

**Product Summary** (Typ. @  $V_{GS} = -4.5V$ ,  $T_A = +25^{\circ}C$ )

$V_{DS}$	$R_{DS(on)}$	$Q_g$	$Q_{gd}$	$I_D$
-12V	65m $\Omega$	2.5nC	0.6nC	-3.3A

**Description**

This new generation MOSFET is 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**

- Battery Management
- Load Switch
- Battery Protection

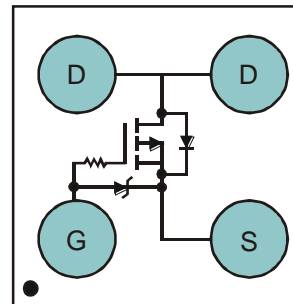

**Features**

- LD-MOS Technology with the Lowest Figure of Merit:  
 $R_{DS(on)} = 65m\Omega$  to Minimize On-State Losses  
 $Q_g = 2.5nC$  for Ultra-Fast Switching
- $V_{GS(th)} = -0.6V$  typ. for a Low Turn-On Potential
- CSP with Footprint 1.0mm x 1.0mm
- Height = 0.62mm for Low Profile
- ESD = 3kV HBM Protection of Gate
- 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: U-WLB1010-4
- Terminal Connections: See Diagram Below
- Weight: 0.0018 grams (Approximate)

U-WLB1010-4


 Top View  
 Equivalent Circuit

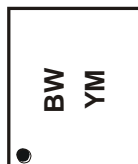
**Ordering Information** (Note 4)

Part Number	Case	Packaging
DMP1080UCB4-7	U-WLB1010-4	3,000/Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - See [http://www.diodes.com/quality/lead\\_free.html](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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**

U-WLB1010-4



BW = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: X = 2010)  
 M = Month (ex: 9 = September)

## Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	-12	V
Gate-Source Voltage			V <sub>GSS</sub>	-6	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-3.3 -2.7	A
Continuous Drain Current (Note 5) V <sub>GS</sub> = -2.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-3.0 -2.4	A
Pulsed Drain Current (Note 6)			I <sub>DM</sub>	20	A

