

NDD03N80Z, NDF03N80Z

N-Channel Power MOSFET 800 V, 4.5 Ω

Features

- ESD Diode-Protected Gate
- 100% Avalanche Tested
- 100% R_g 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	NDD	NDF	Unit
Drain-to-Source Voltage	V _{DSS}	800		V
Continuous Drain Current R _{θJC}	I _D	2.9	3.3 (Note 1)	A
Continuous Drain Current R _{θJC} , T _A = 100°C	I _D	1.9	2.1 (Note 1)	A
Pulsed Drain Current, V _{GS} @ 10 V	I _{DM}	12	13	A
Power Dissipation R _{θJC}	P _D	96	25	W
Gate-to-Source Voltage	V _{GS}	±30		V
Single Pulse Avalanche Energy, I _D = 2.5 A	E _{AS}	100		mJ
ESD (HBM) (JESD22-A114)	V _{esd}	2300		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	3.3		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_S = 3.3 A, di/dt ≤ 100 A/μs, V_{DD} ≤ BV_{DSS}, T_J = +150°C

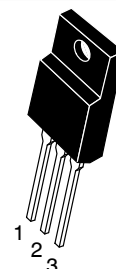
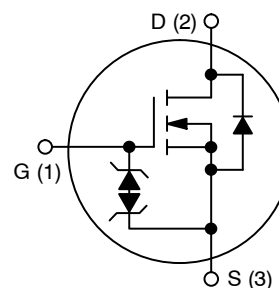


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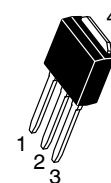
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V _{(BR)DSS}	R _{DS(ON)} MAX
800 V	4.5 Ω @ 10 V

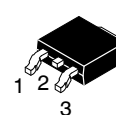
N-Channel



NDF03N80ZH
TO-220FP
CASE 221AH



NDD03N80Z-1G
IPAK
CASE 369D



NDD03N80ZT4G
DPAK
CASE 369AA

MARKING AND ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	NDF03N80Z 4.0 NDD03N80Z 1.3	°C/W
Junction-to-Ambient Steady State	$R_{\theta JA}$	(Note 3) NDF03N80Z 50 (Note 4) NDD03N80Z 33 (Note 3) NDD03N80Z-1 96	

3. Insertion mounted

4. Surface mounted on FR4 board using 1" sq. pad size (Cu area = 1.127" sq [2 oz] including traces).

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	800			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	Reference to 25°C , $I_D = 1\text{ mA}$		870		mV/°C
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		50	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$			± 10	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 50\text{ }\mu\text{A}$	3.0	4.1	4.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	Reference to 25°C , $I_D = 50\text{ }\mu\text{A}$		11		mV/°C
Static Drain-to-Source On Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 1.2\text{ A}$		3.7	4.5	Ω
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 1.2\text{ A}$		2.1		S

DYNAMIC CHARACTERISTICS

Input Capacitance (Note 6)	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		440		pF
Output Capacitance (Note 6)	C_{oss}			52		
Reverse Transfer Capacitance (Note 6)	C_{rss}			9.0		
Total Gate Charge (Note 6)	Q_g	$V_{DS} = 400\text{ V}, I_D = 3.3\text{ A}, V_{GS} = 10\text{ V}$		17		nC
Gate-to-Source Charge (Note 6)	Q_{gs}			3.5		
Gate-to-Drain ("Miller") Charge (Note 6)	Q_{gd}			9.1		
Plateau Voltage	V_{GP}			6.5		V
Gate Resistance	R_g			5.5		Ω

RESISTIVE SWITCHING CHARACTERISTICS (Note 7)

Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400\text{ V}, I_D = 3.3\text{ A}, V_{GS} = 10\text{ V}, R_G = 0\text{ }\Omega$		9.0		ns
Rise Time	t_r			7.0		
Turn-off Delay Time	$t_{d(off)}$			17		
Fall Time	t_f			9.0		

SOURCE-DRAIN DIODE CHARACTERISTICS

Diode Forward Voltage	V _{SD}	I _S = 3.0 A, V _{GS} = 0 V	T _J = 25°C		0.9	1.6	V
			T _J = 100°C		0.8		
Reverse Recovery Time	t _{rr}	V _{GS} = 0 V, V _{DD} = 30 V I _S = 3.3 A, d _i /d _t = 100 A/μs			360		ns
Charge Time	t _a				81		
Discharge Time	t _b				280		
Reverse Recovery Charge	Q _{rr}				1.3		nC

