

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	Package	$I_S$ $T_A = +25^\circ C$
24V	26m $\Omega$ @ $V_{GS} = 4.5V$	X1-WLB1818-4	6.0A

## Description

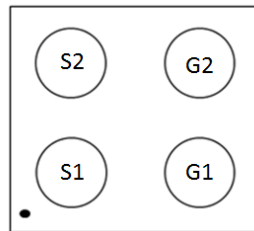
This new generation MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) with thin WLCSP packaging process and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

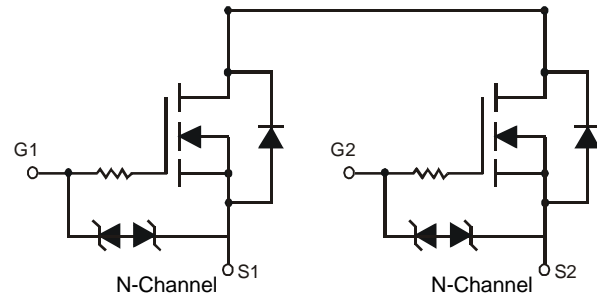
- Battery Management
- Load Switch
- Battery Protection



ESD PROTECTED TO 2kV



Top View



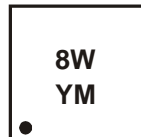
Equivalent Circuit

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2023UCB4-7	X1-WLB1818-4	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



8W = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: Y = 2011)  
 M or  $\bar{M}$  = 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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{SSS}$	24	V
Gate-Source Voltage (Note 5)			$V_{GSS}$	$\pm 12$	V
Continuous Source Current @ $T_A = +25^\circ\text{C}$ (Note 6)	Steady State	$T_A = +25^\circ\text{C}$	$I_S$	6.0	A
		$T_A = +70^\circ\text{C}$		4.8	
Pulsed Source Current @ $T_A = +25^\circ\text{C}$ (Notes 6 & 7)			$I_{SM}$	20	A

**Thermal Characteristics**

Characteristic	Symbol	Value	Units
Power Dissipation, @ $T_A = +25^\circ\text{C}$ (Note 6)	$P_D$	1.45	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 6)	$R_{\theta JA}$	88.21	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Source to Source Breakdown Voltage $T_J = +25^\circ\text{C}$	$V_{(BR)SS}$	24	—	—	V	$I_S = 1\text{mA}, V_{GS} = 0\text{V}$ TEST CIRCUIT 1
Zero Gate Voltage Source Current $T_J = +25^\circ\text{C}$	$I_{SSS}$	—	—	1.0	$\mu\text{A}$	$V_{SS} = 20\text{V}, V_{GS} = 0\text{V}$ TEST CIRCUIT 1
Gate-Body Leakage	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$ TEST CIRCUIT 2
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.3	V	$V_{SS} = 10\text{V}, I_S = 1.0\text{mA}$ TEST CIRCUIT 3
Static Source -Source On-Resistance	$R_{SS(ON)}$	17	21.5	25.5	m $\Omega$	$V_{GS} = 6.5\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
		17.5	22	26		$V_{GS} = 4.5\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
		18.5	23	27		$V_{GS} = 4.0\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
		19	23.5	29		$V_{GS} = 3.7\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
		19.5	24	33		$V_{GS} = 3.1\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
		21.5	27	40		$V_{GS} = 2.5\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 5
Forward Transfer Admittance	$ Y_{fs} $	—	12	—	S	$V_{SS} = 10\text{V}, I_S = 3.0\text{A}$ TEST CIRCUIT 4
Body Diode Forward Voltage	$V_{F(S-S)}$	—	0.7	1	V	$I_F = 3.0\text{A}, V_{GS} = 0\text{V}$ , TEST CIRCUIT 6
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	2564	3333	pF	$V_{SS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ TEST CIRCUIT 7
Output Capacitance	$C_{oss}$	—	197	275		
Reverse Transfer Capacitance	$C_{rss}$	—	183	260		
Total Gate Charge	$Q_g$	—	29	37	nC	$V_{GS} = 4.5\text{V}, V_{SS} = 10\text{V}, I_S = 6\text{A}$ TEST CIRCUIT 9
Turn-On Delay Time	$t_{D(on)}$	—	10	15	ns	$V_{DD} = 10\text{V},$ $R_L = 3.33\Omega, I_S = 3.0\text{A}$ TEST CIRCUIT 8
Turn-On Rise Time	$t_r$	—	20	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	75	110	ns	
Turn-Off Fall Time	$t_f$	—	29	—	ns	

