

NDF60N550U1, NDD60N550U1

Product Preview

N-Channel Power MOSFET 600 V, 550 mΩ

Features

- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

ABSOLUTE MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	NDF	NDD	Unit
Drain-to-Source Voltage			V_{DS}	600		V
Gate-to-Source Voltage			V_{GS}	± 25		V
Continuous Drain Current $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	I_D	9.5	8.5	A
		$T_C = 100^\circ\text{C}$		6	5.4	
Power Dissipation – $R_{\theta JC}$	Steady State	$T_C = 25^\circ\text{C}$	P_D	28	96	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		I_{DM}	38	34	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to +150		$^\circ\text{C}$
Source Current (Body Diode)			I_S	9.5	8.5	A
Single Pulse Drain-to-Source Avalanche Energy			EAS	TBD		mJ
Lead Temperature for Soldering Leads			T_L	260		$^\circ\text{C}$

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

THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain) NDF60N550U1 NDD60N550U1	$R_{\theta JC}$	4.4 1.3	$^\circ\text{C}/\text{W}$
Junction-to-Ambient Steady State NDF60N550U1 NDD60N550U1 NDD60N550U1-1	$R_{\theta JA}$	50 33 96	$^\circ\text{C}/\text{W}$

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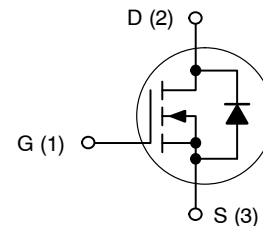


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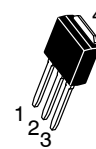
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$V_{(BR)DSS}$	$R_{DS(ON) MAX}$
600 V	550 mΩ @ 10 V

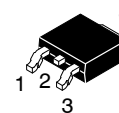
N-Channel MOSFET



TO-220FP
CASE 221AH



IPAK
CASE 369D



DPAK
CASE 369AA

MARKING AND ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	600			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			TBD		$\text{mV}/^\circ\text{C}$
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		50	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 50\ \mu\text{A}$	2	TBD	4	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	Reference to $25^\circ\text{C}, I_D = 50\ \mu\text{A}$		TBD		$\text{mV}/^\circ\text{C}$
Static Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 4.8\text{ A}$		530	550	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 4.8\text{ A}$		TBD		S

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{iss}	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		540		pF
Output Capacitance	C_{oss}			45		
Reverse Transfer Capacitance	C_{rss}			1		
Total Gate Charge	Q_g	$V_{DS} = 300\text{ V}, I_D = 9.5\text{ A}, V_{GS} = 10\text{ V}$		20		nC
Gate-to-Source Charge	Q_{gs}			TBD		
Gate-to-Drain Charge	Q_{gd}			TBD		
Plateau Voltage	V_{GP}			TBD		
Gate Resistance	R_g			TBD		Ω

RESISTIVE SWITCHING CHARACTERISTICS (Note 3)

Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 300\text{ V}, I_D = 9.5\text{ A}, V_{GS} = 10\text{ V}, R_G = 0\ \Omega$		TBD		ns
Rise Time	t_r			TBD		
Turn-off Delay Time	$t_{d(off)}$			TBD		
Fall Time	t_f			TBD		

SOURCE-DRAIN DIODE CHARACTERISTICS

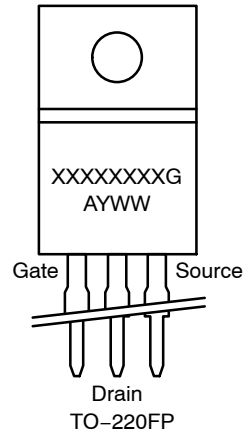
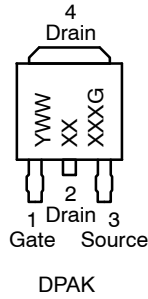
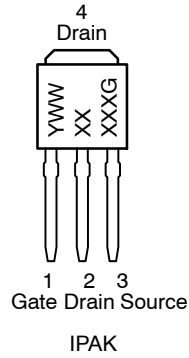
Diode Forward Voltage	V_{SD}	$I_S = 9.5\text{ A}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		TBD	1.6	V
			$T_J = 100^\circ\text{C}$		TBD		
Reverse Recovery Time	t_{rr}	$V_{GS} = 0\text{ V}, V_{DD} = 30\text{ V}, I_S = 9.5\text{ A}, d_i/d_t = 100\text{ A}/\mu\text{s}$			TBD		ns
Charge Time	t_a				TBD		
Discharge Time	t_b				TBD		
Reverse Recovery Charge	Q_{rr}				TBD		

2. Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

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MARKING DIAGRAMS



A = Assembly Location
 Y = Year
 WW = Work Week
 G = Pb-Free Package

ORDERING INFORMATION

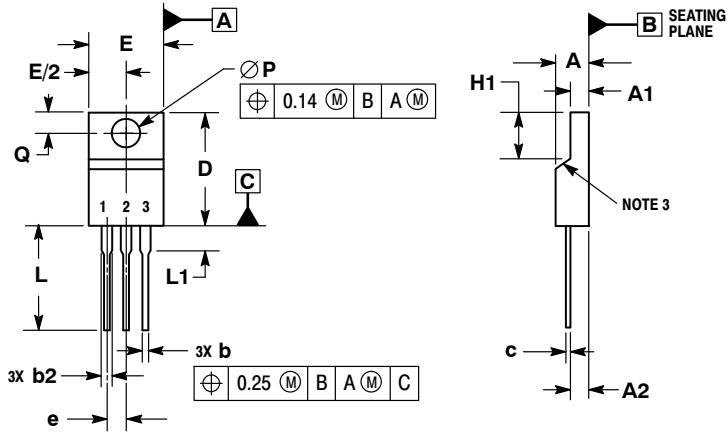
Device	Package	Shipping [†]
NDF60N550U1G	TO-220FP (Pb-Free, Halogen-Free)	50 Units / Rail
NDD60N550U1-1G	IPAK (Pb-Free, Halogen-Free)	75 Units / Rail
NDD60N550U1T4G	DPAK (Pb-Free, Halogen-Free)	2500 / Tape & Reel

[†]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.

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PACKAGE DIMENSIONS

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



NOTES:

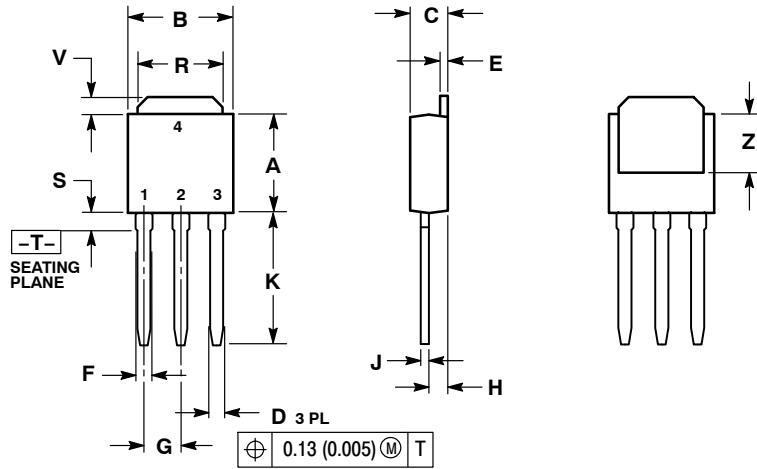
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR UNCONTROLLED IN THIS AREA.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH AND GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.00.

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	---	2.80
P	3.00	3.40
Q	2.80	3.20

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PACKAGE DIMENSIONS

IPAK
CASE 369D-01
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	---

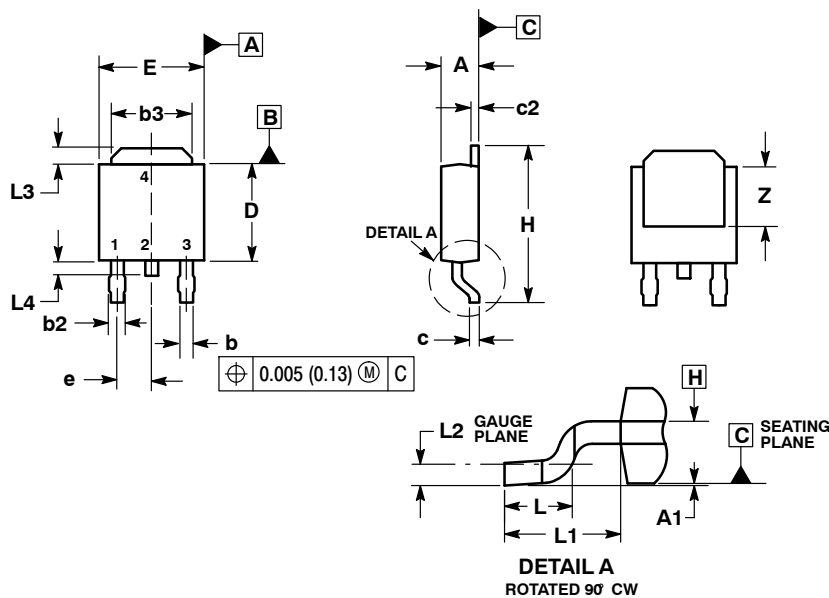
STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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PACKAGE DIMENSIONS

DDPAK (SINGLE GAUGE) CASE 369AA-01 ISSUE B

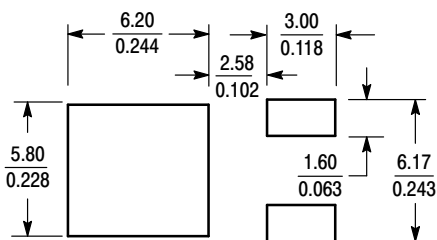


NOTES:

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*



SCALE 3:1 (mm/inches)

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

*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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