20V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
-20V	700mΩ @ V_{GS} = -4.5V	-460mA
	900mΩ @ V_{GS} = -2.5V	-420mA
	1300mΩ @ V_{GS} = -1.8V	-350mA

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected Up To 3kV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC-DC Converters
- Load Switch
- Power Management Functions

Mechanical Data

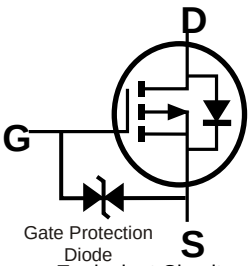
- Case: SOT523
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)



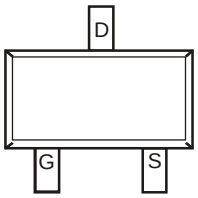
SOT523



Top View



Equivalent Circuit



Top View

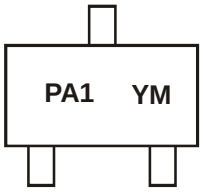
Ordering Information (Note 5)

Part Number	Case	Packaging
DMG1013TQ-7	SOT523	3000/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.htmlfor 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

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Marking Information



PA1 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: D = 2016)
M = Month (ex: 9 = September)

Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024
Code	D	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

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±6	V
Drain Current (Note 6)	Steady State	T_A = +25°C T_A = +85°C	I_D	-0.46 -0.33	A
Pulsed Drain Current (Note 7)			I_{DM}	-6	A

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P_D	0.27	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	461	°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 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	-	-	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	-	-	-100	nA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±2.0	µA	V_{GS} = ±4.5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.5	-	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	-	0.5	0.7	Ω	V_{GS} = -4.5V, I_D = -350mA
			0.7	0.9		V_{GS} = -2.5V, I_D = -300mA
			1.0	1.3		V_{GS} = -1.8V, I_D = -150mA
Forward Transfer Admittance	$\|Y_{fs}\|$	-	0.9	-	S	V_{DS} = -10V, I_D = -250mA
Diode Forward Voltage	V_{SD}		-0.8	-1.2	V	V_{GS} = 0V, I_S = -150mA
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	-	59.76	-	pF	V_{DS} = -16V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	12.07	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	6.36	-	pF	
Total Gate Charge	Q_g	-	580	-	pC	V_{GS} = -4.5V, V_{DS} = -10V, I_D = -250mA
Gate-Source Charge	Q_{gs}	-	104	-	pC	
Gate-Drain Charge	Q_{gd}	-	125	-	pC	
Turn-On Delay Time	$t_{D(ON)}$	-	5.1	-	ns	V_{DD} = -10V, V_{GS} = -4.5V, R_L = 47Ω, R_g = 10Ω, I_D = -200mA
Turn-On Rise Time	t_R	-	8.1	-	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	-	28.4	-	ns	
Turn-Off Fall Time	t_F	-	20.7	-	ns	

Notes:
6. For a device surface mounted on a minimum recommended pad layout of an FR-4 PCB, in still air conditions; the device is measured when operating in steady-state condition.
7. Same as note 5, except the device is pulsed at duty cycle of 1% for a pulse width of 10µs.
8. Measured under pulsed conditions to minimize self-heating effect. Pulse width ≤ 300µs; duty cycle ≤ 2%.
9. For design aid only, not subject to production testing.

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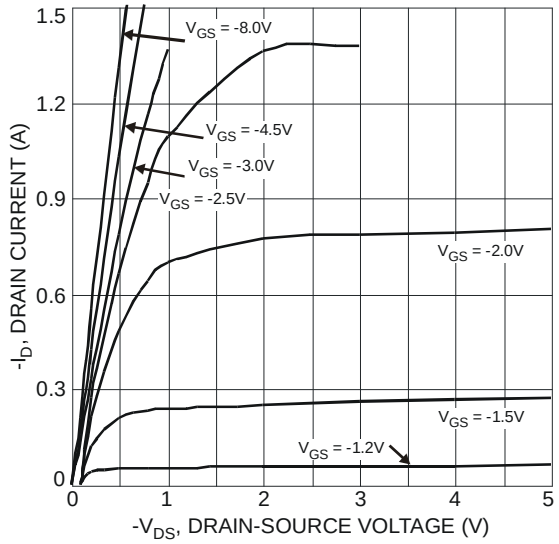


