

40V DUAL P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on) Max}$	I_D $T_A = +25^\circ C$
-40V	50mΩ @ $V_{GS} = -10V$	-5.2A
	79mΩ @ $V_{GS} = -4.5V$	-4.1A

Description

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.


Applications

- Motor Control
- Backlighting
- DC-DC Converters
- Power Management Functions

Features and Benefits

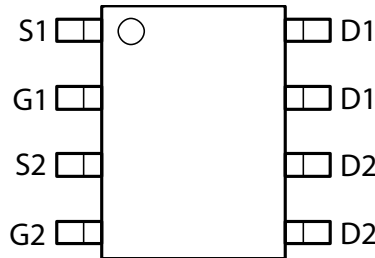
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

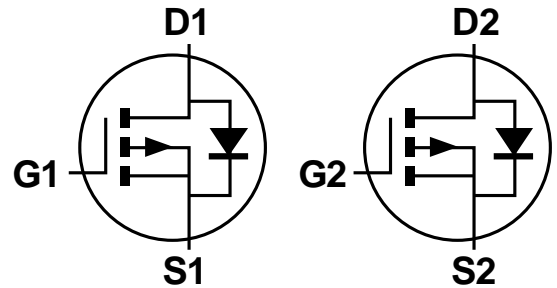
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208 
- Weight: 0.074 grams (approximate)



Top View



Top View



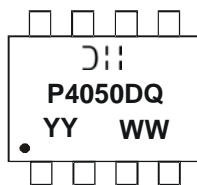
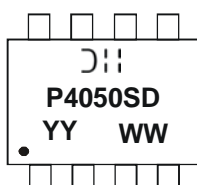
Equivalent Circuit


Ordering Information (Note 4)

Part Number	Qualification	Case	Packaging
DMP4050SSD-13	Standard	SO-8	2500 / Tape & Reel
DMP4050SSDQ-13	Automotive	SO-8	2500 / 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



 = Manufacturer's Marking
 P4050SD = Product Type Marking Code for DMP4050SSD-13
 P4050DQ = Product Type Marking Code for DMP4050SSDQ-13
 YYWW = Date Code Marking
 YY = Year (ex: 09 = 2009)
 WW = Week (01-53)

