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2N7002DW-7-F

Diodes Incorporated

MOSFET 60V 200mW

DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
60V	7.5Ω @ V_{GS} = 5V	0.23A

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

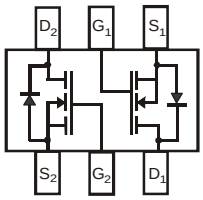
- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Notes 3 & 4)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 5)**

Mechanical Data

- Case: SOT363
- 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 e3
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)

SOT363

Top View



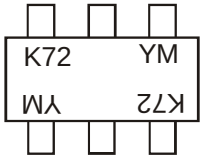
Top View
Internal Schematic

Ordering Information (Note 6)

Part Number	Compliance	Case	Packaging
2N7002DW-7-F	Standard	SOT363	3,000/Tape & Reel
2N7002DWQ-7-F	Automotive	SOT363	3,000/Tape & Reel
2N7002DW-13-F	Standard	SOT363	10,000/Tape & Reel
2N7002DWQ-13-F	Automotive	SOT363	10,000/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. 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.
5. 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/product-compliance-definitions/.
6. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



K72 = Product Type Marking Code
YM or $\overline{Y}$M = Date Code Marking
Y or $\overline{Y}$ = Year (ex: E = 2017)
M = Month (ex: 9 = September)

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	…	2017	2018	2019	2020	2021	2022	2023
Code	J	K	L	M	N	P	R	…	E	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_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Drain-Gate Voltage $R_{GS} \leq 1.0M\Omega$			V_{DGR}	60	V
Gate-Source Voltage		Continuous	V_{GSS}	±20	V
		Pulsed	V_{GSS}	±40	V
Continuous Drain Current (Note 8) V_{GS} = 5V	Steady State	T_A = +25°C T_A = +70°C T_A = +100°C	I_D	0.23 0.18 0.14	A
Maximum Continuous Body Diode Forward Current (Note 8)			I_S	0.53	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	0.8	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 7)	T_A = +25°C	P_D	0.31	W
	T_A = +70°C		0.2	
	T_A = +100°C		0.12	
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	410	°C/W
Total Power Dissipation (Note 8)	T_A = +25°C	P_D	0.4	W
	T_A = +70°C		0.25	
	T_A = +100°C		0.15	
Thermal Resistance, Junction to Ambient (Note 8)	Steady State	$R_{\theta JA}$	318	°C/W
Thermal Resistance, Junction to Case (Note 8)	Steady State	$R_{\theta JC}$	135	°C/W
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 9)						
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} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	2.0	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance @ T_J = +25°C	$R_{DS(ON)}$	—	3.2	7.5	Ω	V_{GS} = 5.0V, I_D = 0.05A
@ T_J = +125°C			4.4	13.5		V_{GS} = 10V, I_D = 0.5A
On-State Drain Current	$I_{D(ON)}$	0.5	1.0	—	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 10)						
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	
SWITCHING CHARACTERISTICS (Note 10)						
Turn-On Delay Time	$t_{D(ON)}$	—	7.0	20	ns	V_{DD} = 30V, I_D = 0.2A, R_L = 150Ω, V_{GEN} = 10V, R_{GEN} = 25Ω
Turn-Off Delay Time	$t_{D(OFF)}$	—	11.0	20		

Notes: 7. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
8. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

