

NTB65N02R, NTP65N02R

Product Preview

Power MOSFET 65 A, 24 V N-Channel TO-220, D²PAK



ON Semiconductor®

<http://onsemi.com>

65 A, 24 V

$R_{DS(on)} = 8.3 \text{ m}\Omega$ (TYP)

Features

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{iss} to Minimize Driver Loss
- Low Gate Charge
- Fast Switching

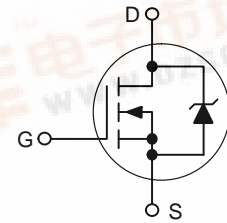
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ Unless otherwise specified)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	24	V_{dc}	
Gate-to-Source Voltage	V_{GS}	± 20	V_{dc}	
Drain Current (Continuous @ $T_A = 25^\circ\text{C}$ (Note 3) Single Pulse ($t_p = 10 \mu\text{s}$)	I_D I_{DM}	65 160	A A	
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	78	W	
Operating and Storage Temperature	T_J and T_{stg}	-55 to 150	$^\circ\text{C}$	
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 50 V_{dc}$, $V_{GS} = 5 V_{dc}$, $I_L = A_{pk}$, $L = 1 \text{ mH}$, $R_G = 25 \Omega$)	E_{AS}	TBD	mJ	
Thermal Resistance	Junction-to-Case Junction-to-Ambient (Note 1) Junction-to-Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	1.6 67 120	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds	T_L	260	$^\circ\text{C}$	

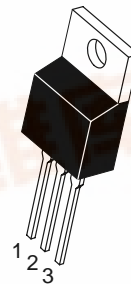
1. When surface mounted to an FR4 board using 1 inch pad size, (Cu Area 1.127 in²).
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu Area 0.412 in²).
3. Chip current capability limited by package.

PIN ASSIGNMENT

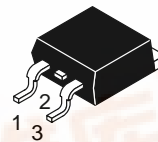
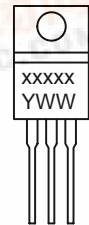
PIN	FUNCTION
1	Gate
2	Drain
3	Source
4	Drain



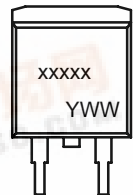
MARKING DIAGRAMS



TO-220AB
CASE 221A
Style 5



D²PAK
CASE 418B
Style 2



xxxxx = Specific Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTB65N02R	D ² PAK	50 Units/Rail
NTB65N02RT4	D ² PAK	800 Tape & Reel
NTP65N02R	TO-220AB	50 Units/Rail



NTB65N02R, NTP65N02R

ELECTRICAL CHARACTERISTICS (T_J = 25°C Unless otherwise specified)

Characteristics	Symbol	Min	Typ	Max	Unit
-----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 4) (V _{GS} = 0 V _{dc} , I _D = 250 μA _{dc}) Temperature Coefficient (Positive)	V _(br) DSS	24 –	27.5 25.5	– –	V _{dc} mV/°C
Zero Gate Voltage Drain Current (V _{DS} = 20 V _{dc} , V _{GS} = 0 V _{dc}) (V _{DS} = 20 V _{dc} , V _{GS} = 0 V _{dc} , T _J = 150°C)	I _{DSS}	– –	– –	1.5 15	μA _{dc}
Gate-Body Leakage Current (V _{GS} = ±20 V _{dc} , V _{DS} = 0 V _{dc})	I _{GSS}	–	–	±100	nA _{dc}

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage (Note 4) (V _{DS} = V _{GS} , I _D = 250 μA _{dc}) Threshold Temperature Coefficient (Negative)	V _{GS(th)}	1.0 –	1.5 –4.1	2.0 –	V _{dc} mV/°C
Static Drain-to-Source On-Resistance (Note 4) (V _{GS} = 4.5 V _{dc} , I _D = 15 A _{dc}) (V _{GS} = 10 V _{dc} , I _D = 20 A _{dc}) (V _{GS} = 10 V _{dc} , I _D = 30 A _{dc})	R _{DS(on)}	– – –	10.5 8.3 9.5	12.5 10.5 –	mΩ
Forward Transconductance (Note 4) (V _{DS} = 10 V _{dc} , I _D = 15 A _{dc})	g _{FS}	–	20	–	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 24 V _{dc} , V _{GS} = 0 V f = 1 MHz)	C _{iss}	–	1050	1470	pF
Output Capacitance		C _{oss}	–	394	550	
Transfer Capacitance		C _{riss}	–	88	120	

