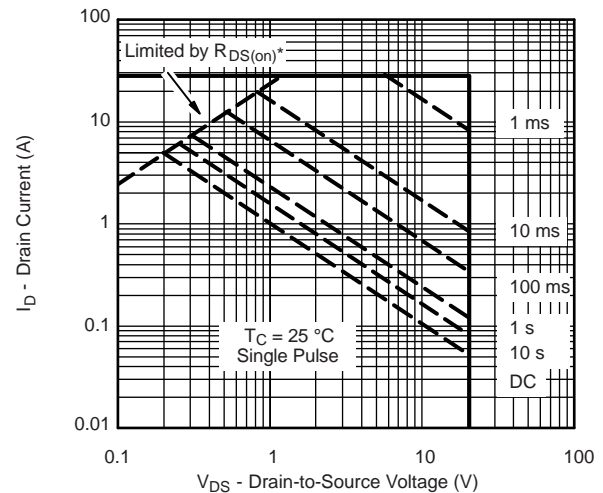
**On-Resistance vs. Gate-to-Source Voltage**



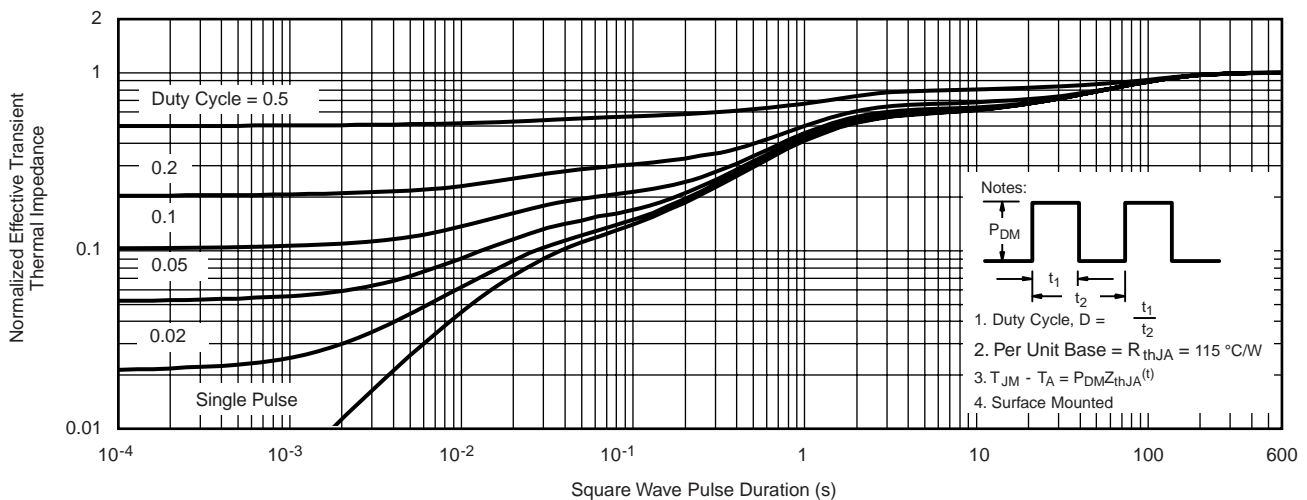
**Threshold Voltage**



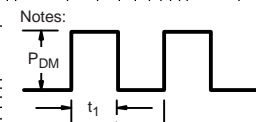
**Single Pulse Power**



**Safe Operating Area, Junction-to-Case**

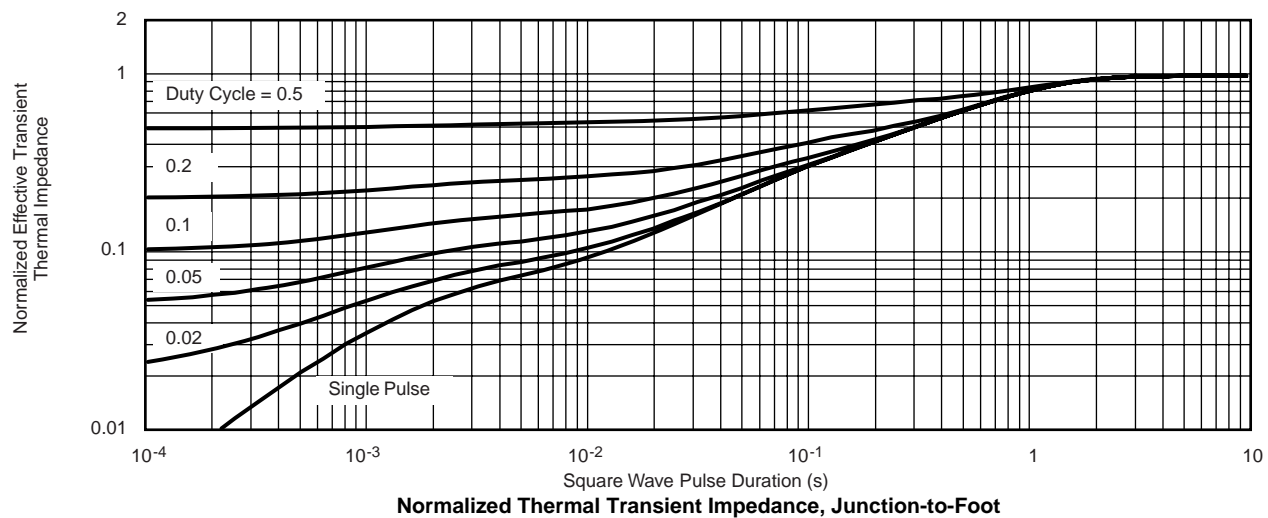


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



1. Duty Cycle,  $D = \frac{t_1}{t_2}$
2. Per Unit Base =  $R_{thJA} = 115^{\circ}\text{C/W}$
3.  $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



## TSSOP: 8-LEAD

JEDEC Part Number: MO-153



Dim	MILLIMETERS		
	Min	Nom	Max
A	—	—	1.20
A <sub>1</sub>	0.05	0.10	0.15
A <sub>2</sub>	0.80	1.00	1.05
B	0.19	0.28	0.30
C	—	0.127	—
D	2.90	3.00	3.10
E	6.20	6.40	6.60
E <sub>1</sub>	4.30	4.40	4.50
e	—	0.65	—
L	0.45	0.60	0.75
L <sub>1</sub>	0.90	1.00	1.10
Y	—	—	0.10
£K1	0°	3°	6°

ECN: S-03946—Rev. G, 09-Jul-01  
DWG: 5844

RECOMMENDED MINIMUM PADS FOR TSSOP-8



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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