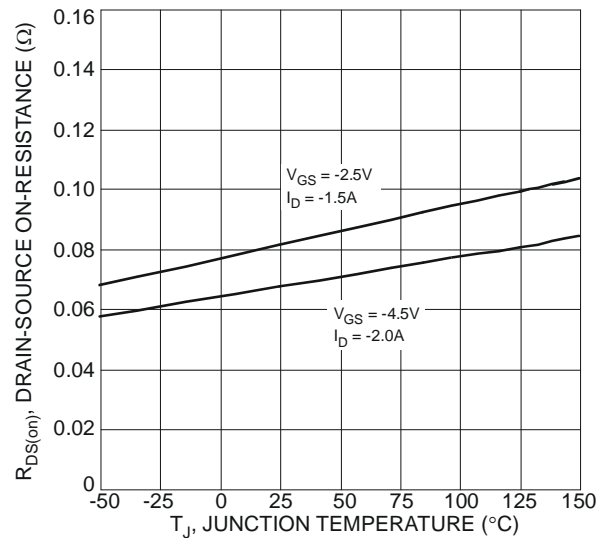
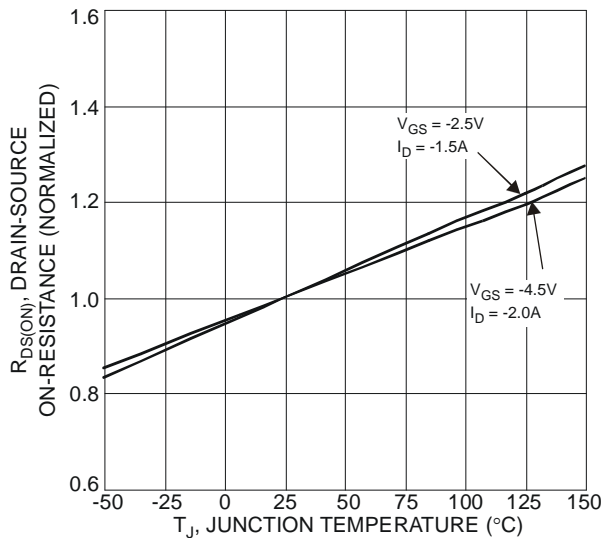
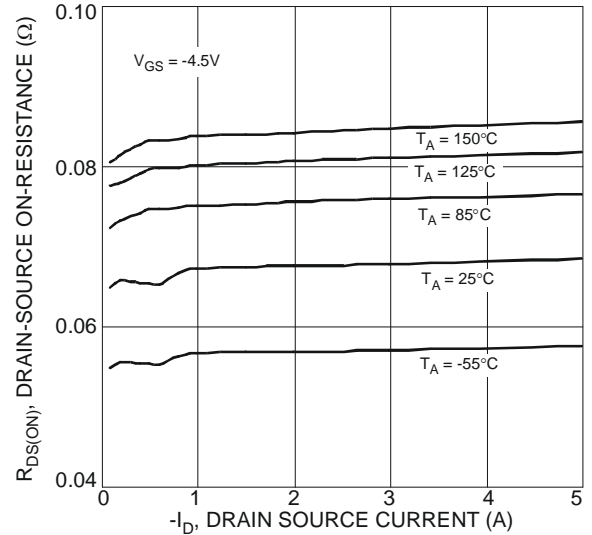
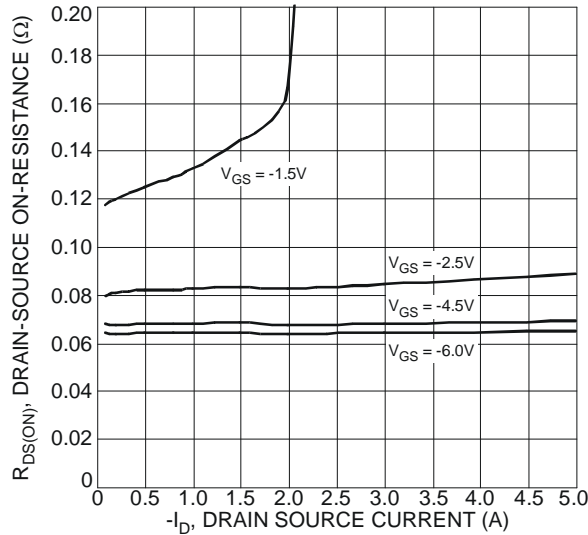
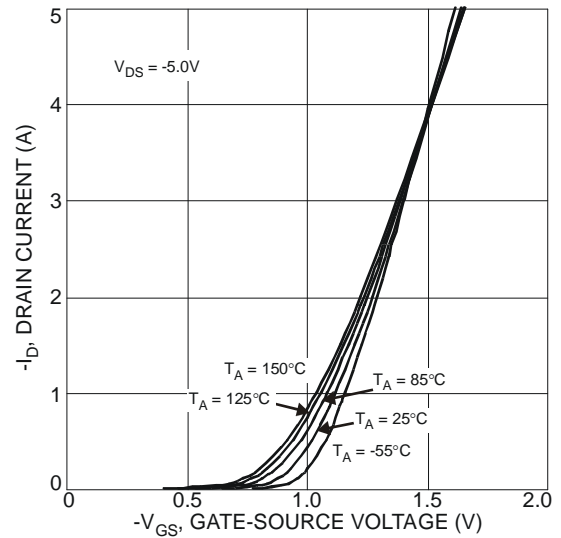
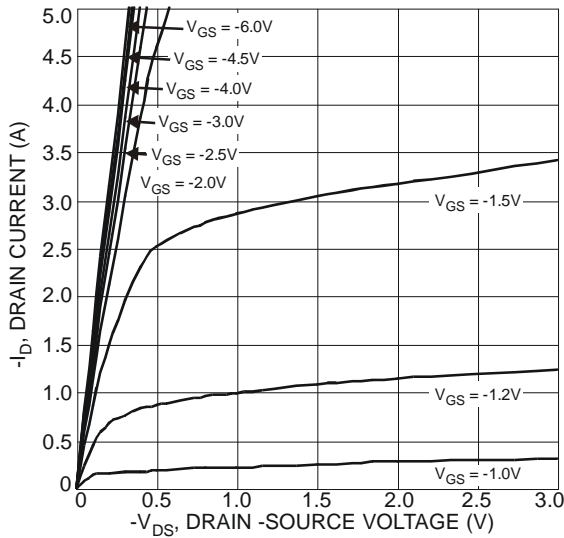
**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 7)	P <sub>D</sub>	0.82	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 7)	R <sub>θJA</sub>	150	°C/W
Thermal Resistance, Junction to Case @T <sub>C</sub> = +25°C (Note 7)	R <sub>θJC</sub>	42.66	°C/W
Power Dissipation (Note 5)	P <sub>D</sub>	1.59	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 5)	R <sub>θJA</sub>	80.29	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-12	-	-	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Gate-Source Breakdown Voltage	BV <sub>GSS</sub>	-6.0	-	-	V	V <sub>DS</sub> = 0V, I <sub>G</sub> = -250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	-	-	-1	μA	V <sub>DS</sub> = -9.6V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	-100	nA	V <sub>GS</sub> = -6V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	-0.6	-1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	-	65	80	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -500mA
		-	77	93		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -500mA
