

AP9990GR-HF-VB Datasheet

N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a
60	0.003 at $V_{GS} = 10$ V	210
	0.005 at $V_{GS} = 4.5$ V	185

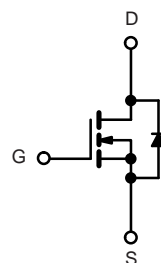
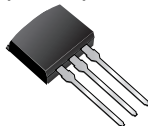
FEATURES

- 175 °C Junction Temperature
- TrenchFET® Power MOSFET
- Material categorization:



RoHS
COMPLIANT

I²PAK
(TO-262)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175$ °C) ^b	$T_C = 25$ °C	I_D	210	A
	$T_C = 100$ °C		185 ^a	
Pulsed Drain Current		I_{DM}	200	
Continuous Source Current (Diode Conduction)		I_S	180 ^a	
Avalanche Current		I_{AS}	70	
Single Avalanche Energy (Duty Cycle ≤ 1 %)	$L = 0.1$ mH	E_{AS}	125	mJ
Maximum Power Dissipation	$T_C = 25$ °C	P_D	136	W
	$T_A = 25$ °C		3 ^b , 8.3 ^{b, c}	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10$ sec	R_{thJA}	15	18	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	0.85	1.1	

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

c. $t \leq 10$ s.

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

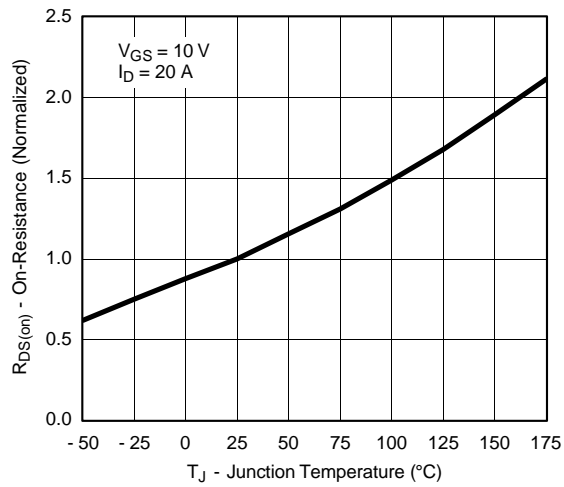
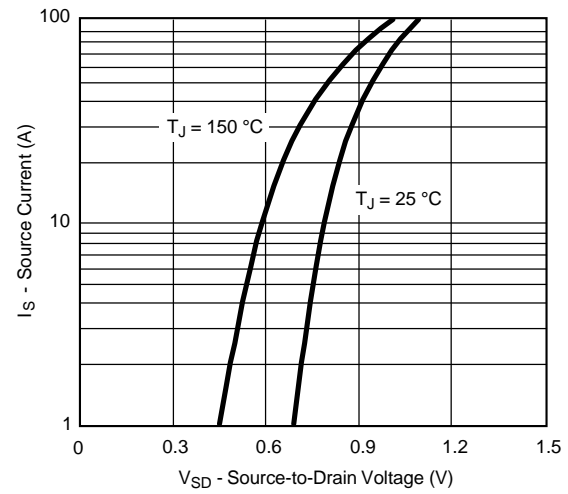
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	2	3	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 125 °C			50	
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 175 °C			250	
On-State Drain Current ^b	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	60			A
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		0.003		Ω
		V _{GS} = 10 V, I _D = 20 A, T _J = 125 °C		0.008		
		V _{GS} = 10 V, I _D = 20 A, T _J = 175 °C		0.010		
		V _{GS} = 4.5 V, I _D = 15 A		0.005		
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 20 A		60		S
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz		2650		pF
Output Capacitance	C _{oss}			470		
Reverse Transfer Capacitance	C _{rss}			225		
Total Gate Charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 50 A		47	70	nC
Gate-Source Charge ^c	Q _{gs}			10		
Gate-Drain Charge ^c	Q _{gd}			12		
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 0.6 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 2.5 Ω		10	20	ns
Rise Time ^c	t _r			15	25	
Turn-Off Delay Time ^c	t _{d(off)}			35	50	
Fall Time ^c	t _f			20	30	
Source-Drain Diode Ratings and Characteristics (T _C = 25 °C)						
Pulsed Current	I _{SM}				60	A
Diode Forward Voltage	V _{SD}	I _F = 20 A, V _{GS} = 0 V		1	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs		45	100	ns

Notes:

- a. For design aid only; not subject to production testing.
 b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 c. Independent of operating temperature.

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.

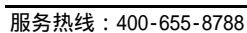
TYPICAL CHARACTERISTICS (25 °C unless noted)**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****Capacitance****Gate Charge**

TYPICAL CHARACTERISTICS (25 °C unless noted)**On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage**

The graph shows the relationship between Drain Current (I_D) and Ambient Temperature (T_A) for the 2N3866 JFET. The current is constant at 50 A for temperatures up to 100°C and then decreases to 0 A at 175°C.

T_A - Ambient Temperature ($^{\circ}\text{C}$)	I_D - Drain Current (A)
0	50
25	50
50	50
75	50
100	50
125	40
150	28
175	0

Figure 10 is a Safe Operating Area (SOA) graph for the MOSFET. The y-axis represents Drain Current (I_D) in Amperes (A) on a logarithmic scale from 0.01 to 1000. The x-axis represents Drain-to-Source Voltage (V_{DS}) in Volts (V) on a logarithmic scale from 0.1 to 100. The graph shows the maximum allowable I_D for various pulse widths: 10 μ s, 100 μ s, 1 ms, 10 ms, 100 ms, and DC. The DC limit is the lowest, starting at approximately 5 A for $V_{DS} = 0.1$ V and decreasing to about 1 A at $V_{DS} = 100$ V. The 10 μ s limit is the highest, starting at approximately 100 A for $V_{DS} = 0.1$ V and decreasing to about 10 A at $V_{DS} = 100$ V. A note indicates that the DC limit is limited by $R_{DS(on)} \cdot I_D$. The temperature is specified as $T_C = 25^\circ\text{C}$ and the pulse is a single pulse.



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