- Notes:
- AEC-Q101 VGS maximum is  $\pm 9.6\text{V}$ .
  - 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.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

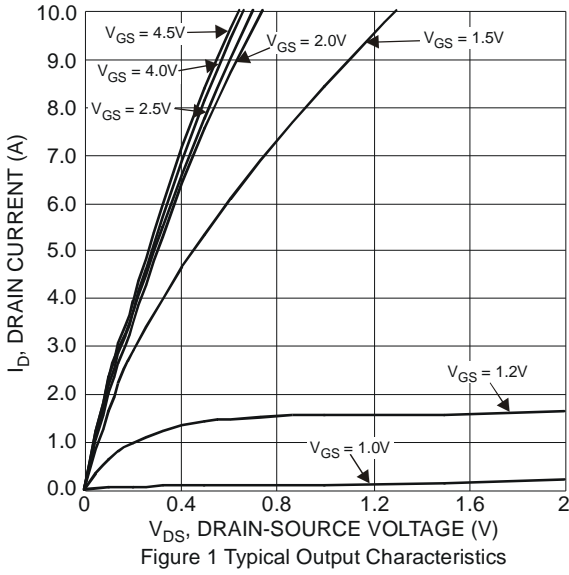


Figure 1 Typical Output Characteristics

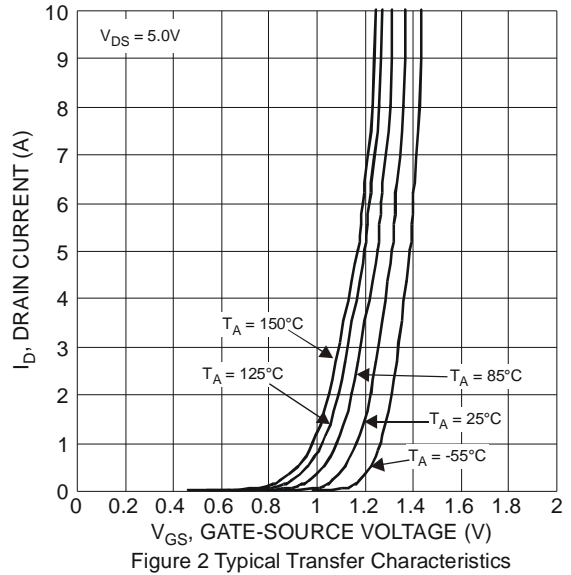


Figure 2 Typical Transfer Characteristics