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

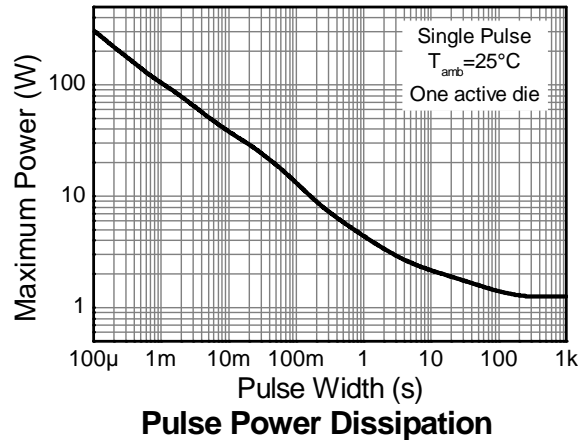
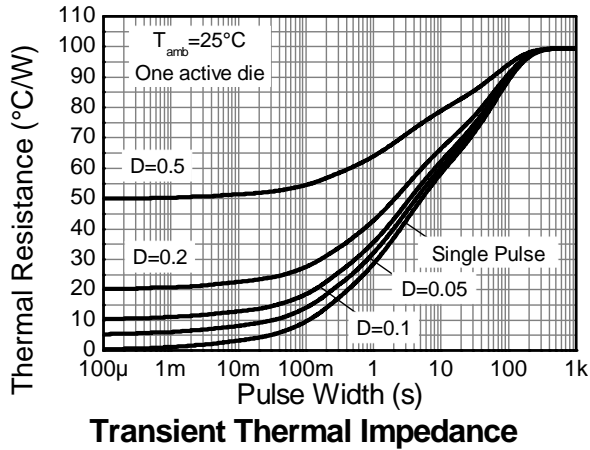
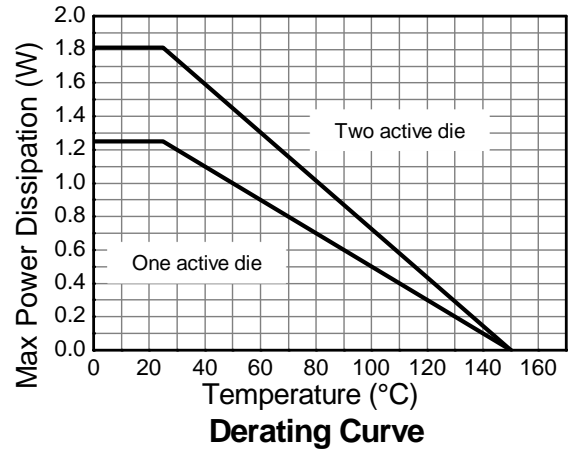
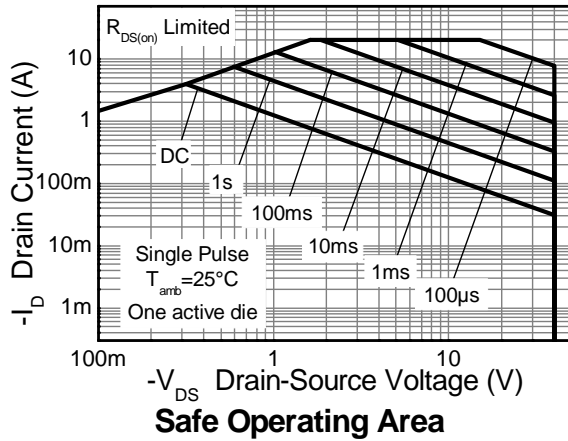
Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage		(Note 5)	V_{GS}	± 20	V
Continuous Drain Current	$V_{GS} = 10\text{V}$	(Notes 9 & 11)	I_D	-5.2	A
		$T_A = +70^\circ\text{C}$ (Notes 7 & 9)		-4.2	
		(Notes 6 & 9)		-4.0	
Pulsed Drain Current	$V_{GS} = 10\text{V}$	(Notes 8 & 9)	I_{DM}	-20.0	A
Continuous Source Current (Body Diode)			I_S	-3.2	A
Pulsed Source Current (Body Diode)			I_{SM}	-20.0	A

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

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Notes 6 & 9)	P_D	1.25	W mW/ $^\circ\text{C}$
			10.0	
	(Notes 6 & 10)		1.8	
			14.3	
Thermal Resistance, Junction to Ambient	(Notes 7 & 9)	$R_{\theta JA}$	2.14	$^\circ\text{C/W}$
	(Notes 6 & 9)		100	
	(Notes 6 & 10)		70	
	(Notes 7 & 9)	58		
Thermal Resistance, Junction to Lead	(Notes 9 & 11)	$R_{\theta JL}$	53	
Operating and storage temperature range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

- Notes:
- AEC-Q101 V_{GS} maximum is $\pm 16\text{V}$.
 - For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 - Same as note (3), except the device is measured at $t \leq 10$ sec.
 - Same as note (3), except the device is pulsed with $D = 0.02$ and pulse width 300 μs . The pulse current is limited by the maximum junction temperature.
 - For a dual device with one active die.
 - For a device with two active die running at equal power.
 - Thermal resistance from junction to solder-point (at the end of the drain lead).

