

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON) \max}$	$I_D \max$ $T_A = +25^\circ C$
60V	7.5Ω @ $V_{GS} = 5V$	210mA

Description

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.

Applications

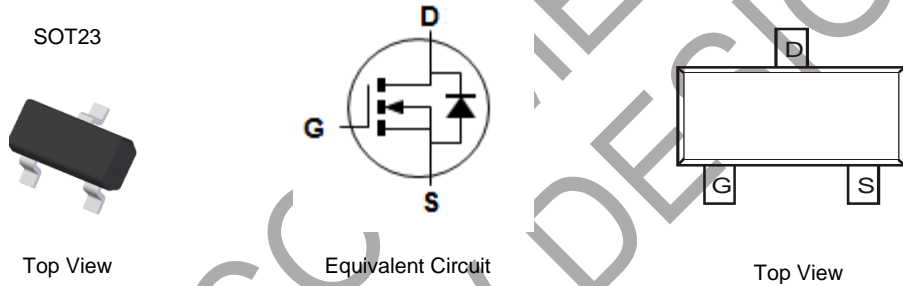
- Motor control
- Power Management Functions

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Notes 3)**
- **Qualified to AEC-Q101 standards for High Reliability**

Mechanical Data

- Case: SOT23
- 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 208
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

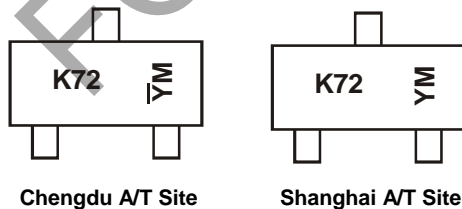


Ordering Information (Note 4)

Part Number	Case	Packaging
2N7002-7-02	SOT23	3,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



K72 = Product Type Marking Code
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)
 YM = Date Code Marking for CAT (Chengdu Assembly/ Test site)
 Y or \bar{Y} = Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code	N	P	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
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	
Drain-Gate Voltage R _{GS} ≤ 1.0MΩ		V _{DGR}	60	V	
Gate-Source Voltage		V _{GSS}	±20	V	
			Pulsed		±40
Continuous Drain Current (Note 5)	Steady State	I _D	T _A = +25°C	170	mA
			T _A = +85°C	120	
			T _A = +100°C	105	
Continuous Drain Current (Note 6)	Steady State	I _D	T _A = +25°C	210	mA
			T _A = +85°C	150	
			T _A = +100°C	135	
Maximum Body Diode Forward Current (Note 6)		I _S	0.5	A	

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5)	P _D	380	mW
	(Note 6)		520	
Thermal Resistance, Junction to Ambient	(Note 5)	R _{θJA}	335	°C/W
	(Note 6)		243	
Thermal Resistance, Junction to Case	(Note 6)	R _{θJC}	89	
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 7)							
Drain-Source Breakdown Voltage	BV _{DSS}	60	—	—	V	V _{GS} = 0V, I _D = 10μA	
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1.0 500	μA	@T _C = +25°C @T _C = +125°C V _{DS} = 60V, V _{GS} = 0V	
Gate-Body Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V	
ON CHARACTERISTICS (Note 7)							
Gate Threshold Voltage	V _{GS(th)}	@T _J = +25°C	2.1	—	2.55	V	V _{DS} = V _{GS} , I _D = 250μA V _{DS} = V _{GS} , I _D = 250μA
		@T _J = +0°C~+100°C (Note 8)	1.8	—	2.65		
Static Drain-Source On-Resistance	R _{DS(ON)}	—	—	7.5 13.5	Ω	@T _J = +25°C @T _J = +125°C V _{GS} = 5.0V, I _D = 0.05A V _{GS} = 10V, I _D = 0.5A	
On-State Drain Current	I _{D(ON)}	0.5	—	—	A	V _{GS} = 10V, V _{DS} = 7.5V	
Forward Transconductance	g _{FS}	80	—	—	mS	V _{DS} = 10V, I _D = 0.2A	
Diode Forward Voltage	V _{SD}	—	0.78	1.5	V	V _{GS} = 0V, I _S = 115mA	
DYNAMIC CHARACTERISTICS (Note 8)							
Input Capacitance	C _{iss}	—	—	50	pF	V _{DS} = 25V, V _{GS} = 0V f = 1.0MHz	
Output Capacitance	C _{oss}	—	—	25	pF		
Reverse Transfer Capacitance	C _{rss}	—	—	5.0	pF		
Total Gate Charge (V _{GS} = 4.5V)	Q _g	—	0.34	—	pC	V _{DS} = 15V, I _D = 0.2A	
Gate-Source Charge	Q _{gs}	—	0.17	—			
Gate-Drain Charge	Q _{gd}	—	0.13	—			
SWITCHING CHARACTERISTICS (Note 8)							
Turn-On Delay Time	t _{D(on)}	—	3.2	—	ns	V _{DD} = 30V, I _D = 0.2A, R _L = 150Ω, V _{GEN} = 10V, R _{GEN} = 25Ω	
Turn-On Rise Time	t _r	—	2.4	—			
Turn-Off Delay Time	t _{D(off)}	—	7.5	—			
Turn-Off Fall Time	t _f	—	3.8	—			

- 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.