		-	108	130		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -500mA
		-	-	-		V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -500mA
Forward Transfer Admittance	Y <sub>fs</sub>	-	4	-	S	V <sub>DS</sub> = -6V, I <sub>D</sub> = -500mA
Diode Forward Voltage	V <sub>SD</sub>	-	-0.6	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -500mA
Reverse Recovery Charge	Q <sub>rr</sub>	-	2.0	-	nC	V <sub>dd</sub> = -4.0V, I <sub>F</sub> = -0.5A, di/dt = 100A/μs
Reverse Recovery Time	t <sub>rr</sub>	-	9.5	-	ns	
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	-	213	350	pF	V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	119	250		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	54.4	90		
Total Gate Charge	Q <sub>g</sub>	-	2.5	5	nC	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -6V, I <sub>D</sub> = -500mA
Gate-Source Charge	Q <sub>gs</sub>	-	0.3	-		
Gate-Drain Charge	Q <sub>gd</sub>	-	0.6	-		
Gate Charge at V <sub>th</sub>	Q <sub>g(th)</sub>	-	0.15	-		
Turn-On Delay Time	t <sub>D(on)</sub>	-	16.7	-	ns	V <sub>DS</sub> = -6V, V <sub>GS</sub> = -2.5V, R <sub>G</sub> = 20Ω, I <sub>D</sub> = -500mA
Turn-On Rise Time	t <sub>r</sub>	-	20.6	-		
Turn-Off Delay Time	t <sub>D(off)</sub>	-	38.4	-		
Turn-Off Fall Time	t <sub>f</sub>	-	28.4	-		

