

## Product Summary

BV <sub>DSS</sub>	R <sub>DSON</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
60V	3Ω @ V <sub>GS</sub> = 10V	300mA

## Description and Applications

This MOSFET has been designed to minimize the on-state resistance (R<sub>DSON</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

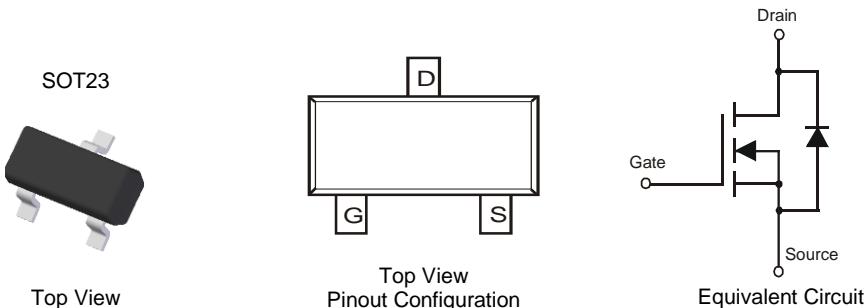
- Motor controls
- Power-management functions

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- 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 (Note 3)
- This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.  
<https://www.diodes.com/quality/product-definitions/>
- An automotive-compliant part is available under separate datasheet ([2N7002EQ](#))

## Mechanical Data

- Package: SOT23
- Package 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 e3
- Weight: 0.008 grams (Approximate)



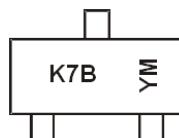
## Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
2N7002E-7-F	SOT23	3,000	Tape & Reel
2N7002E-13-F	SOT23	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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



K7B = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  or  $\underline{Y}$  = Year (ex: L = 2024)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2003	-	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	P	-	L	M	N	P	R	S	T	U	V	W

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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic		Symbol	Value	Units
Drain-Source Voltage		$V_{DSS}$	60	V
Drain-Gate Voltage $R_{GS} \leq 1.0\text{M}\Omega$		$V_{DGR}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$ $\pm 40$	V
Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$ 250 200	mA
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$ 300 240	mA
Maximum Body Diode Forward Current (Note 6)		$I_S$	500	mA
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)		$I_{DM}$	800	mA

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5)	$P_D$	370	mW
	(Note 6)		540	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	348	°C/W
	(Note 6)		241	
Thermal Resistance, Junction to Case	(Note 6)	$R_{\theta JC}$	91	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to 150	°C

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	70	—	V	$V_{GS} = 0\text{V}, I_D = 10\mu\text{A}$
Zero Gate Voltage Drain Current @ $T_c = +25^\circ\text{C}$ @ $T_c = +125^\circ\text{C}$	$I_{DS(0)}$	— —	— —	1.0 500	μA	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
Gate-Body Leakage	$I_{GSS}$	—	—	±10	nA	$V_{GS} = \pm 15\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	2.5	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance @ $T_J = +25^\circ\text{C}$	$R_{DS(ON)}$	— —	1.6 2.0	3 4	Ω	$V_{GS} = 10\text{V}, I_D = 250\text{mA}$ $V_{GS} = 4.5\text{V}, I_D = 200\text{mA}$
On-State Drain Current	$I_{D(ON)}$	0.8	1.0	—	A	$V_{GS} = 10\text{V}, V_{DS} = 7.5\text{V}$
Forward Transconductance	$g_{FS}$	80	—	—	mS	$V_{DS} = 10\text{V}, I_D = 0.2\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	22	50	pF	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	11	25	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	2.0	5.0	pF	
Gate Resistance	$R_g$	—	120	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_g$	—	223	—	pC	$V_{DS} = 10\text{V}, I_D = 250\text{mA}$
Gate-Source Charge	$Q_{gs}$	—	82	—	pC	
Gate-Drain Charge	$Q_{gd}$	—	178	—	pC	
<b>SWITCHING CHARACTERISTICS (Note 8)</b>						
Turn-On Delay Time	$t_{D(ON)}$	—	7.0	20	ns	$V_{DD} = 30\text{V}, I_D = 0.2\text{A}$
Turn-Off Delay Time	$t_{D(OFF)}$	—	11	20	ns	$R_L = 150\Omega, V_{GEN} = 10\text{V}, R_{GEN} = 25\Omega$

