

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ C$
60V	7.5Ω @ $V_{GS} = 5V$	115mA

## Description and Applications

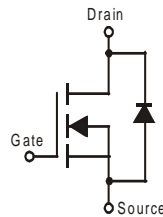
This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- DC-DC Converters
- Power Management Functions
- Battery Operated Systems and Solid-State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.

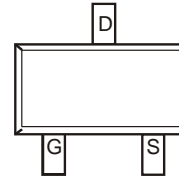
SOT523



Top View



Equivalent Circuit



Top View

## Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

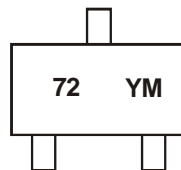
- Case: SOT523
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208③
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)

## Ordering Information (Notes 5 and 6)

Part Number	Qualification	Case	Packaging
2N7002T-7-F	Commercial	SOT523	3,000/Tape & Reel
2N7002T-13-F	Commercial	SOT523	10,000/Tape & Reel
2N7002TQ-7-F	Automotive	SOT523	3,000/Tape & Reel
2N7002TQ-13-F	Automotive	SOT523	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. 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.
  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 <https://www.diodes.com/quality/>.
  5. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or  $Sb_2O_3$  Fire Retardants.
  6. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



72 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: F = 2018)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2005	~	2018	2019	2020	2021	2022	2023
Code	S	~	F	G	H	I	J	K

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	Unit
Drain-Source Voltage	V <sub>DSS</sub>	60	V
Drain-Gate Voltage (R <sub>GS</sub> ≤ 1.0MΩ)	V <sub>DGR</sub>	60	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Pulsed		±40	
Drain Current (Note 7)	I <sub>D</sub>	Continuous	115
		Continuous @ +100°C	73
		Pulsed	800

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 7)	P <sub>D</sub>	150	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	833	°C/W
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 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1.0	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
@ T <sub>C</sub> = +125°C				500		
Gate-Body Leakage	I <sub>GSS</sub>	—	—	±10	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.0	—	2.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	2.0	7.5	Ω	V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 0.05A
@ T <sub>J</sub> = +125°C			4.4	13.5		
On-State Drain Current	I <sub>D(ON)</sub>	0.5	1.0	—	A	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 7.5V
Forward Transconductance	g <sub>FS</sub>	80	—	—	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>ISS</sub>	—	22	50	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	11	25	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	2.0	5.0	pF	
<b>SWITCHING CHARACTERISTICS (Note 9)</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	—	7.0	20	ns	V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.2A, R <sub>L</sub> = 150Ω, V <sub>GEN</sub> = 10V, R <sub>GEN</sub> = 25Ω
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	11	20	ns	

- Notes:
7. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to production testing.