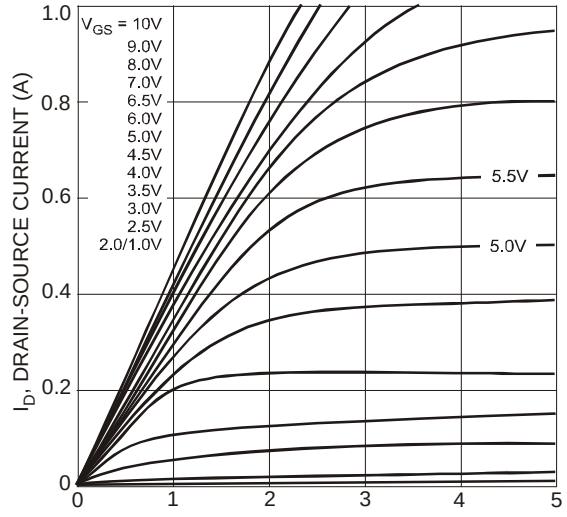


Figure 1 On-Region Characteristics

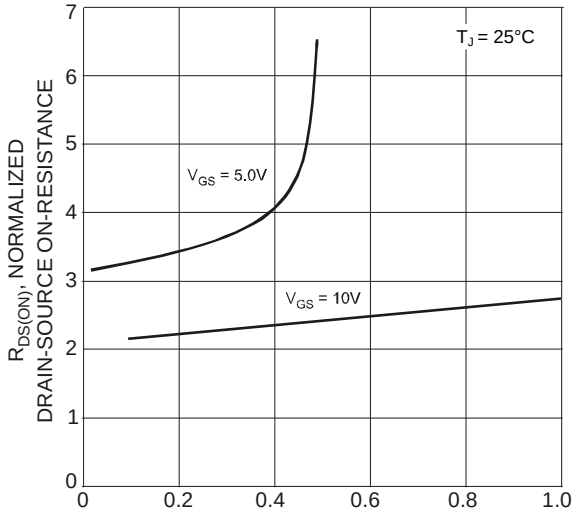


Figure 2 On-Resistance vs. Drain Current

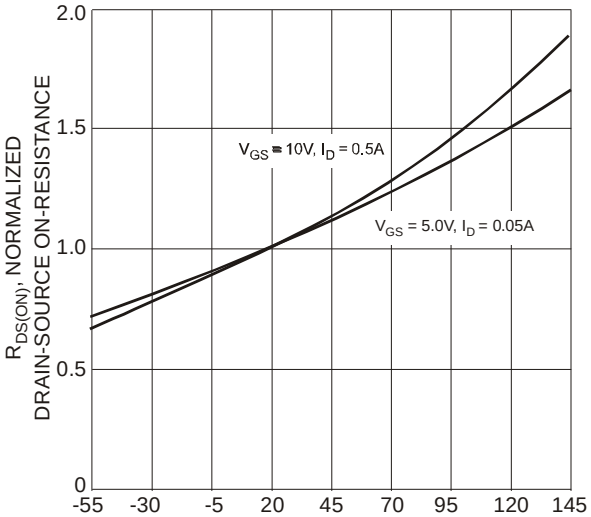


Figure 3 On-Resistance vs. Junction Temperature

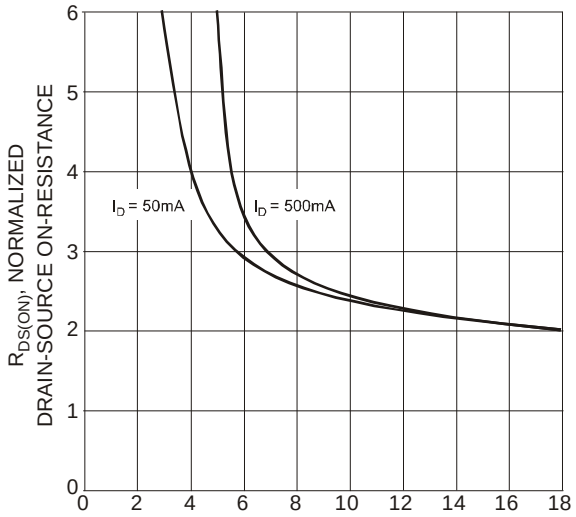


Figure 4 On-Resistance vs. Gate-Source Voltage

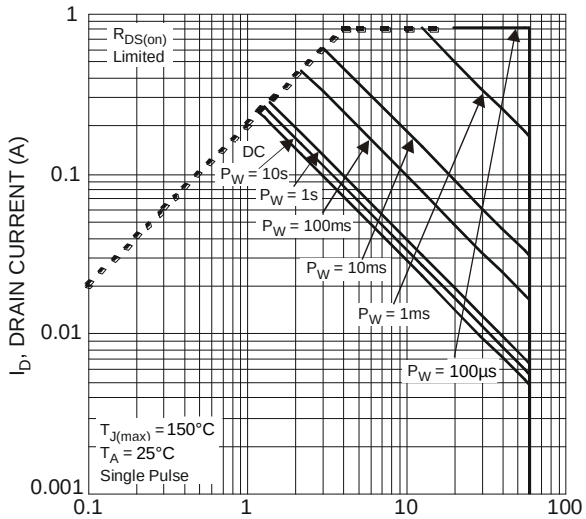


Figure 5 SOA, Safe Operation Area

Package Outline Dimensions

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

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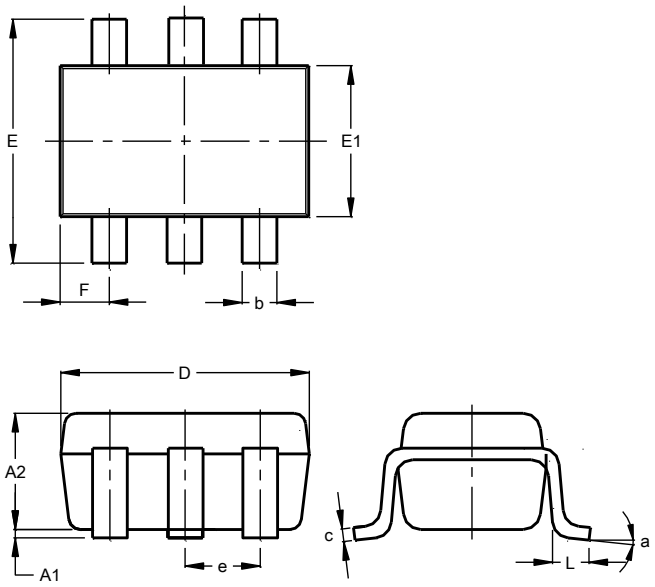

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Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	1.00
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

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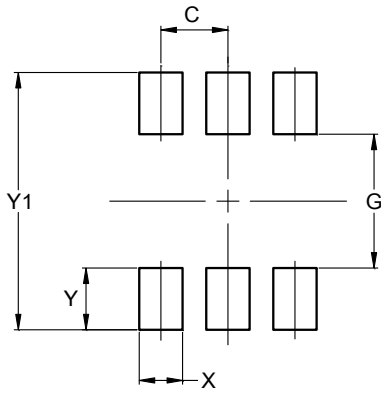

Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500

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