Thermal Characteristics

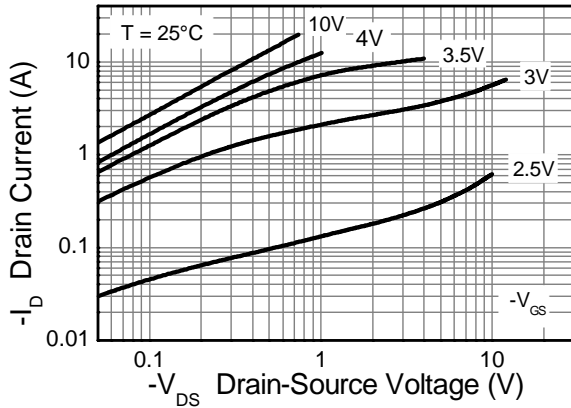


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

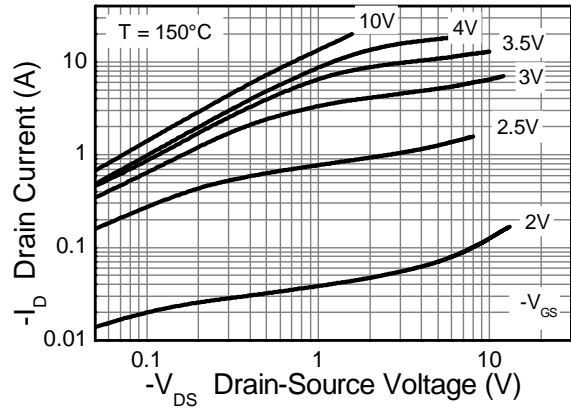
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	I _D = -250μA, V _{GS} = 0V
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-0.5	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(th)}	-1.0	—	-3.0	V	I _D = -250μA, V _{DS} = V _{GS}
Static Drain-Source On-Resistance (Note 12)	R _{DS(ON)}	—	0.038	0.050	Ω	V _{GS} = -10V, I _D = -6A
			0.055	0.079		V _{GS} = -4.5V, I _D = -5A
Forward Transconductance (Notes 12 & 13)	g _{fs}	—	14	—	S	V _{DS} = -15V, I _D = -6A
Diode Forward Voltage (Note 12)	V _{SD}	—	-0.86	-1.2	V	I _S = -6A, V _{GS} = 0V
Reverse recovery time (Note 13)	t _{rr}	—	18	—	ns	I _S = -2A, di/dt = 100A/μs
Reverse recovery charge (Note 13)	Q _{rr}	—	12.7	—	nC	
DYNAMIC CHARACTERISTICS (Note 13)						
Input Capacitance	C _{iSS}	—	674	—	pF	V _{DS} = -20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oSS}	—	115	—	pF	
Reverse Transfer Capacitance	C _{rSS}	—	67.7	—	pF	
Total Gate Charge (Note 14)	Q _g	—	6.9	—	nC	V _{GS} = -4.5V
Total Gate Charge (Note 14)	Q _g	—	13.9	—	nC	V _{GS} = -10V
Gate-Source Charge (Note 14)	Q _{gs}	—	2	—	nC	
Gate-Drain Charge (Note 14)	Q _{gd}	—	3.4	—	nC	
Turn-On Delay Time (Note 14)	t _{D(on)}	—	1.9	—	ns	V _{DD} = -20V, V _{GS} = -10V I _D = -1A, R _G ≅ 6.0Ω
Turn-On Rise Time (Note 14)	t _r	—	3.1	—	ns	
Turn-Off Delay Time (Note 14)	t _{D(off)}	—	31.5	—	ns	
Turn-Off Fall Time (Note 14)	t _f	—	12.6	—	ns	

- Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
13. For design aid only, not subject to production testing.
14. Switching characteristics are independent of operating junction temperatures.