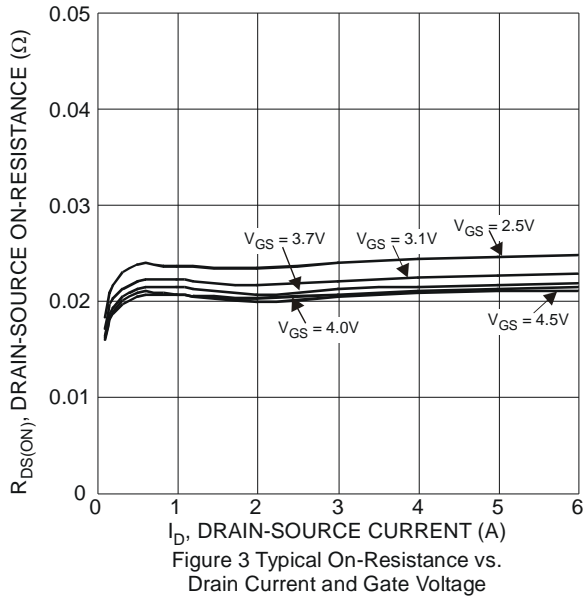


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

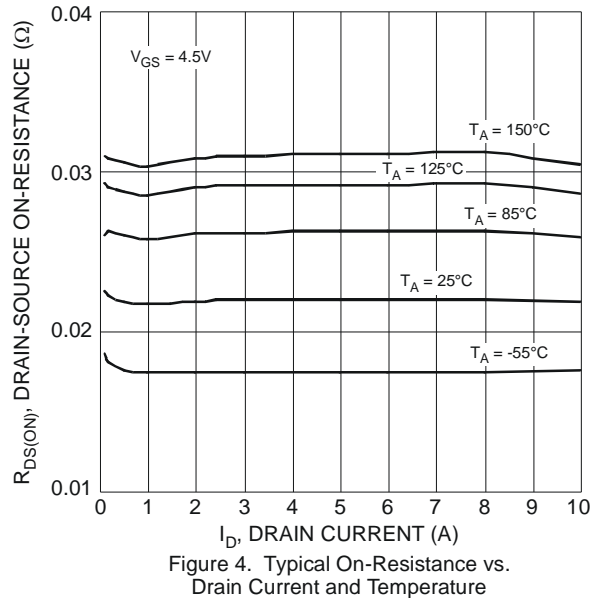


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

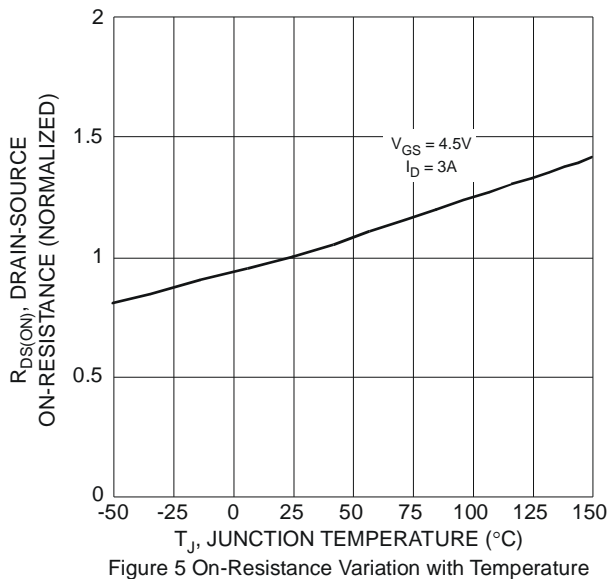


Figure 5 On-Resistance Variation with Temperature

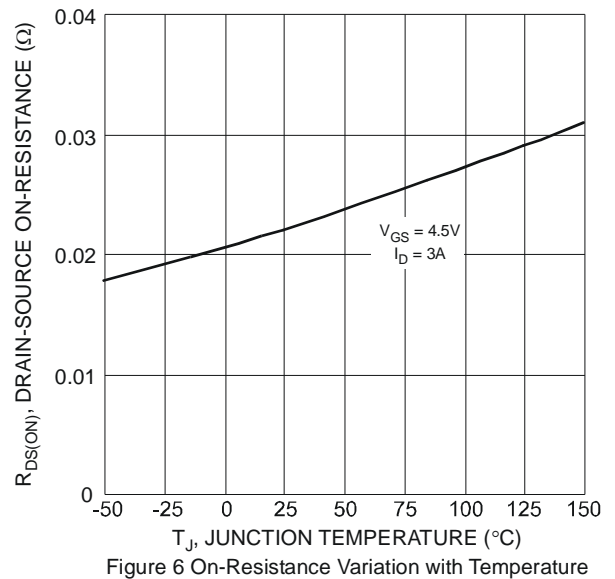


Figure 6 On-Resistance Variation with Temperature

