



**THE DATASHEET OF
NTD65N03RG**



NTD65N03R

Power MOSFET 25 V, 65 A, Single N-Channel, DPAK

Features

- Low $R_{DS(on)}$
- Ultra Low Gate Charge
- Low Reverse Recovery Charge
- Pb-Free Packages are Available

Applications

- Desktop CPU Power
- DC-DC Converters
- High and Low Side Switch

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	25	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current ($R_{\theta JC}$) Limited by Die	I_D	$T_C = 25^\circ\text{C}$	65	A
		$T_C = 85^\circ\text{C}$	45	A
Continuous Drain Current ($R_{\theta JC}$) Limited by Wire	I_D	$T_C = 25^\circ\text{C}$	32	A
		$T_C = 25^\circ\text{C}$	P_D	50
Power Dissipation ($R_{\theta JC}$)				
Continuous Drain Current (Note 1)	I_D	$T_A = 25^\circ\text{C}$	11.4	A
		$T_A = 85^\circ\text{C}$	8.9	A
Power Dissipation (Note 1)	P_D	1.88	W	
Continuous Drain Current (Note 2)	I_D	$T_A = 25^\circ\text{C}$	9.5	A
		$T_A = 85^\circ\text{C}$	7.4	A
Power Dissipation (Note 2)	P_D	1.3	W	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	130	A
Operating Junction and Storage Temperature	T_J, T_{stg}	-55 to 175	$^\circ\text{C}$	
Drain-to-Source (dv/dt)	dv/dt	2.0	V/ns	
Source Current (Body Diode)	I_S	2.1	A	
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 24 \text{ V}, V_{GS} = 10 \text{ V}, I_L = 12 \text{ A}, L = 1.0 \text{ mH}, R_G = 25 \Omega$)	E_{AS}	71.7	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	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. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.15 in sq [1 oz] including traces).

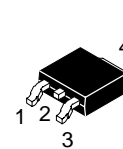
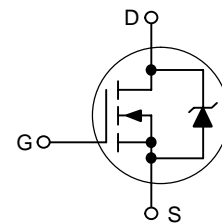


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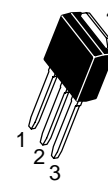
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
25 V	6.5 m Ω @ 10 V	65 A
	9.7 m Ω @ 4.5 V	

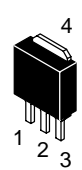
N-Channel



CASE 369AA
DPAK
(Bend Lead)
STYLE 2

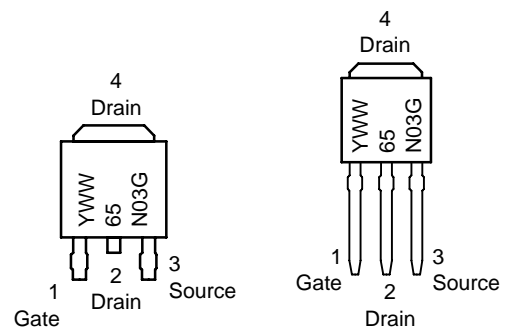


CASE 369D
DPAK
(Straight Lead)
STYLE 2



CASE 369AC
3 IPAK
(Straight Lead)

MARKING DIAGRAMS & PIN ASSIGNMENTS



Y = Year
 WW = Work Week
 65N03 = Device Code
 G = Pb-Free Package

ORDERING INFORMATION

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

NTD65N03R

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	2.5	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	80	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	115	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	25	29.5		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			19.2		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$	$T_J = 25^\circ\text{C}$		1.5	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0	1.74	2.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		6.5	8.4	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		9.7	14.6	
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		27		mHos

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 20\text{ V}$		1177	1400	pF
Output Capacitance	C_{oss}			555		
Reverse Transfer Capacitance	C_{rss}			218		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 5.0\text{ V}, V_{DS} = 10\text{ V}, I_D = 30\text{ A}$		12.2	16	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.5		
Gate-to-Source Charge	Q_{GS}			2.95		
Gate-to-Drain Charge	Q_{GD}			6.08		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 25\text{ V}, I_D = 30\text{ A}, R_G = 3.0\ \Omega$		6.3		ns
Rise Time	t_r			18.6		
Turn-Off Delay Time	$t_{d(off)}$			20.3		
Fall Time	t_f			8.8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}$	$T_J = 25^\circ\text{C}$		0.85	1.1	V
			$T_J = 125^\circ\text{C}$		0.72		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 20\text{ A}$			28.8		ns
Charge Time	t_a				12.8		
Discharge Time	t_b				16		
Reverse Recovery Time	Q_{RR}				20		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		2.49		nH
Drain Inductance	L_D			0.02		
Gate Inductance	L_G			3.46		
Gate Resistance	R_G			1.75		

- Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
- Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.15 in sq [1 oz] including traces).
- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

NTD65N03R

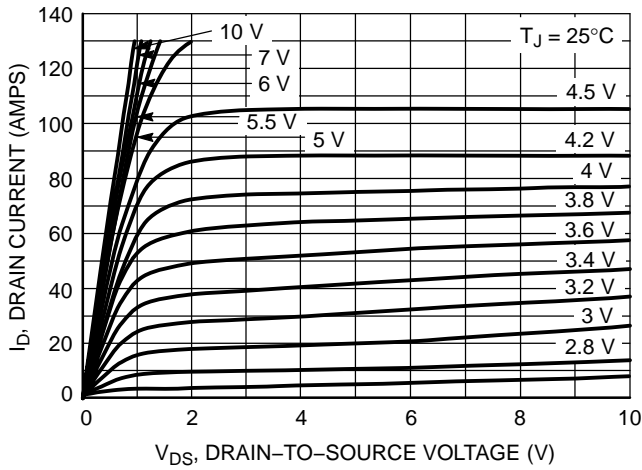


Figure 1. On-Region Characteristics

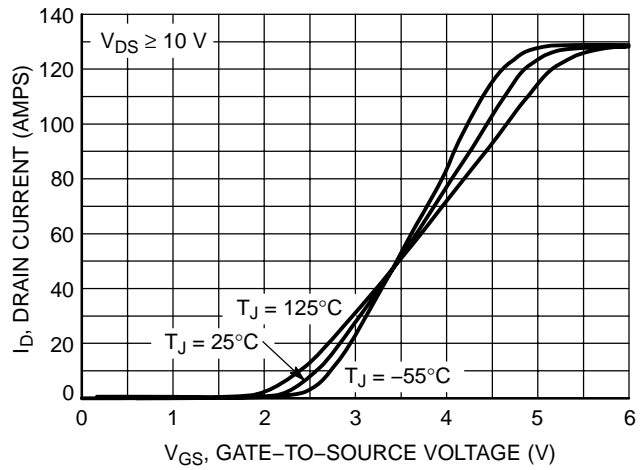


Figure 2. Transfer Characteristics

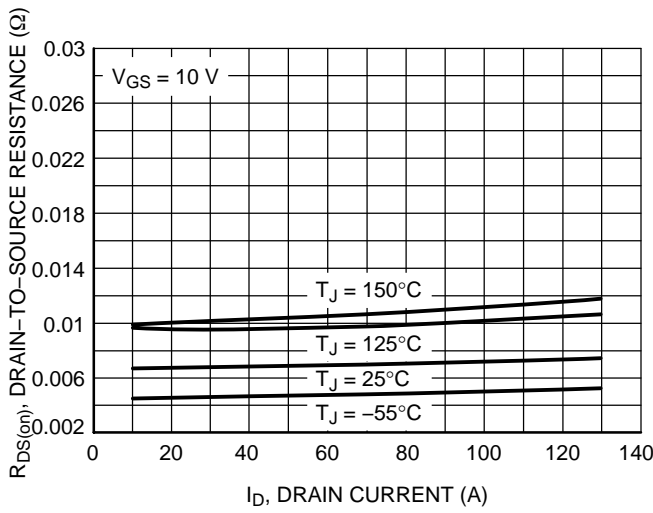


Figure 3. On-Resistance versus Drain Current and Temperature

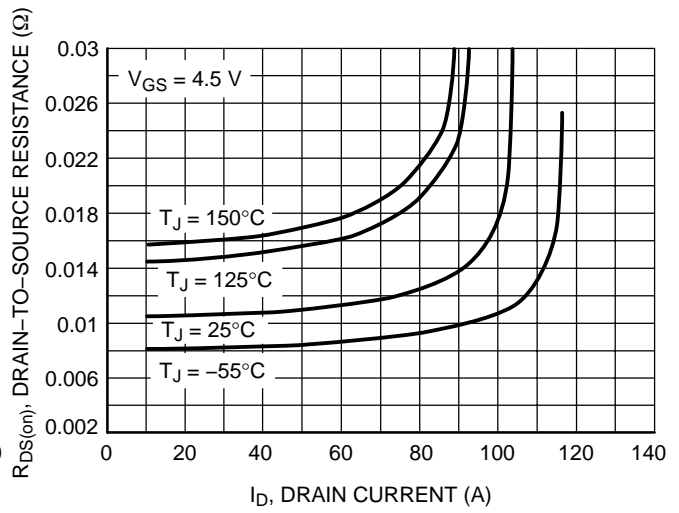


Figure 4. On-Resistance versus Drain Current and Temperature

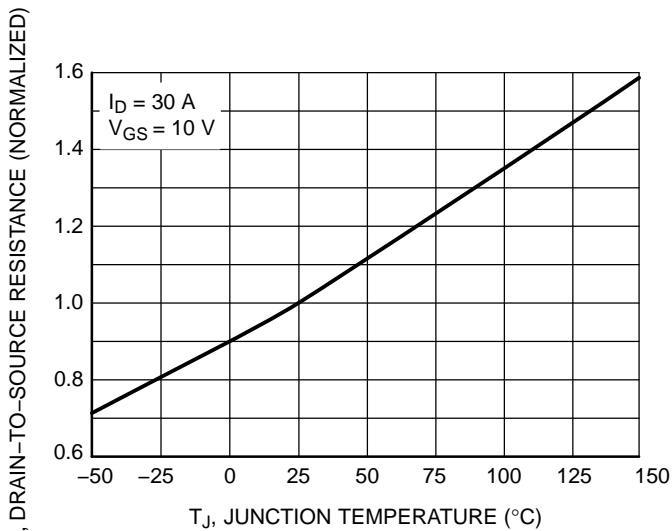


