

# NDF08N60Z

## N-Channel Power MOSFET 600 V, 0.95 $\Omega$

### Features

- Low ON Resistance
- Low Gate Charge
- ESD Diode-Protected Gate
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

Rating	Symbol	NDF08N60Z	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	600	V
Continuous Drain Current R <sub>θJC</sub> (Note 1)	I <sub>D</sub>	8.4	A
Continuous Drain Current R <sub>θJC</sub> T <sub>A</sub> = 100°C (Note 1)	I <sub>D</sub>	5.3	A
Pulsed Drain Current, V <sub>GS</sub> @ 10 V	I <sub>DM</sub>	30	A
Power Dissipation	P <sub>D</sub>	36	W
Gate-to-Source Voltage	V <sub>GS</sub>	$\pm 30$	V
Single Pulse Avalanche Energy, I <sub>D</sub> = 7.5 A	E <sub>AS</sub>	235	mJ
ESD (HBM) (JESD 22-A114)	V <sub>esd</sub>	4000	V
RMS Isolation Voltage (t = 0.3 sec., R.H. $\leq$ 30%, T <sub>A</sub> = 25°C) (Figure 14)	V <sub>ISO</sub>	4500	V
Peak Diode Recovery (Note 2)	dv/dt	4.5	V/ns
Continuous Source Current (Body Diode)	I <sub>S</sub>	7.5	A
Maximum Temperature for Soldering Leads	T <sub>L</sub>	260	°C
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

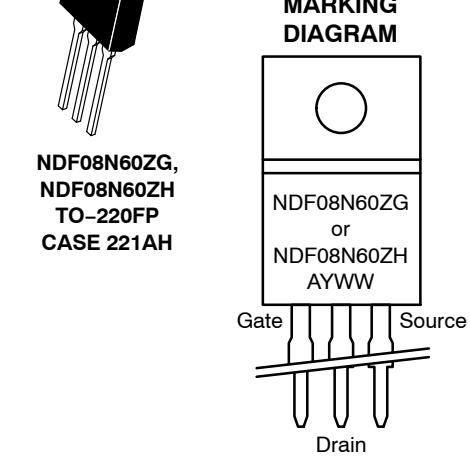
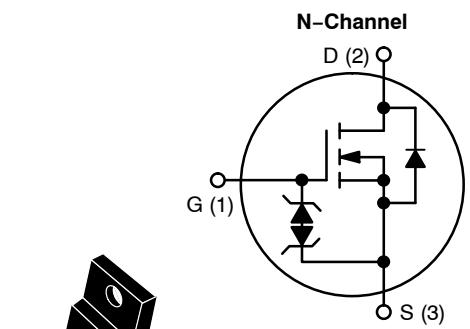
1. Limited by maximum junction temperature
2. I<sub>D</sub>  $\leq$  7.5 A, di/dt  $\leq$  200 A/μs, V<sub>DD</sub>  $\leq$  BV<sub>DSS</sub>, T<sub>J</sub>  $\leq$  150°C.



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

V <sub>DSS</sub>	R <sub>DSON</sub> (MAX) @ 3.5 A
600 V	0.95 $\Omega$



A = Location Code  
Y = Year  
WW = Work Week  
G, H = Pb-Free, Halogen-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# NDF08N60Z

## THERMAL RESISTANCE

Parameter	Symbol	NDF08N60Z	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.5	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient Steady State (Note 3)	$R_{\theta JA}$	50	

3. Insertion mounted

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$	$BV_{DSS}$	600			V
Breakdown Voltage Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D = 1 \text{ mA}$	$\Delta BV_{DSS}/\Delta T_J$		0.6		$^{\circ}\text{C}/\text{V}$
Drain-to-Source Leakage Current	$V_{DS} = 600 \text{ V}$ , $V_{GS} = 0 \text{ V}$	$I_{DSS}$		1		$\mu\text{A}$
				50		
Gate-to-Source Forward Leakage	$V_{GS} = \pm 20 \text{ V}$	$I_{GSS}$		$\pm 10$		$\mu\text{A}$

