![Chipsmall logo]

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

NTMD6N04R2

Power MOSFET

40 V, 5.8 A, Dual N−Channel SOIC−8

Features

- Designed for use in low voltage, high speed switching applications
- Ultra Low On−Resistance Provides
  Higher Efficiency and Extends Battery Life
  - $R_{DS(on)}$ = 0.027 Ω, V_{GS} = 10 V (Typ)
  - $R_{DS(on)}$ = 0.034 Ω, V_{GS} = 4.5 V (Typ)
- Miniature SOIC−8 Surface Mount Package Saves Board Space
- Diode is Characterized for Use in Bridge Circuits
- Diode Exhibits High Speed, with Soft Recovery
- Pb−Free Package is Available

Applications

- DC−DC Converters
- Computers
- Printers
- Cellular and Cordless Phones
- Disk Drives and Tape Drives

ON Semiconductor®

V_{DSS}	$R_{DS(ON)}$ Typ	I_D Max
40 V	27 mΩ @ V_{GS} = 10 V	5.8 A

N−Channel

MARKING DIAGRAM & PIN ASSIGNMENT

SOIC−8
CASE 751
STYLE 11

```
D1  D1  D2  D2
8

E6N04
AYWW ▪

1
S1  G1  S2  G2
```
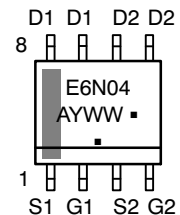
E6N04 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	40	V
Gate−to−Source Voltage − Continuous	V_{GS}	±20	V
Drain Current (Note 1) − Continuous @ T_A = 25°C − Single Pulse (tp ≤ 10 μs)	I_D I_{DM}	5.8 29	Adc Apk
Drain Current (Note 2) − Continuous @ T_A = 25°C	I_D	4.6	Adc
Total Power Dissipation @ T_A = 25°C (Note 1) @ T_A = 25°C (Note 2)	P_D	2.0 1.29	W
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C
Single Pulse Drain−to−Source Avalanche Energy − Starting T_J = 25°C (V_{DD} = 40 Vdc, V_{GS} = 5.0 Vdc, Vdc, Peak I_L = 7.0 Apk, L = 10 mH, R_G = 25 Ω)	E_{AS}	245	mJ
Thermal Resistance − Junction−to−Ambient (Note 1) − Junction−to−Ambient (Note 2)	$R_{\theta JA}$	62.5 97	°C/W
Maximum Lead Temperature for Soldering Purposes for 10 Sec	T_L	260	°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. When surface mounted to an FR4 board using 1″ pad size, t ≤ 10 s
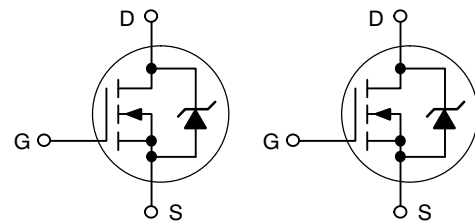2. When surface mounted to an FR4 board using 1″ pad size, t = steady state

ORDERING INFORMATION

Device	Package	Shipping[†]
NTMD6N04R2G	SOIC−8 (Pb−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 Specification Brochure, BRD8011/D.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–to–Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 250 μA) Temperature Coefficient (Positive)	$V_{(BR)DSS}$ $V_{(BR)DSS}/T_J$	40 –	47 45	– –	Vdc mV/°C

Zero Gate Voltage Drain Current
   (V_{DS} = 40 Vdc, V_{GS} = 0 Vdc, T_J = 25°C)
   (V_{DS} = 40 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)
	I_{DSS}	
		–
		–
			
			–
			–
				
				1.0
				10
					μAdc

Gate–Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	–￼	–	± 100	nAdc
ON CHARACTERISTICS (Note 3)					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μAdc) Temperature Coefficient (Negative)	$V_{GS(th)}$ $V_{GS(th)}/T_J$	1.0 –	1.9 4.7	3.0 –	Vdc mV/°C