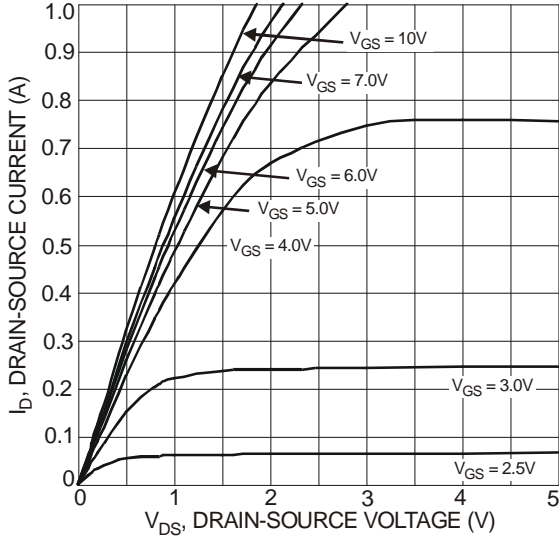


Fig. 1 On-Region Characteristics

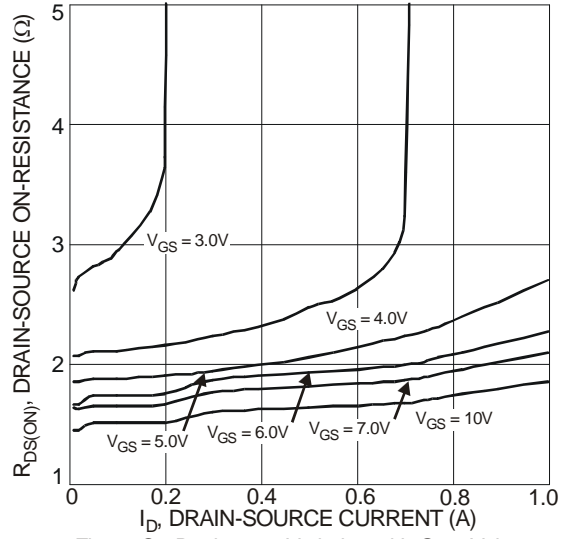


Fig. 2 On-Resistance Variation with Gate Voltage and Drain-Source Current

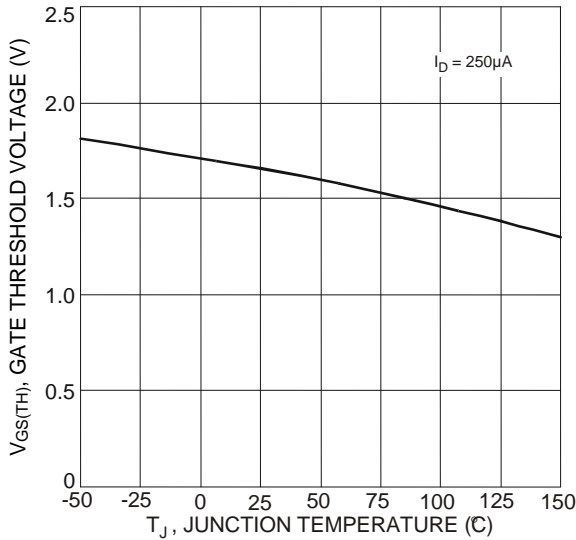


Fig. 3 Gate Threshold Variation with Temperature

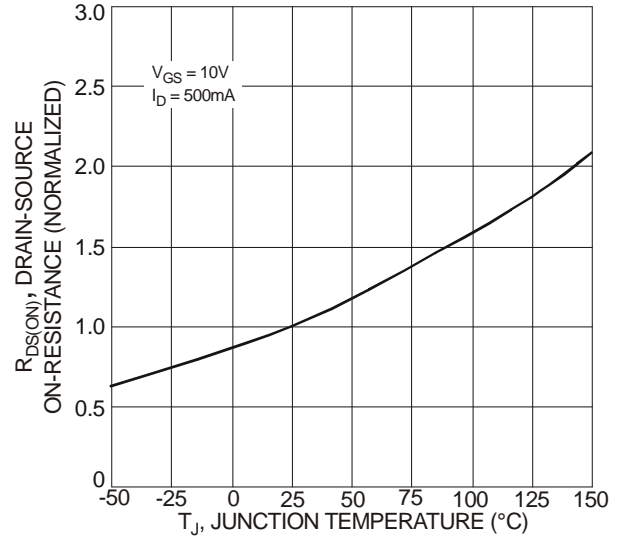


Fig. 4 On-Resistance Variation with Temperature

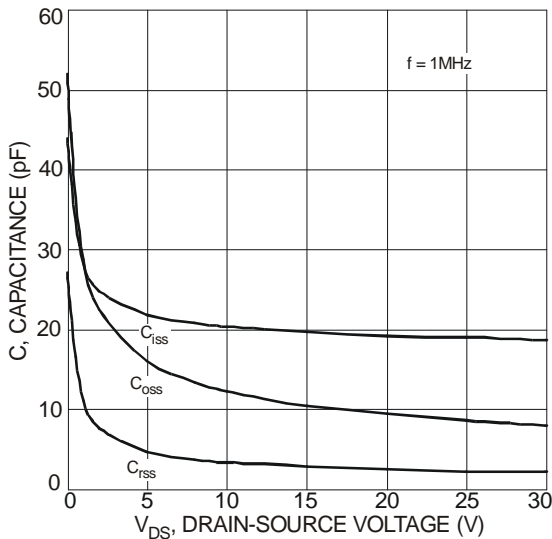


Fig. 5 Typical Capacitance

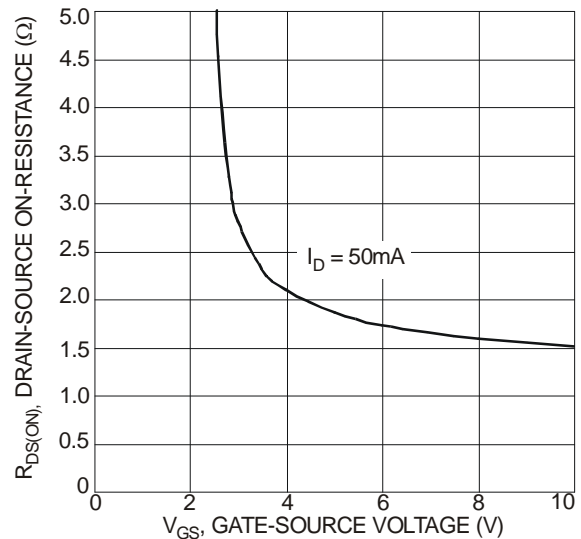
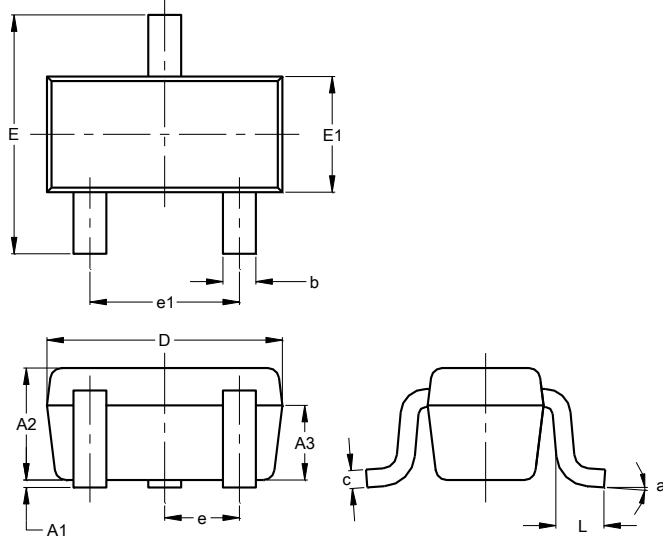


Fig. 6 On-Resistance vs. Gate-Source Voltage

**Package Outline Dimensions**

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

**SOT523**

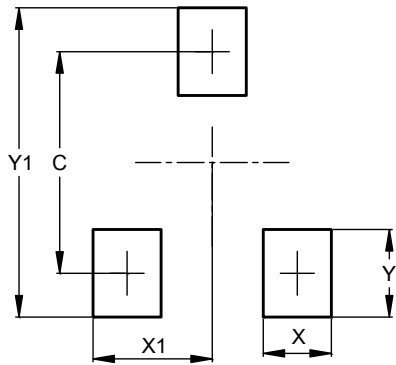


SOT523			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.60	0.80	0.75
A3	0.45	0.65	0.50
b	0.15	0.30	0.22
c	0.10	0.20	0.12
D	1.50	1.70	1.60
E	1.45	1.75	1.60
E1	0.75	0.85	0.80
e	0.50 BSC		
e1	0.90	1.10	1.00
L	0.20	0.40	0.33
a	0°	--	8°
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**SOT523**



Dimensions	Value (in mm)
C	1.29
X	0.40
X1	0.70
Y	0.51
Y1	1.80

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