### ON CHARACTERISTICS (Note 4)

Static Drain-to-Source On-Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 3.5 \text{ A}$	$R_{DS(on)}$		0.82	0.95	$\Omega$
Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 100 \mu\text{A}$	$V_{GS(th)}$	3.0	3.9	4.5	V
Forward Transconductance	$V_{DS} = 15 \text{ V}$ , $I_D = 3.5 \text{ A}$	$g_{FS}$		6.3		S

### DYNAMIC CHARACTERISTICS

Input Capacitance (Note 5)	$V_{DS} = 25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$	$C_{iss}$	913	1140	1370	pF
Output Capacitance (Note 5)		$C_{oss}$	105	129	160	
Reverse Transfer Capacitance (Note 5)		$C_{rss}$	20	30	40	
Total Gate Charge (Note 5)	$V_{DD} = 300 \text{ V}$ , $I_D = 7.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_g$	20	39	58	nC
Gate-to-Source Charge (Note 5)		$Q_{gs}$	4	7.5	11.5	
Gate-to-Drain ("Miller") Charge (Note 5)		$Q_{gd}$	10	21	31	
Plateau Voltage		$V_{GP}$		6.2		V
Gate Resistance		$R_g$		1.6		$\Omega$

### RESISTIVE SWITCHING CHARACTERISTICS

Turn-On Delay Time	$V_{DD} = 300 \text{ V}$ , $I_D = 7.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 5 \Omega$	$t_{d(on)}$		14		ns
Rise Time		$t_r$		22		
Turn-Off Delay Time		$t_{d(off)}$		36		
Fall Time		$t_f$		15		

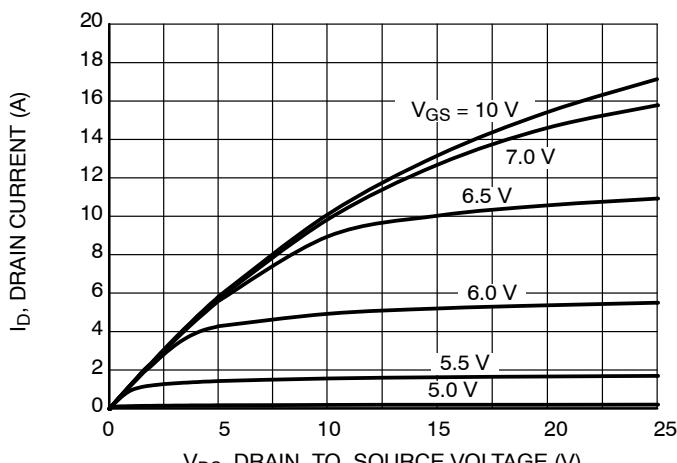
### SOURCE-DRAIN DIODE CHARACTERISTICS ( $T_C = 25^{\circ}\text{C}$ unless otherwise noted)

Diode Forward Voltage	$I_S = 7.5 \text{ A}$ , $V_{GS} = 0 \text{ V}$	$V_{SD}$		1.6	V
Reverse Recovery Time	$V_{GS} = 0 \text{ V}$ , $V_{DD} = 30 \text{ V}$	$t_{rr}$		320	
Reverse Recovery Charge		$Q_{rr}$		2.2	$\mu\text{C}$

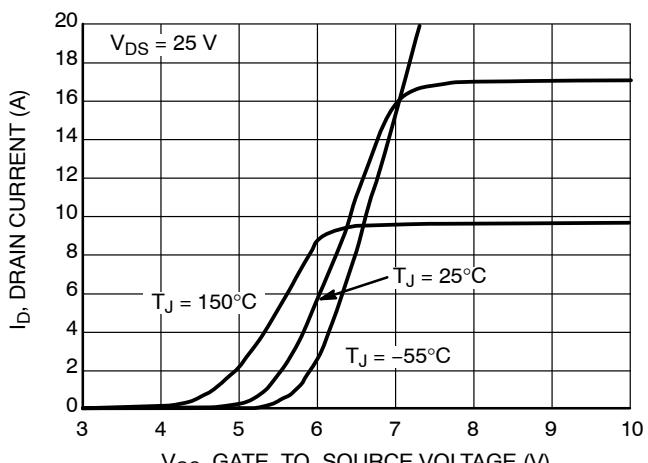
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Width  $\leq 380 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
5. Guaranteed by design.

