

## AP9916J-VB Datasheet

### N-Channel 30-V (D-S) MOSFET

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
30	7 at $V_{GS} = 10$ V	50	19 nC
	9 at $V_{GS} = 4.5$ V	45	

#### FEATURES

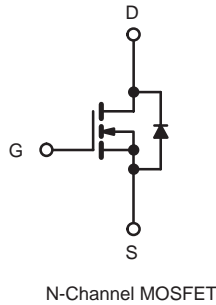
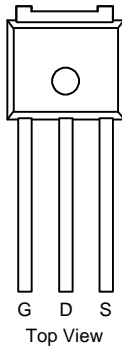
- Halogen-free
- TrenchFET® Gen III Power MOSFET
- 100 %  $R_g$  Tested
- 100 % UIS Tested


**RoHS**  
 COMPLIANT

#### APPLICATIONS

- DC/DC Conversion
- System Power

TO-251



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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	30	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	$I_D$	50	A
	$T_C = 70^\circ\text{C}$		45	
	$T_A = 25^\circ\text{C}$		14 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$		10 <sup>b, c</sup>	
Pulsed Drain Current		$I_{DM}$	150	
Avalanche Current		$I_{AS}$	25	mJ
Avalanche Energy		$E_{AS}$	40	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	$I_S$	15	A
	$T_A = 25^\circ\text{C}$		2.9 <sup>b, c</sup>	
	$T_C = 25^\circ\text{C}$		28	W
Maximum Power Dissipation	$T_C = 70^\circ\text{C}$	$P_D$	18	
	$T_A = 25^\circ\text{C}$		3.5 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$		2.2 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature)			260	

#### THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient	$t \leq 10$ s	$R_{thJA}$	29	36	$^\circ\text{C/W}$
Maximum Junction-to-Case (Drain)	Steady State	$R_{thJC}$	3.6	4.5	

Notes:

- Based on  $T_C = 25^\circ\text{C}$ .
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$  s.

SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	30			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		33		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			- 5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1.2		3.0	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			5	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	15			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		7		mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7 A		9		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A		24		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		1700		pF
Output Capacitance	C <sub>oss</sub>			200		
Reverse Transfer Capacitance	C <sub>rss</sub>			150		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		33		nC
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		18		
Gate-Drain Charge	Q <sub>gd</sub>			7.3		
				6.2		
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.2	0.8	1.6	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω		15	30	ns
Rise Time	t <sub>r</sub>			12	24	
Turn-Off Delay Time	t <sub>d(off)</sub>			13	26	
Fall Time	t <sub>f</sub>			10	20	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		9	18	
Rise Time	t <sub>r</sub>			9	18	
Turn-Off Delay Time	t <sub>d(off)</sub>			14	28	
Fall Time	t <sub>f</sub>			8	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			16	A
Pulse Diode Forward Current	I <sub>SM</sub>				32	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 3 A, V <sub>GS</sub> = 0 V		0.78	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 10 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		17	34	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			9.5	19	nC
Reverse Recovery Fall Time	t <sub>a</sub>			10		ns
Reverse Recovery Rise Time	t <sub>b</sub>			7		

Notes:

