NEW PRODUCT

Description and Applications

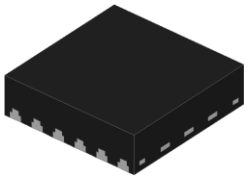
The DML3009LDC load switch provides a component and area-reducing solution for efficient power domain switching with inrush current limit via soft−start. In addition to integrated control functionality with ultra low on−resistance, this device offers system safeguards and monitoring via fault protection and power good signaling. This cost effective solution is ideal for power management and hot-swap applications requiring low power consumption in a small footprint.

- Portable Electronics and Systems
- Notebook and Tablet Computers
- Telecom, Networking, Medical, and Industrial Equipment
- Set−Top Boxes, Servers, and Gateways
- Hot−Swap Devices and Peripheral Ports

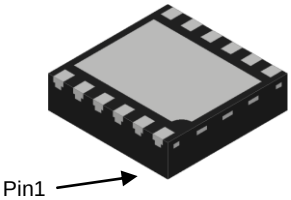
Features and Benefits

- Advanced Controller with Charge Pump
- Integrated N-Channel MOSFET with Ultra Low R_{ON}
- Input Voltage Range 0.5V to 13.5V
- Soft-Start via Controlled Slew Rate
- Adjustable Slew Rate Control
- Power Good Signal
- Thermal Shutdown
- V_{IN} Under-Voltage Lockout
- Short-Circuit Protection
- Extremely Low Standby Current
- Load Bleed (Quick Discharge)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

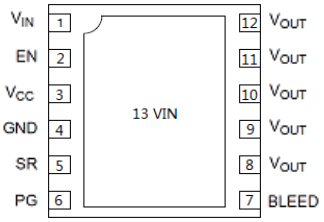
V-DFN3030-12 (Type B)



Top View



Bottom View



Top View

Ordering Information (Note 4)

Part Number	Case	Packaging
DML3009LDC-7	V-DFN3030-12 (Type B)	3,000/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/.

Pin Description

Pin Number	Pin Name	Pin Function
1, 13	V_{IN}	Drain of MOSFET (0.5V to 13.5V), Pin 1 must be connected to Pin 13
2	EN	Active−high digital input used to turn on the MOSFET, pin has an internal pull down resistor to GND
3	V_{CC}	Supply voltage to controller (3.0V to 5.5V)
4	GND	Controller ground
5	SR	Slew rate adjustment; float if not used
6	PG	Active−high, open−drain output that indicates when the gate of the MOSFET is fully charged, external pull up resistor ≥ 1kΩ to an external voltage source required; tie to GND if not used.
7	BLEED	Load bleed connection, must be tied to V_{OUT} either directly or through a resistor ≤ 1kΩ
8 to 12	V_{OUT}	Source of MOSFET connected to load

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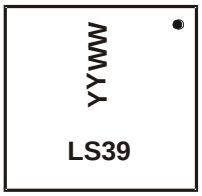
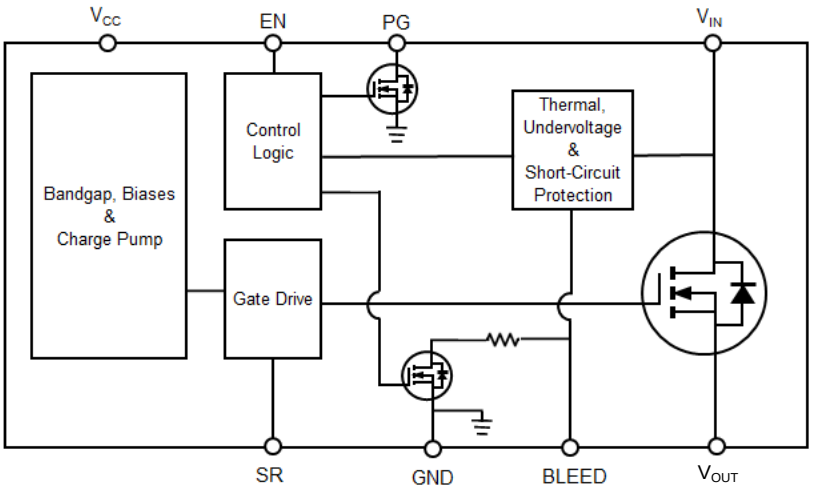
Marking Information

