40V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D T_A = +25°C
40V	0.05Ω @ V_{GS} = 10V	7A

Description

This new generation MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- DC-DC Converters
- Audio Output Stages
- Relay and Solenoid driving
- Motor Control

Features

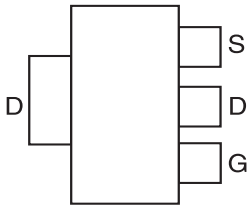
- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Available**

Mechanical Data

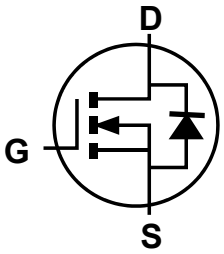
- Case: SOT223
- Case Material: Molded Plastic, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.112 grams (approximate)

SOT223

Top View



Pin Out - Top View



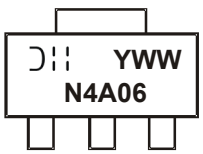
Equivalent Circuit

Ordering Information (Note 4 & 5)

Part Number	Compliance	Case	Packaging
ZXMN4A06GQTA	Automotive	SOT223	1,000/Tape & Reel
ZXMN4A06GQTC	Automotive	SOT223	4,000/Tape & Reel

Note:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product_grade_definitions/.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



= Manufacturer's Marking
N4A06 = Marking Code
YWW = Date Code Marking
Y = Year (ex: 3 = 2013)
WW = Week (01 - 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage			V_{GS}	±20	V
Continuous Drain Current	V_{GS} = 10V	(Note 7)	I_D	7	A
		T_A = +70°C (Note 7)		5.6	
		(Note 6)		5	
Pulsed Drain Current	V_{GS}= 10V	(Note 8)	I_{DM}	22	A
Continuous Source Current (Body diode)		(Note 7)	I_S	5.4	A
Pulsed Source Current (Body diode)		(Note 8)	I_{SM}	22	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 6)	P_D	2	W
Linear Derating Factor			16	mW/°C
	(Note 7)		3.9	W
			31	mW/°C
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	62.5	°C/W
	(Note 7)		32.2	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	I_D = 250µA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	1	—	—	V	I_D = 250µA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 9)	$R_{DS(ON)}$	—	—	0.05	Ω	V_{GS} = 10V, I_D = 4.5A
				0.075		V_{GS} = 4.5V, I_D = 3.2A
Forward Transconductance (Notes 11)	g_{fs}	—	8.7	—	S	V_{DS} = 15V, I_D = 2.5A
Diode Forward Voltage (Note 9)	V_{SD}	—	0.8	0.95	V	I_S = 2.5A, V_{GS} = 0V, T_J = +25°C
Reverse recovery time (Note 11)	t_{rr}		14.5	—	ns	I_F = 2.5A, di/dt = 100A/µs,
Reverse recovery charge (Note 11)	Q_{rr}	—	7.8	—	nC	T_J = +25°C
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	746	—	pF	V_{DS} = 40V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	93	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	60	—	pF	
Total Gate Charge (Note 11)	Q_g	—	19	—	nC	V_{DS} = 30V, V_{GS} = 10V, I_D = 2.5A (refer to test circuit)
Gate-Source Charge (Note 11)	Q_{gs}	—	2.3	—	nC	
Gate-Drain Charge (Note 11)	Q_{gd}	—	4.1	—	nC	
Turn-On Delay Time (Note 11)	$t_{D(on)}$	—	3.4	—	ns	V_{DD} = 30V, V_{GS} = 10V I_D = 2.5A, $R_G \cong 6\Omega$ (refer to test circuit)
Turn-On Rise Time (Note 11)	t_r	—	2.8	—	ns	
Turn-Off Delay Time (Note 11)	$t_{D(off)}$	—	20	—	ns	
Turn-Off Fall Time (Note 11)	t_f	—	7.7	—	ns	

Notes:
6. For a device surface mounted on 25mm x 25mm FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions.
7. For a device surface mounted on FR-4 PCB measured at t≤5 secs.
8. Repetitive rating 25mm x 25mm FR4 PCB, D = 0.05, pulse width 10µs - pulse width limited by maximum junction temperature.
9. Measured under pulsed conditions. Pulse width ≤ 300µs; duty cycle ≤ 2%.
10. Switching characteristics are independent of operating junction temperatures.
11. For design aid only, not subject to production testing.

