NDF08N60Z

N-Channel Power MOSFET 600 V, 0.95 Ω

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_C = 25°C unless otherwise noted)

Rating	Symbol	NDF08N60Z	Unit
Drain−to−Source Voltage	V_{DSS}	600	V
Continuous Drain Current $R_{\theta JC}$ (Note 1)	I_D	8.4	A
Continuous Drain Current $R_{\theta JC}$ T_A = 100°C (Note 1)	I_D	5.3	A
Pulsed Drain Current, V_{GS} @ 10 V	I_{DM}	30	A
Power Dissipation	P_D	36	W
Gate−to−Source Voltage	V_{GS}	±30	V
Single Pulse Avalanche Energy, I_D = 7.5 A	E_{AS}	235	mJ
ESD (HBM) (JESD 22−A114)	V_{esd}	4000	V
RMS Isolation Voltage (t = 0.3 sec., R.H. ≤ 30%, T_A = 25°C) (Figure 14)	V_{ISO}	4500	V
Peak Diode Recovery (Note 2)	dv/dt	4.5	V/ns
Continuous Source Current (Body Diode)	I_S	7.5	A
Maximum Temperature for Soldering Leads	T_L	260	°C
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−55 to 150	°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.

1. Limited by maximum junction temperature
2. $I_D \le 7.5$ A, di/dt ≤ 200 A/μs, $V_{DD} \le BV_{DSS}$, $T_J \le 150$°C.

ON Semiconductor®

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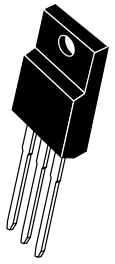
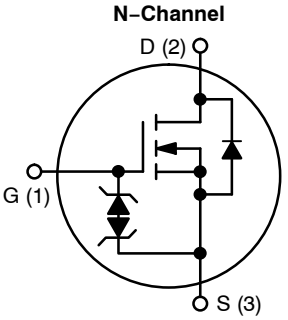
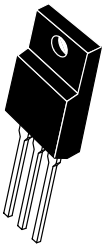
V_{DSS}	$R_{DS(ON)}$ (MAX) @ 3.5 A
600 V	0.95 Ω



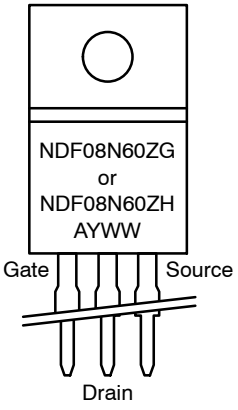
NDF08N60ZG
TO−220FP
CASE 221D





NDF08N60ZH
TO−220FP
CASE 221AH

MARKING DIAGRAM



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

ORDERING INFORMATION

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

THERMAL RESISTANCE

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

3. Insertion mounted

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Test Conditions		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA		BV_{DSS}	600			V
Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D = 1 mA		$\Delta BV_{DSS}/\Delta T_J$		0.6		V/°C
Drain−to−Source Leakage Current	V_{DS} = 600 V, V_{GS} = 0 V	25°C	I_{DSS}			1	μA
		125°C				50	
Gate−to−Source Forward Leakage	V_{GS} = ±20 V		I_{GSS}			±10	μA
ON CHARACTERISTICS (Note 4)							
Static Drain−to−Source On−Resistance	V_{GS} = 10 V, I_D = 3.5 A		$R_{DS(on)}$		0.82	0.95	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 100 μA		$V_{GS(th)}$	3.0	3.9	4.5	V
Forward Transconductance	V_{DS} = 15 V, I_D = 3.5 A		g_{FS}		6.3		S
DYNAMIC CHARACTERISTICS							
Input Capacitance (Note 5)	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 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 V, I_D = 7.5 A, V_{GS} = 10 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		Ω
RESISTIVE SWITCHING CHARACTERISTICS							
Turn−On Delay Time	V_{DD} = 300 V, I_D = 7.5 A, V_{GS} = 10 V, R_G = 5 Ω		$t_{d(on)}$		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°C unless otherwise noted)

Diode Forward Voltage	I_S = 7.5 A, V_{GS} = 0 V	V_{SD}			1.6	V
Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 30 V, I_S = 7.5 A, di/dt = 100 A/μs	t_{rr}		320		ns
Reverse Recovery Charge		Q_{rr}		2.2		μC

4. Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%.
5. Guaranteed by design.