Static Drain–to–Source On–State Resistance
   (V_{GS} = 10 Vdc, I_D = 5.8 Adc)
   (V_{GS} = 4.5 Vdc, I_D = 3.9 Adc)
	$R_{DS(on)}$	
		–
		–
			
			0.027
			0.034
				
				0.034
				0.043
					Ω

Forward Transconductance (V_{DS} = 10 Vdc, I_D = 5.8 Adc)	g_{FS}	–	8.12	–	Mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	C_{iss}	–	723	900	pF
Output Capacitance	C_{oss}	–	156	225	
Reverse Transfer Capacitance	C_{rss}	–	53	75	
SWITCHING CHARACTERISTICS (Notes 3 & 4)					
Turn–On Delay Time	$t_{d(on)}$	–	10	18	ns
Rise Time	t_r	–	20	35	
Turn–Off Delay Time	$t_{d(off)}$	–	45	70	
Fall Time	t_f	–	40	65	
Turn–On Delay Time	$t_{d(on)}$	–	15	–	ns
Rise Time	t_r	–	55	–	
Turn–Off Delay Time	$t_{d(off)}$	–	30	–	
Fall Time	t_f	–	35	–	
Gate Charge	Q_T	–	20	30	nC
	Q_{gs}	–	2.5	–	
	Q_{gd}	–	5.5	–	
BODY–DRAIN DIODE RATINGS (Note 3)					
Diode Forward On–Voltage	V_{SD}	– –	0.76 0.56	1.1 –	Vdc
Reverse Recovery Time	t_{rr}	–	23	–	ns
	t_a	–	16	–	
	t_b	–	7	–	
Reverse Recovery Stored Charge	Q_{RR}	–	20	–	nC

Additional test condition notes within the Dynamic/Switching/Body-Drain sections:
- Dynamic Characteristics: (V_{DS} = 32 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)
- Switching (first group): (V_{DD} = 20 Vdc, I_D = 5.8 A, V_{GS} = 10 V, R_G = 6 Ω)
- Switching (second group): (V_{DD} = 20 Vdc, I_D = 5.8 A, V_{GS} = 4.5 V, R_G = 6 Ω)
- Gate Charge: (V_{DS} = 20 Vdc, V_{GS} = 10 Vdc, I_D = 5.8 A)
- Diode Forward On–Voltage: (I_S = 1.7 Adc, V_{GS} = 0 V) / (I_S = 1.7 Adc, V_{GS} = 0 V, T_J = 150°C)
- Reverse Recovery Time: (I_S = 1.7 A, V_{GS} = 0 V, dI_S/dt = 100 A/μs)
- Reverse Recovery Stored Charge: (I_S = 1.7 A, dI_S/dt = 100 A/μs, V_{GS} = 0 V)

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
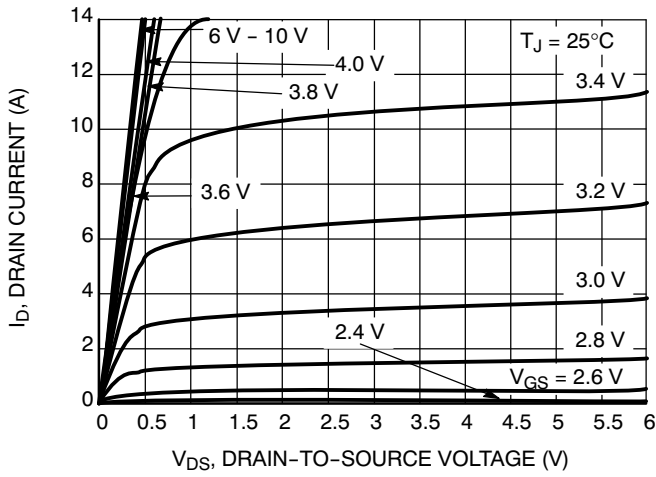4. Switching characteristics are independent of operating junction temperature.
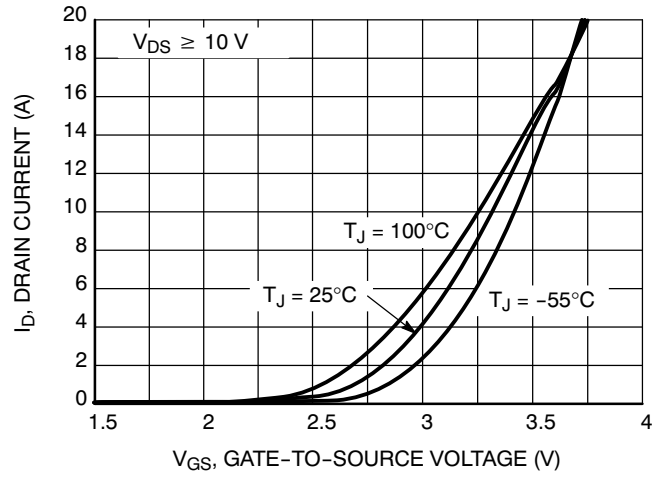
Figure 1. On-Region Characteristics