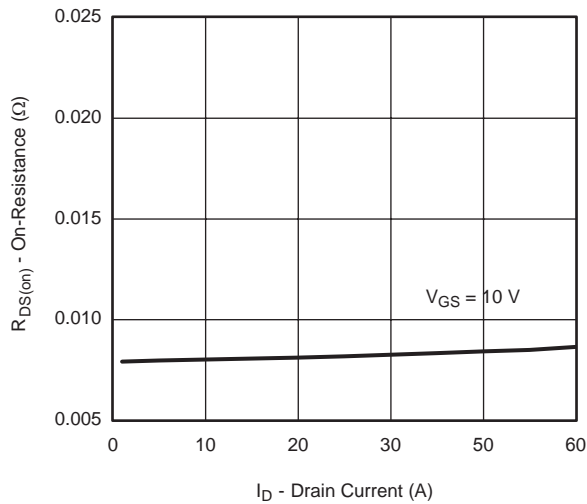
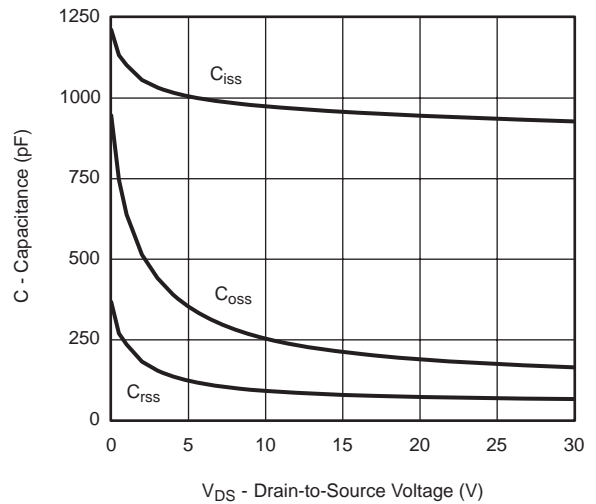
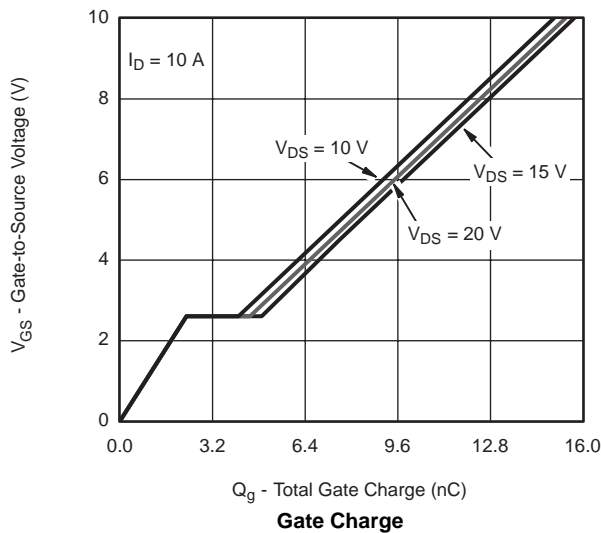
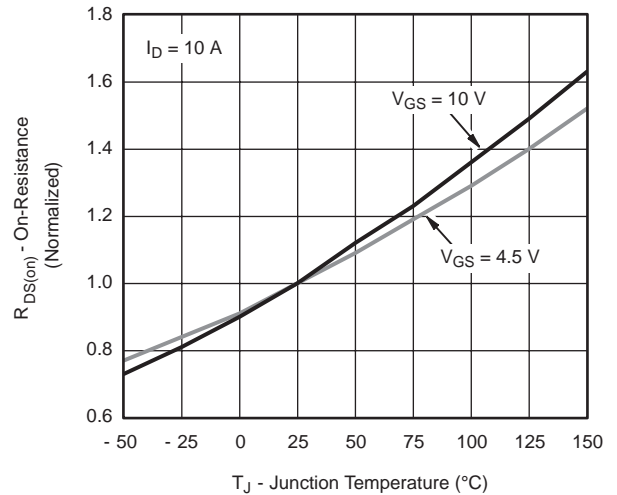
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

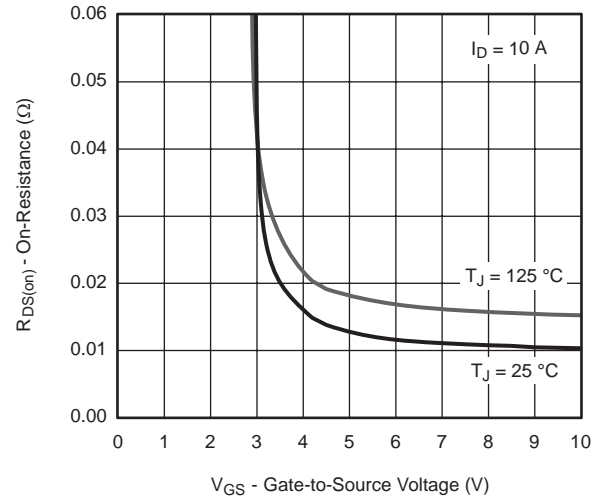
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