Fig. 1 Typical Output Characteristic

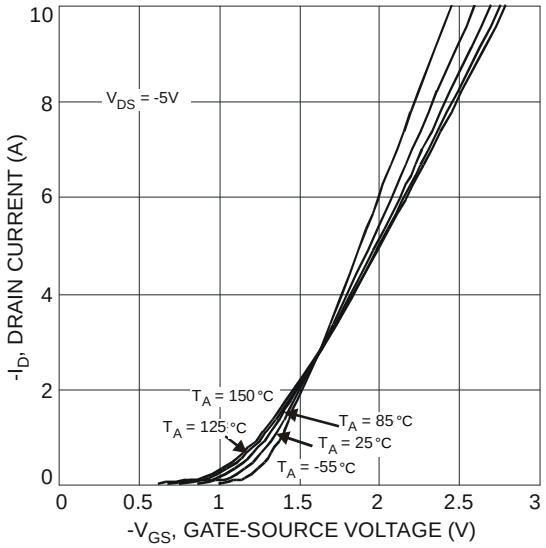


Fig. 2 Typical Transfer Characteristic

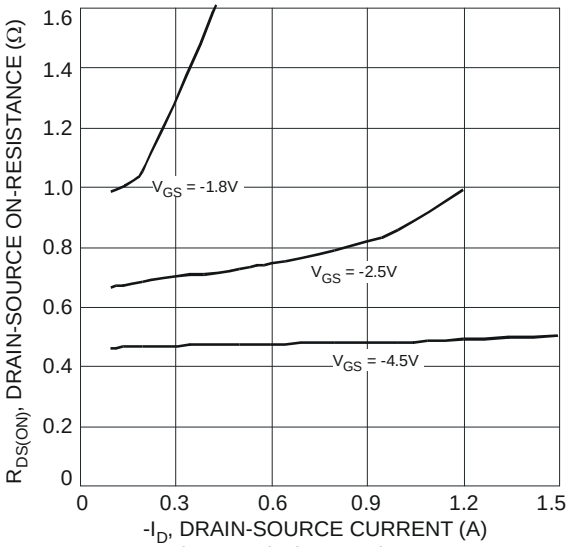


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

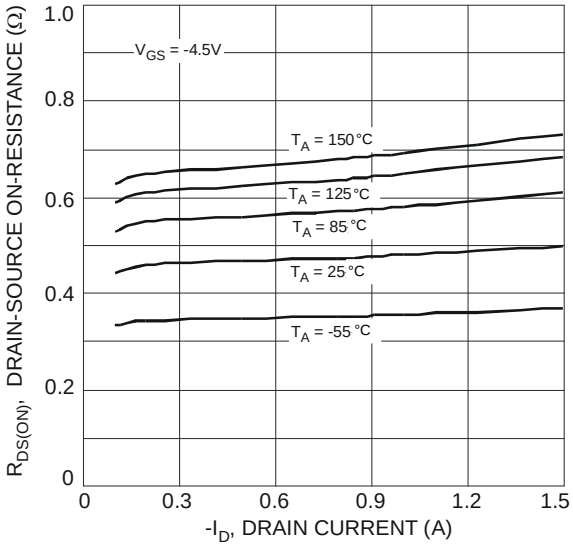


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

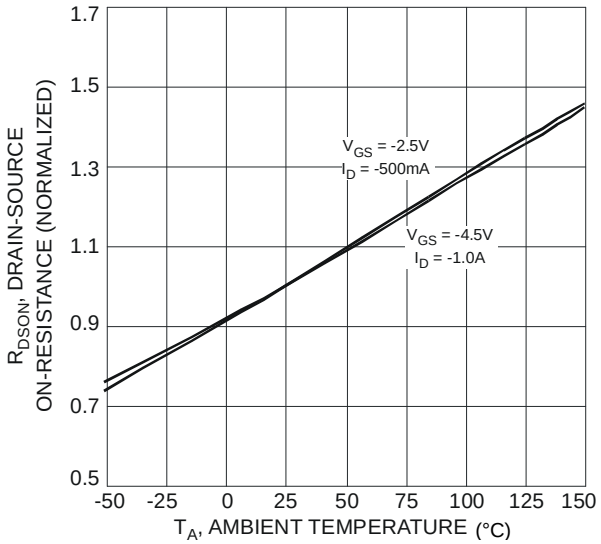


Fig. 5 On-Resistance Variation with Temperature

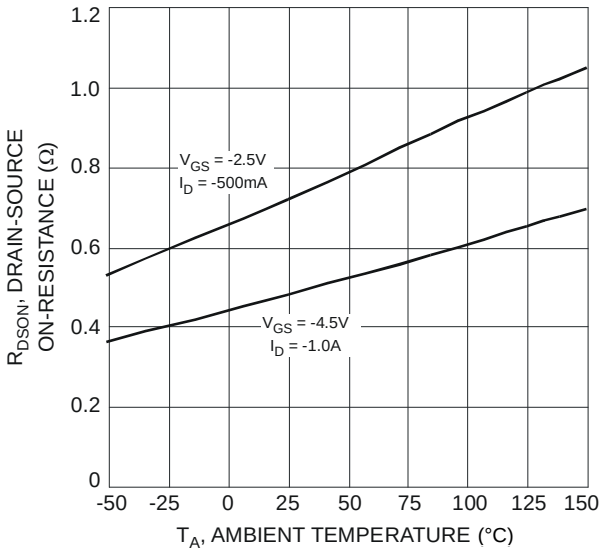


Fig. 6 On-Resistance Variation with Temperature

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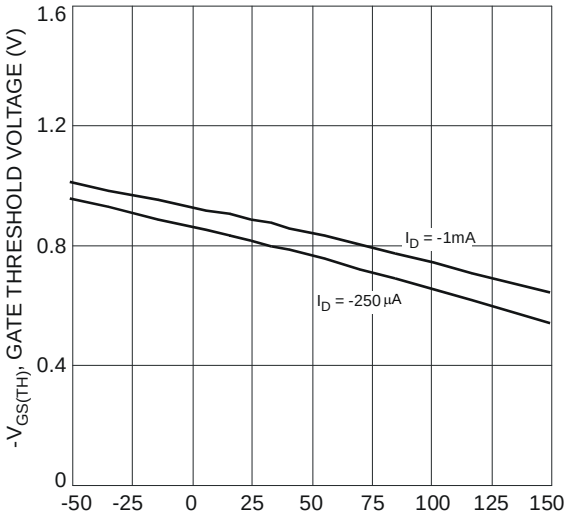