Figure 5. On-Resistance Variation with Temperature

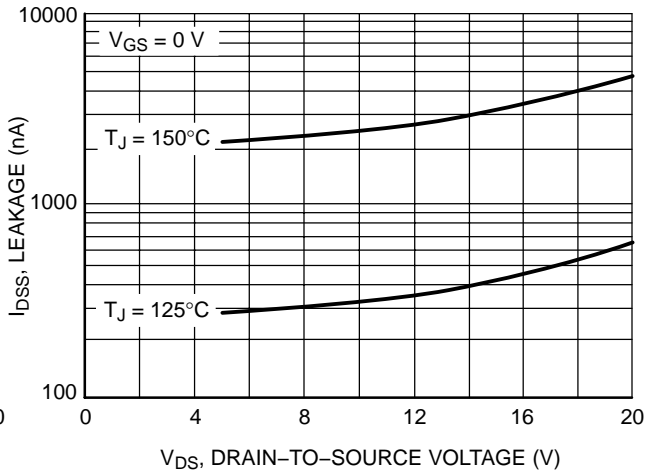


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD65N03R

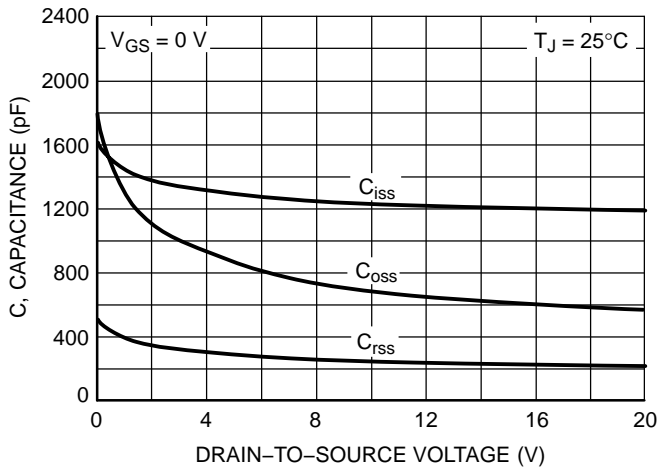


Figure 7. Capacitance Variation

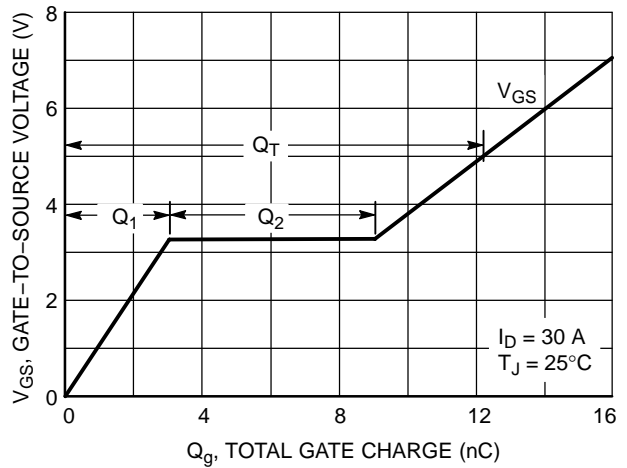


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

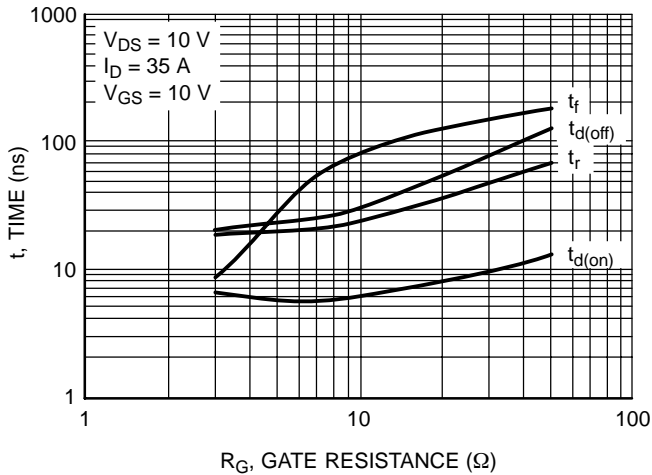


Figure 9. Resistive Switching Time Variation versus Gate Resistance

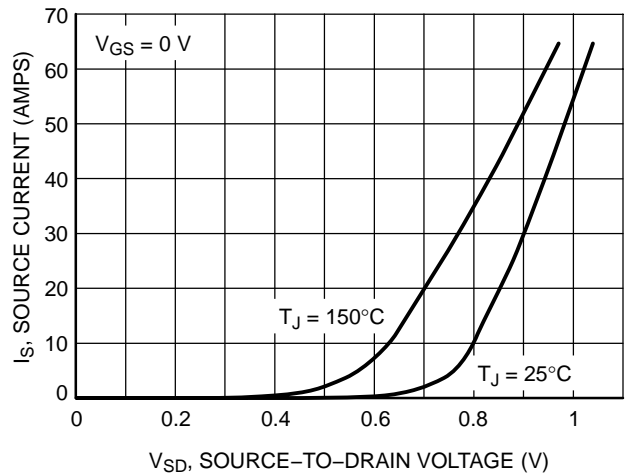


Figure 10. Diode Forward Voltage versus Current

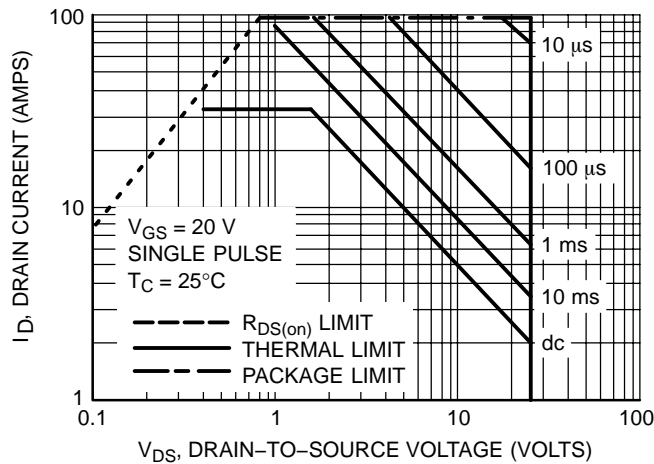