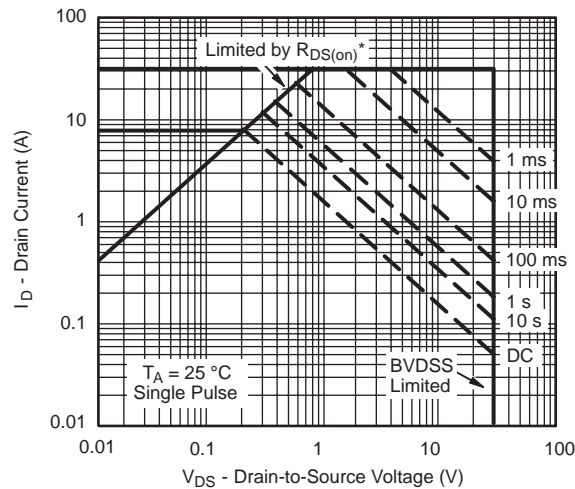
**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current and Gate Voltage**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

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

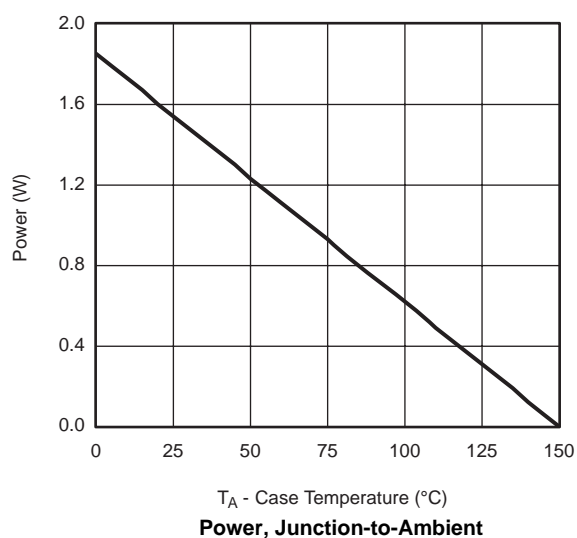
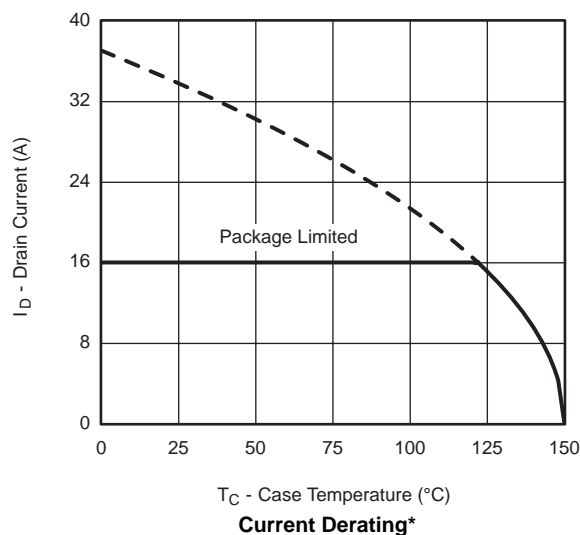
**Source-Drain Diode Forward Voltage**