TYPICAL CHARACTERISTICS

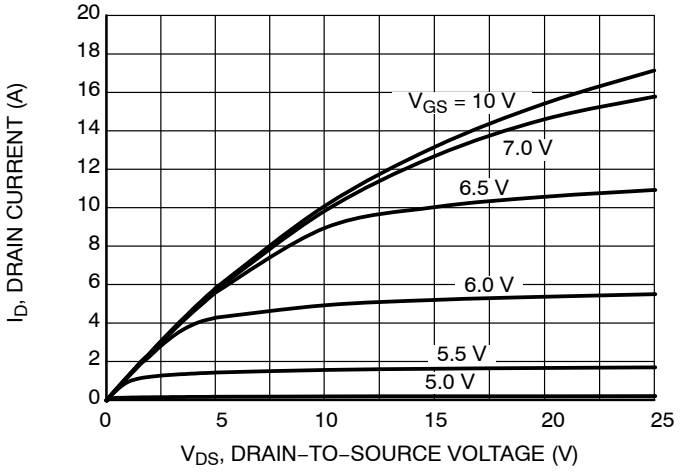


Figure 1. On−Region Characteristics

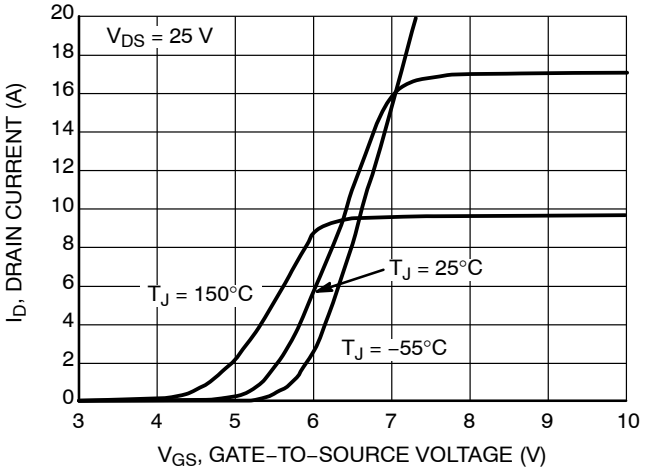


Figure 2. Transfer Characteristics

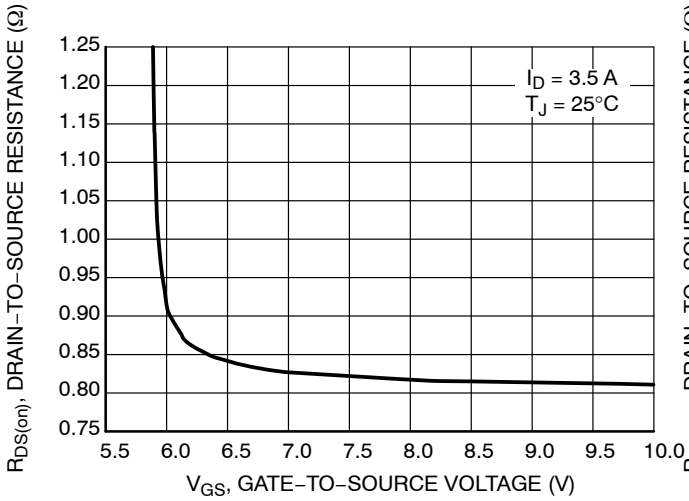


Figure 3. On−Region versus Gate−to−Source Voltage

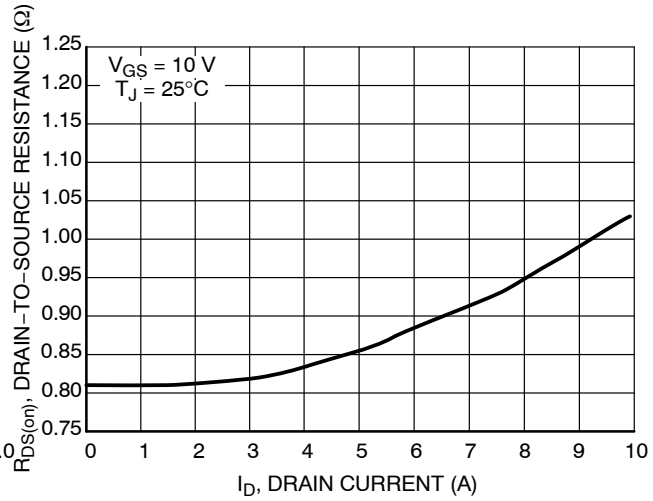


Figure 4. On−Resistance versus Drain Current and Gate Voltage

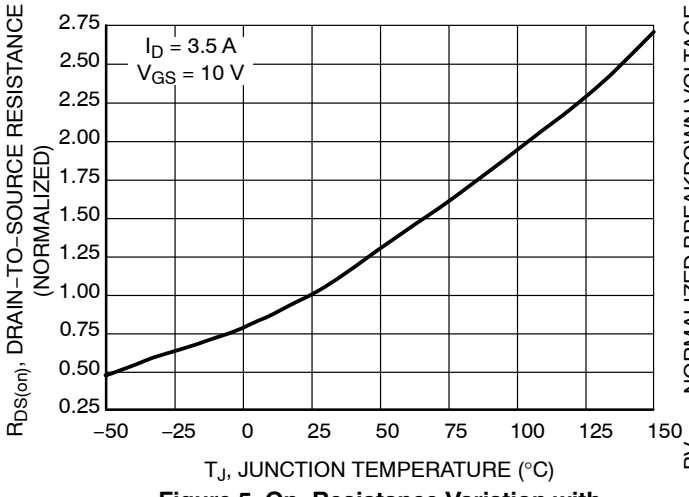


Figure 5. On−Resistance Variation with Temperature

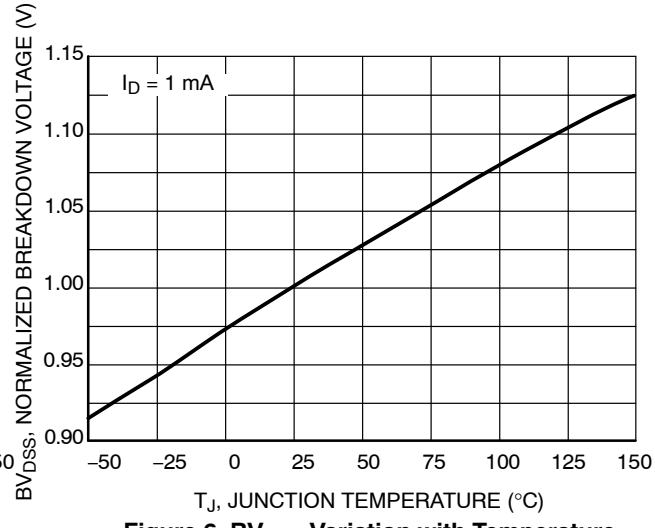