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

6. Guaranteed by design.

7. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

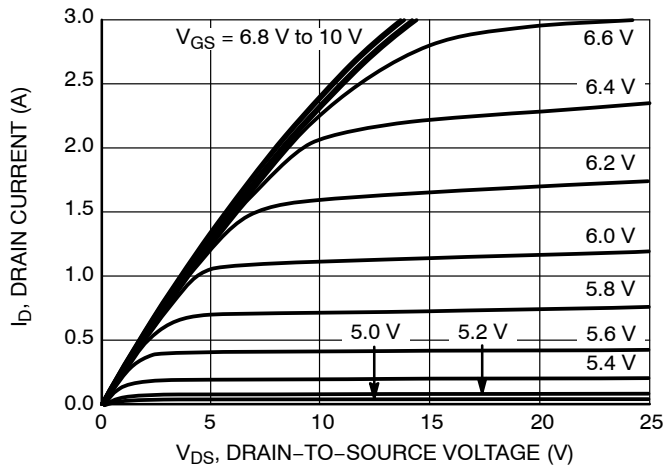


Figure 1. On-Region Characteristics

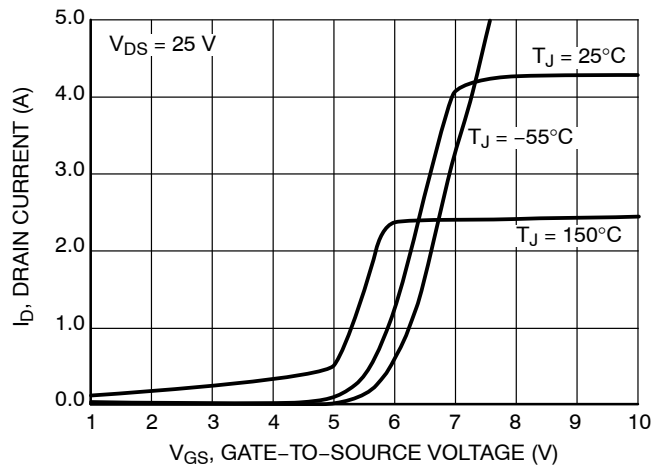


Figure 2. Transfer Characteristics

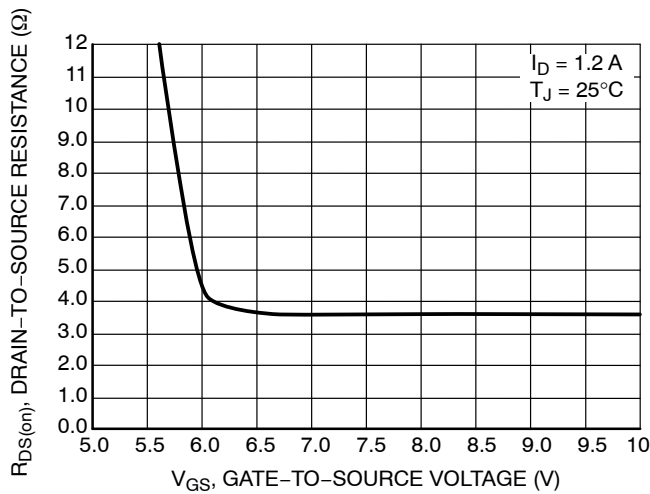


Figure 3. On-Region versus Gate-to-Source Voltage

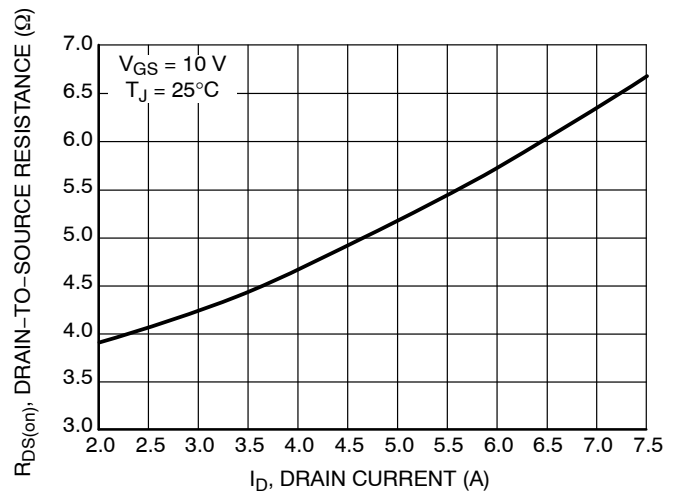


Figure 4. On-Resistance versus Drain Current and Gate Voltage

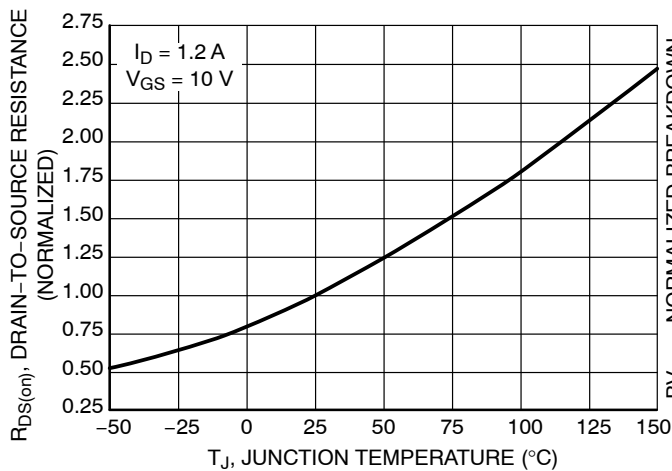


