

DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV _{DSS}	R _{DS(ON)}	Package	I _D T _A = +25°C
60V	8Ω @ V _{GS} = 5V	SOT363	170mA
	6Ω @ V _{GS} = 10V		200mA

Description

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

Applications

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

Features

- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- HBM Class 1C
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The 2N7002DWAQ is suitable for automotive applications requiring specific change control; it is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
- <https://www.diodes.com/quality/product-definitions/>

Mechanical Data

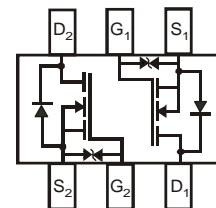
- Case: SOT363
- Case Material: Molded Plastic.
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe
Solderable per MIL-STD-202, Method 208 Ⓔ
- Terminal Connections: See Diagram
- Weight: 0.006 grams (Approximate)



HBM Class 1C



Top View



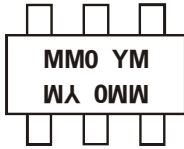
Top View
Internal Schematic

Ordering Information (Note 4)

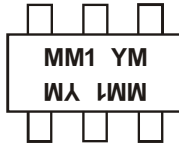
Part Number	Compliance	Case	Packaging
2N7002DWA-7	Standard	SOT363	3,000/Tape & Reel
2N7002DWA-13	Standard	SOT363	10,000/Tape & Reel
2N7002DWAQ-7	Automotive	SOT363	3,000/Tape & Reel
2N7002DWAQ-13	Automotive	SOT363	10,000/Tape & Reel

- 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/>.

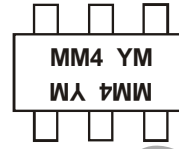
Marking Information



MM0 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: E = 2017)
M = Month (ex: 9 = September)



MM1 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: E = 2017)
M = Month (ex: 9 = September)



MM4 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: E = 2017)
M = Month (ex: 9 = September)

Date Code Key

Year	2012	-	2017	2018	2019	2020	2021	2022	2023	2024
Code	Z	-	E	F	G	H	I	J	K	L

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
Gate-Source Voltage				V _{GSS}	±20	V
Continuous Drain Current (Note 5)	V _{GS} = 10V	Steady State	T _A = +25°C	I _D	180	mA
			T _A = +70°C		140	
Continuous Drain Current (Note 5)	V _{GS} = 5V	Steady State	T _A = +25°C	I _D	150	mA
			T _A = +70°C		120	
Continuous Drain Current (Note 6)	V _{GS} = 10V	Steady State	T _A = +25°C	I _D	200	mA
			T _A = +70°C		160	
Continuous Drain Current (Note 6)	V _{GS} = 5V	Steady State	T _A = +25°C	I _D	170	mA
			T _A = +70°C		140	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)				I _{DM}	700	mA

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P _D	300	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	435	°C/W
Total Power Dissipation (Note 6)	P _D	400	mW
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	330	°C/W
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	139	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.

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 = 250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1.0	μA	V _{DS} = 60V, V _{GS} = 0V
Gate-Body Leakage	I _{GSS}	—	—	±5	μA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	0.8	—	2.5	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	—	8	Ω	V _{GS} = 5.0V, I _D = 0.115A
		—	—	6	Ω	V _{GS} = 10.0V, I _D = 0.115A
Forward Transconductance	g _{FS}	80	—	—	mS	V _{DS} = 10V, I _D = 0.115A
Diode Forward Voltage	V _{SD}	—	0.8	1.2	V	V _{GS} = 0V, I _S = 115mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	22.0	—	pF	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	3.2	—		
Reverse Transfer Capacitance	C _{rss}	—	2.0	—		
Gate Resistance	R _G	—	88	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge V _{GS} = 10V	Q _g	—	0.87	—	nC	V _{GS} = 10V, V _{DS} = 30V, I _D = 150mA
Total Gate Charge V _{GS} = 4.5V	Q _g	—	0.43	—		
Gate-Source Charge	Q _{gs}	—	0.11	—		
Gate-Drain Charge	Q _{gd}	—	0.11	—		
Turn-On Delay Time	t _{D(ON)}	—	3.3	—	ns	V _{DD} = 30V, I _D = 0.115A, V _{GEN} = 10V, R _{GEN} = 25Ω
Turn-On Rise Time	t _R	—	3.2	—		
Turn-Off Delay Time	t _{D(OFF)}	—	12.0	—		
Turn-Off Fall Time	t _F	—	6.3	—		