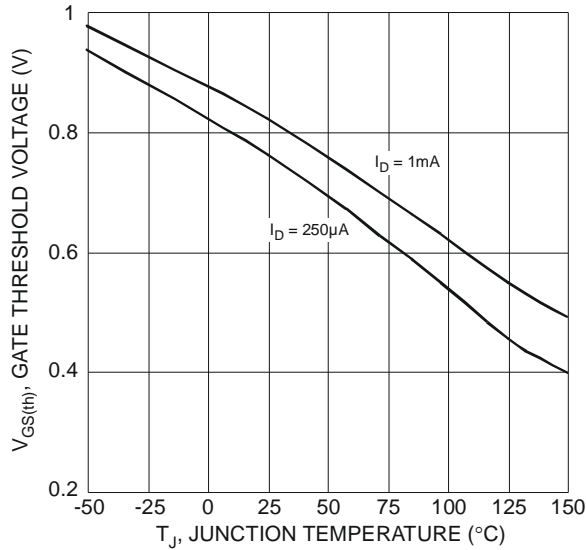


Figure 7 Gate Threshold Variation vs. Ambient Temperature

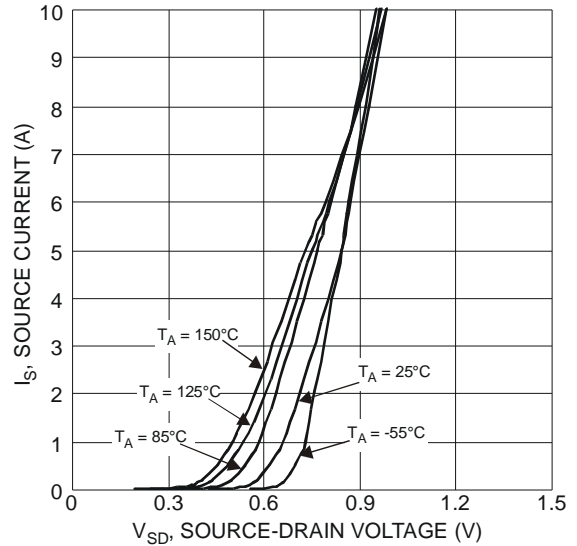


Figure 8 Diode Forward Voltage vs. Current

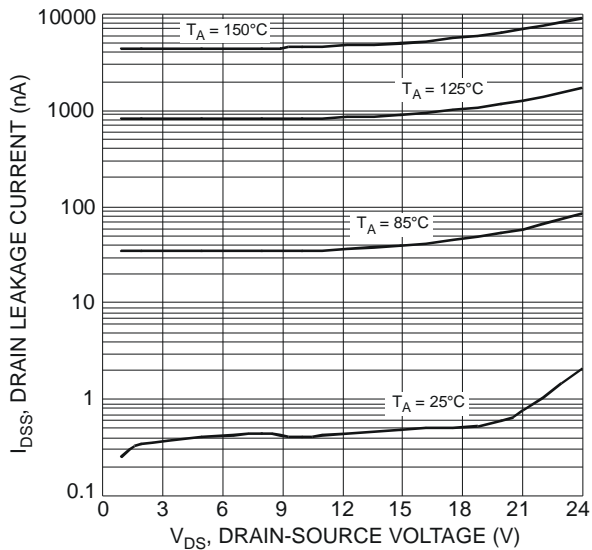


Figure 9 Typical Drain-Source Leakage Current vs. Voltage

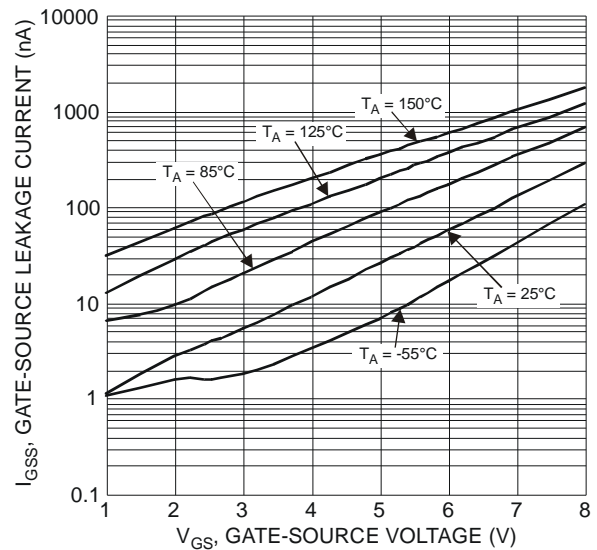