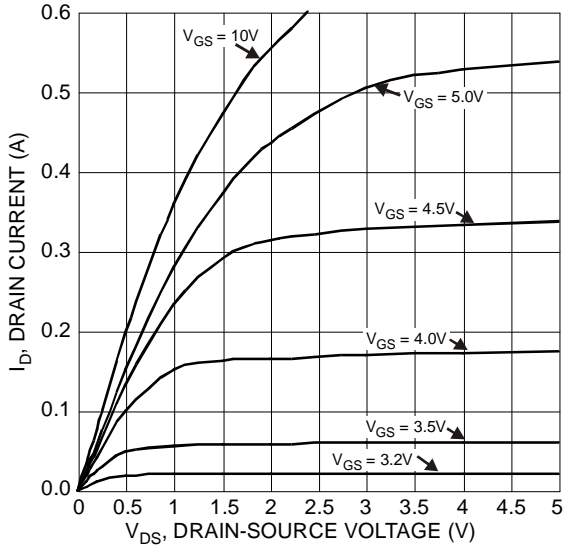


Figure 1 Typical Output Characteristic

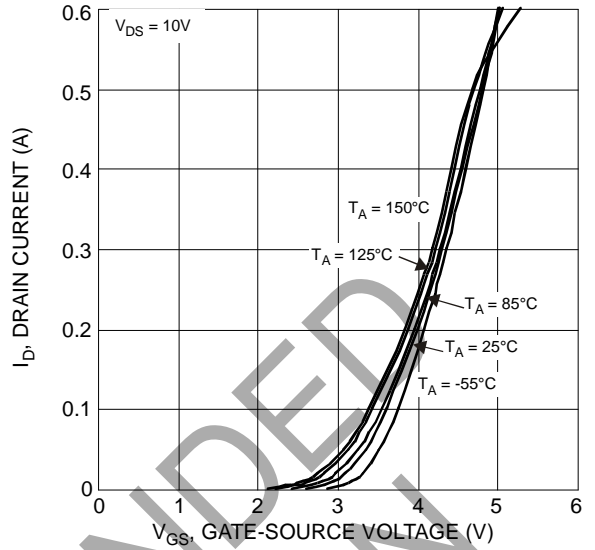


Figure 2 Typical Transfer Characteristics

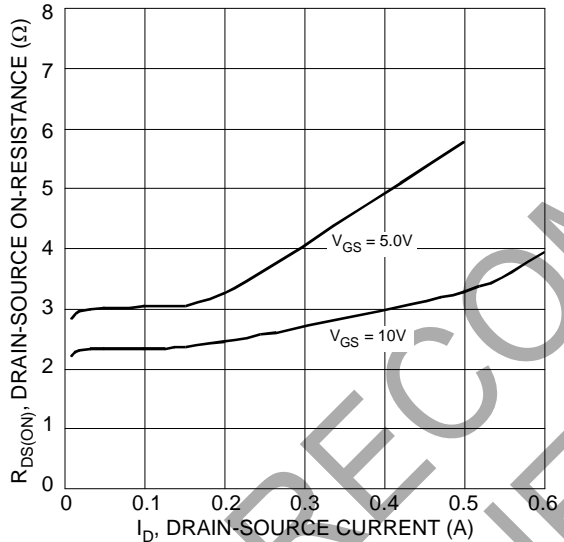


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

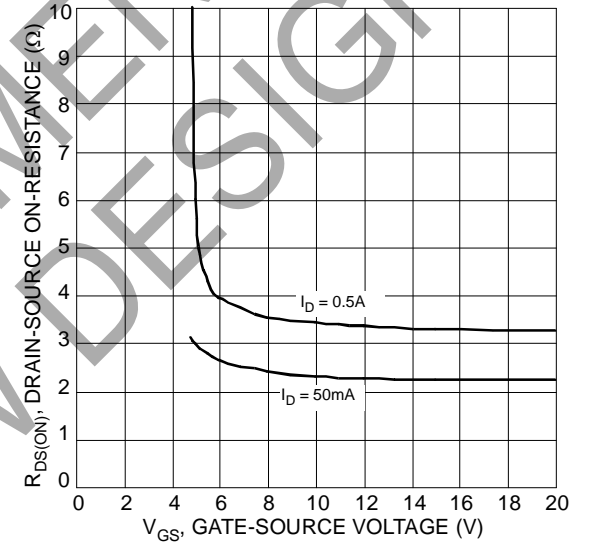


Figure 4 Typical Transfer Characteristic

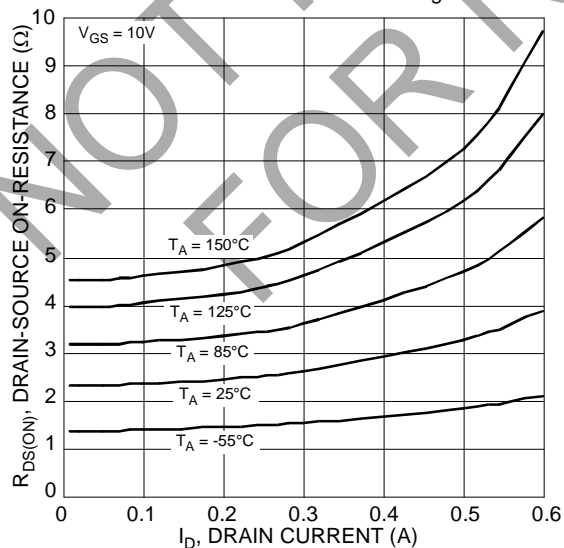


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