V-DFN3030-12 (Type B)

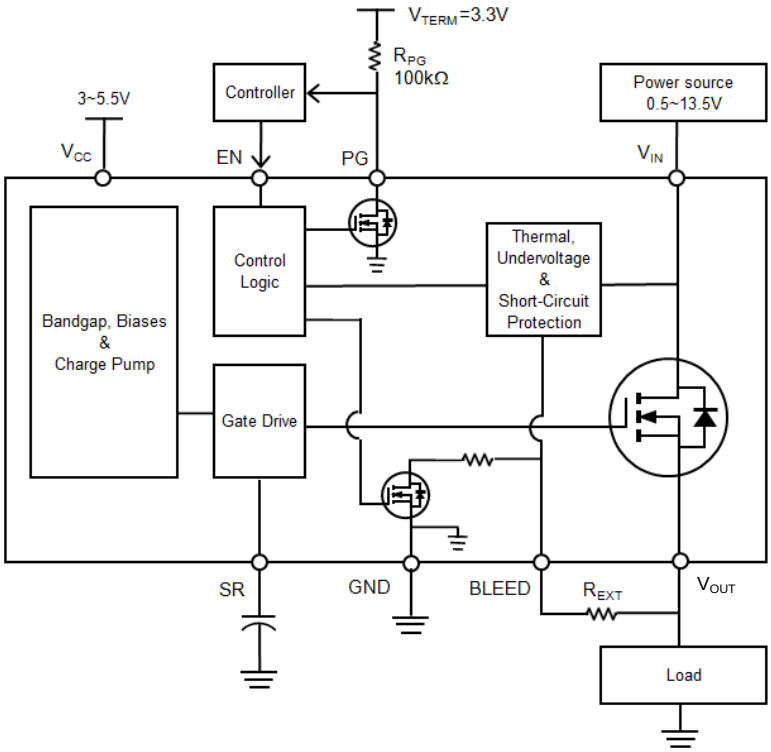


LS39 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

Functional Block Diagram



Application Circuit



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Absolute Maximum Ratings

Parameter	Rating
V_{IN}, BLEED, V_{OUT} to GND	-0.3V to 18V
EN, V_{CC}, SR, PG to GND	-0.3V to 6V
I_{MAX}	20A
Junction Temperature (T_J)	+150°C
Storage Temperature (T_S)	-65°C to +150°C