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

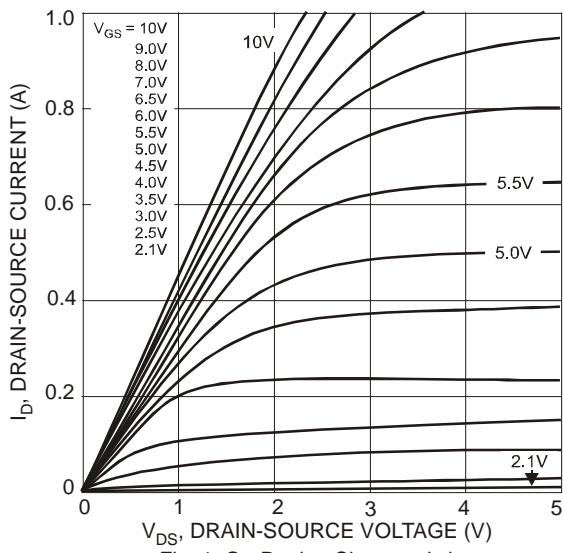


Fig. 1 On-Region Characteristics

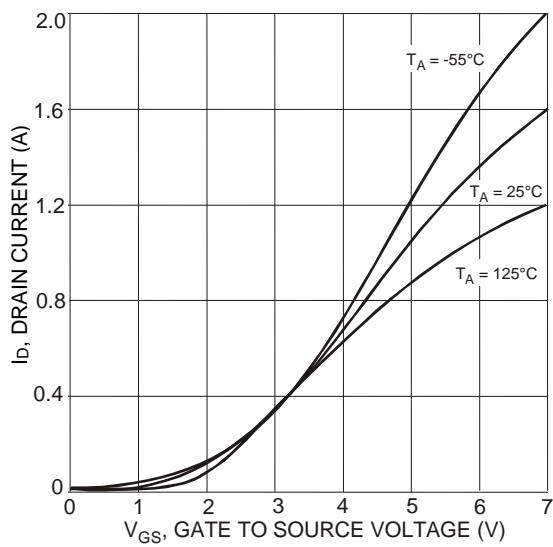


Fig. 2 Drain Current vs. Gate-Source Voltage

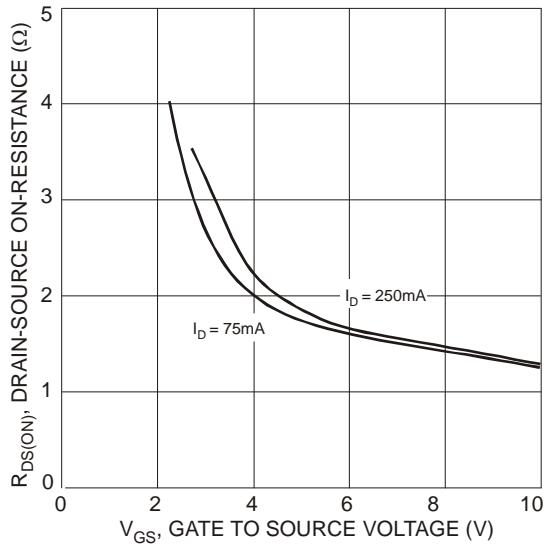


Fig. 3 On Resistance vs. Gate-Source Voltage

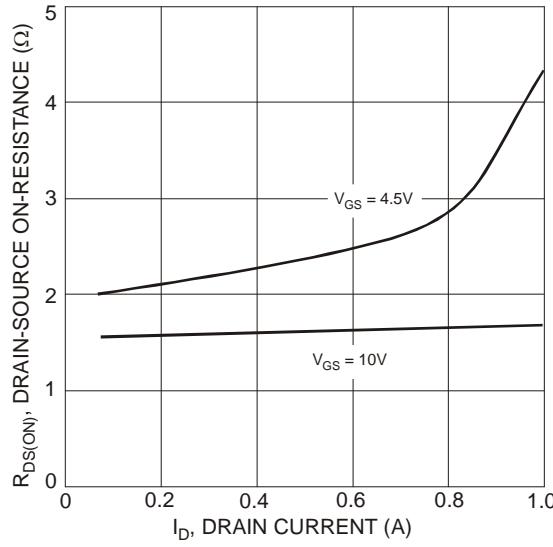


Fig. 4 On Resistance vs. Drain Current

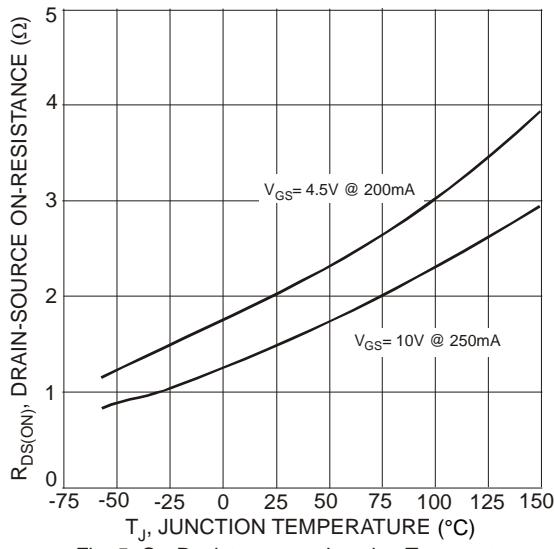


Fig. 5 On-Resistance vs. Junction Temperature

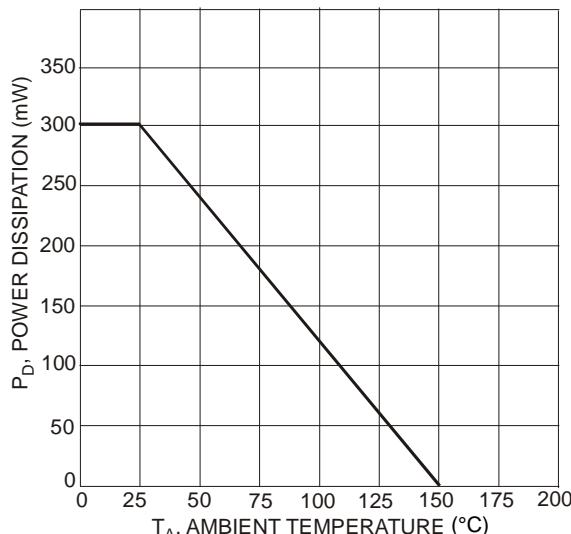