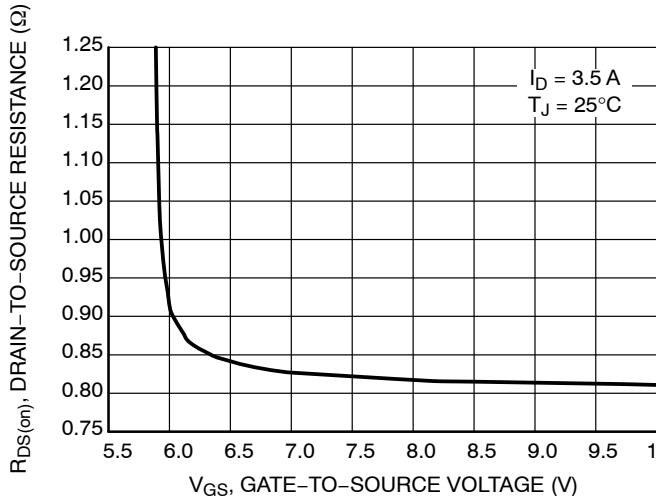
**TYPICAL CHARACTERISTICS**



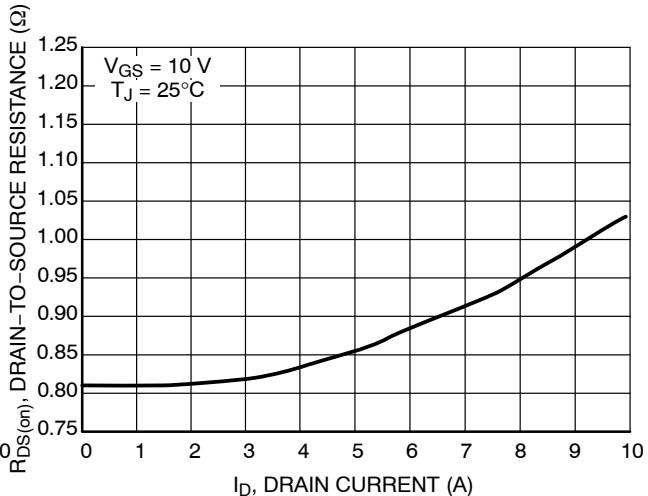
**Figure 1. On-Region Characteristics**



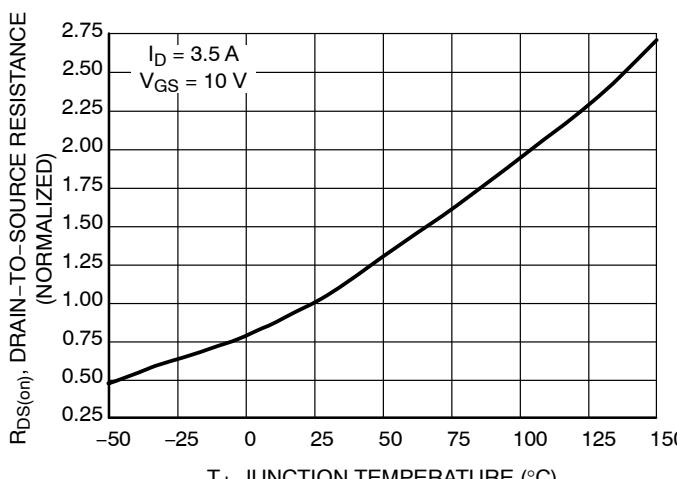
**Figure 2. Transfer Characteristics**



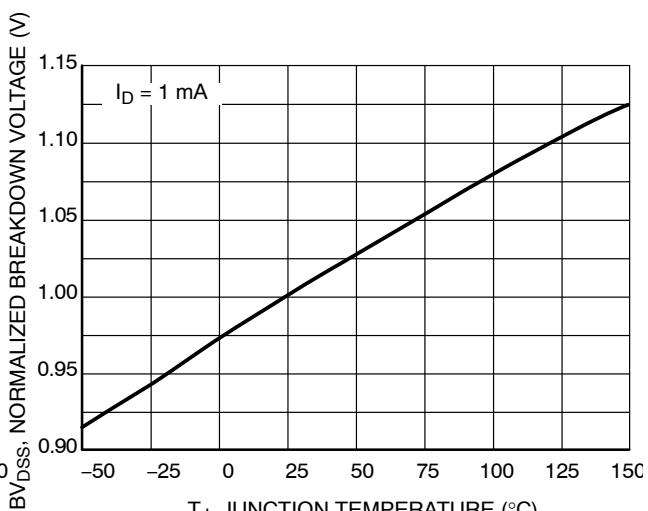
**Figure 3. On-Region versus Gate-to-Source Voltage**