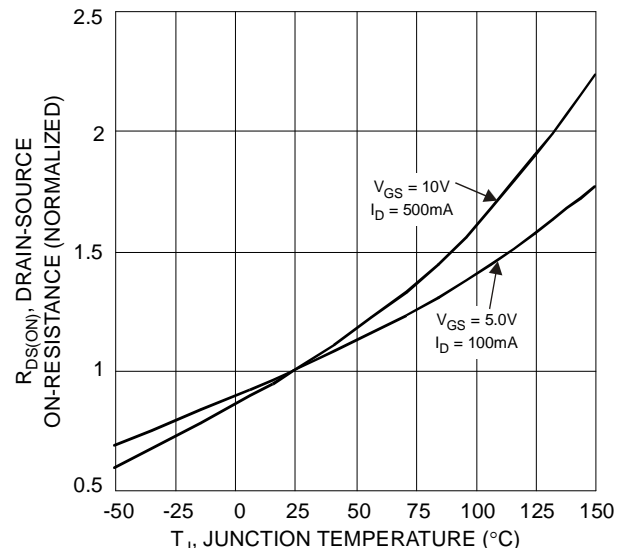


Figure 6 On-Resistance Variation with Temperature

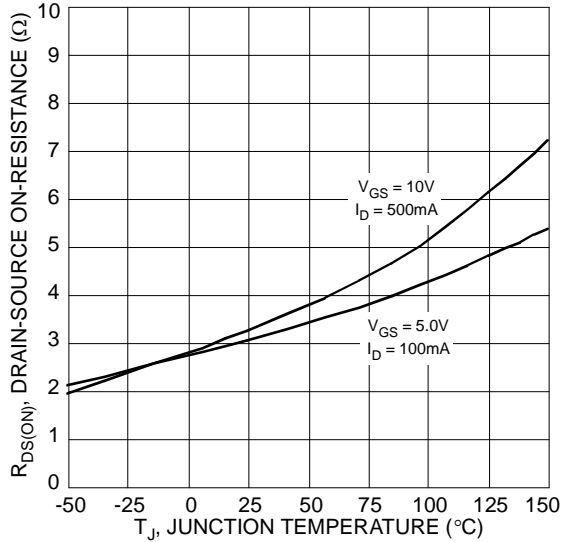


Figure 7 On-Resistance Variation with Temperature

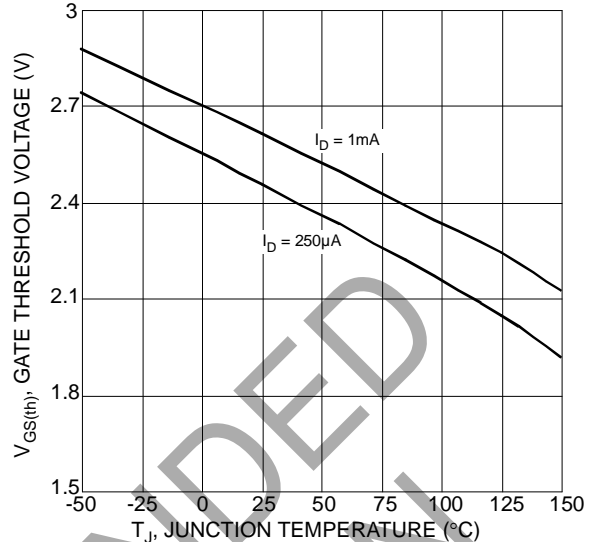


Figure 8 Gate Threshold Variation vs. Ambient Temperature

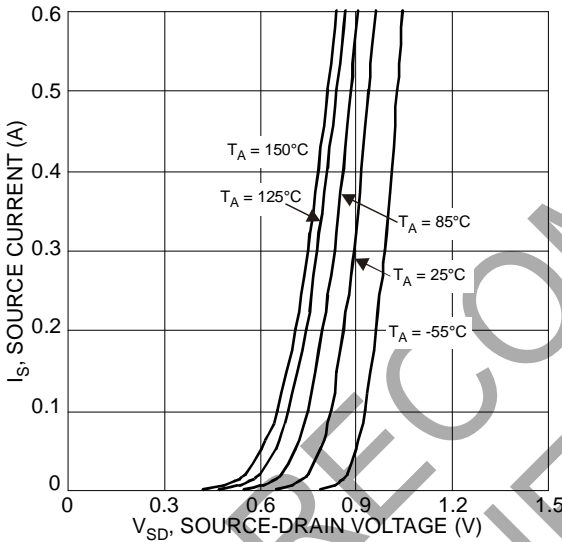


Figure 9 Diode Forward Voltage vs. Current

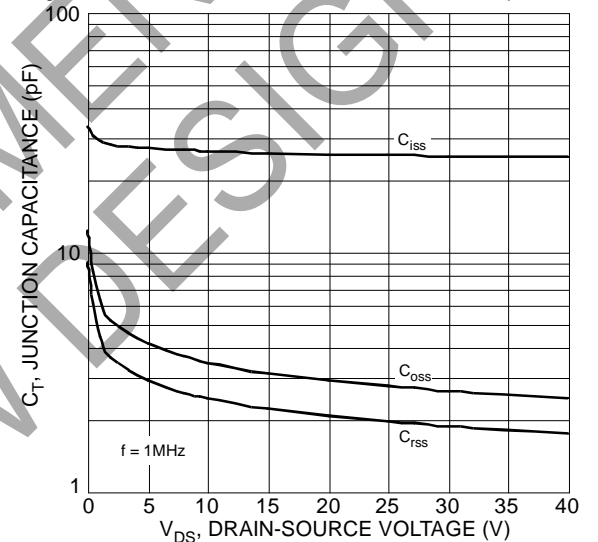


Figure 10 Typical Junction Capacitance

