# **ON Semiconductor**

# Is Now



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# **Power MOSFET**

# 75 Amps, 60 Volts, N-Channel TO-220 and D<sup>2</sup>PAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

#### **Features**

- These Devices are Pb-Free and are RoHS Compliant
- NTBV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable

#### **Typical Applications**

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

#### MAXIMUM RATINGS (T, I = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	60	Vdc
Drain-to-Gate Voltage ( $R_{GS}$ = 10 $M\Omega$ )	$V_{DGR}$	60	Vdc
Gate-to-Source Voltage - Continuous - Non-Repetitive (t <sub>p</sub> ≤10 ms)	V <sub>GS</sub> V <sub>GS</sub>	±20 ±30	Vdc
Drain Current - Continuous @ $T_A$ = 25°C - Continuous @ $T_A$ = 100°C - Single Pulse ( $t_p \le 10 \ \mu s$ )	I <sub>D</sub> I <sub>D</sub>	75 50 225	Adc Apk
Total Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	214 1.4 2.4	W W/°C W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^{\circ}C$ ( $V_{DD} = 50$ Vdc, $V_{GS} = 10$ Vdc, $L = 0.3$ mH $I_{L(pk)} = 75$ A, $V_{DS} = 60$ Vdc)	E <sub>AS</sub>	844	mJ
Thermal Resistance  - Junction-to-Case  - Junction-to-Ambient	R <sub>θJC</sub> R <sub>θJA</sub>	0.7 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	TL	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

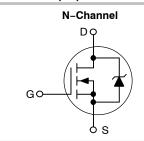


## ON Semiconductor®

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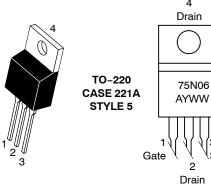
# **75 AMPERES, 60 VOLTS**

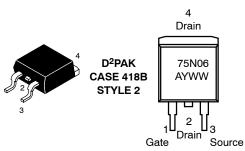
 $R_{DS(on)} = 9.5 \text{ m}\Omega$ 



#### MARKING DIAGRAMS

Source





75N06 = Device Code
A = Assembly Location
Y = Year
WW = Work Week

## **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# **ELECTRICAL CHARACTERISTICS** (T<sub>1</sub> = 25°C unless otherwise noted)

Characteristic			Min	Тур	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage (Note 1) $(V_{GS}=0\ Vdc,\ I_D=250\ \mu Adc)$ Temperature Coefficient (Positive)		V <sub>(BR)DSS</sub>	60 -	71 73	- -	Vdc mV/°C
Zero Gate Voltage Drain Current $(V_{DS} = 60 \text{ Vdc}, V_{GS} = 0 \text{ Vdc})$ $(V_{DS} = 60 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T_J = 150^{\circ}\text{C})$			- -	- -	10 100	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)			-	-	±100	nAdc
ON CHARACTERISTICS (Note 1)						
Gate Threshold Voltage (Note 1) $(V_{DS} = V_{GS}, I_D = 250 \ \mu Adc)$ Threshold Temperature Coefficient (Negative)			2.0	2.8 8.0	4.0 -	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 1) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 37.5 Adc)			-	8.2	9.5	mΩ
Static Drain-to-Source On-Voltage (Note 1) ( $V_{GS}$ = 10 Vdc, $I_D$ = 75 Adc) ( $V_{GS}$ = 10 Vdc, $I_D$ = 37.5 Adc, $T_J$ = 150°C)			- -	0.72 0.63	0.86	Vdc
Forward Transconductance (Note 1)	$(V_{DS} = 15 \text{ Vdc}, I_D = 37.5 \text{ Adc})$	9FS	-	40.2	-	mhos
OYNAMIC CHARACTERISTICS						
Input Capacitance		C <sub>iss</sub>	-	3220	4510	pF
Output Capacitance	(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>oss</sub>	-	1020	1430	
Transfer Capacitance	,	C <sub>rss</sub>	-	234	330	
SWITCHING CHARACTERISTICS (N	ote 2)					
Turn-On Delay Time		t <sub>d(on)</sub>	-	16	25	ns
Rise Time	(V <sub>DD</sub> = 30 Vdc, I <sub>D</sub> = 75 Adc,	t <sub>r</sub>	-	112	155	
Turn-Off Delay Time	$V_{GS}$ = 10 Vdc, $R_G$ = 9.1 $\Omega$ ) (Note 1)	t <sub>d(off)</sub>	-	90	125	
Fall Time		t <sub>f</sub>	-	100	140	1
Gate Charge		Q <sub>T</sub>	-	92	130	nC
	(V <sub>DS</sub> = 48 Vdc, I <sub>D</sub> = 75 Adc, V <sub>GS</sub> = 10 Vdc) (Note 1)	Q <sub>1</sub>	-	14	-	1
	VGS = 10 VGS/ (11010-1)	Q <sub>2</sub>	-	44	-	
OURCE-DRAIN DIODE CHARACT	ERISTICS					
Forward On-Voltage	(I <sub>S</sub> = 75 Adc, V <sub>GS</sub> = 0 Vdc) (Note 1) (I <sub>S</sub> = 75 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	$V_{SD}$	- -	1.0 0.9	1.1 -	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 75 Adc, V <sub>GS</sub> = 0 Vdc, dI <sub>S</sub> /dt = 100 A/μs) (Note 1)	t <sub>rr</sub>	-	77	-	ns
		t <sub>a</sub>	-	49	-	1
		t <sub>b</sub>	-	28	-	1
Reverse Recovery Stored Charge		Q <sub>RR</sub>	-	0.16	-	μС

Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
 Switching characteristics are independent of operating junction temperatures.

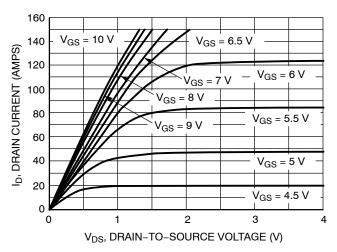


Figure 1. On-Region Characteristics

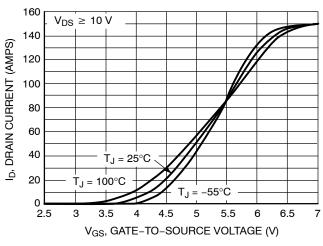


Figure 2. Transfer Characteristics

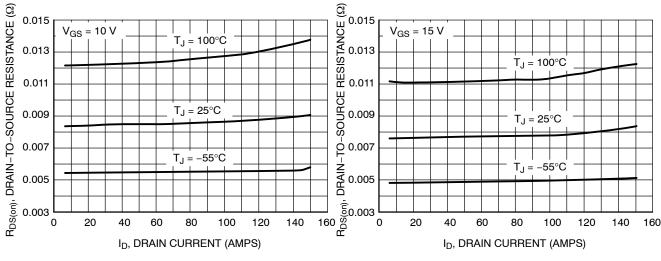


Figure 3. On-Resistance vs. Gate-to-Source Voltage

Figure 5. On–Resistance Variation with Temperature

Figure 4. On-Resistance vs. Drain Current and Gate Voltage

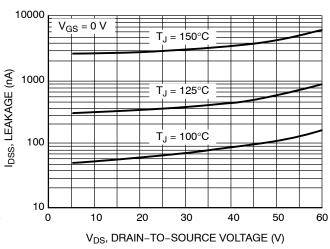


Figure 6. Drain-to-Source Leakage Current vs. Voltage

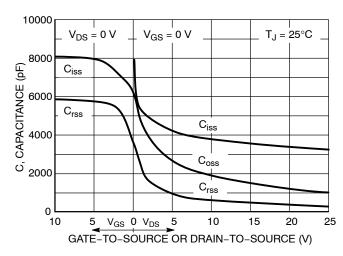


Figure 7. Capacitance Variation

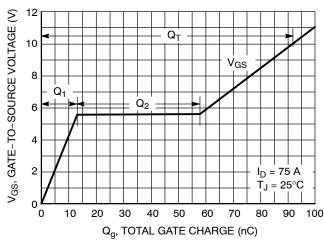


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

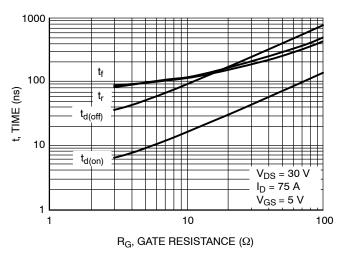


Figure 9. Resistive Switching Time Variations vs. Gate Resistance

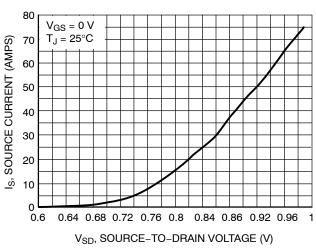


Figure 10. Diode Forward Voltage vs. Current

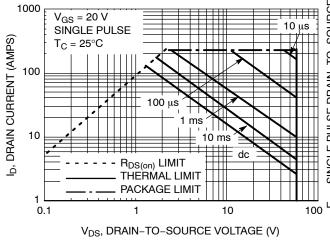


Figure 11. Maximum Rated Forward Biased Safe Operating Area

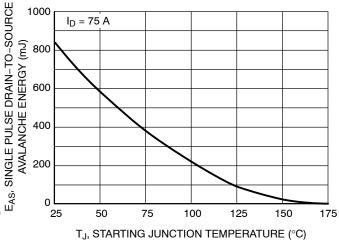


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

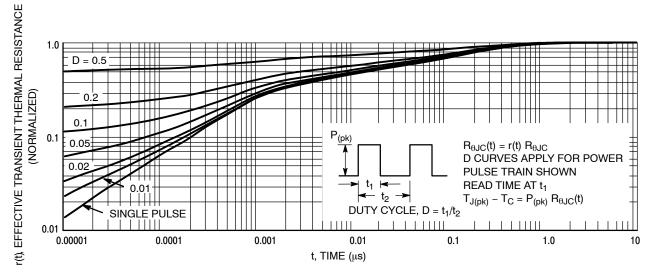


Figure 13. Thermal Response

#### **ORDERING INFORMATION**

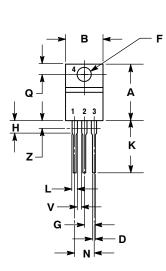
Device	Package	Shipping $^{\dagger}$
NTP75N06G	TO-220 (Pb-Free)	50 Units/Rail
NTB75N06G	D <sup>2</sup> PAK (Pb-Free)	50 Units/Rail
NTB75N06T4G	D <sup>2</sup> PAK (Pb-Free)	800 Tape & Reel
NTBV75N06T4G*	D <sup>2</sup> PAK (Pb-Free)	800 Tape & Reel

