

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ max}$	$I_D \text{ max}$ $T_A = +25^\circ\text{C}$
60V	$6\Omega @ V_{GS} = 5V$	200mA

## Description

This MOSFET is 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

- Motor Control
- Power Management Functions

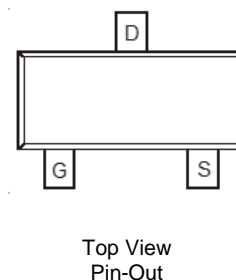
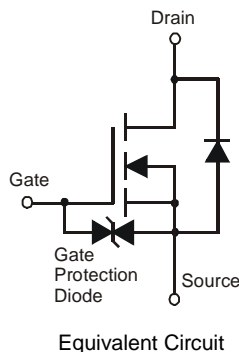
## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- ESD Protected Gate, 1.2kV HBM
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- The 2N7002AQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

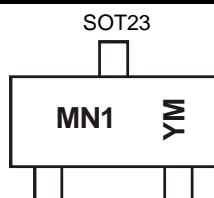


## Ordering Information (Note 4)

Part Number	Case	Packaging
2N7002AQ-7	SOT23	3,000/Tape & Reel
2N7002AQ-13	SOT23	10,000/Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  - See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



MN1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: H = 2020)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2015	...	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Code	C	...	H	I	J	K	L	M	N	O	P	R
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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	60	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	180	mA
		T <sub>A</sub> = +85°C		130	
		T <sub>A</sub> = +100°C		115	
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	220	mA
		T <sub>A</sub> = +85°C		160	
		T <sub>A</sub> = +100°C		140	
Maximum Continuous Body Diode Forward Current (Note 6)			I <sub>S</sub>	0.5	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	800	mA

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5)	P <sub>D</sub>	370	mW
	(Note 6)		540	
Thermal Resistance, Junction to Ambient	(Note 5)	R <sub>θJA</sub>	348	°C/W
	(Note 6)		241	
Thermal Resistance, Junction to Case	(Note 6)	R <sub>θJC</sub>	91	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	70	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10µA
Zero Gate Voltage Drain Current @ T <sub>C</sub> = +25°C @ T <sub>C</sub> = +125°C	I <sub>DSS</sub>	—	—	1.0 500	µA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Body Leakage	I <sub>GSS</sub>	—	—	±10	µA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.2	—	2.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance @ T <sub>J</sub> = +25°C @ T <sub>J</sub> = +125°C	R <sub>DS(ON)</sub>	—	3.5 3.0	6 5	Ω	V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 0.115A
						V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.115A
Forward Transconductance	g <sub>FS</sub>	80	—	—	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.115A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	23	—	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	3.4	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	1.4	—	pF	
Gate Resistance	R <sub>G</sub>	—	260	400	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
<b>SWITCHING CHARACTERISTICS (Note 8)</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	—	10	—	ns	V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.115A, R <sub>L</sub> = 150 Ω, V <sub>GEN</sub> = 10V, R <sub>GEN</sub> = 25 Ω
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	33	—	ns	