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

NOT RECOMMENDED FOR NEW DESIGN

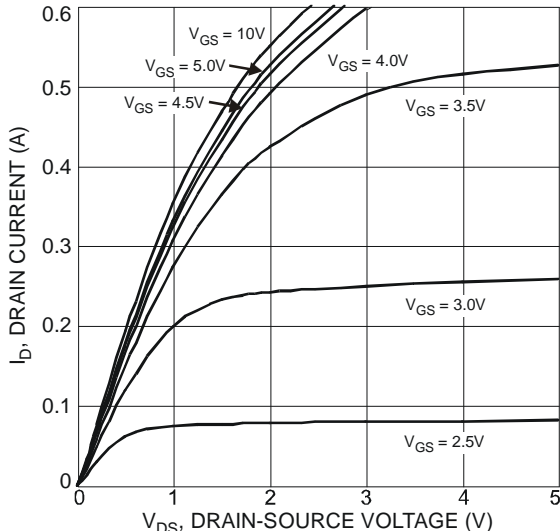


Figure 1 Typical Output Characteristic

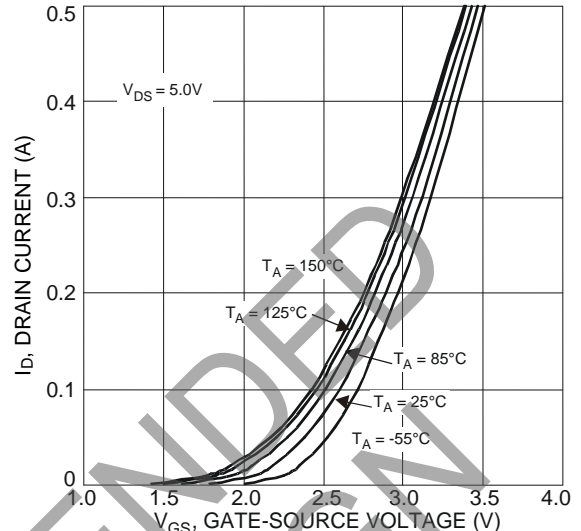


Figure 2 Typical Transfer Characteristics

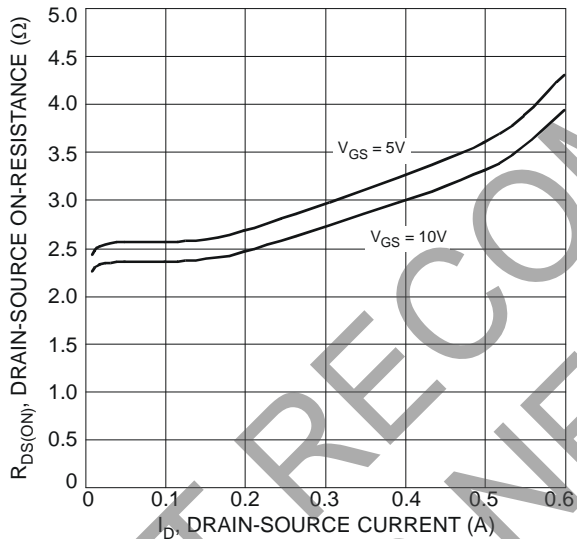


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

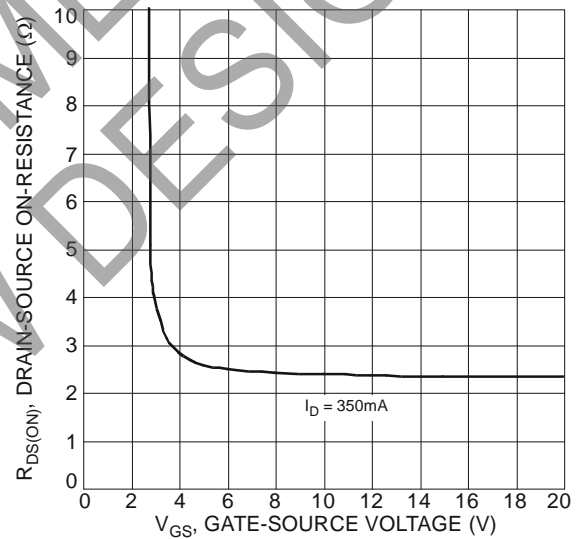


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

