N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = 25°C
60V	6Ω @ V_{GS} = 5V	200mA

Features and Benefits

- N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- ESD Protected Gate, 1.2kV HBM
- **Lead, Halogen and Antimony Free, RoHS Compliant "Green" Device (Notes 1 and 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

This 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.

- Motor control
- Power Management Functions

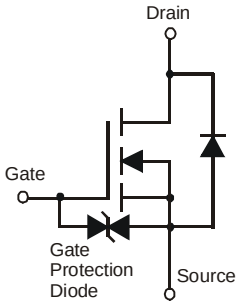
Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Copper leadframe).
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

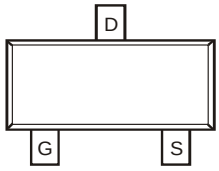
ESD PROTECTED TO 1.2kV

SOT23

Top View



Equivalent Circuit



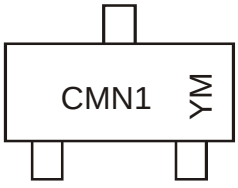
Top View
Pin-Out

Ordering Information (Note 3)

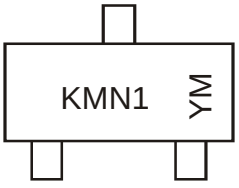
Part Number	Case	Packaging
2N7002A-7	SOT23	3,000/Tape & Reel
2N7002A-13	SOT23	10,000/Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free.
2. Product manufactured with Data Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date Code V9 are built with Non-Green Molding Compound and may contain Halogens or Sb203 Fire Retardants.
3. For packaging details, go to our website at http://www.diodes.com.

Marking Information



Chengdu A/T Site



Shanghai A/T Site

K = SAT (Shanghai Assembly/ Test site)
C = CAT (Chengdu Assembly/ Test site)
MN1= Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)

Date Code Key

Year	2008	2009	2010	2011	2012	2013	2014	2015
Code	V	W	X	Y	Z	A	B	C

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Maximum Ratings @T_A = 25°C unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 4) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 85°C T_A = 100°C	I_D	180 130 115	mA
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 85°C T_A = 100°C	I_D	220 160 140	mA
Maximum Continuous Body Diode Forward Current (Note 5)			I_S	0.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	800	mA

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 4)	P_D	370	mW
	(Note 5)		540	
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	348	°C/W
	(Note 5)		241	
Thermal Resistance, Junction to Case	(Note 5)	$R_{\theta JC}$	91	
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 (Note 6)							
Drain-Source Breakdown Voltage		BV_{DSS}	60	70	—	V	V_{GS} = 0V, I_D = 10µA
Zero Gate Voltage Drain Current	@ T_C = 25°C @ T_C = 125°C	I_{DSS}	—	—	1.0 500	µA	V_{DS} = 60V, V_{GS} = 0V
Gate-Body Leakage		I_{GSS}	—	—	±10	µA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)							
Gate Threshold Voltage		$V_{GS(th)}$	1.2	—	2.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	@ T_J = 25°C	$R_{DS\ (ON)}$	—	3.5	6	Ω	V_{GS} = 5.0V, I_D = 0.115A
	@ T_J = 125°C			3.0	5		V_{GS} = 10V, I_D = 0.115A
Forward Transconductance		g_{FS}	80	—	—	mS	V_{DS} = 10V, I_D = 0.115A
DYNAMIC CHARACTERISTICS (Note 7)							
Input Capacitance		C_{iss}	—	23	—	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance		C_{oss}	—	3.4	—	pF	
Reverse Transfer Capacitance		C_{rss}	—	1.4	—	pF	
Gate Resistance		R_G	—	260	400	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
SWITCHING CHARACTERISTICS (Note 7)							
Turn-On Delay Time		$t_{D(ON)}$	—	10	—	ns	V_{DD} = 30V, I_D = 0.115A, R_L = 150Ω,
Turn-Off Delay Time		$t_{D(OFF)}$	—	33	—	ns	V_{GEN} = 10V, R_{GEN} = 25Ω

Notes: 4. Device mounted on FR-4 PCB, with minimum recommended pad layout
5. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