**Figure 4. On-Resistance versus Drain Current and Gate Voltage**

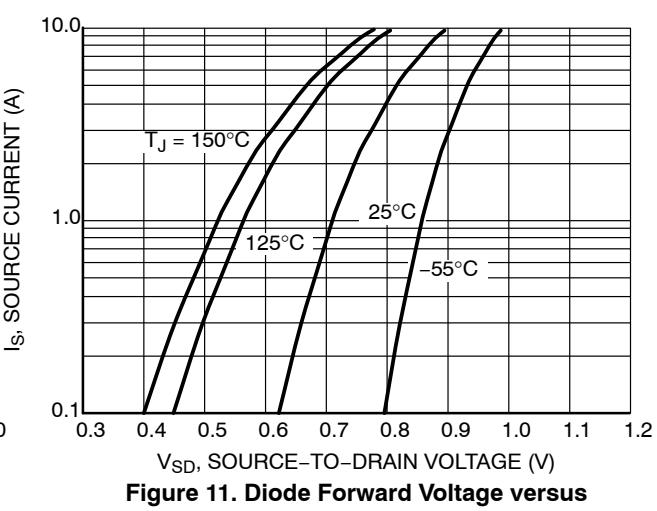
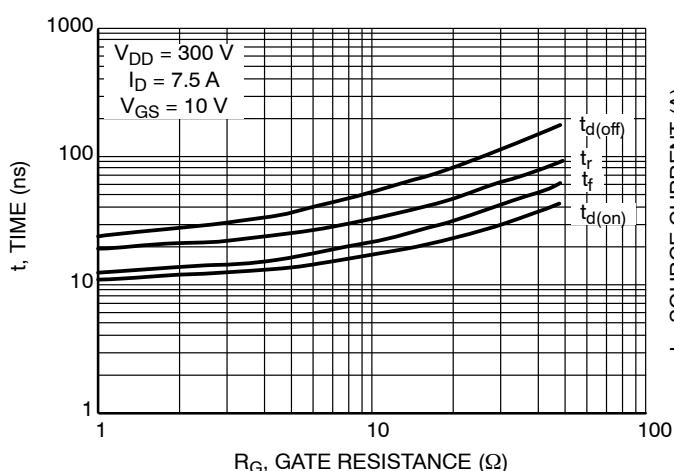
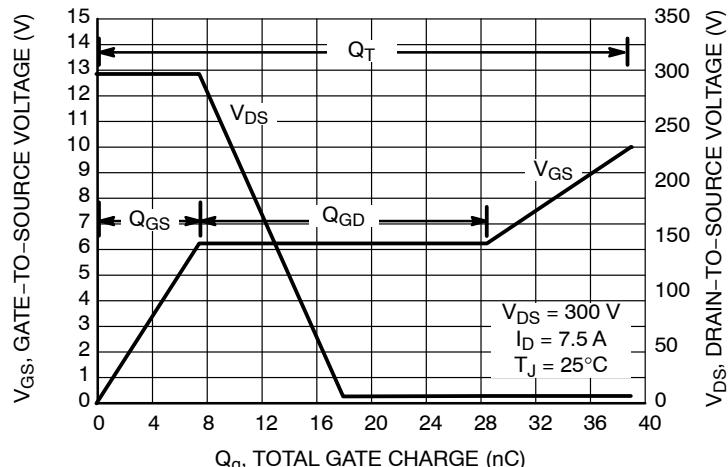
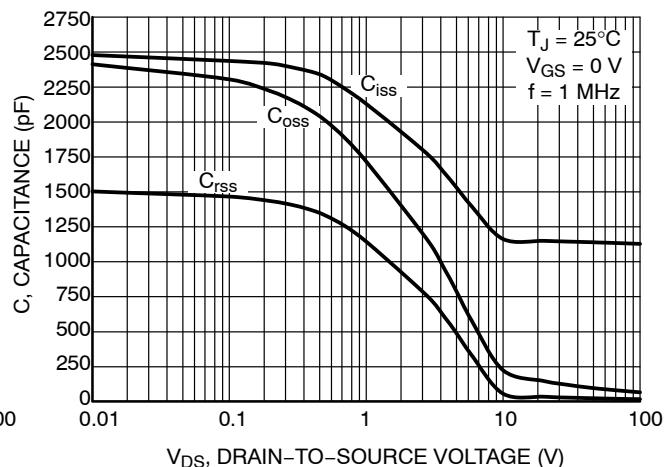
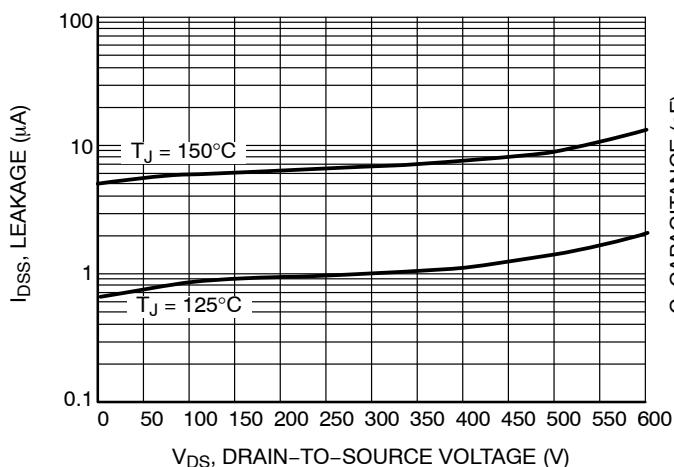