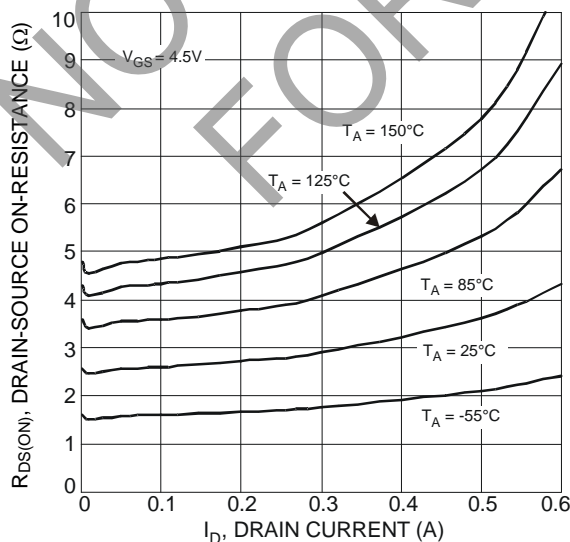


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

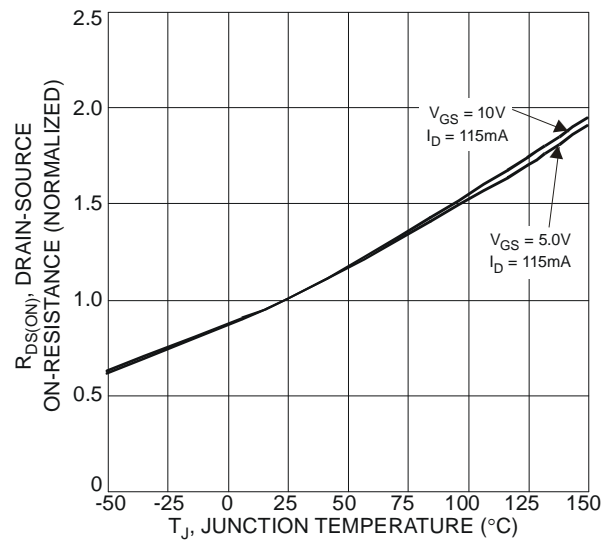


Figure 6 On-Resistance Variation with Temperature

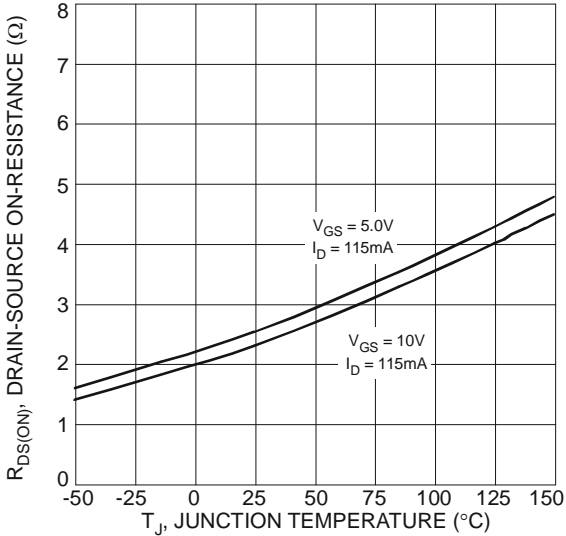


Figure 7 On-Resistance Variation with Temperature

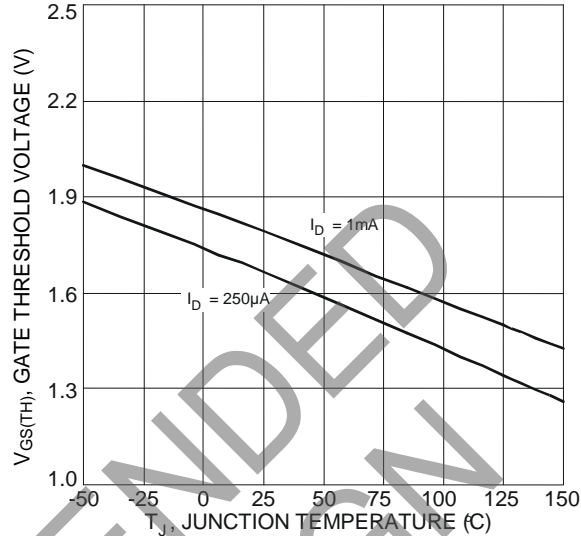


Figure 8 Gate Threshold Variation vs. Temperature

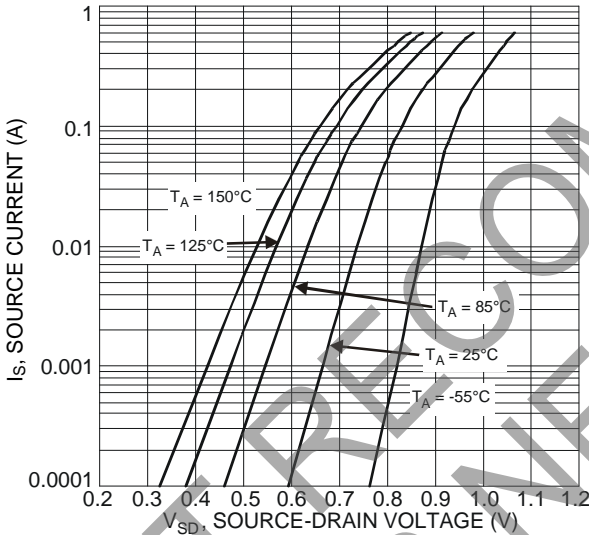


Figure 9 Diode Forward Voltage vs. Current