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

**Threshold Voltage**

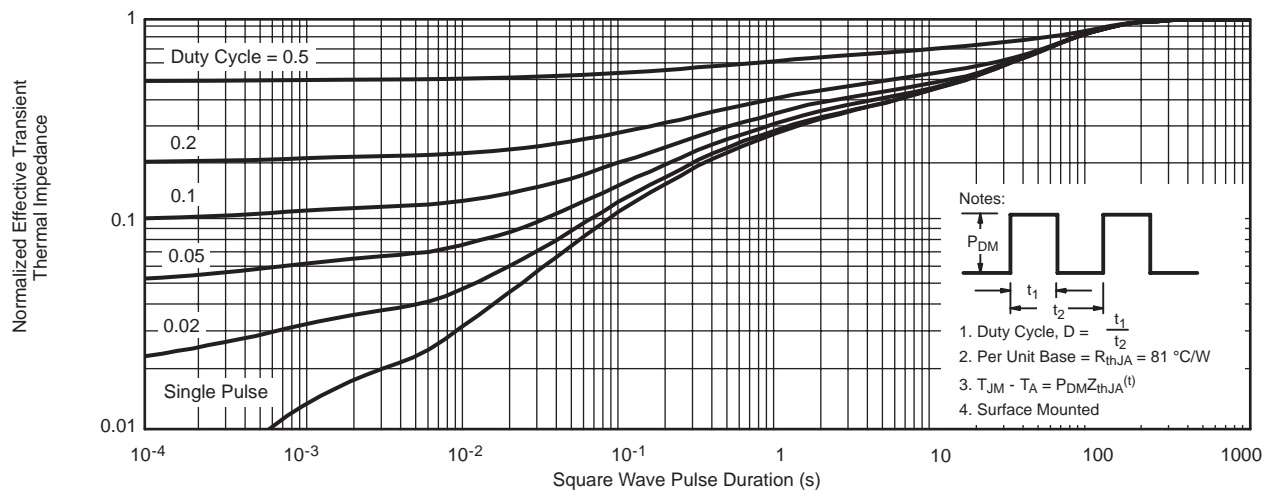
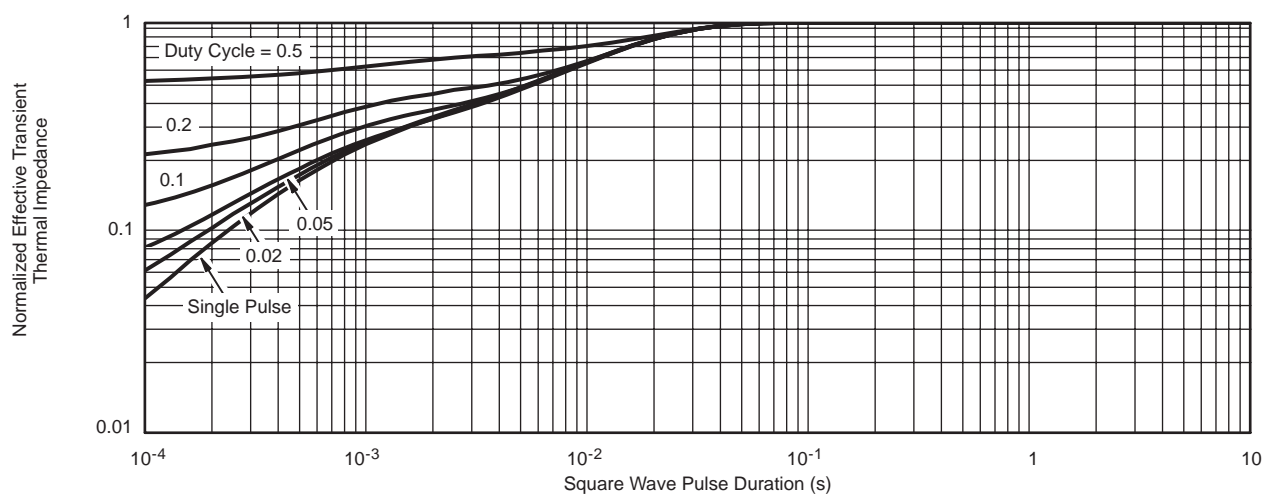
**Single Pulse Power (Junction-to-Ambient)**


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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

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


\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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

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

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

**TO-251AA (DPAK)**



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060
ECN: S-03946—Rev. E, 09-Jul-01 DWG: 5346				

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