**Figure 5. On-Resistance Variation with Temperature**

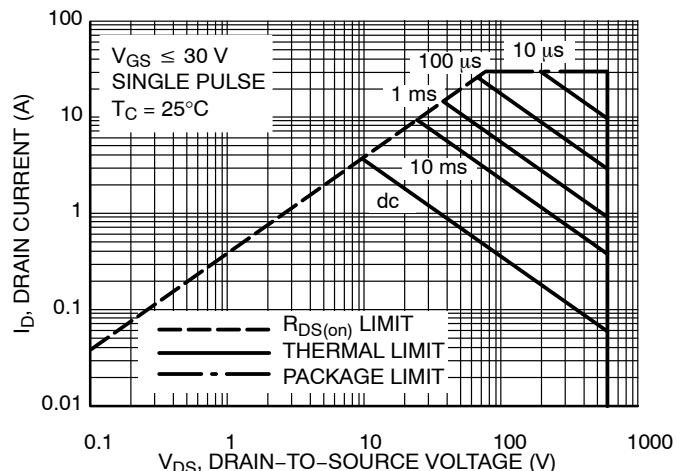


**Figure 6.  $BV_{DSS}$  Variation with Temperature**

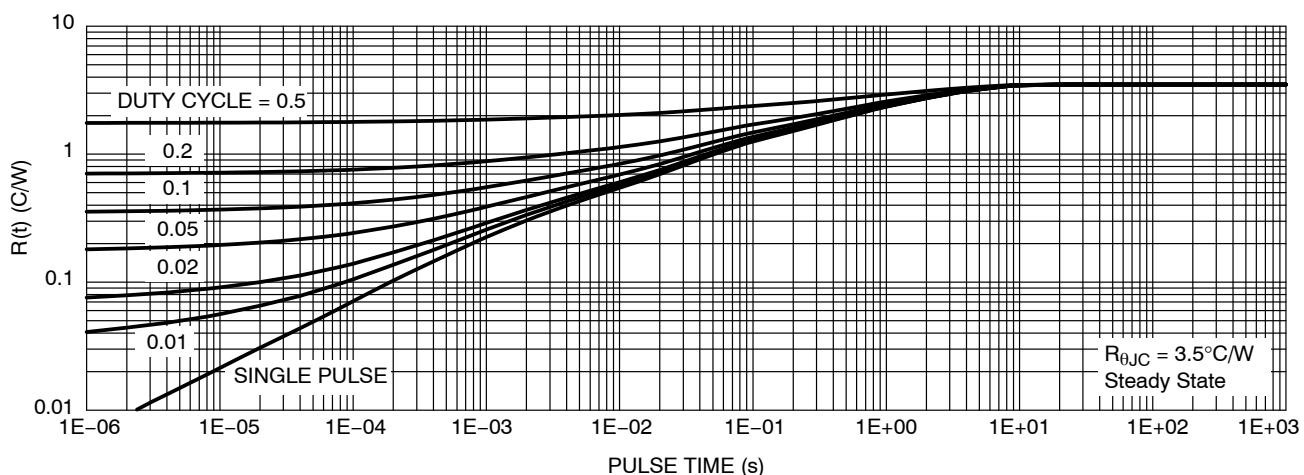
**TYPICAL CHARACTERISTICS**



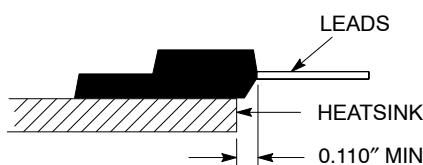
# NDF08N60Z



**Figure 12. Maximum Rated Forward Biased Safe Operating Area NDF08N60Z**



**Figure 13. Thermal Impedance (Junction-to-Case) for NDF08N60Z**



**Figure 14. Isolation Test Diagram**

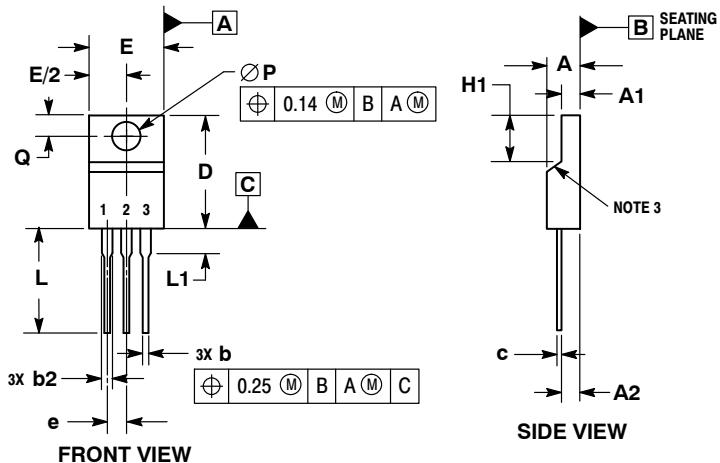
Measurement made between leads and heatsink with all leads shorted together.

\*For additional mounting information, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## ORDERING INFORMATION

Order Number	Package	Shipping
NDF08N60ZG	TO-220FP (Pb-Free, Halogen-Free)	50 Units / Rail