Figure 10 Typical Gate-Source Leakage Current vs. Gate-Source Voltage

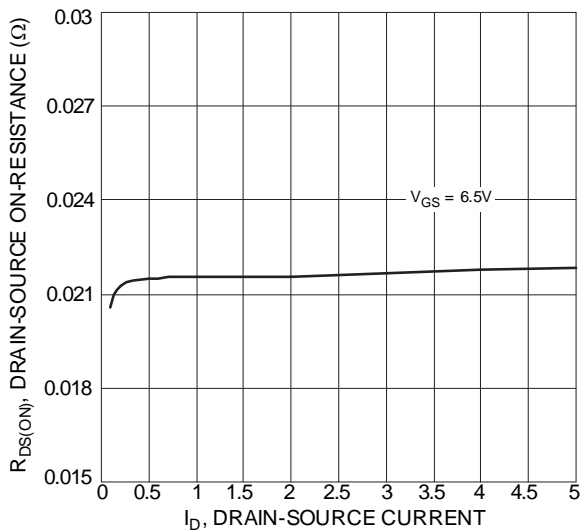


Figure 11 Typical On-Resistance vs. Drain Current and Gate Voltage

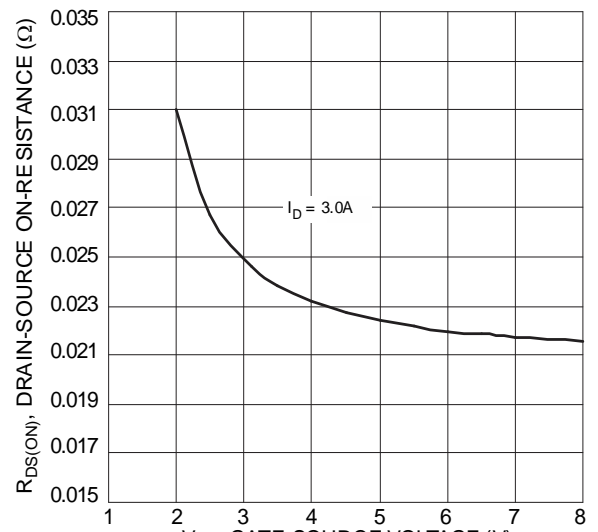
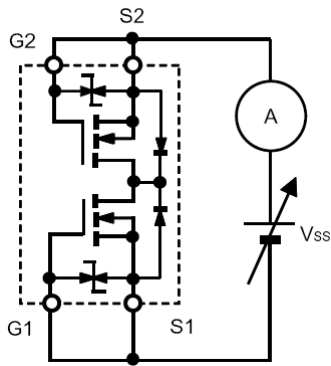


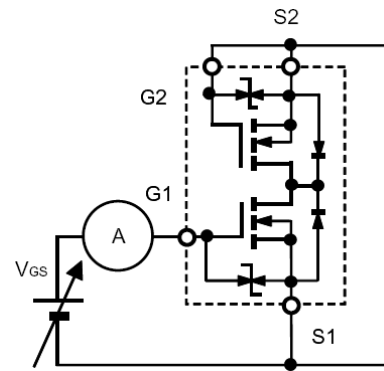
Figure 12 Typical Transfer Characteristic