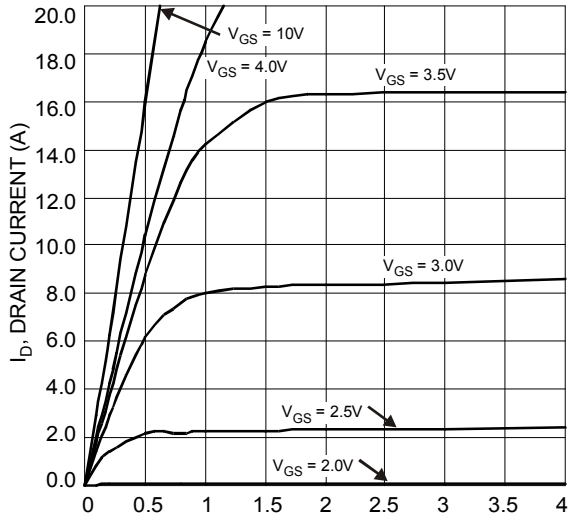


Figure 1 Typical Output Characteristic

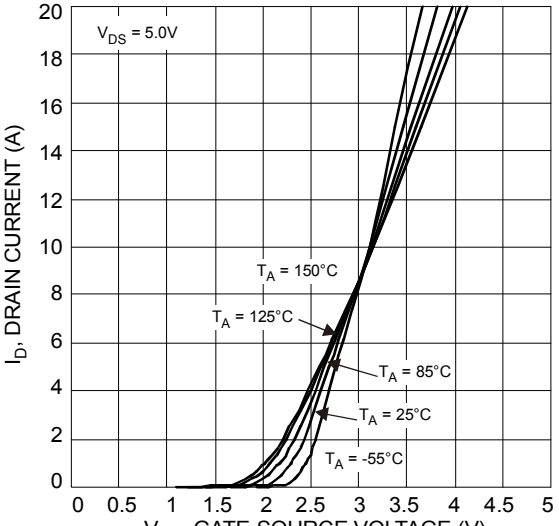


Figure 2 Typical Transfer Characteristics

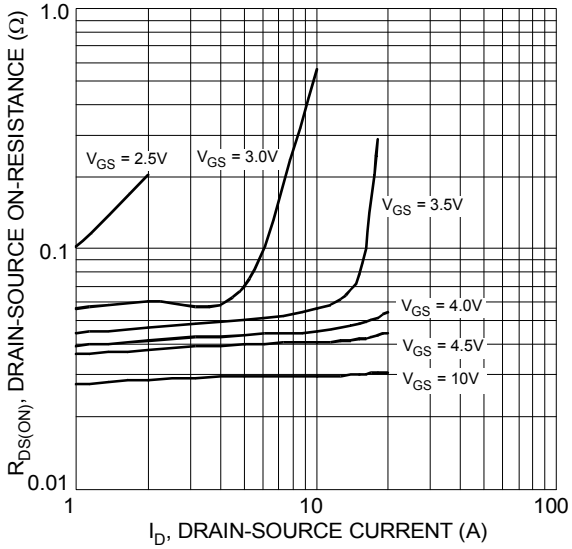


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

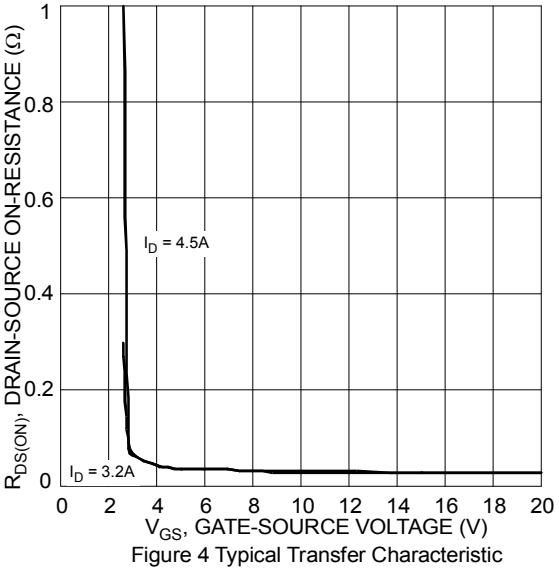


Figure 4 Typical Transfer Characteristic

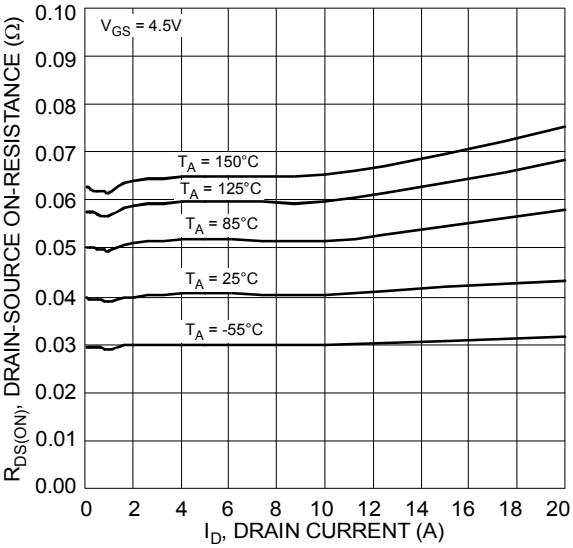


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