Figure 5. On-Resistance Variation with Temperature

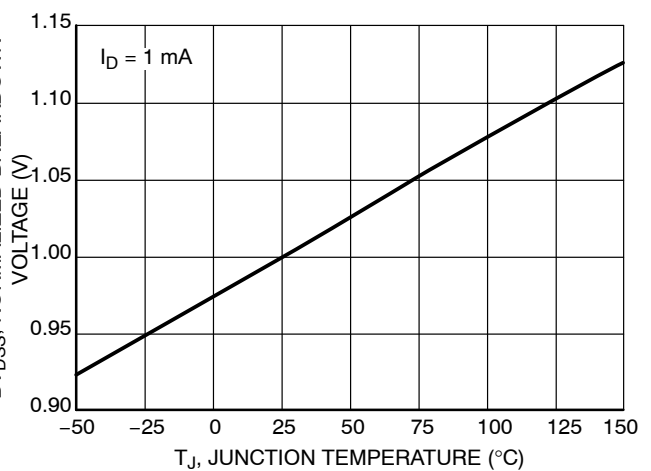


Figure 6. BV_{DSS} Variation with Temperature

TYPICAL CHARACTERISTICS

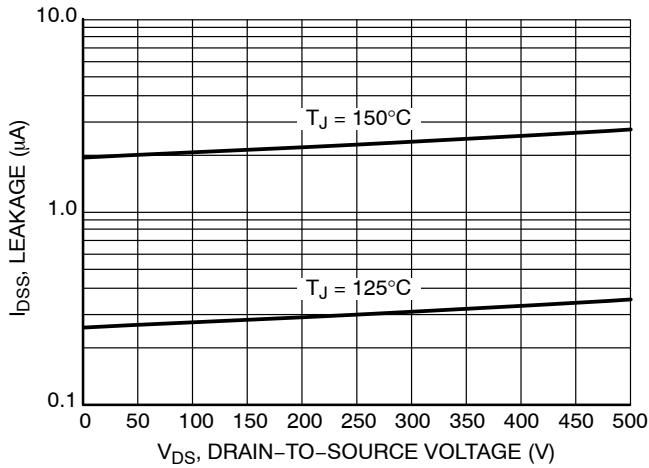


Figure 7. Drain-to-Source Leakage Current versus Voltage

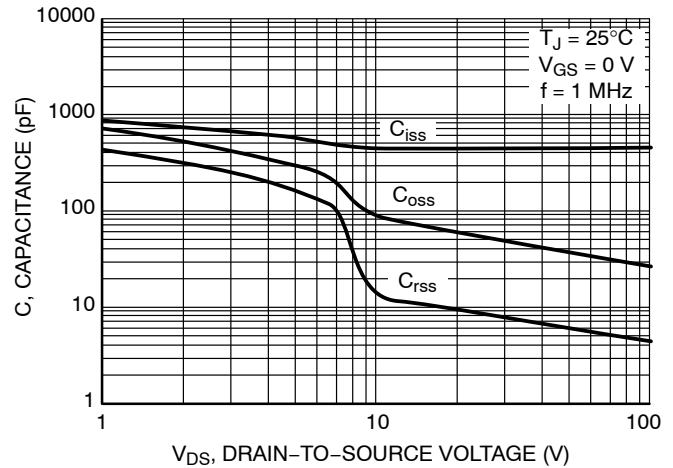


Figure 8. Capacitance Variation

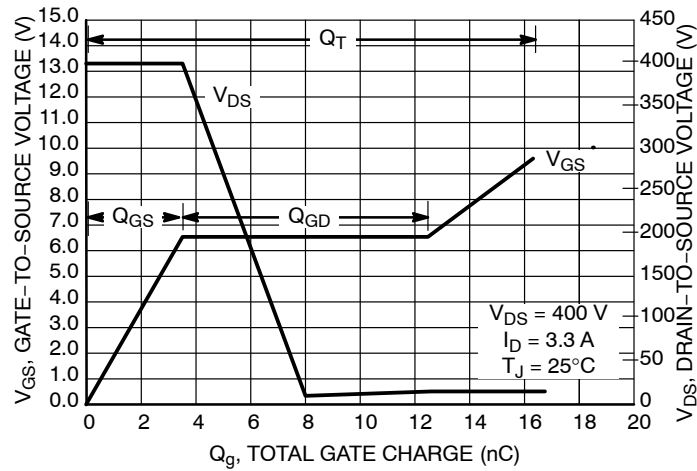


Figure 9. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

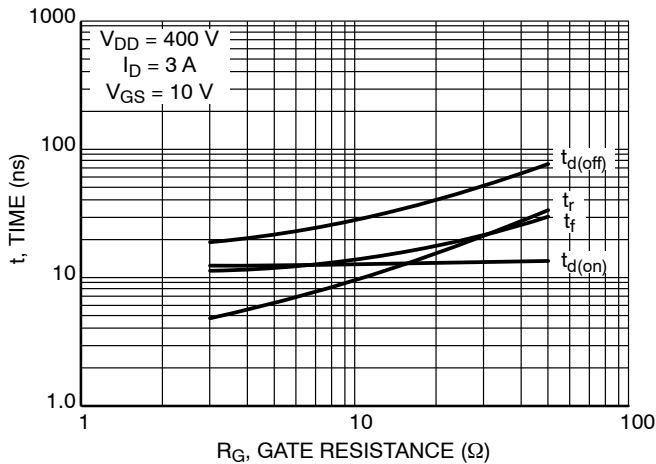