Figure 6. BV_{DSS} Variation with Temperature

TYPICAL CHARACTERISTICS

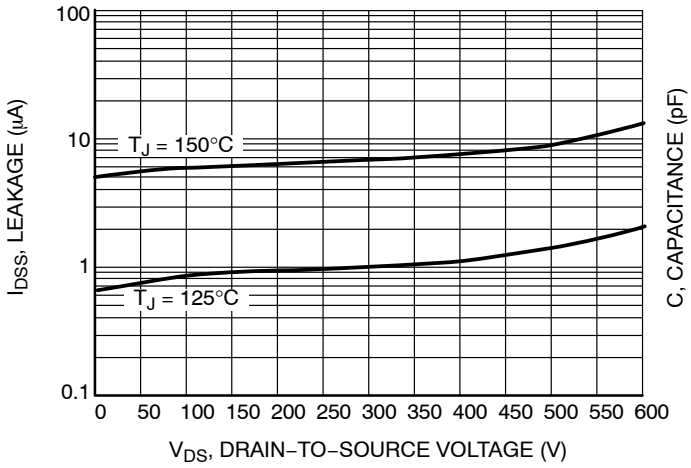


Figure 7. Drain−to−Source Leakage Current versus Voltage

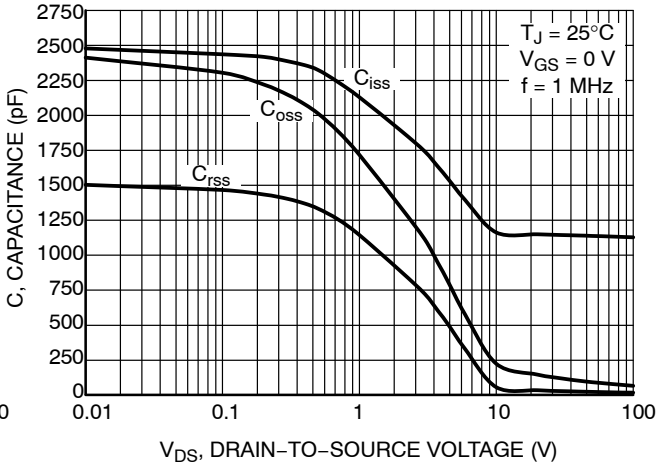


Figure 8. Capacitance Variation

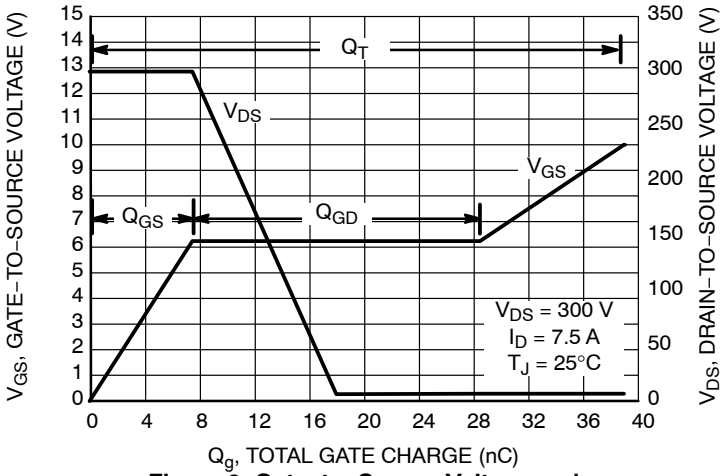


Figure 9. Gate−to−Source Voltage and Drain−to−Source Voltage versus Total Charge

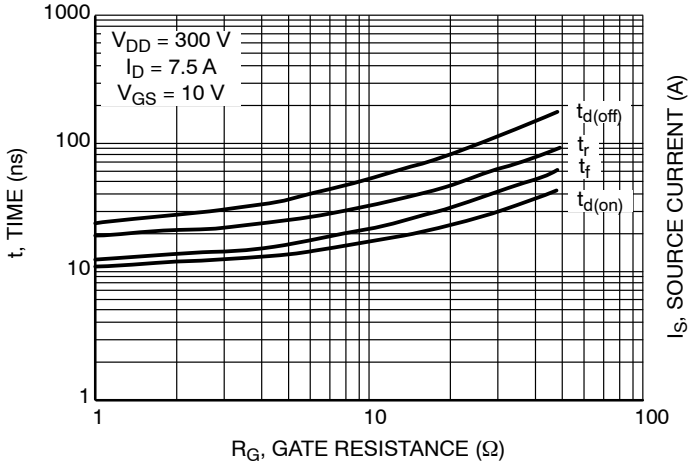


Figure 10. Resistive Switching Time Variation versus Gate Resistance