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

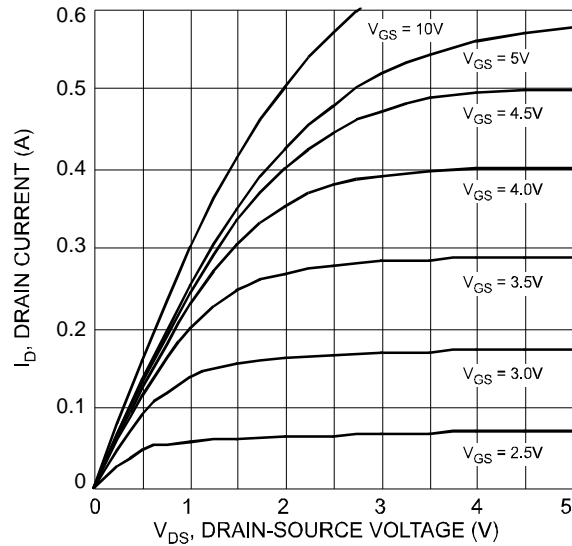


Fig. 1 Typical Output Characteristic

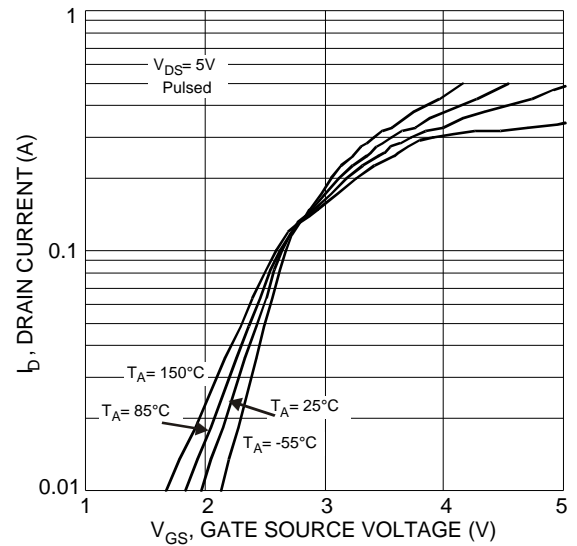


Fig. 2 Typical Transfer Characteristics

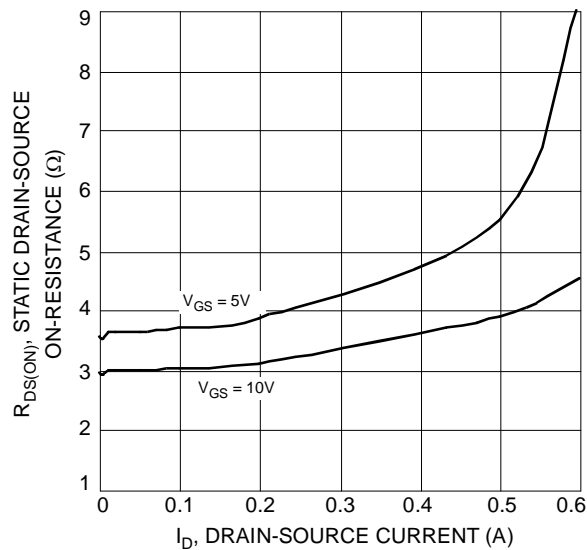


Fig. 3 On-Resistance vs. Drain Current & Gate Voltage

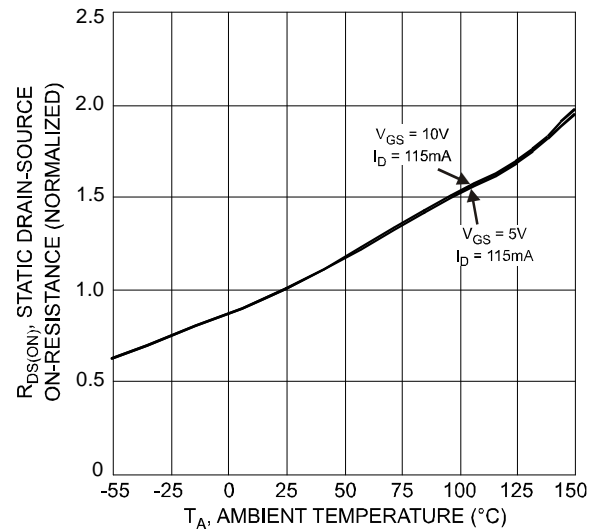


Fig. 4 Normalized Static Drain-Source On-Resistance vs. Ambient Temperature

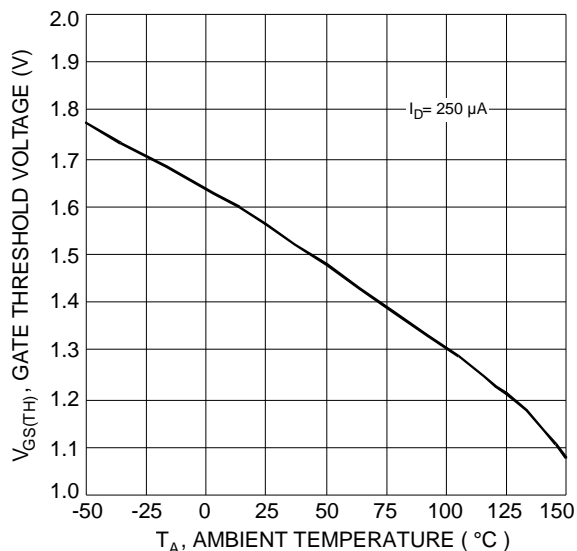


Fig. 5 Gate Threshold Variation vs. Ambient Temperature