NDF08N60ZH	TO-220FP (Pb-Free, Halogen-Free)	50 Units / Rail

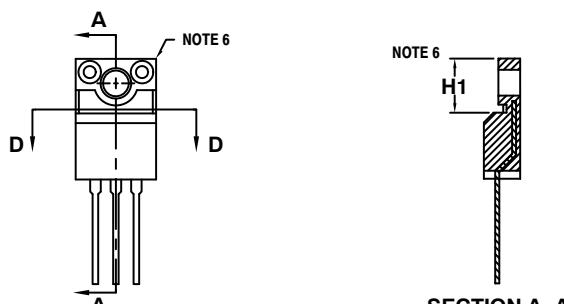
## PACKAGE DIMENSIONS

TO-220 FULLPACK, 3-LEAD  
CASE 221AH  
ISSUE F

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR UNCONTROLLED IN THIS AREA.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH AND GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.00.
6. CONTOURS AND FEATURES OF THE MOLDED PACKAGE BODY MAY VARY WITHIN THE ENVELOP DEFINED BY DIMENSIONS A1 AND H1 FOR MANUFACTURING PURPOSES.

DIM	MILLIMETERS	
	MIN	MAX
A	4.30	4.70
A1	2.50	2.90
A2	2.50	2.90
b	0.54	0.84
b2	1.10	1.40
c	0.49	0.79
D	14.70	15.30
E	9.70	10.30
e	2.54 BSC	
H1	6.60	7.10
L	12.50	14.73
L1	---	2.80
P	3.00	3.40
Q	2.80	3.20



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