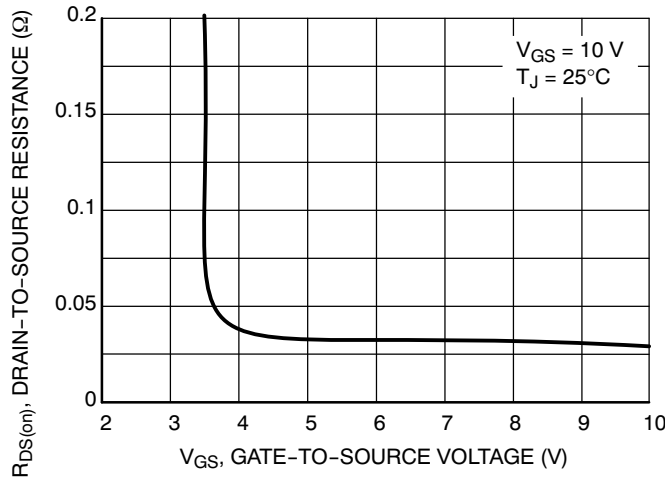**Figure 2. Transfer Characteristics**
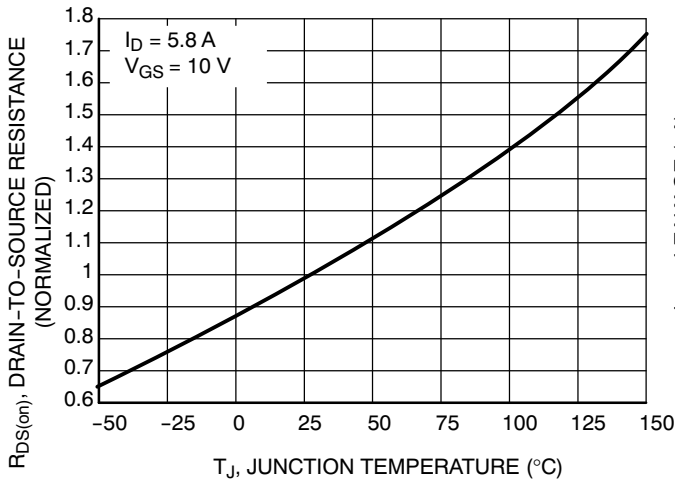
Figure 3. On-Resistance vs. Gate-to-Source Voltage
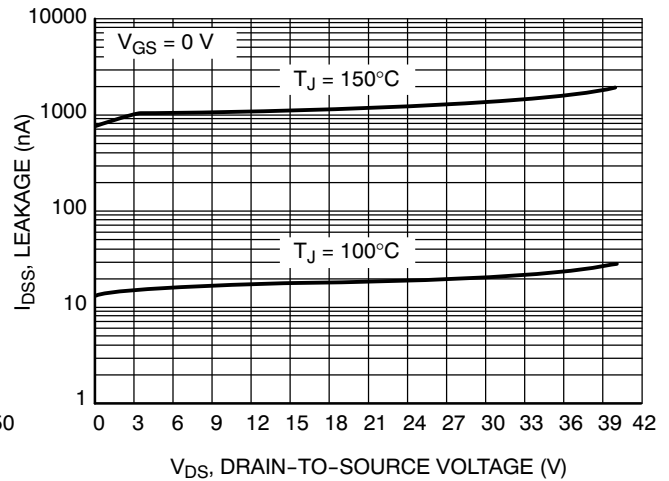
Figure 4. On Resistance Variation with Temperature
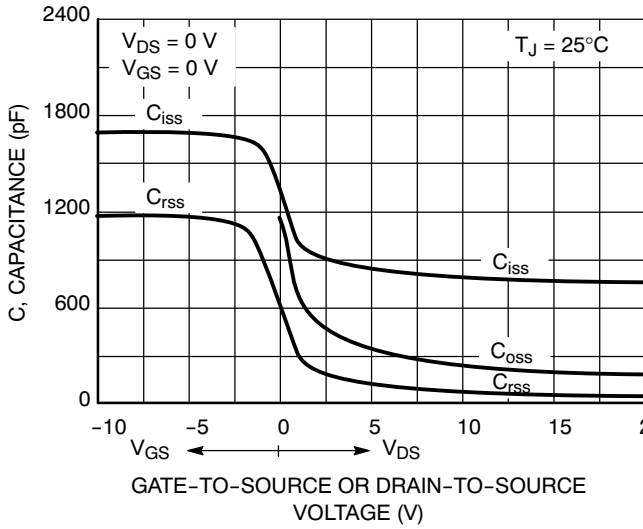
Figure 5. Drain-to-Source Leakage Current vs. Voltage