**Test Circuits**

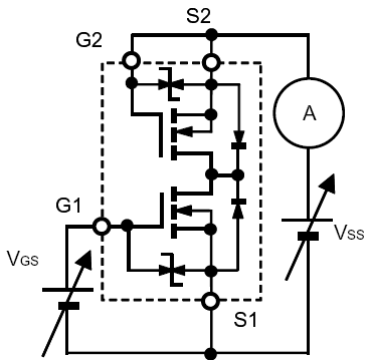
NEW PRODUCT



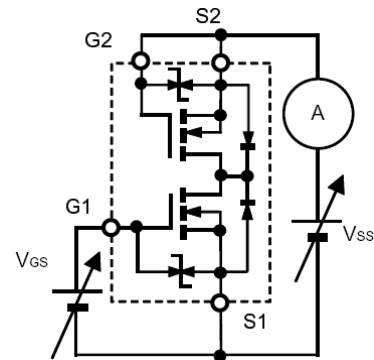
TEST CIRCUIT 1  $I_{SSS}$



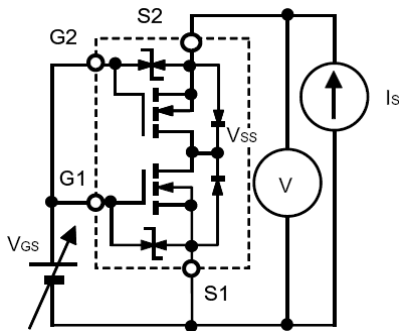
TEST CIRCUIT 2  $I_{GSS}$   
When FET1 is measured, between GATE and SOURCE of FET2 are shorted.



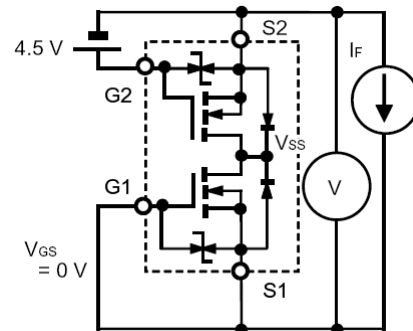
TEST CIRCUIT 3  $V_{GS(off)}$   
When FET1 is measured, between GATE and SOURCE of FET2 are shorted.



TEST CIRCUIT 4  $|y_{fs}|$   
 $\Delta I_S / \Delta V_{GS}$

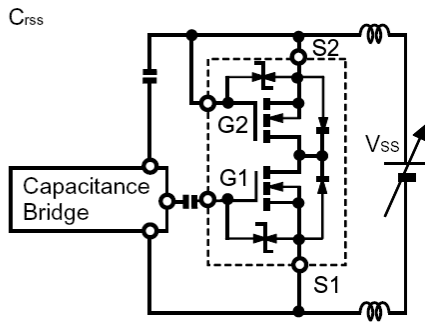
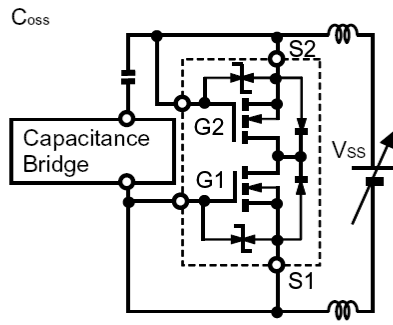
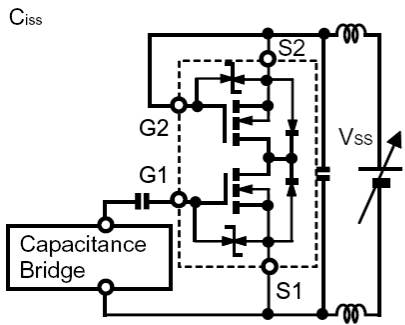