Figure 10. Resistive Switching Time Variation versus Gate Resistance

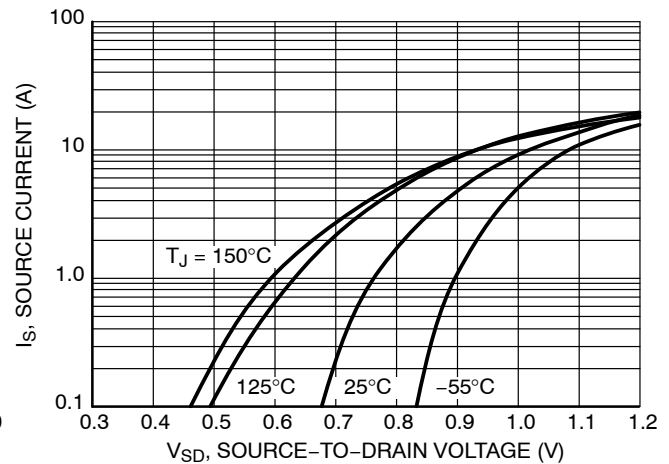


Figure 11. Diode Forward Voltage versus Current

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TYPICAL CHARACTERISTICS

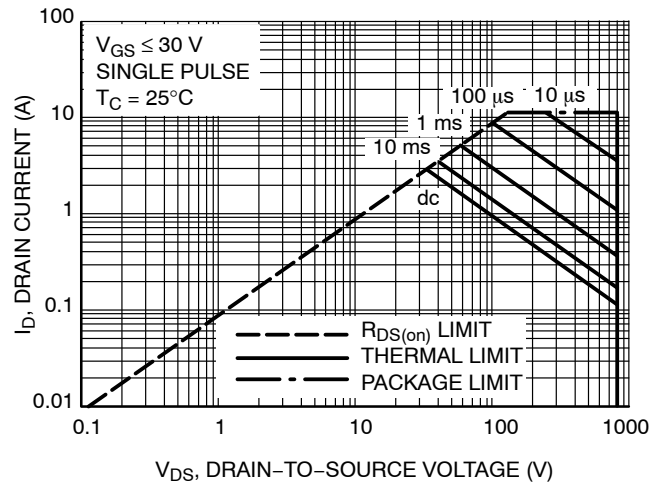


Figure 12. Maximum Rated Forward Biased Safe Operating Area – NDD03N80Z

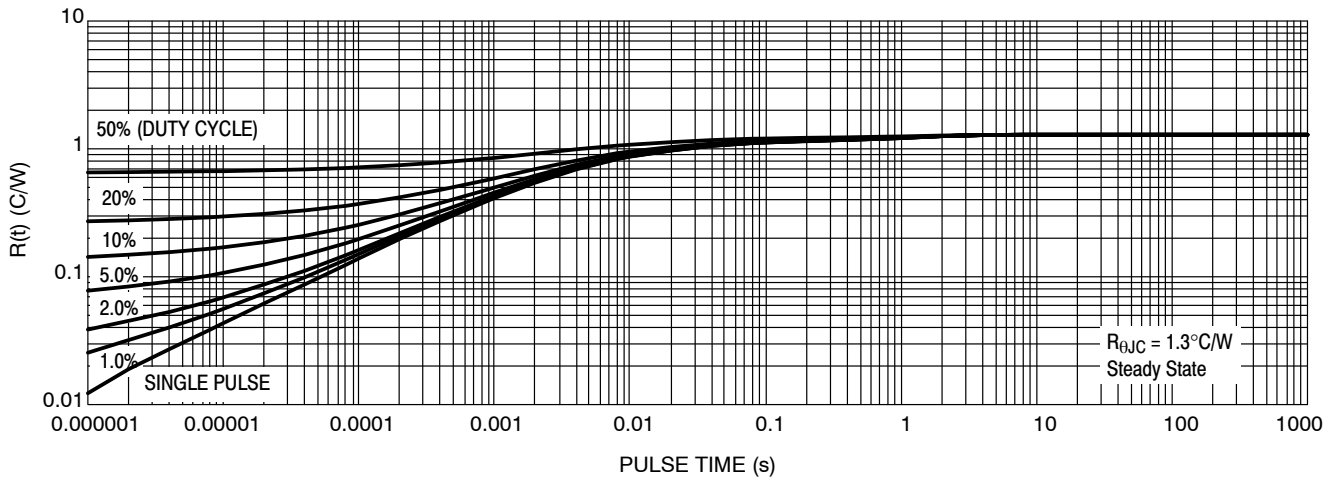


Figure 13. Thermal Impedance (Junction-to-Case) – NDD03N80Z

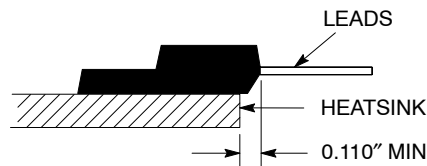


Figure 14. Isolation Test Diagram

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.

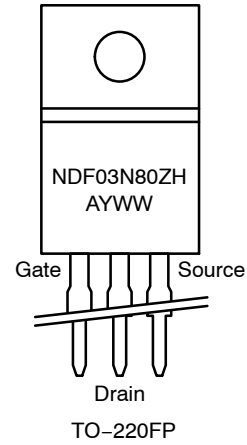
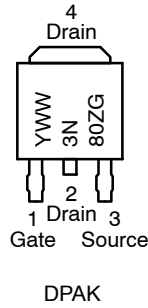
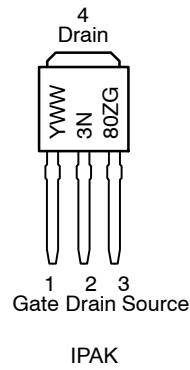
NDD03N80Z, NDF03N80Z

Table 1. ORDERING INFORMATION

Device	Package	Shipping [†]
NDD03N80Z-1G	IPAK (Pb-Free, Halogen-Free)	75 Units / Rail
NDD03N80ZT4G	DPAK (Pb-Free, Halogen-Free)	2500 / Tape & Reel
NDF03N80ZH (In Development)	TO-220FP (Pb-Free, Halogen-Free)	50 Units / Rail

[†]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.