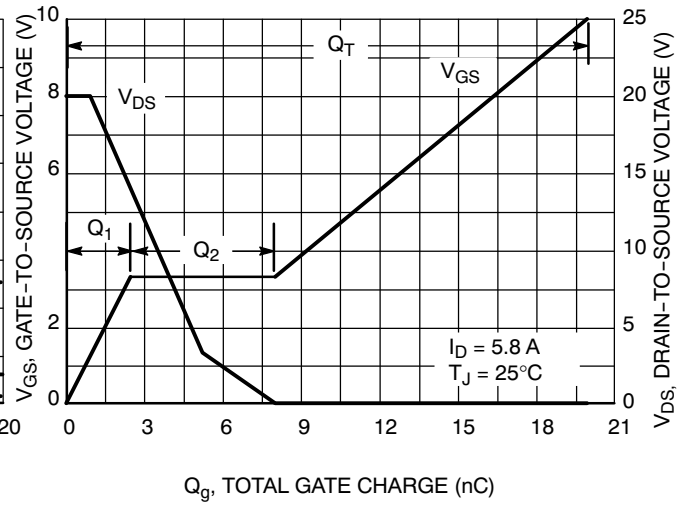**Figure 6. Capacitance Variation**

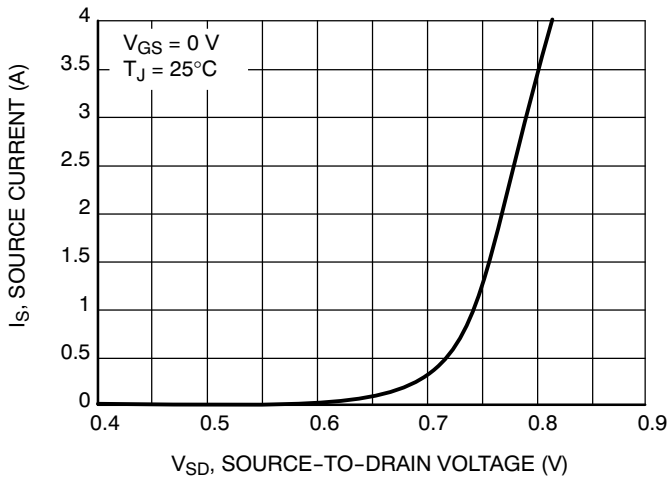**Figure 7. Gate–to–Source and Drain–to–Source Voltage vs. Total Charge**
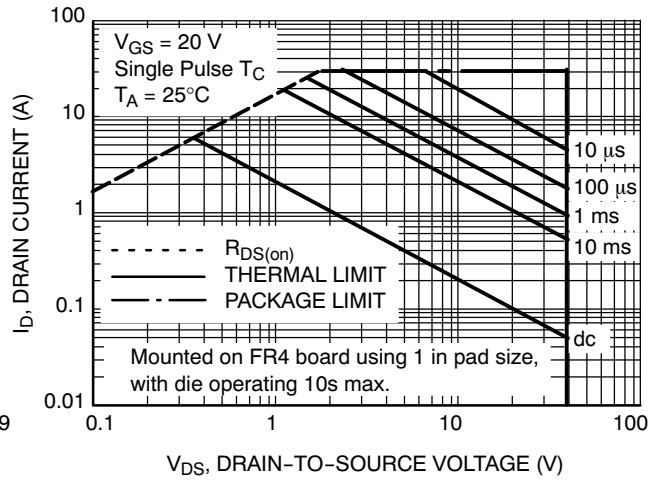