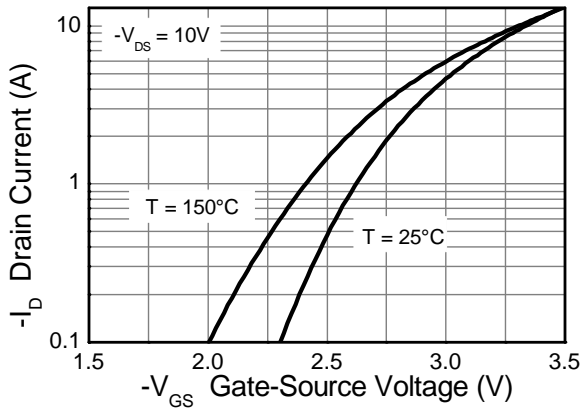
Typical Characteristics



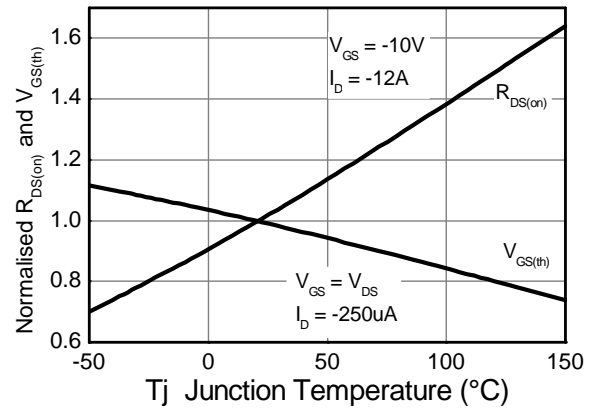
Output Characteristics



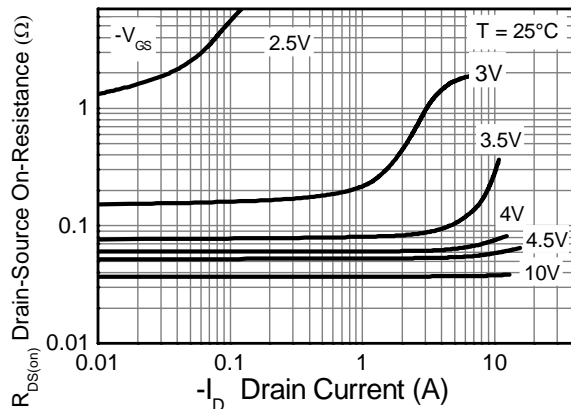
Output Characteristics



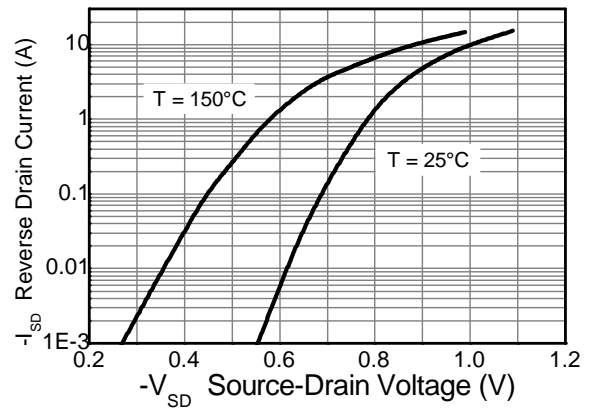
Typical Transfer Characteristics



Normalised Curves v Temperature

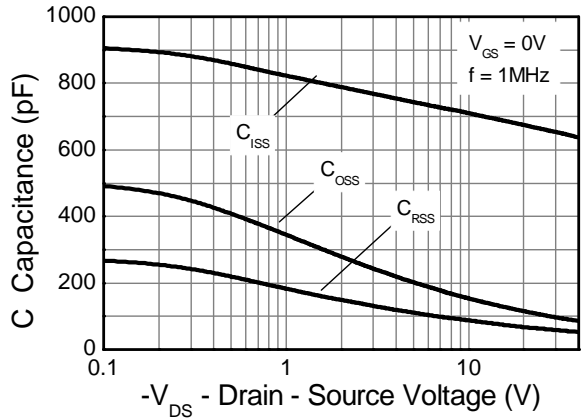


On-Resistance v Drain Current

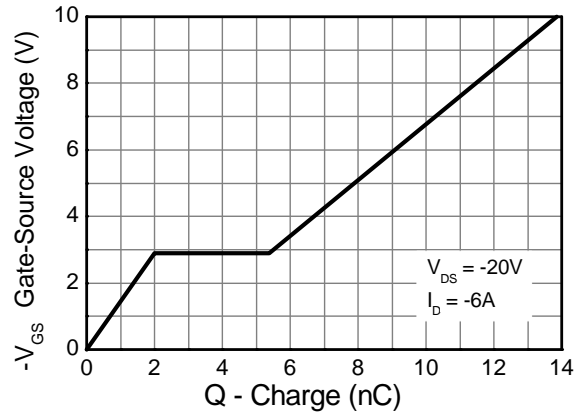


Source-Drain Diode Forward Voltage

Typical Characteristics – (cont.)