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NTD65N03R

ORDERING INFORMATION

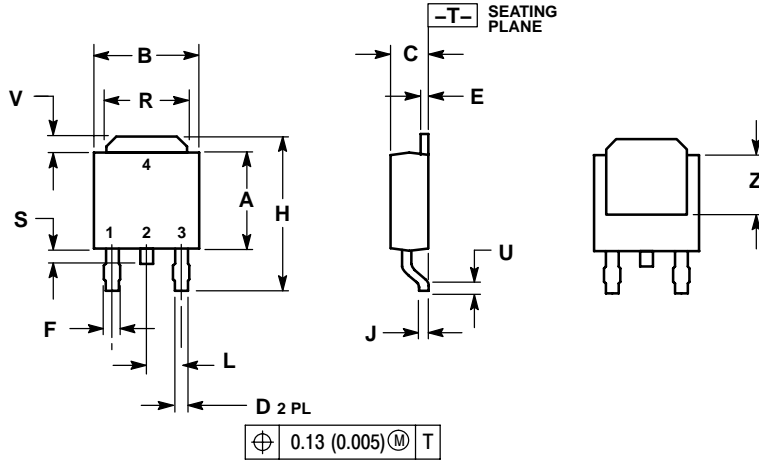
Order Number	Package	Shipping†
NTD65N03R	DPAK-3	75 Units / Rail
NTD65N03RG	DPAK-3 (Pb-Free)	75 Units / Rail
NTD65N03RT4	DPAK-3	2500 / Tape & Reel
NTD65N03RT4G	DPAK-3 (Pb-Free)	2500 / Tape & Reel
NTD65N03R-1	DPAK-3 Straight Lead	75 Units / Rail
NTD65N03R-1G	DPAK-3 Straight Lead (Pb-Free)	75 Units / Rail
NTD65N03R-35	DPAK Straight Lead Trimmed (3.5 ± 0.15 mm)	75 Units / Rail
NTD65N03R-35G	DPAK Straight Lead Trimmed (3.5 ± 0.15 mm) (Pb-Free)	75 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.

