

NTMS4404N

Power MOSFET

30 V, 12 A, Single N-Channel, SO-8

Features

- High Density Power MOSFET with Ultra Low $R_{DS(on)}$ for Higher Efficiency
- Miniature SO-8 Surface Mount Package Saving Board Space
- I_{DSS} Specified at Elevated Temperature
- Diode Exhibits High Speed, Soft Recovery

Applications

- Power Management for Battery Power Products
- Portable Products
- Computers, Printers, PCMCIA Cards
- Cell Phones, Cordless Telephones

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

Parameter	Symbol	Value	Unit		
Drain-to-Source Voltage	V_{DSS}	30	V		
Gate-to-Source Voltage	V_{GS}	± 20	V		
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	9.6	A	
		$T_A = 70^\circ\text{C}$			7.6
	$t_p \leq 10$ s	$T_A = 25^\circ\text{C}$	12		
Power Dissipation (Note 1)	Steady State		P_D	1.56	W
	$t_p \leq 10$ s				
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	I_D	7.0	A
		$T_A = 70^\circ\text{C}$			
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	P_D	0.83	W
Pulsed Drain Current		$t_p = 10$ μs , DC = 2 %	I_{DM}	50	A
Operating Junction and Storage Temperature	T_J , T_{STG}	-55 to 150			$^\circ\text{C}$
Source Current (Body Diode)	I_S	6.0			A
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 20$ V, $V_{GS} = 5$ V, $I_{PK} = 7.25$ A, $L = 19$ mH, $R_G = 25$ Ω)	E_{AS}	500			mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260			$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	80	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t = 10$ s (Note 1)	$R_{\theta JA}$	50	
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	150	

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 = 0.412 in sq.)

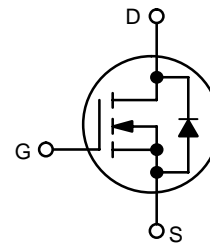


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$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
30 V	9.7 m Ω @ 10 V	12 A
	15.5 m Ω @ 4.5 V	

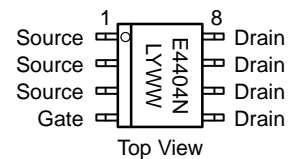
N-Channel



MARKING DIAGRAM/ PIN ASSIGNMENT



SO-8
CASE 751
STYLE 12



E4404N = Device Code
L = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NTMS4404NR2	SO-8	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.

NTMS4404N

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

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Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			25		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 30 V			1.0	μA
					5.0	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	1.0	2.2	3.0	V
Gate Threshold Temperature Coefficient	V _{GS(TH)} /T _J			-5.0		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 12 A		9.7	11.5	mΩ
		V _{GS} = 4.5 V, I _D = 6.0 A		15.5	17.5	
Forward Transconductance	g _{FS}	V _{DS} = 15 V, I _D = 12 A		17.5		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 24 V		1975	2500	pF
Output Capacitance	C _{OSS}			575	750	
Reverse Transfer Capacitance	C _{RSS}			180	300	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 24 V, I _D = 12 A		50	70	nC
Threshold Gate Charge	Q _{G(TH)}			2.4		
Gate-to-Source Charge	Q _{GS}			7.5		
Gate-to-Drain Charge	Q _{GD}			16		

SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 24 V, I _D = 12 A, R _G = 2.5 Ω		15	25	ns
Rise Time	t _r			25	50	
Turn-Off Delay Time	t _{d(OFF)}			35	55	
Fall Time	t _f			15	30	

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DS} = 24 V, I _D = 6.0 A, R _G = 2.5 Ω		20		ns
Rise Time	t _r			80		
Turn-Off Delay Time	t _{d(OFF)}			25		
Fall Time	t _f			15		

DRAIN-SOURCE DIODE CHARACTERISTICS (Note 4)