Recommended Operating Ranges

Parameter	Rating
Supply Voltage (V_{CC})	3V to 5.5V
Input Voltage (V_{IN})	0.5V to 13.5V
Ambient Temperature (T_A)	-40°C to +85°C
Package Thermal Resistance (θ_{JC})	3.5°C/W
Package Thermal Resistance (θ_{JA})	30°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage	—	0.5	—	13.5	V
V_{CC}	Supply Voltage	—	3.0	—	5.5	V
I_{DYN}	V_{CC} Dynamic Supply Current	V_{EN} =V_{CC}= 3V, V_{IN} = 12V	—	310	400	µA
		V_{EN} =V_{CC}= 5.5V, V_{IN} = 1.8V	—	510	750	µA
I_{STBY}	V_{CC} Shutdown Supply Current	V_{CC} = 3V, V_{EN} = 0V	—	0.1	1	µA
		V_{CC} = 5.5V, V_{EN} = 0V	—	0.1	2	µA
V_{ENH}	EN High Level Voltage	V_{CC} = 3V to 5.5V	2.0	—	—	V
V_{ENL}	EN Low Level Voltage	V_{CC} = 3V to 5.5V	—	—	0.8	V
R_{BLEED}	Bleed Resistance	V_{CC} = 3V, V_{EN} = 0V	86	108	130	Ω
		V_{CC} = 5.5V, V_{EN} = 0V	64	80	100	Ω
I_{BLEED}	Bleed Pin Leakage Current	V_{CC} = V_{EN} = 3V, V_{IN} = 1.8V	—	20	45	µA
		V_{CC} = V_{EN} = 3V, V_{IN} = 12V	—	50	70	µA
V_{PGL}	PG Output Low Voltage	V_{CC} = 3V; I_{SINK} = 5mA	—	—	0.2	V
I_{PG}	PG Output Leakage Current	V_{CC} = 3V; V_{TERM} = 3.3V	—	—	100	nA
Switching Device						
R_{ON}	Switch On-State Resistance	V_{CC} = 3.3V, V_{IN} = 1.8V	—	6.1	9	mΩ
		V_{CC} = 3.3V, V_{IN} = 5V	—	5.9	8	mΩ
		V_{CC} = 3.3V, V_{IN} = 12V	—	5.8	8	mΩ
		V_{CC} = 5V, V_{IN} = 1.8V	—	4.8	7	mΩ
		V_{CC} = 5V, V_{IN} = 5V	—	4.8	7	mΩ
		V_{CC} = 5V, V_{IN} = 12V	—	4.8	7	mΩ
I_{LEAK}	Input Shutdown Supply Current	V_{EN} = 0V, V_{IN} = 13.5V	—	—	1	µA
R_{PDEN}	EN Pull Down Resistance	—	76	100	124	kΩ
Fault Protection						
OTP	Thermal Shutdown Threshold	V_{CC} = 3V to 5.5V	—	145	—	°C
OTP_{HYS}	Thermal Shutdown Hysteresis	V_{CC} = 3V to 5.5V	—	20	—	°C
UVLO	V_{IN} Lockout Threshold	V_{CC} = 3V	0.25	0.35	0.45	V
$UVLO_{HYS}$	V_{IN} Lockout Hysteresis	V_{CC} = 3V	20	40	70	mV
SCP	Short−Circuit Protection Threshold	V_{CC} = 3.3V; V_{IN} = 0.5V	180	265	350	mV
		V_{CC} = 3.3V; V_{IN} = 13.5V	100	285	500	mV

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Switching Characteristics (T_J = +25°C, V_{TERM} = V_{CC}; R_{PG} = 100kΩ; R_L = 10Ω; C_L = 0.1µF, unless otherwise specified).

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{IN} = 1.8V						
t_{ON}	Output Turn-On Delay time	V_{CC}=3.3V	—	375	—	µs
		V_{CC}=5V	—	370	—	
t_{OFF}	Output Turn-Off Delay time	V_{CC}=3.3V	—	0.5	—	
		V_{CC}=5V	—	0.5	—	
t_{PGON}	Power Good Turn−on Time	V_{CC}=3.3V	—	1.4	—	ms
		V_{CC}=5V	—	1.3	—	
t_{PGOFF}	Power Good Turn−off Time	V_{CC}=3.3V	—	10	—	ns
		V_{CC}=5V	—	6	—	
SR	Output Slew Rate	V_{CC}=3.3V	—	9	—	kV/s
		V_{CC}=5V	—	9	—	
V_{IN} = 12V						
t_{ON}	Output Turn-On Delay time	V_{CC}=3.3V	—	340	—	µs
		V_{CC}=5V	—	330	—	
t_{OFF}	Output Turn-Off Delay time	V_{CC}=3.3V	—	0.5	—	
		V_{CC}=5V	—	0.4	—	
t_{PGON}	Power Good Turn−on Time	V_{CC}=3.3V	—	1.6	—	ms
		V_{CC}=5V	—	1.5	—	
t_{PGOFF}	Power Good Turn−off Time	V_{CC}=3.3V	—	10	—	ns
		V_{CC}=5V	—	8	—	
SR	Output Slew Rate	V_{CC}=3.3V	—	30	—	kV/s
		V_{CC}=5V	—	31	—	