- Notes:
- Device mounted on FR4 material with 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz. (0.071-mm thick) Cu.
  - Repetitive rating, pulse width limited by junction temperature.
  - Device mounted on FR-4 PCB with minimum recommended pad layout, single sided.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.



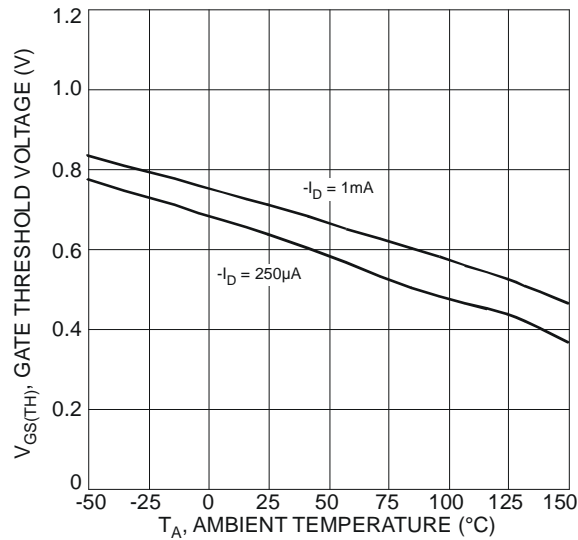


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

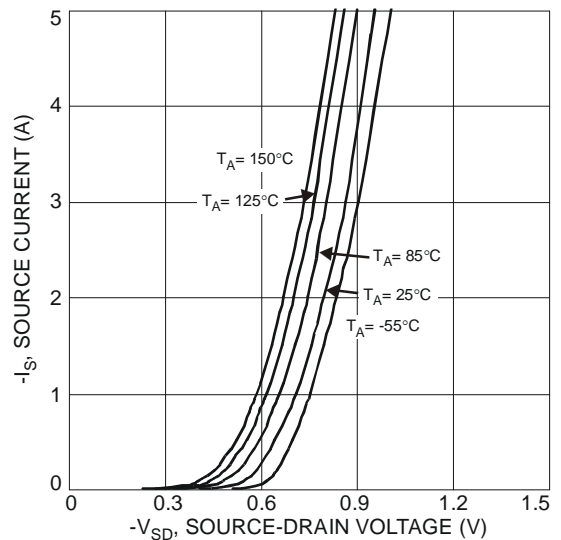


Fig. 8 Diode Forward Voltage vs. Current

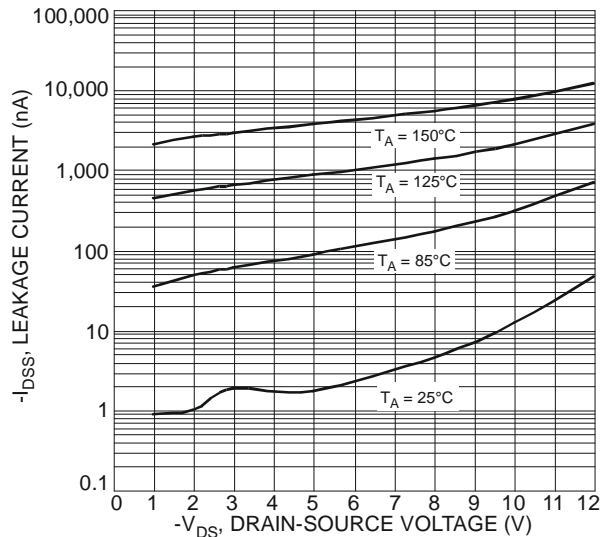


Fig. 9 Typical Drain-Source Leakage Current vs. Voltage

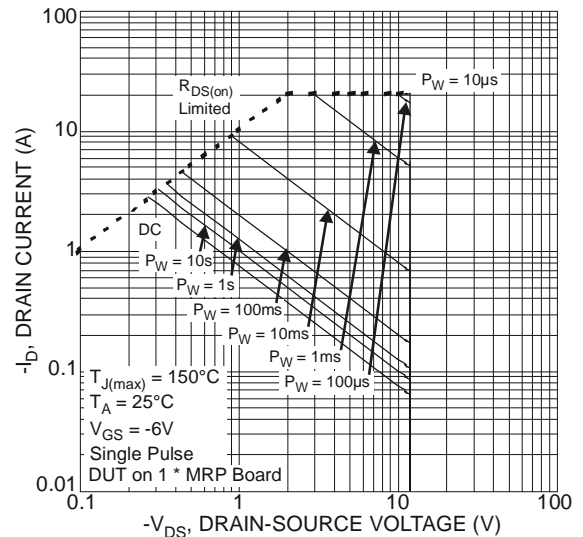


Fig. 10 SOA, Safe Operation Area

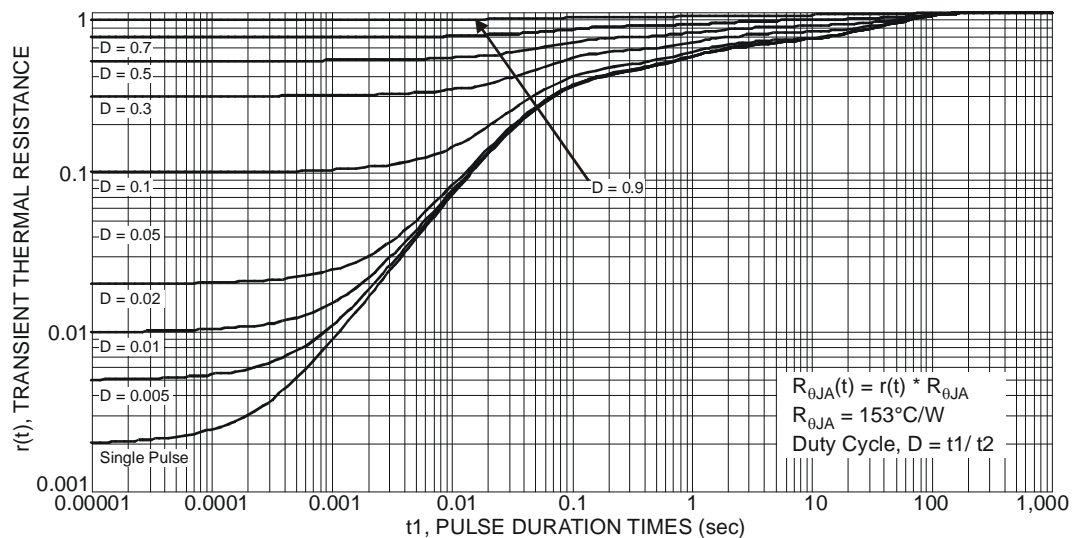
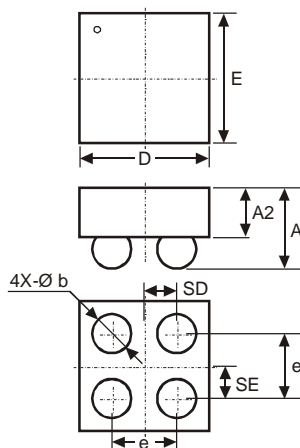


Fig. 11 Transient Thermal Resistance

## Package Outline Dimension

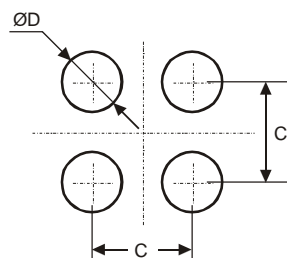
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



U-WLB1010-4			
Dim	Min	Max	Typ
D	0.95	1.05	1.00
E	0.95	1.05	1.00
A	–	0.62	–
A2	–	–	0.38
b	0.25	0.35	0.30
e	–	–	0.50
SD	–	–	0.25
SE	–	–	0.25
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)
C	0.50
D	0.25

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