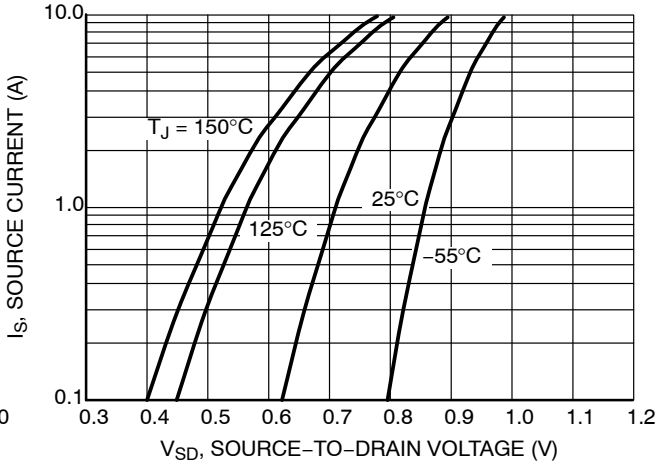


Figure 11. Diode Forward Voltage versus Current

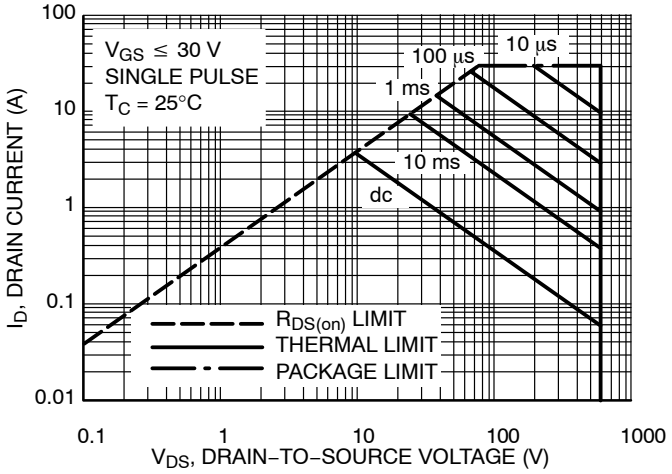


Figure 12. Maximum Rated Forward Biased Safe Operating Area NDF08N60Z

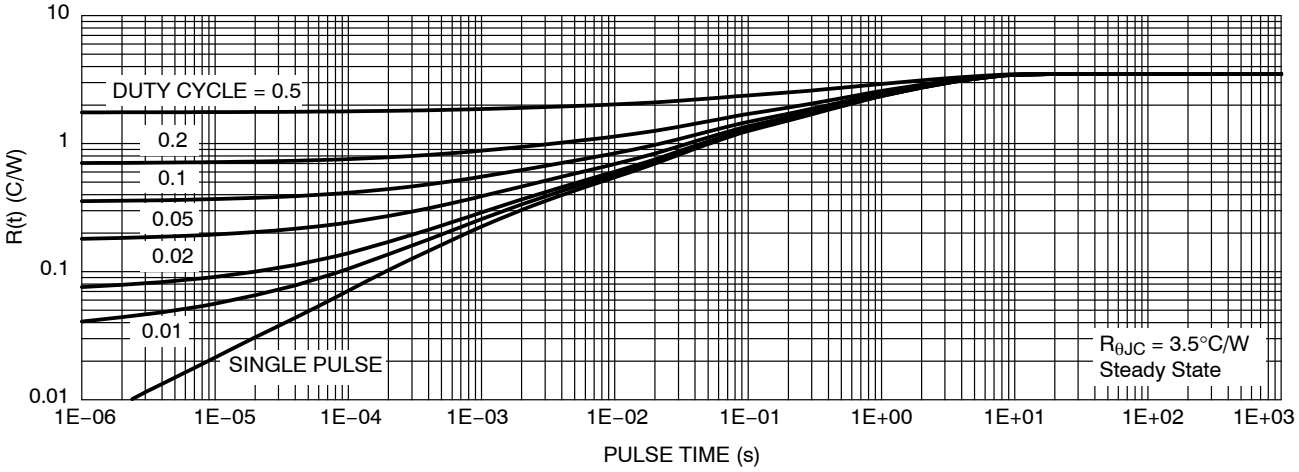


Figure 13. Thermal Impedance (Junction−to−Case) for NDF08N60Z

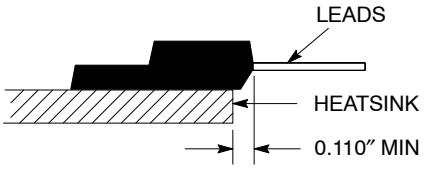


Figure 14. Isolation Test Diagram

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

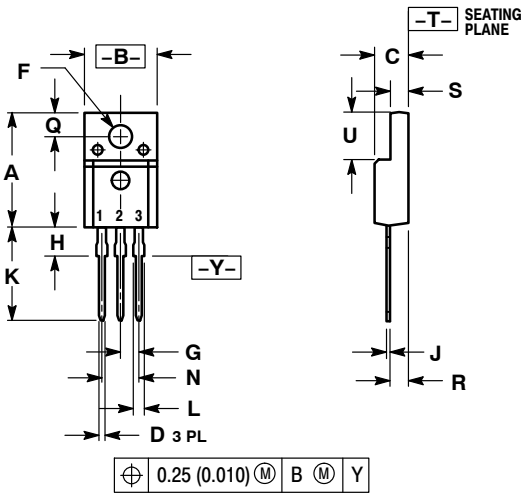