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	(V _{GS} = 5 V _{dc} , V _{DD} = 10 V _{dc} , I _D = 30 A _{dc} , R _G = 3 Ω)	t _{d(on)}	–	11.2	20	ns
Rise Time		t _r	–	52	100	
Turn-Off Delay Time		t _{d(off)}	–	10	20	
Fall Time		t _f	–	4	10	
Gate Charge	(V _{GS} = 4.5 V _{dc} , I _D = 30 A _{dc} , V _{DS} = 10 V _{dc}) (Note 4)	Q _T	–	8.4	12	nC
		Q ₁	–	3.7	–	
		Q ₂	–	4.04	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

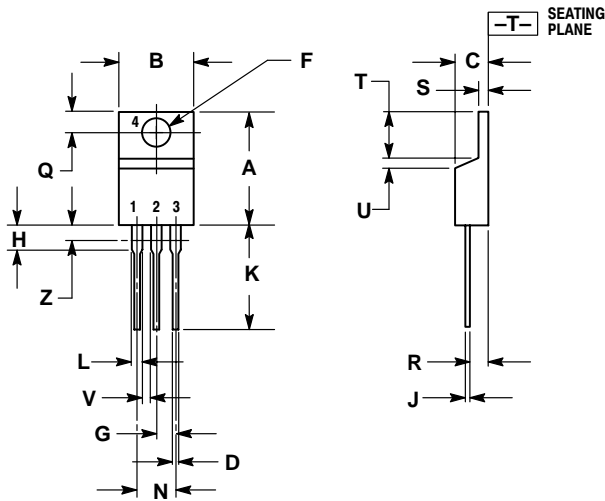
Forward On-Voltage	(I _S = 20 A _{dc} , V _{GS} = 0 V _{dc}) (Note 4) (I _S = 30 A _{dc} , V _{GS} = 0 V _{dc}) (I _S = 20 A _{dc} , V _{GS} = 0 V _{dc} , T _J = 125°C)	V _{SD}	– – –	0.88 1.10 0.80	1.2 – –	V _{dc}
Reverse Recovery Time	(I _S = 20 A _{dc} , V _{GS} = 0 V _{dc} , dI _S /dt = 100 A/μs) (Note 4)	t _{rr}	–	15.5	–	ns
		t _a	–	12.6	–	
		t _b	–	2.6	–	
Reverse Recovery Stored Charge		Q _{RR}	–	0.005	–	μC

4. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.
5. Switching characteristics are independent of operating junction temperatures.

NTB65N02R, NTP65N02R

PACKAGE DIMENSIONS

TO-220AB CASE 221A-09 ISSUE AA

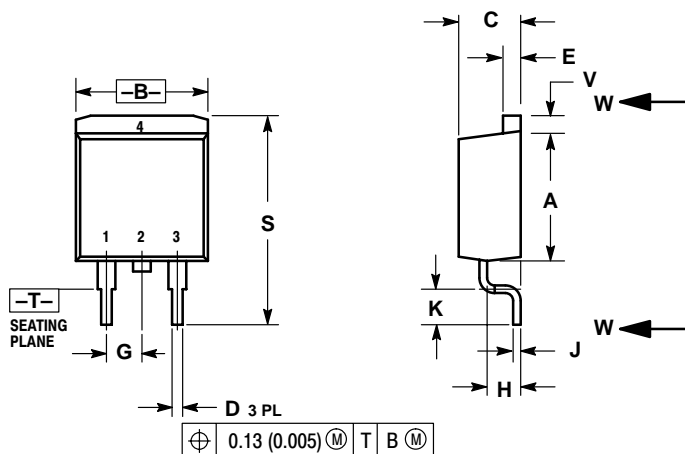


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

- STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

D²PAK CASE 418B-04 ISSUE G




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100	BSC	2.54	BSC
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197	REF	5.00	REF
P	0.079	REF	2.00	REF
R	0.039	REF	0.99	REF
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

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

NTB65N02R, NTP65N02R

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

PUBLICATION ORDERING INFORMATION

Literature Fulfillment:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

JAPAN: ON Semiconductor, Japan Customer Focus Center
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051
Phone: 81-3-5773-3850
Email: r14525@onsemi.com

ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.