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 6.0 A	T _J = 25°C	0.80	1.1	V
			T _J = 125°C	0.65		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _{SD} /dt = 100 A/μs, I _S = 6.0 A		40	55	ns
Charge Time	t _a			23		
Discharge Time	t _b			17		
Reverse Recovery Charge	Q _{RR}			0.05		

NOTES:

- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

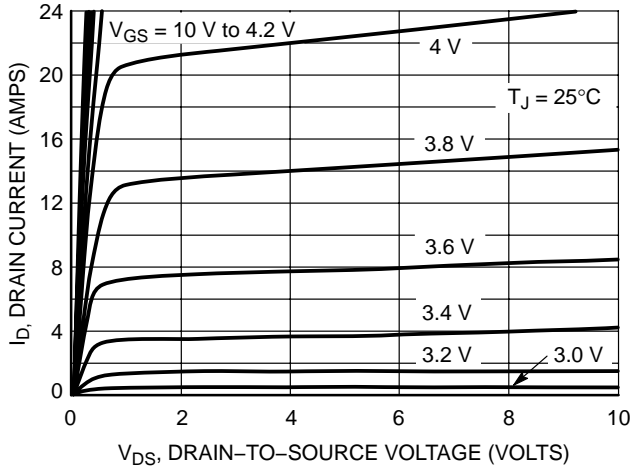


Figure 1. On-Region Characteristics

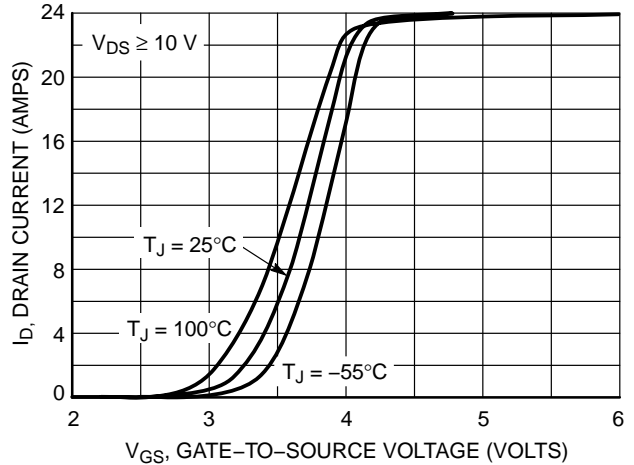


Figure 2. Transfer Characteristics

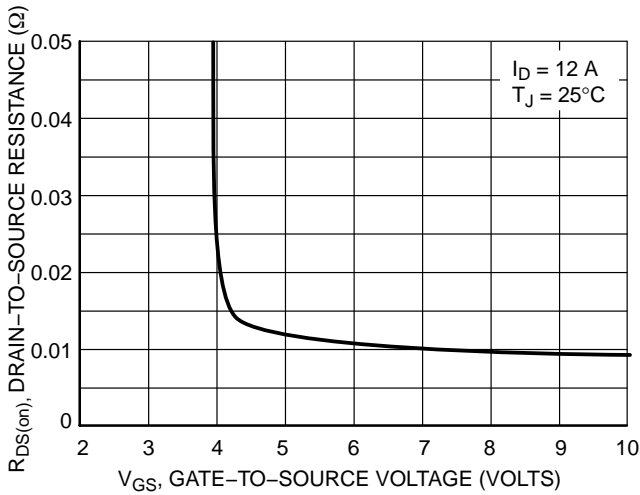


Figure 3. On-Resistance vs. Gate-to-Source Voltage

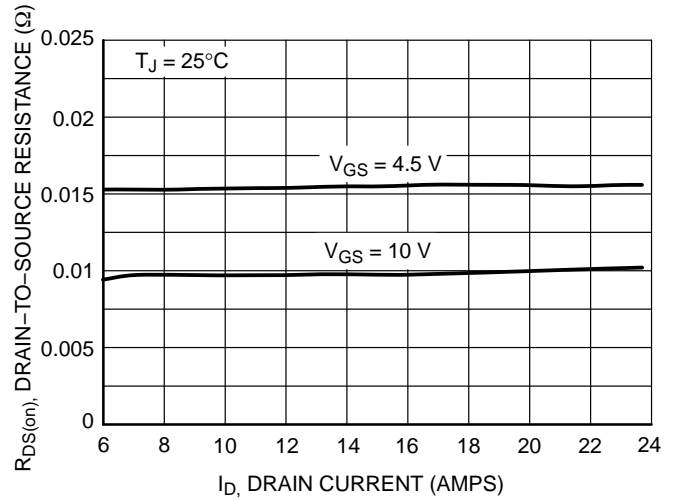


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