Figure 8. Diode Forward Voltage vs. Current

Figure 9. Maximum Rated Forward Biased Safe Operating Area

NTMD6N04R2

PACKAGE DIMENSIONS

SOIC–8 NB
CASE 751–07
ISSUE AJ
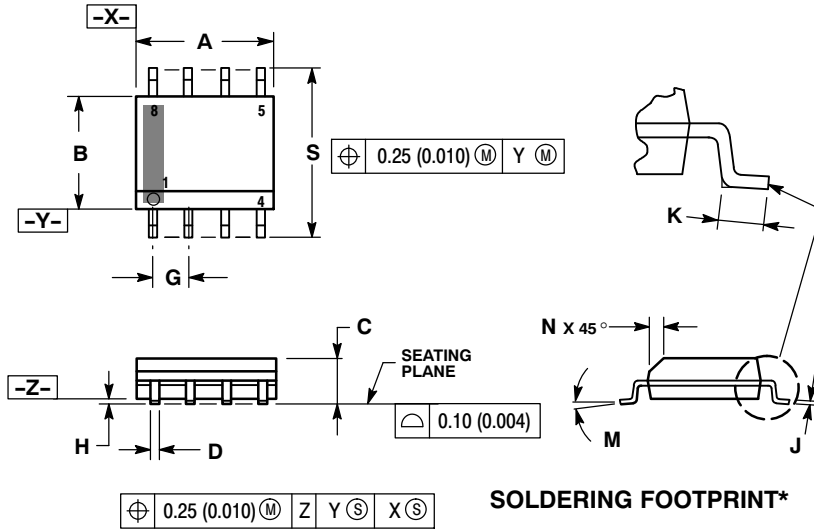
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751–01 THRU 751–06 ARE OBSOLETE. NEW STANDARD IS 751–07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244
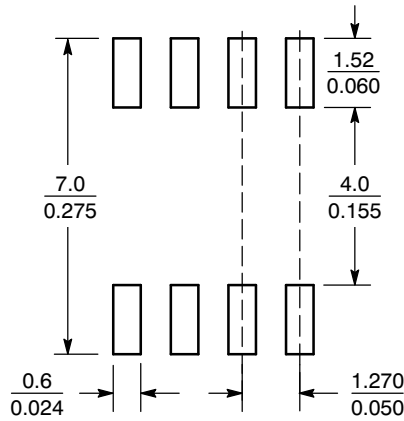
STYLE 11:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

0.25 (0.010) Ⓜ Y Ⓜ

0.10 (0.004)

SEATING PLANE

N X 45 °

0.25 (0.010) Ⓜ Z Y Ⓢ X Ⓢ

SOLDERING FOOTPRINT*

$\frac{1.52}{0.060}$

$\frac{7.0}{0.275}$

$\frac{4.0}{0.155}$

$\frac{0.6}{0.024}$

$\frac{1.270}{0.050}$

SCALE 6:1 $\left(\frac{mm}{inches}\right)$

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

NTMD6N04R2/D