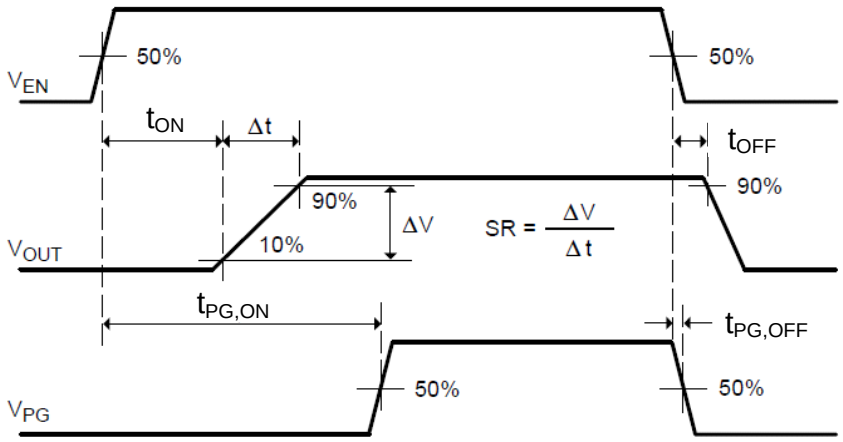

Figure 1 Timing Diagram

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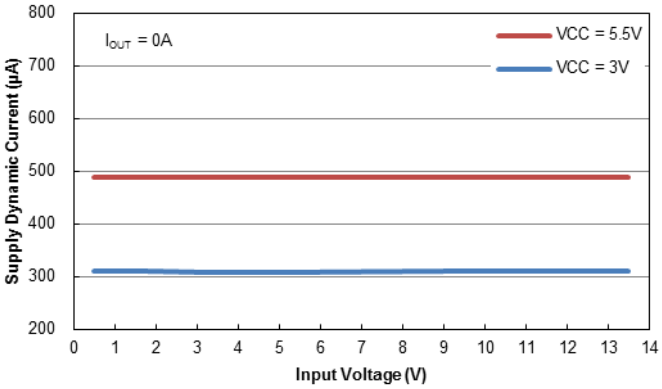
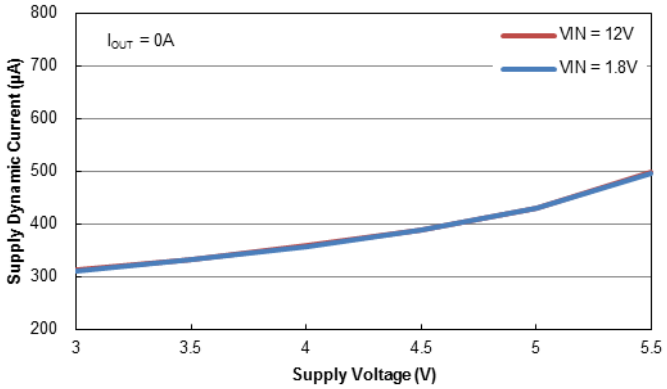
Performance Characteristics (@T_A = +25°C, unless otherwise specified.)

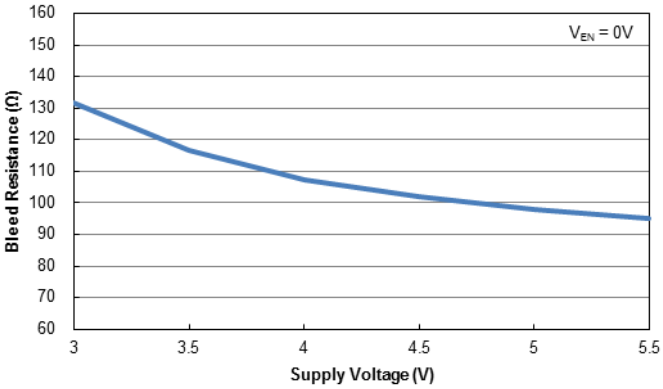
Supply Dynamic Current vs. Input Voltage



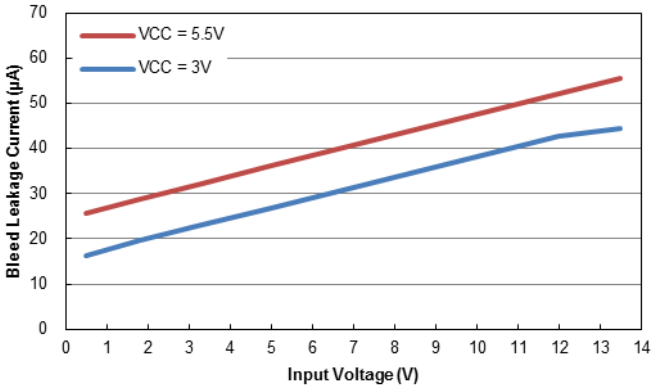
Supply Dynamic Current vs. Supply Voltage