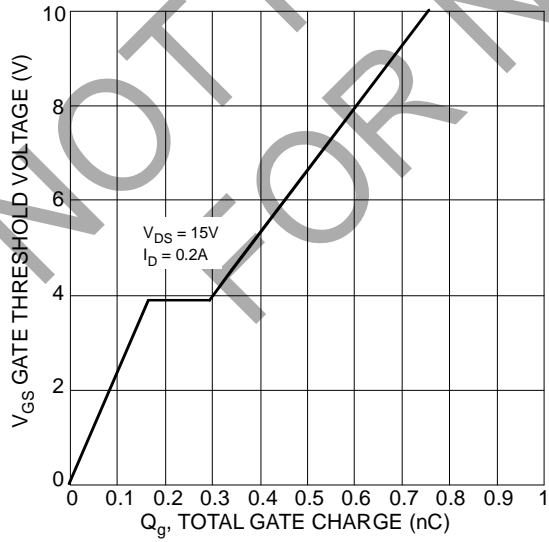
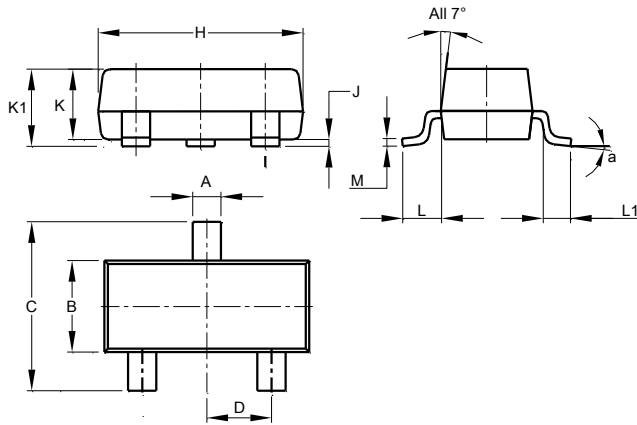


Figure 11 Gate Charge

Package Outline Dimensions

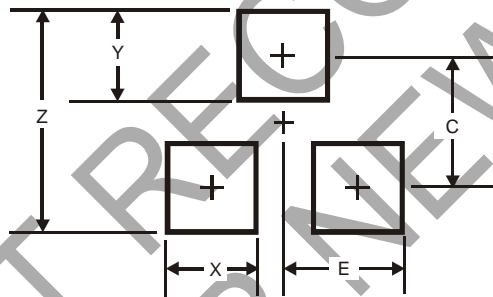
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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 AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> 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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