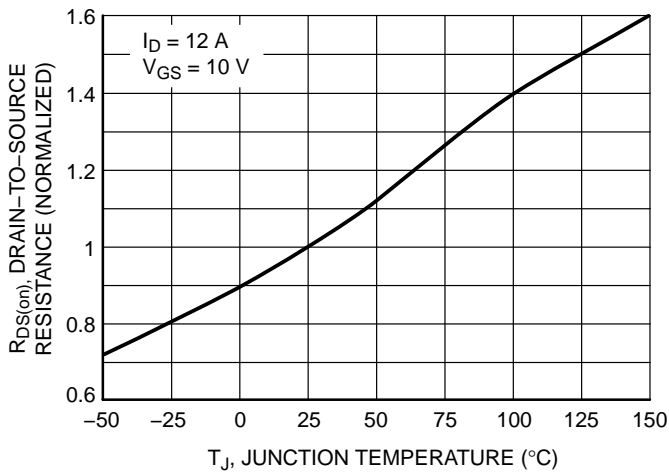


Figure 5. On-Resistance Variation with Temperature

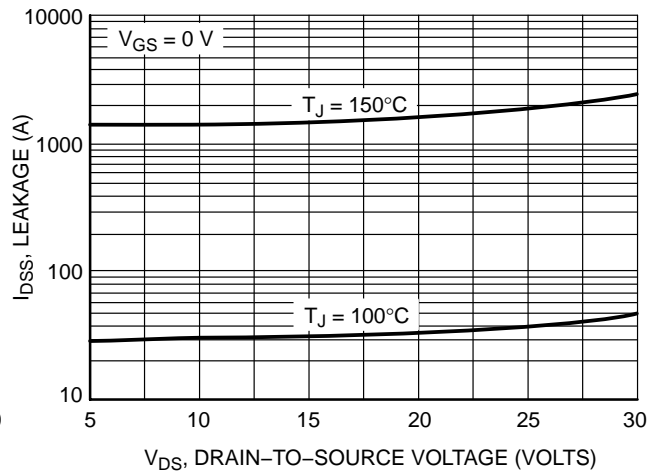
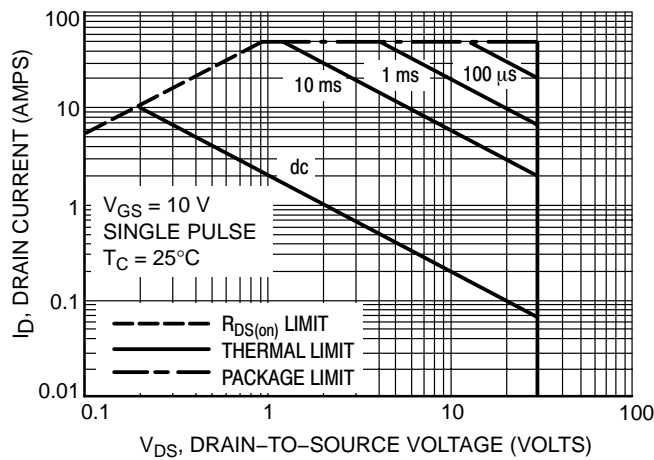
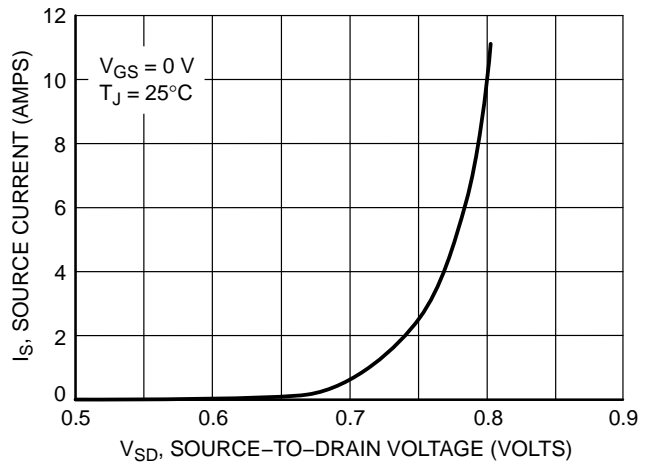
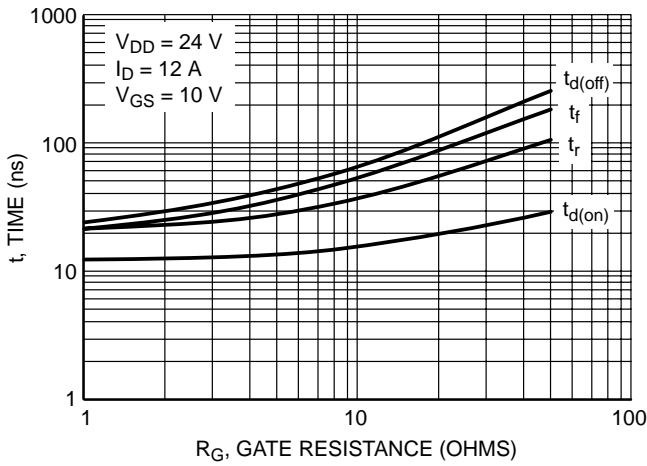
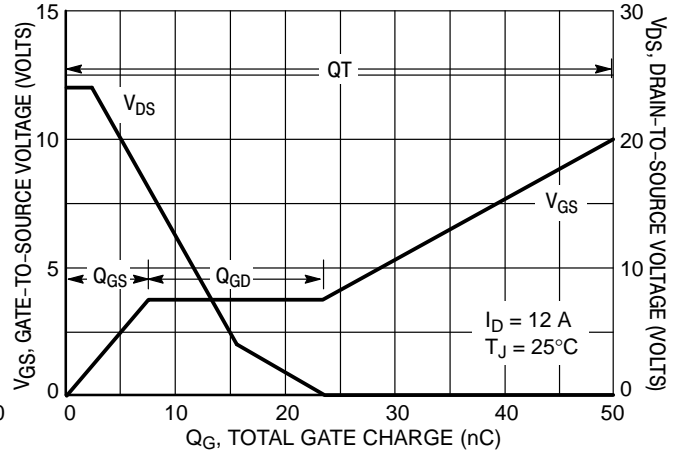
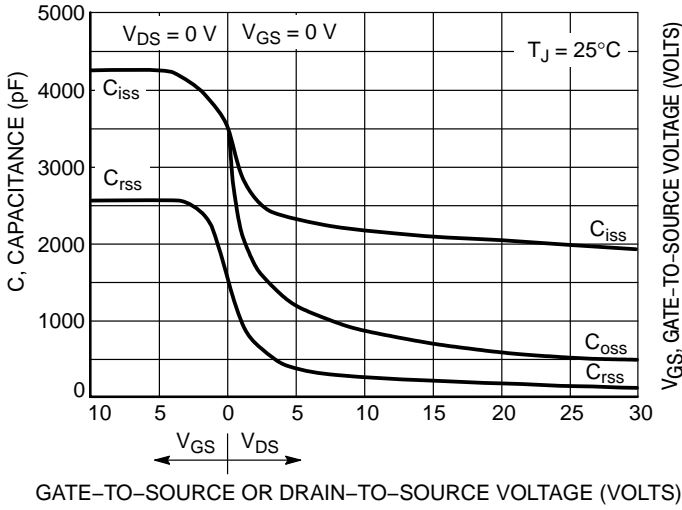