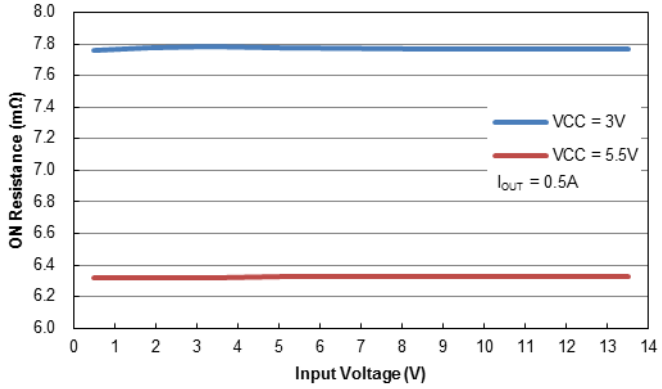
Bleed Resistance vs. Supply Voltage



Bleed Leakage Current vs. Input Voltage



ON Resistance vs. Input Voltage



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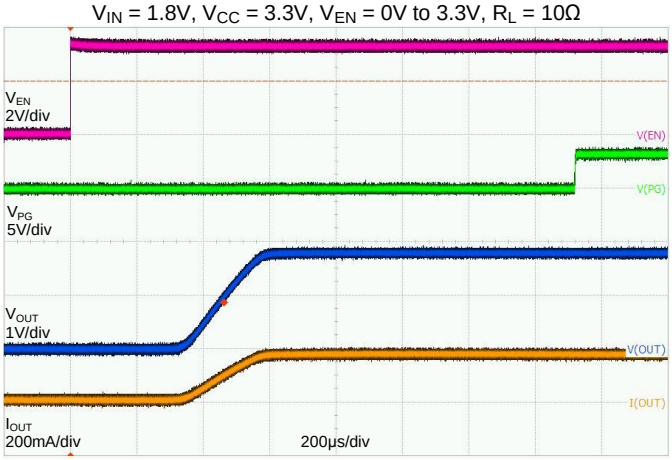
Performance Characteristics (@T_A = +25°C, unless otherwise specified. Cont.)