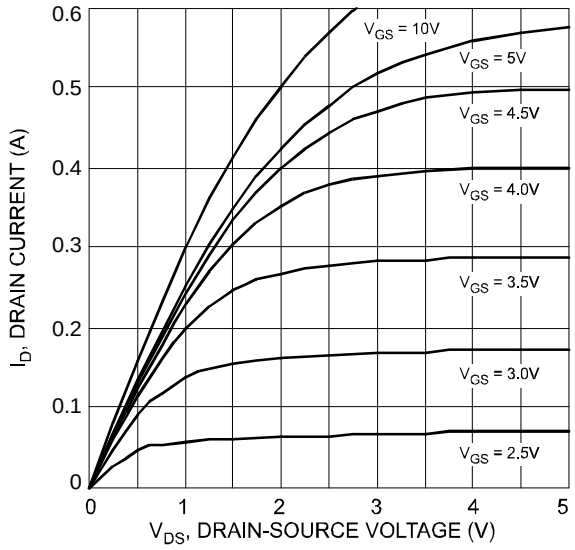


Fig.1 Typical Output Characteristic

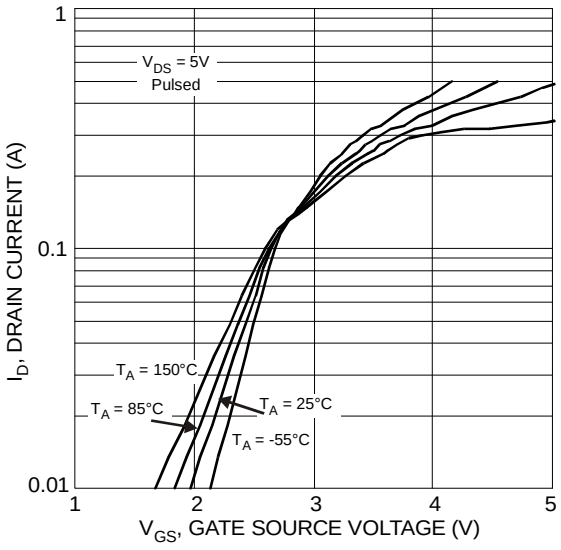


Fig. 2 Typical Transfer Characteristics

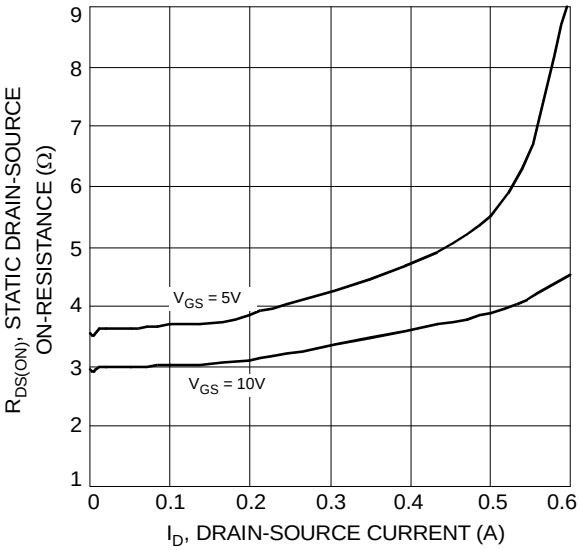


Fig. 3 On-Resistance vs. Drain Current & Gate Voltage

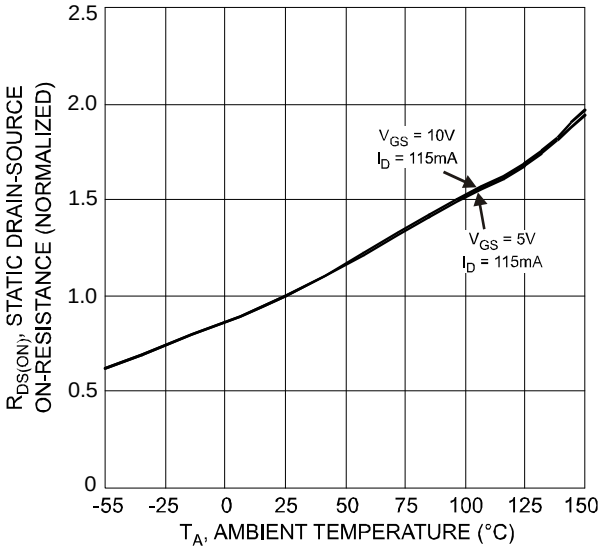


Fig. 4 Normalized Static Drain-Source On-Resistance vs. Ambient Temperature

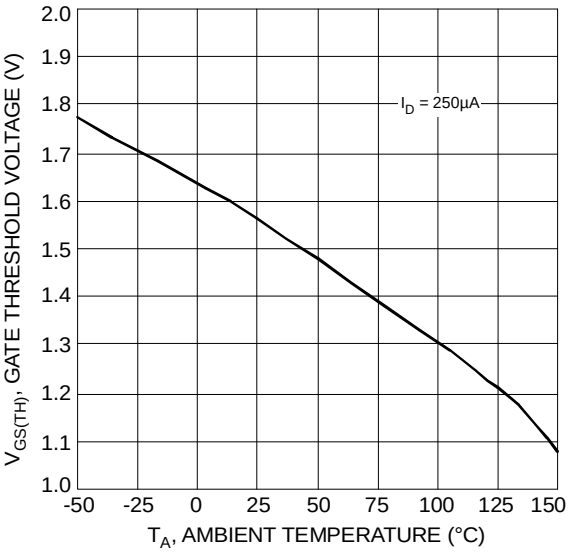