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES



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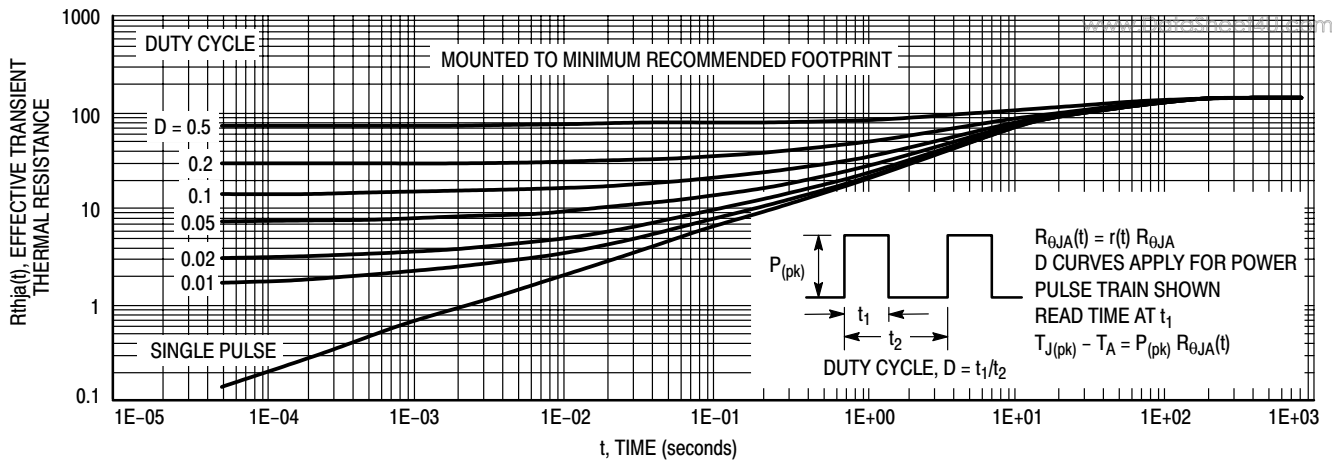


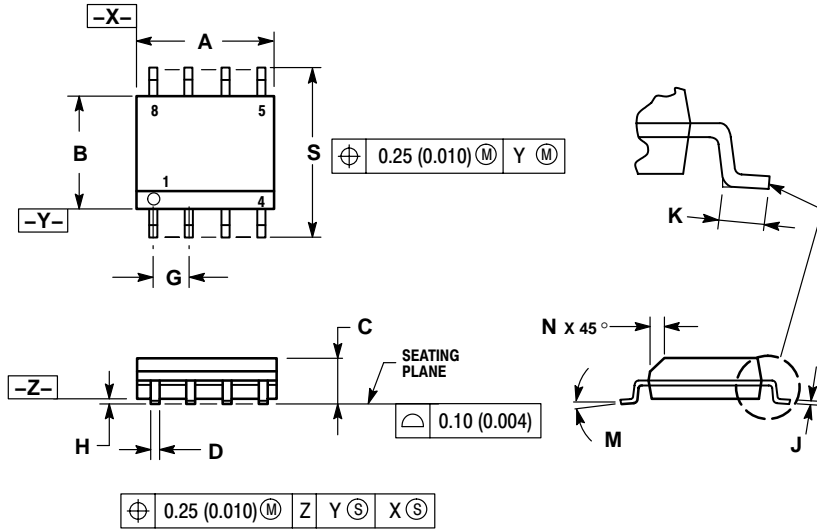
Figure 12. Thermal Response – Various Duty Cycles

NTMS4404N

PACKAGE DIMENSIONS

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SOIC-8 NB
CASE 751-07
ISSUE AA



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 12:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

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