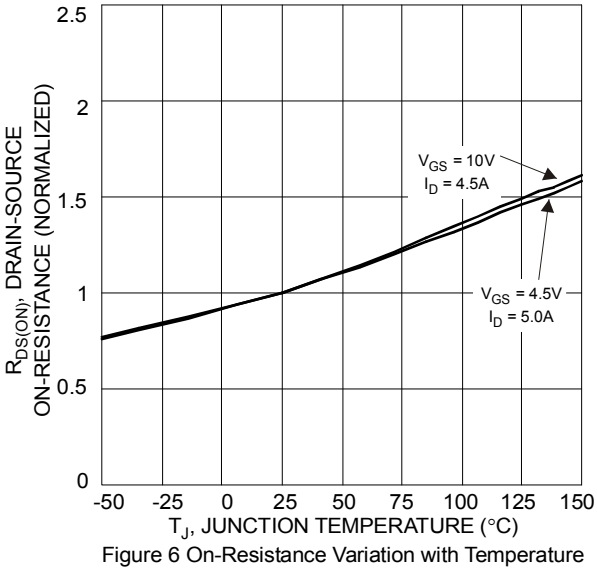


Figure 6 On-Resistance Variation with Temperature

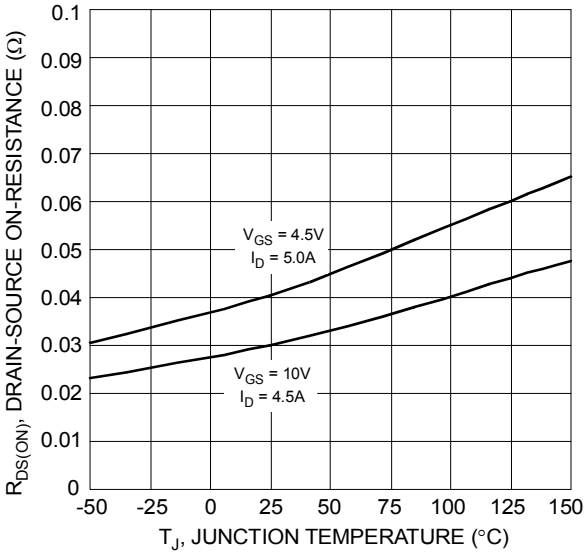


Figure 7 On-Resistance Variation with Temperature

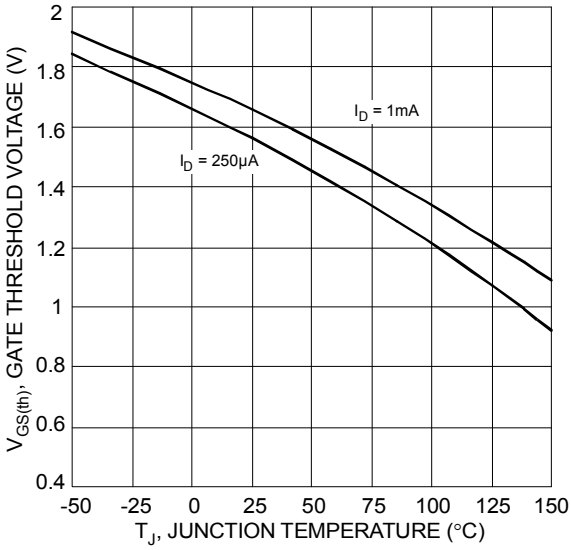


Figure 8 Gate Threshold Variation vs. Ambient Temperature

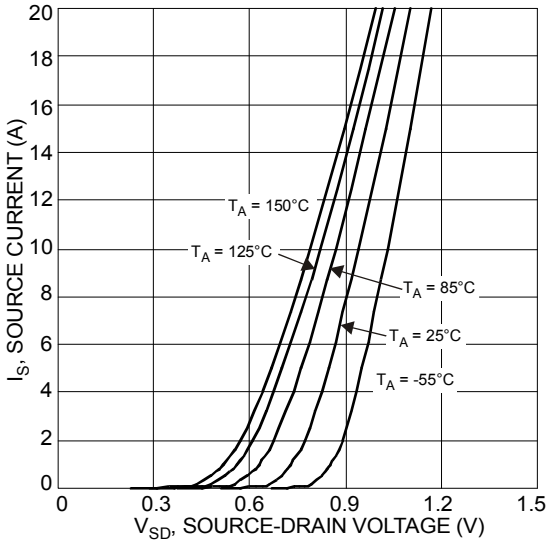


Figure 9 Diode Forward Voltage vs. Current

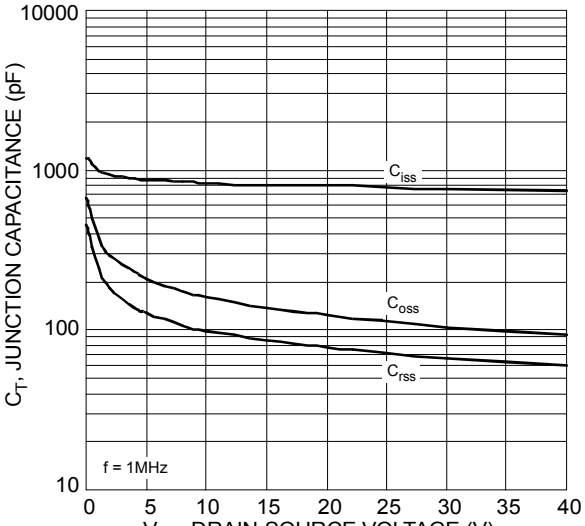