TEST CIRCUIT 5  $R_{SS(on)}$   
 $V_{SS} / I_S$

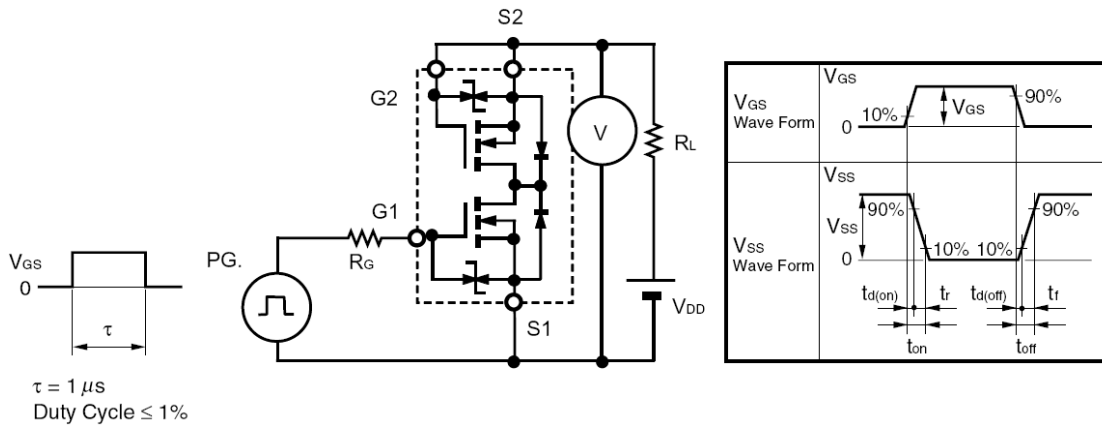


TEST CIRCUIT 6  $V_{F(S-S)}$   
When FET1 is measured, FET2 is added  $V_{GS} + 4.5V$ .

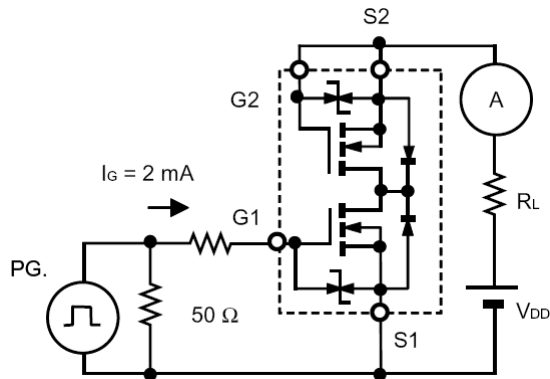
**Test Circuits** (cont.)



TEST CIRCUIT 7



TEST CIRCUIT 8  $t_{d(on)}$ ,  $t_r$ ,  $t_{d(off)}$ ,  $t_f$

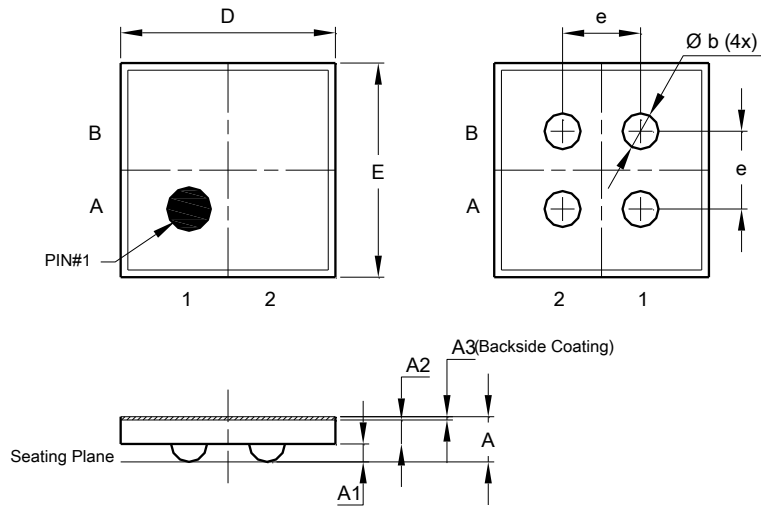


TEST CIRCUIT 9  $Q_G$

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**Package Outline Dimensions**

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

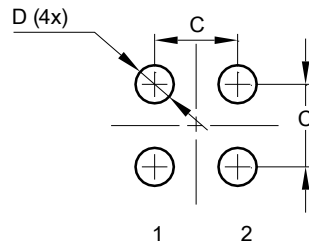


X1-WLB1818-4			
Dim	Min	Max	Typ
A	0.3420	0.4080	0.3750
A1	0.1350	0.1650	0.1500
A2	0.1850	0.2150	0.2000
A3	0.0220	0.0280	0.0250
b	0.2700	0.3300	0.3000
D	1.7800	1.8000	1.7900
E	1.7800	1.8000	1.7900
e	0.650 BSC		
All Dimensions in mm			

NEW PRODUCT

**Suggested Pad Layout**

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



Dimensions	Value (in mm)
C	0.650
D	0.300

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