NTD65N03R

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)
CASE 369AA-01
ISSUE A

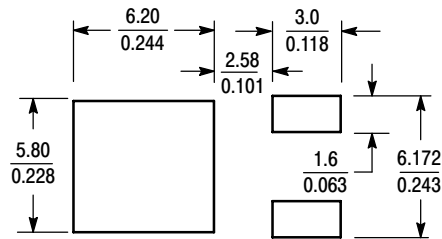


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.025	0.035	0.63	0.89
E	0.018	0.024	0.46	0.61
F	0.030	0.045	0.77	1.14
H	0.386	0.410	9.80	10.40
J	0.018	0.023	0.46	0.58
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.024	0.040	0.60	1.01
U	0.020	---	0.51	---
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

SOLDERING FOOTPRINT*



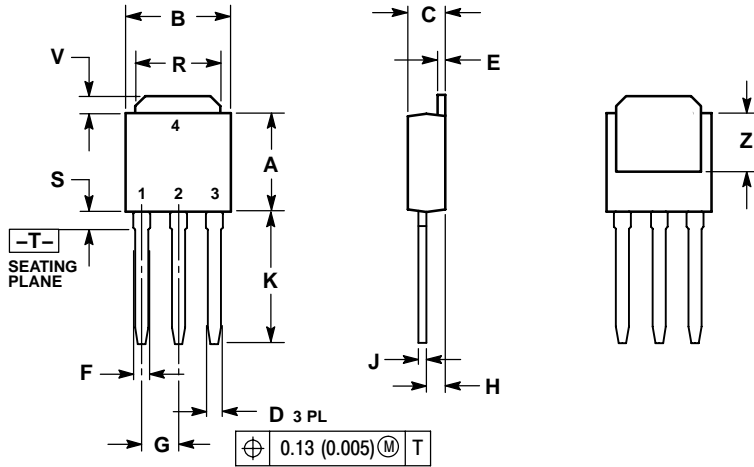
SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}} \right)$

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

NTD65N03R

PACKAGE DIMENSIONS

DPAK
CASE 369D-01
ISSUE B

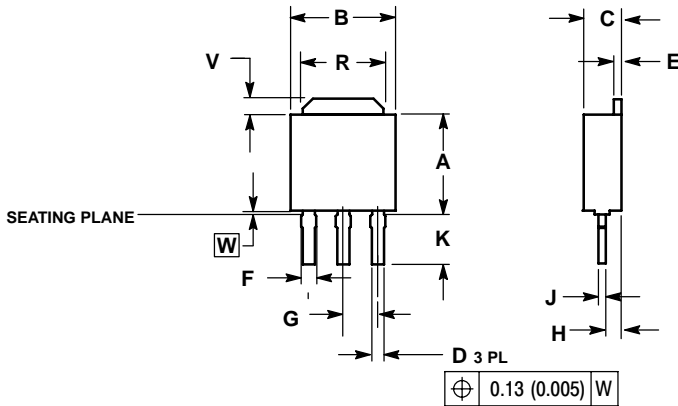


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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

3 IPAK, STRAIGHT LEAD
CASE 369AC-01
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. SEATING PLANE IS ON TOP OF DAMBAR POSITION.
4. DIMENSION A DOES NOT INCLUDE DAMBAR POSITION OR MOLD GATE.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
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	0.043	0.94	1.09
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	0.134	0.142	3.40	3.60
R	0.180	0.215	4.57	5.46
V	0.035	0.050	0.89	1.27
W	0.000	0.010	0.000	0.25

NTD65N03R

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