Figure 10 Typical Junction Capacitance

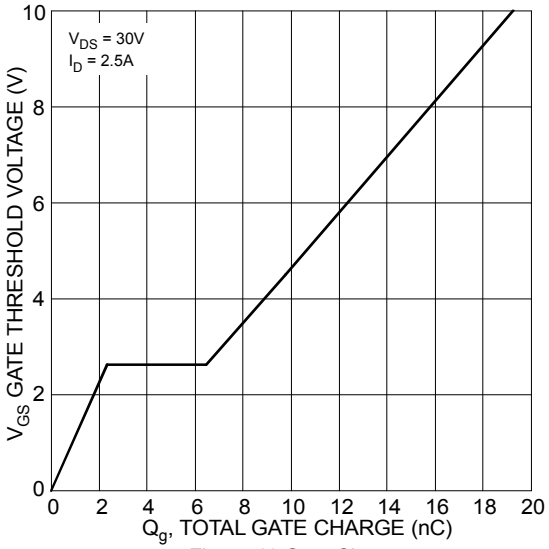


Figure 11 Gate Charge

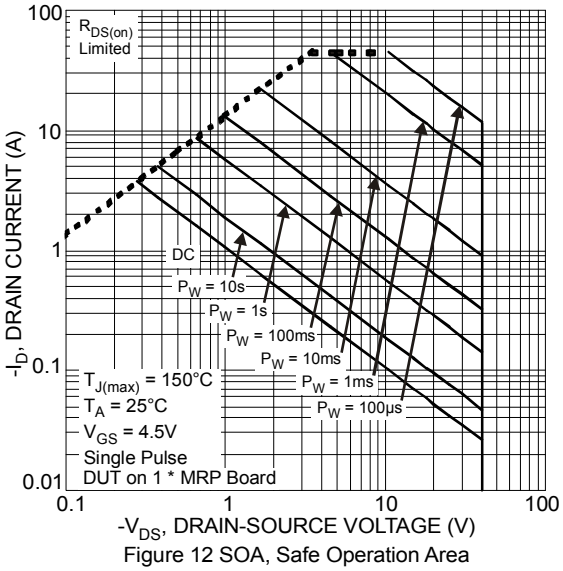


Figure 12 SOA, Safe Operation Area

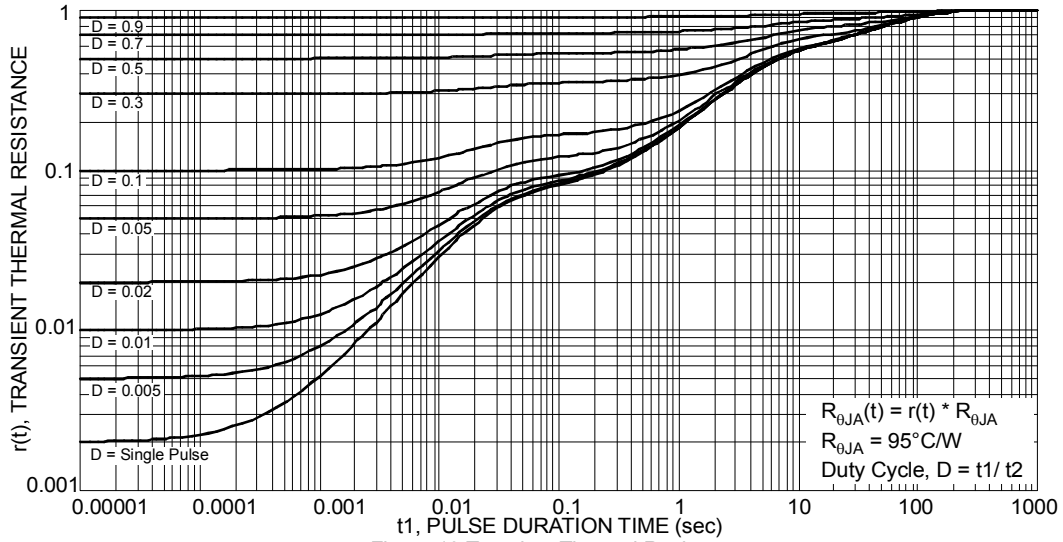
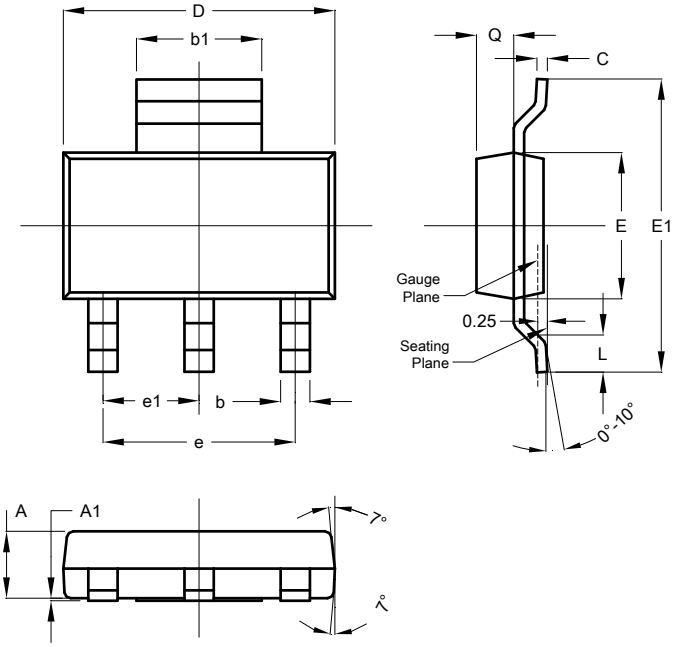


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

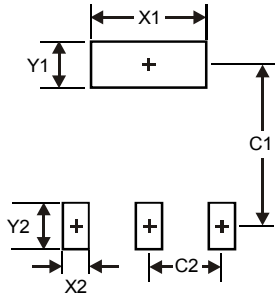
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SOT223			
Dim	**Min**	**Max**	**Typ**
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b1	2.90	3.10	3.00
b2	0.60	0.80	0.70
C	0.20	0.30	0.25
D	6.45	6.55	6.50
E	3.45	3.55	3.50
E1	6.90	7.10	7.00
e	—	—	4.60
e1	—	—	2.30
L	0.85	1.05	0.95
Q	0.84	0.94	0.89
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for latest version.



Dimensions	Value (in mm)
X1	3.3
X2	1.2
Y1	1.6
Y2	1.6
C1	6.4
C2	2.3

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