MARKING DIAGRAMS

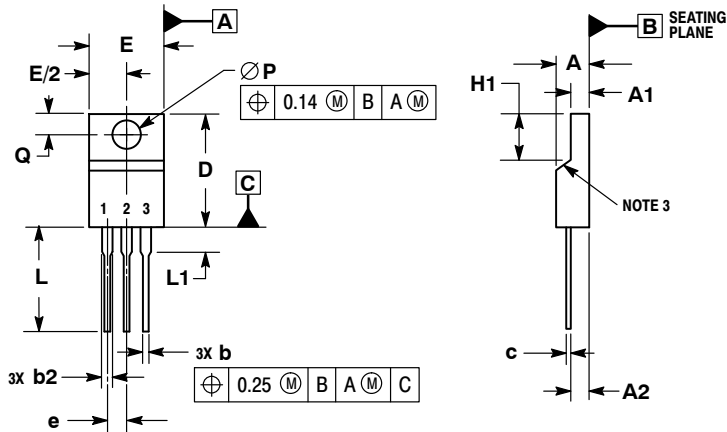


A = Location Code
 Y = Year
 WW = Work Week
 G, H = Pb-Free, Halogen-Free Package

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PACKAGE DIMENSIONS

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

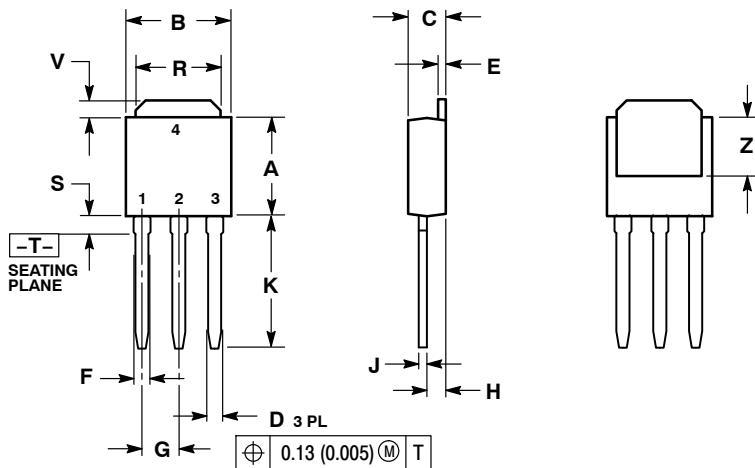


NOTES:

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.

DIM	MILLIMETERS	
	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	---	2.80
P	3.00	3.40
Q	2.80	3.20

IPAK CASE 369D ISSUE C



NOTES:

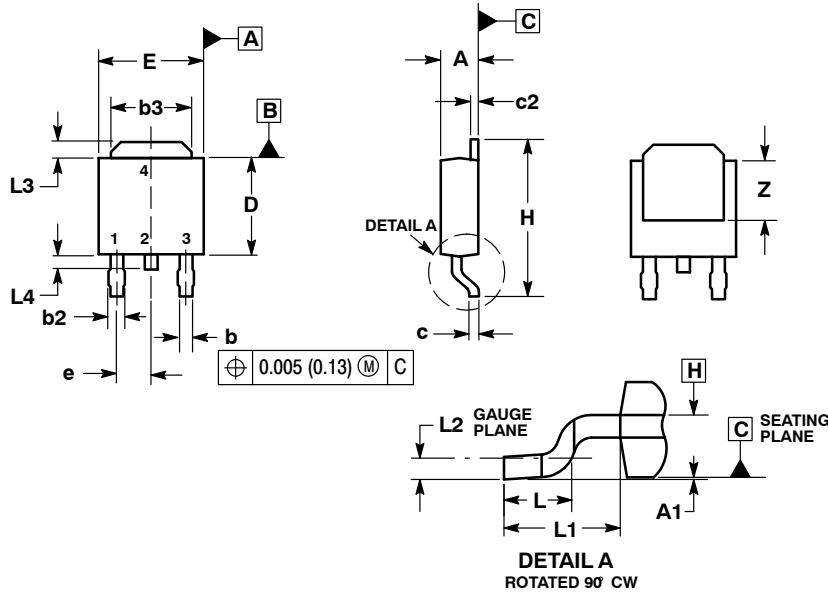
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

NDD03N80Z, NDF03N80Z

PACKAGE DIMENSIONS

DPAK (SINGLE GUAGE) CASE 369AA ISSUE B

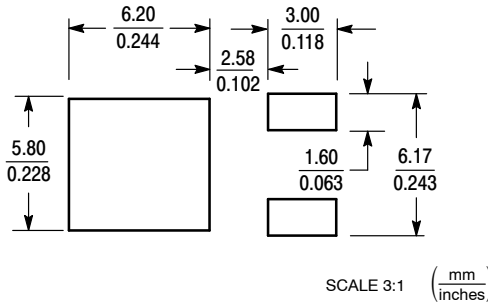


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108	REF	2.74	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

SOLDERING FOOTPRINT*



*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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