Fig. 5 Gate Threshold Variation vs. Ambient Temperature

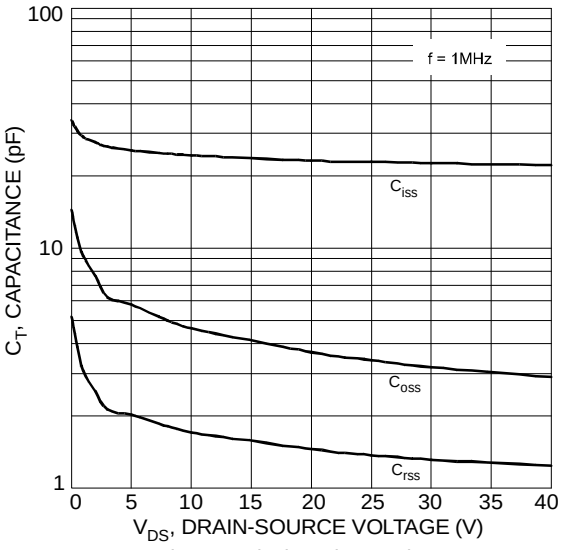


Fig. 6 Typical Total Capacitance

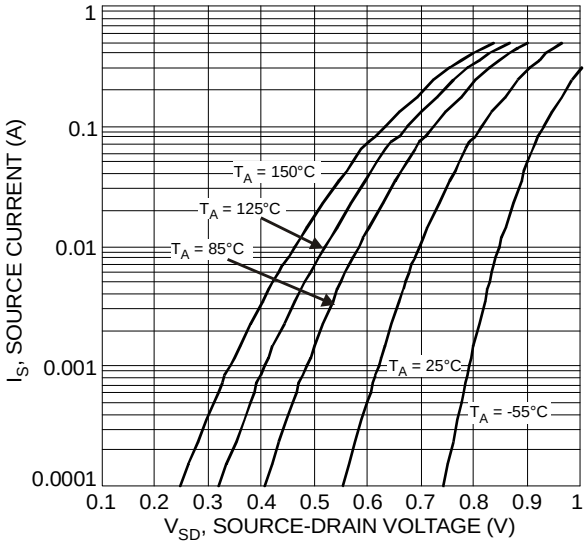
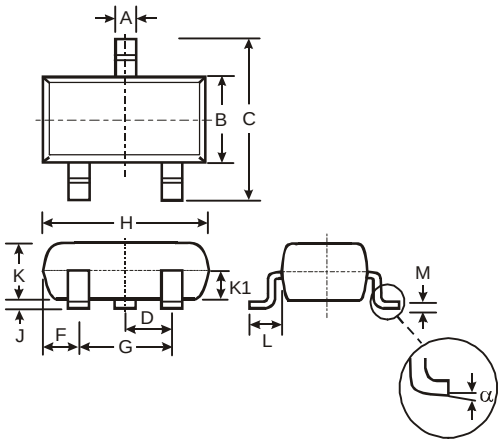


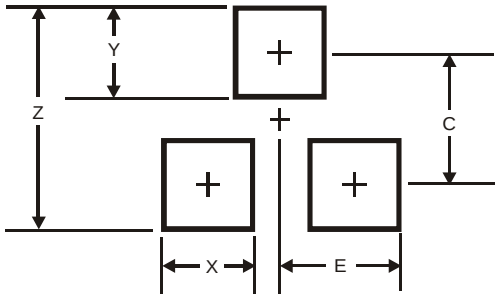
Fig. 7 Reverse Drain Current vs. Source-Drain Voltage

Package Outline Dimensions



SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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