Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
60V	3Ω @ V_{GS} = 10V	300mA

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)**

Description and Applications

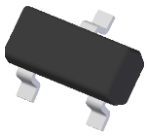
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Motor controls
- Power-management functions

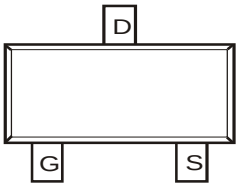
Mechanical Data

- 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)

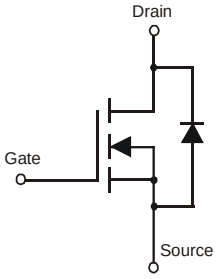
SOT23



Top View



Top View
Pinout Configuration



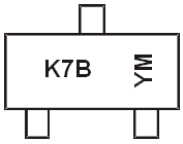
Equivalent Circuit

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 $\overline{Y}$ 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°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	60	V
Drain-Gate Voltage $R_{GS} \leq 1.0M\Omega$			V_{DGR}	60	V
Gate-Source Voltage		Continuous Pulsed	V_{GSS}	±20 ±40	V
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	250 200	mA
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°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°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°C, unless otherwise specified.)

Characteristic		Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)							
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	nA	V_{GS} = ±15V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)							
Gate Threshold Voltage		$V_{GS(th)}$	1.0	—	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	@ T_J = +25°C	$R_{DS(ON)}$	— —	1.6 2.0	3 4	Ω	V_{GS} = 10V, I_D = 250mA V_{GS} = 4.5V, I_D = 200mA
On-State Drain Current		$I_{D(ON)}$	0.8	1.0	—	A	V_{GS} = 10V, V_{DS} = 7.5V
Forward Transconductance		g_{FS}	80	—	—	mS	V_{DS} =10V, I_D = 0.2A
DYNAMIC CHARACTERISTICS (Note 8)							
Input Capacitance		C_{iss}	—	22	50	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz
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} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 4.5V)		Q_g	—	223	—	pC	V_{DS} = 10V, I_D = 250mA
Gate-Source Charge		Q_{gs}	—	82	—	pC	
Gate-Drain Charge		Q_{gd}	—	178	—	pC	
SWITCHING CHARACTERISTICS (Note 8)							
Turn-On Delay Time		$t_{D(ON)}$	—	7.0	20	ns	V_{DD} = 30V, I_D = 0.2A
Turn-Off Delay Time		$t_{D(OFF)}$	—	11	20	ns	R_L = 150Ω, V_{GEN} = 10V, R_{GEN} = 25Ω

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.