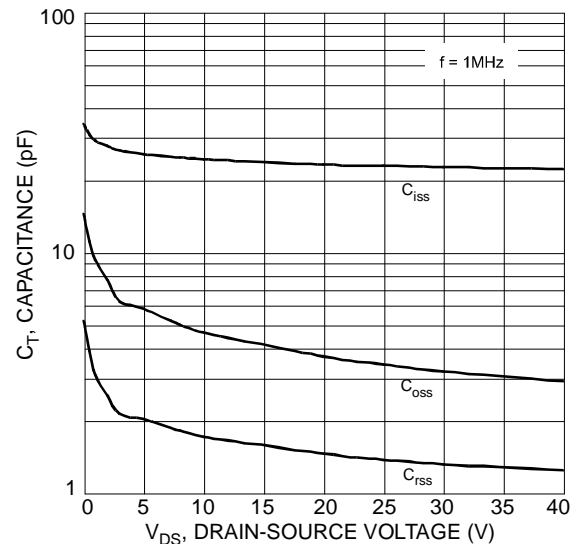


Fig. 6 Typical Total Capacitance

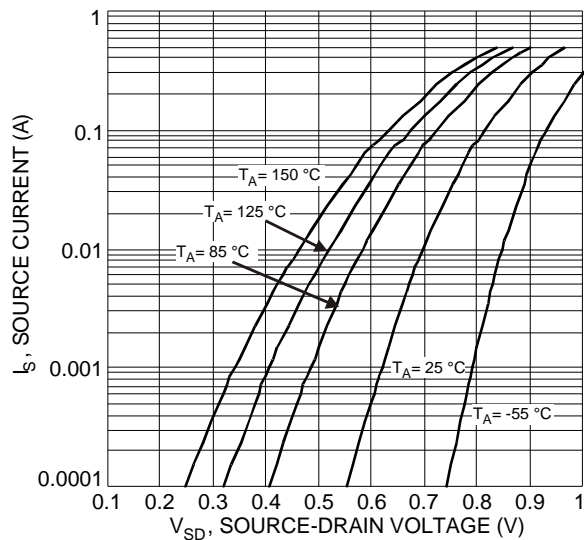
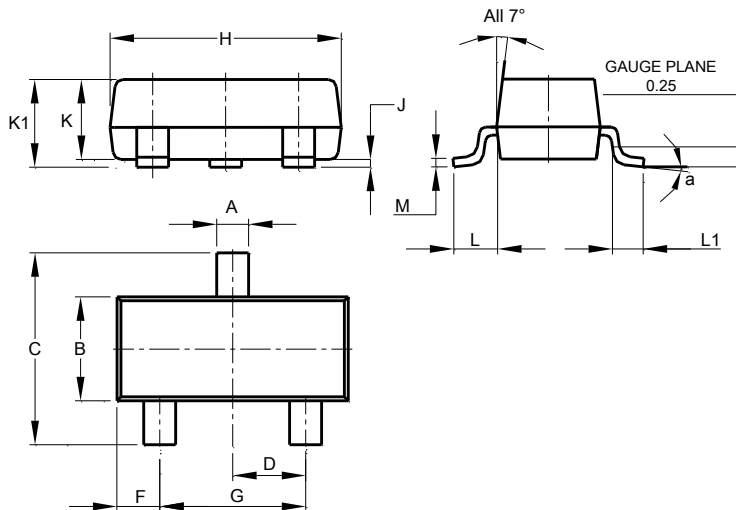


Fig. 7 Reverse Drain Current vs. Source-Drain Voltage

## Package Outline Dimensions

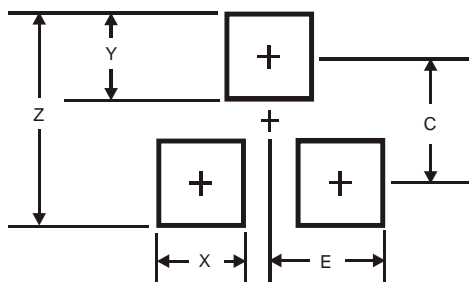
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	8°		
All Dimensions in mm			

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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

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