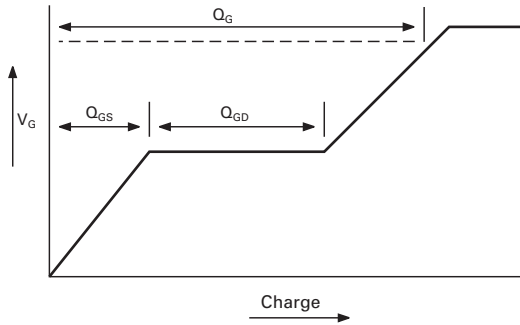


Capacitance v Drain-Source Voltage

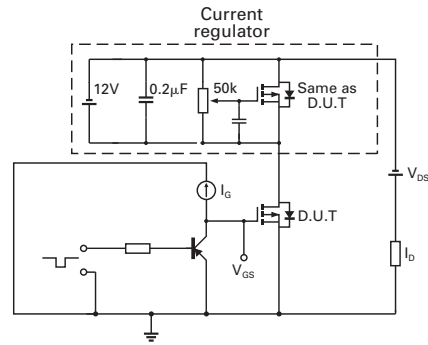


Gate-Source Voltage v Gate Charge

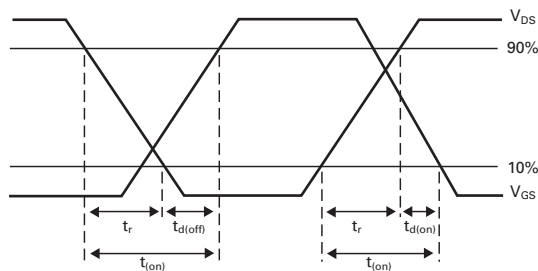
Test Circuits



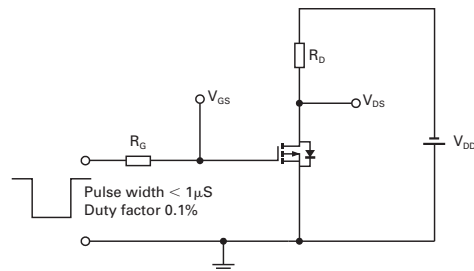
Basic gate charge waveform



Gate charge test circuit



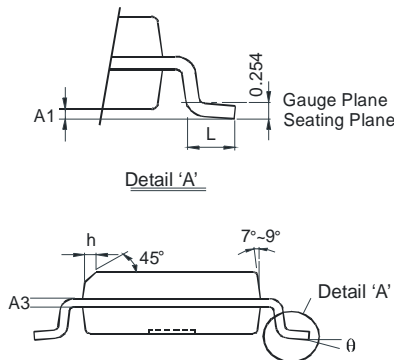
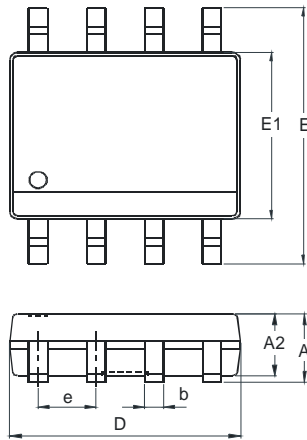
Switching time waveforms



Switching time test circuit

Package Outline Dimensions

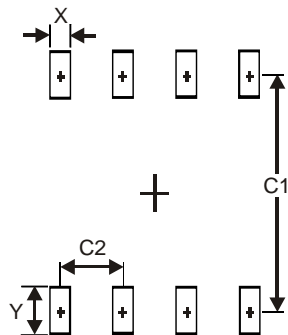
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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