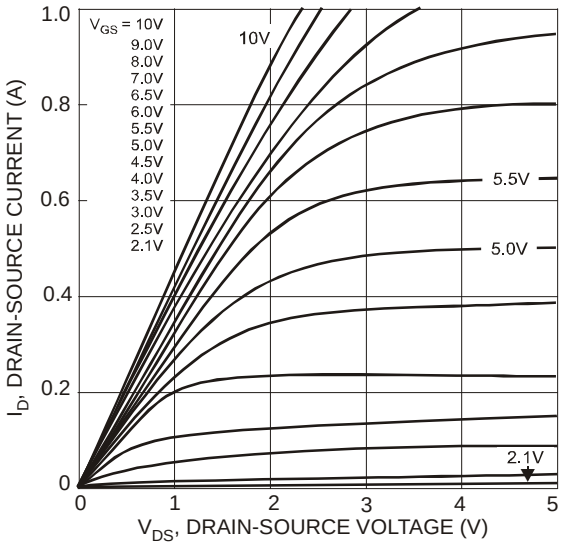


Fig. 1 On-Region Characteristics

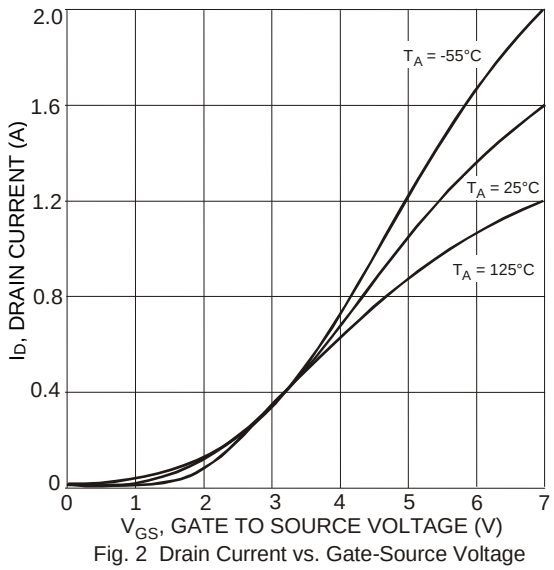


Fig. 2 Drain Current vs. Gate-Source Voltage

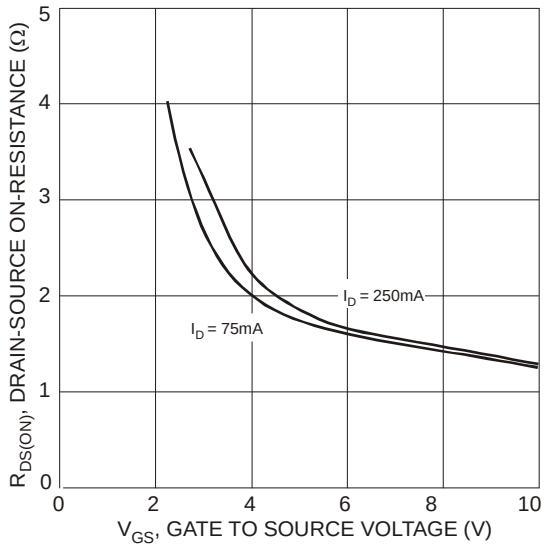


Fig. 3 On Resistance vs. Gate-Source Voltage

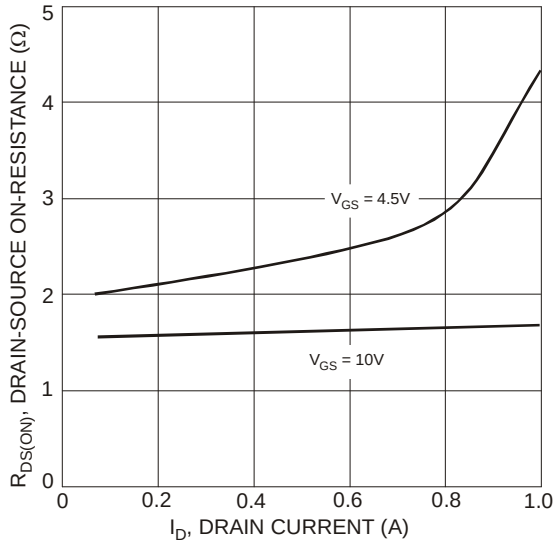


Fig. 4 On Resistance vs. Drain Current

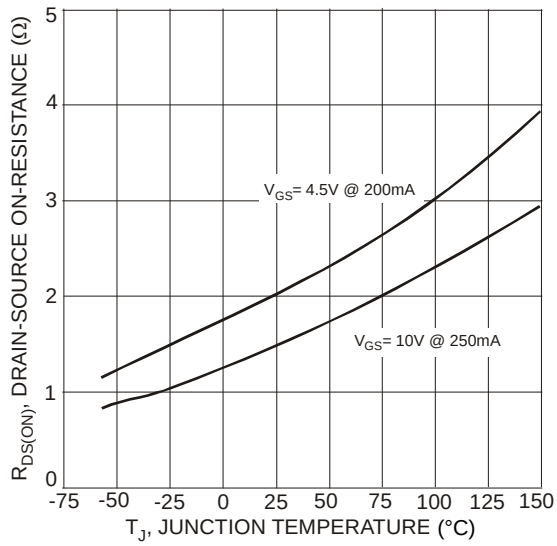


Fig. 5 On-Resistance vs. Junction Temperature

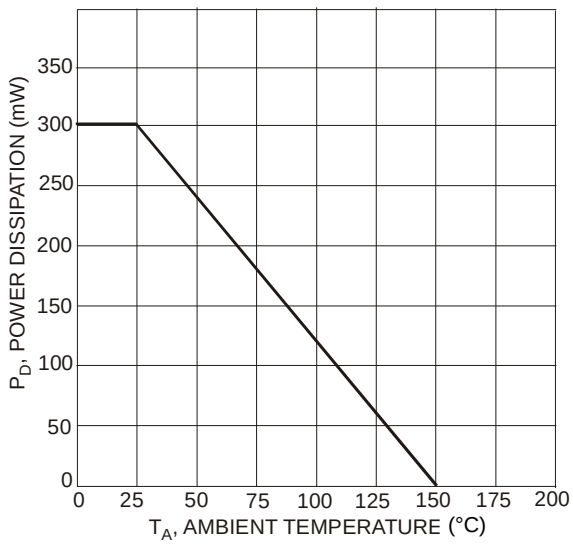
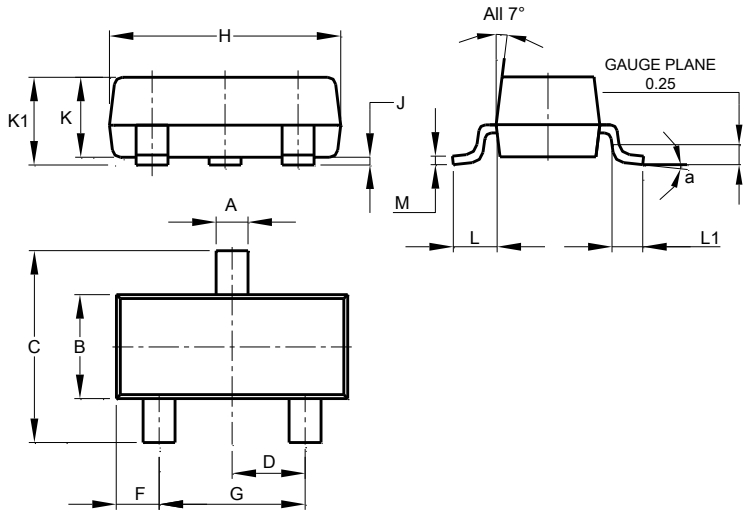


Fig. 6 Max Power Dissipation vs. Ambient Temperature

Package Outline Dimensions

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

SOT23

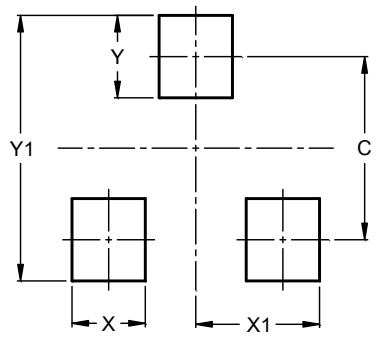


SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

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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