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

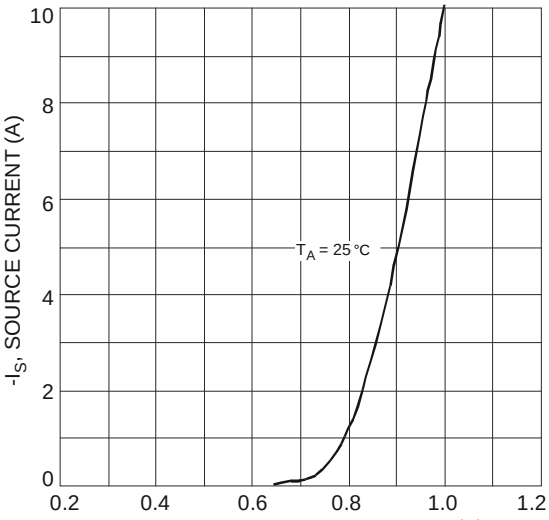


Fig. 8 Diode Forward Voltage vs. Current

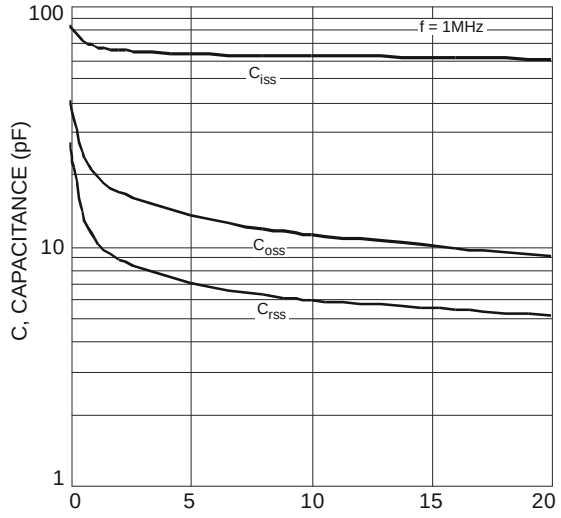


Fig. 9 Typical Total Capacitance

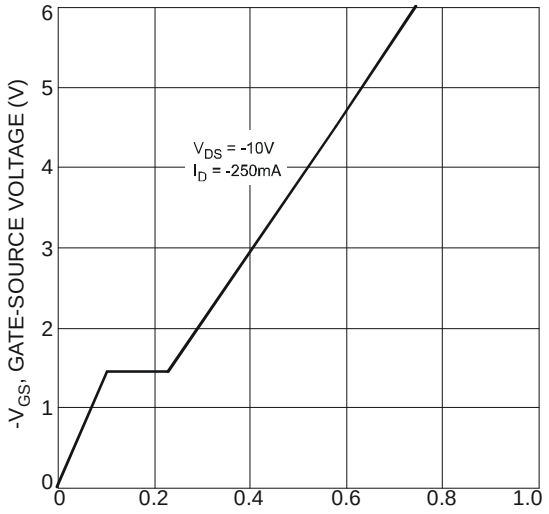


Fig. 10 Gate-Charge Characteristics

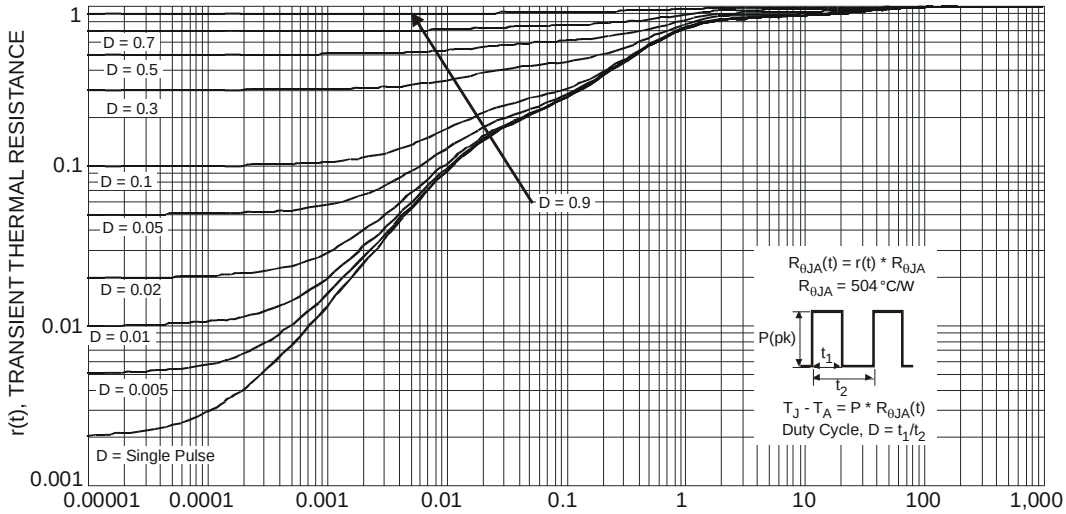


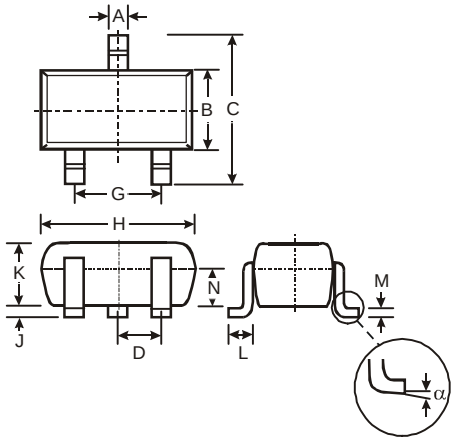
Fig. 11 Transient Thermal Response

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Package Outline Dimensions

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SOT523

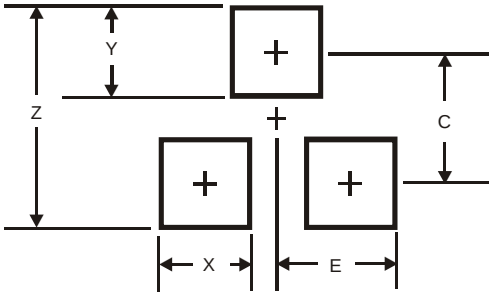


SOT523			
Dim	**Min**	**Max**	**Typ**
A	0.15	0.30	0.22
B	0.75	0.85	0.80
C	1.45	1.75	1.60
D	—	—	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
J	0.00	0.10	0.05
K	0.60	0.80	0.75
L	0.10	0.30	0.22
M	0.10	0.20	0.12
N	0.45	0.65	0.50
α	0°	8°	—
All Dimensions in mm			

Suggested Pad Layout

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

SOT523



Dimensions	Value (in mm)
Z	1.8
X	0.4
Y	0.51
C	1.3
E	0.7

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