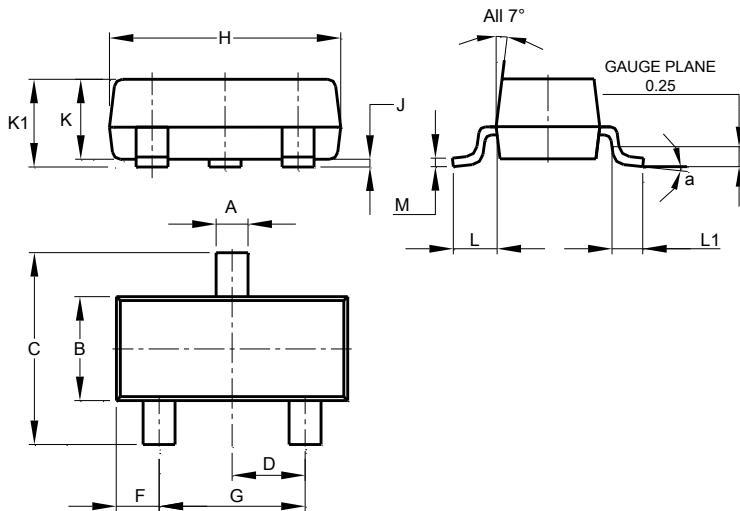


Fig. 6 Max Power Dissipation vs. Ambient Temperature

## Package Outline Dimensions

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

SOT23



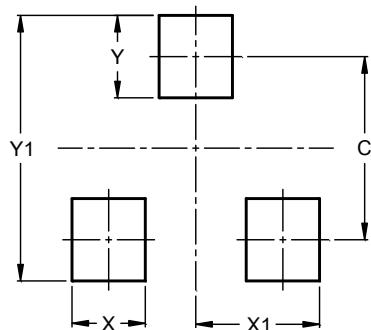
SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--

All Dimensions in mm

## Suggested Pad Layout

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

SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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