*For additional mounting information, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

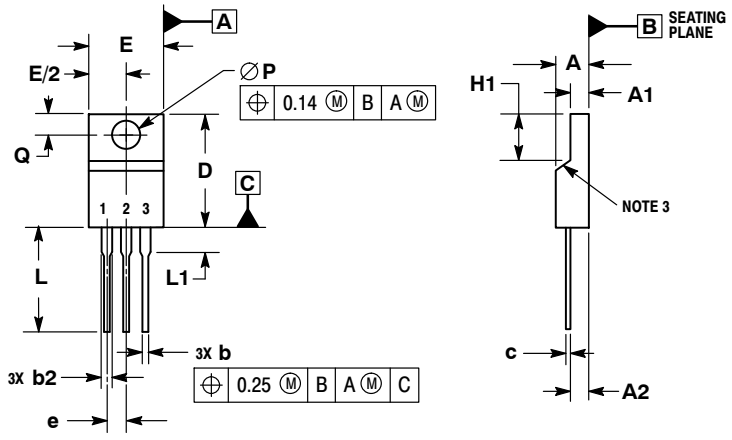
TO−220 FULLPAK
CASE 221D−03
ISSUE K



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D−01 THRU 221D−02 OBSOLETE, NEW STANDARD 221D−03.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.617	0.635	15.67	16.12
B	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54 BSC	
H	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88

TO−220 FULLPACK, 3−LEAD
CASE 221AH
ISSUE D



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.

	MILLIMETERS	
DIM	MIN	MAX
A	4.30	4.70
A1	2.50	2.90
A2	2.50	2.70
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	6.70	7.10
L	12.70	14.73
L1	---	2.10
P	3.00	3.40
Q	2.80	3.20

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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Email: orderlit@onsemi.com

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Japan Customer Focus Center
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