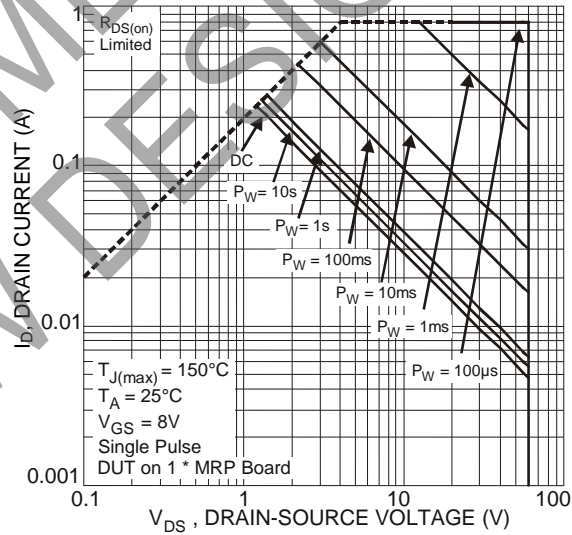
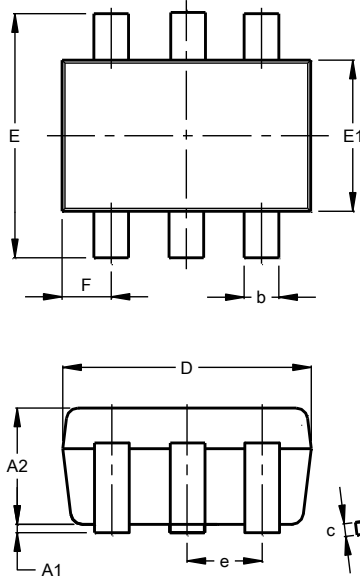


Figure 10 SOA, Safe Operation Area

Package Outline Dimensions

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

SOT363

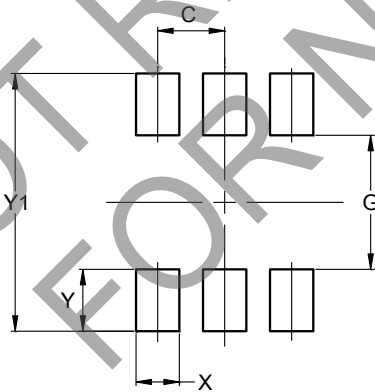


SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	1.00
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT363



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

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