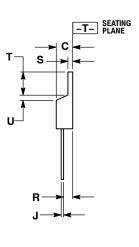
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

<sup>\*</sup>NTBV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

# **PACKAGE DIMENSIONS**

TO-220 CASE 221A-09 ISSUE AG





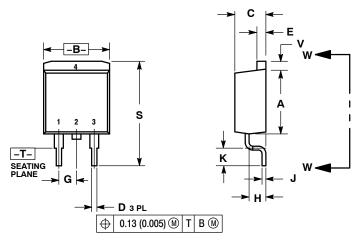
- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	0.160	0.190	4.07	4.82
D	0.025	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
Н	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
5	0.000	0.050	0.00	1.27
٧	0.045		1.15	
Z		0.080		2.04

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

#### **PACKAGE DIMENSIONS**

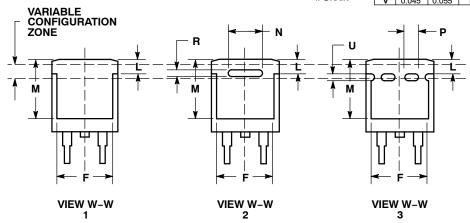
#### D<sup>2</sup>PAK CASE 418B-04 **ISSUE K**



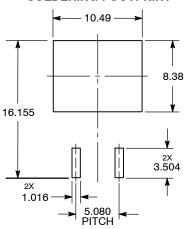
- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

	INCHES		MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	0.340	0.380	8.64	9.65	
В	0.380	0.405	9.65	10.29	
С	0.160	0.190	4.06	4.83	
D	0.020	0.035	0.51	0.89	
E	0.045	0.055	1.14	1.40	
F	0.310	0.350	7.87	8.89	
G	0.100 BSC		2.54 BSC		
Н	0.080	0.110	2.03	2.79	
J	0.018	0.025	0.46	0.64	
K	0.090	0.110	2.29	2.79	
L	0.052	0.072	1.32	1.83	
М	0.280	0.320	7.11	8.13	
N	0.197 REF		5.00 REF		
P	0.079 REF		2.00 REF		
R	0.039 REF		0.99 REF		
S	0.575	0.625	14.60	15.88	
V	0.045	0.055	1 14	1 40	

STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN



### **SOLDERING FOOTPRINT\***



DIMENSIONS: MILLIMETERS

<sup>\*</sup>For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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