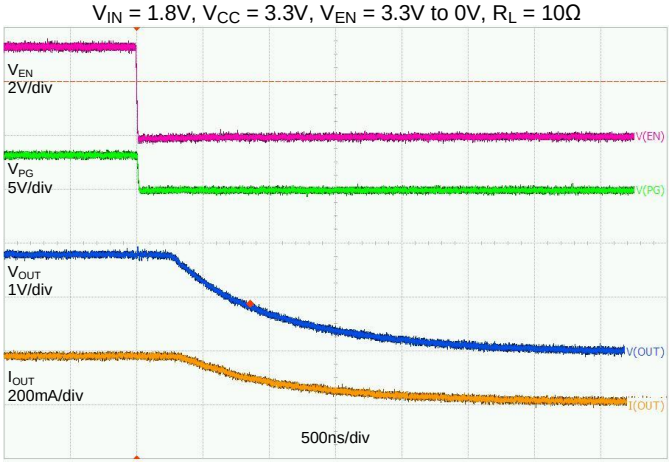
Turn ON Response

V_{IN} = 1.8V, V_{CC} = 3.3V, V_{EN} = 0V to 3.3V, R_L = 10Ω



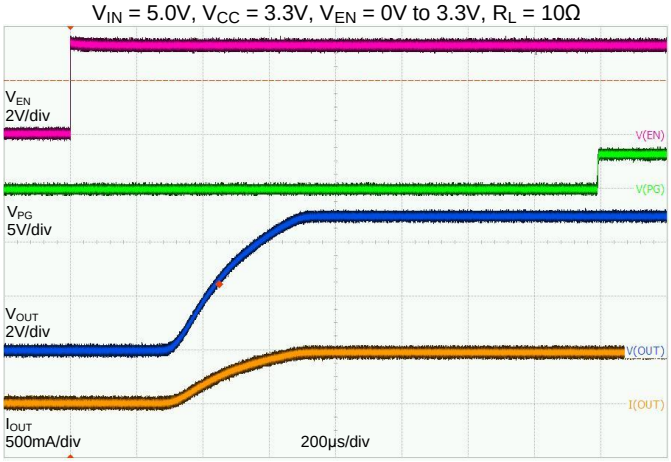
Turn OFF Response

V_{IN} = 1.8V, V_{CC} = 3.3V, V_{EN} = 3.3V to 0V, R_L = 10Ω



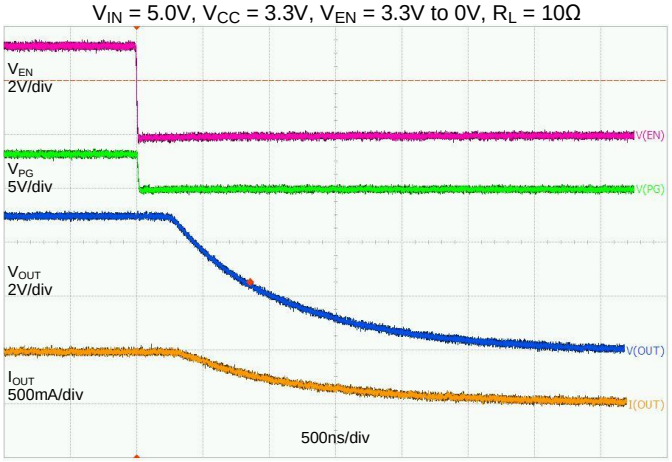
Turn ON Response

V_{IN} = 5.0V, V_{CC} = 3.3V, V_{EN} = 0V to 3.3V, R_L = 10Ω



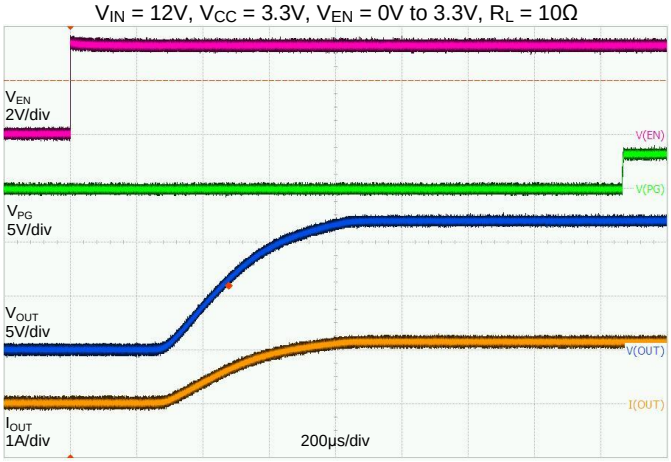
Turn OFF Response

V_{IN} = 5.0V, V_{CC} = 3.3V, V_{EN} = 3.3V to 0V, R_L = 10Ω



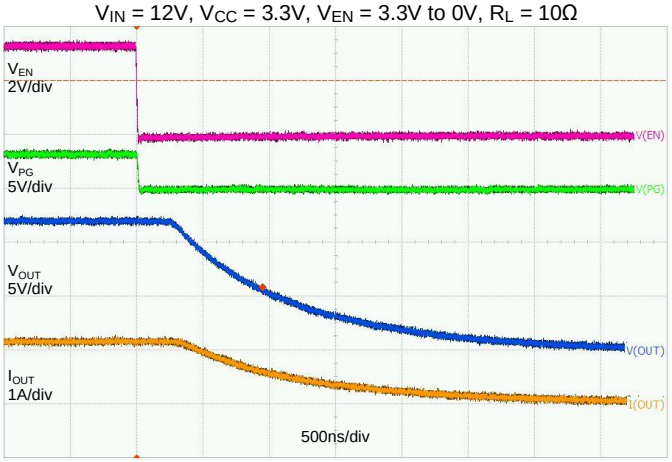
Turn ON Response

V_{IN} = 12V, V_{CC} = 3.3V, V_{EN} = 0V to 3.3V, R_L = 10Ω



Turn OFF Response

V_{IN} = 12V, V_{CC} = 3.3V, V_{EN} = 3.3V to 0V, R_L = 10Ω



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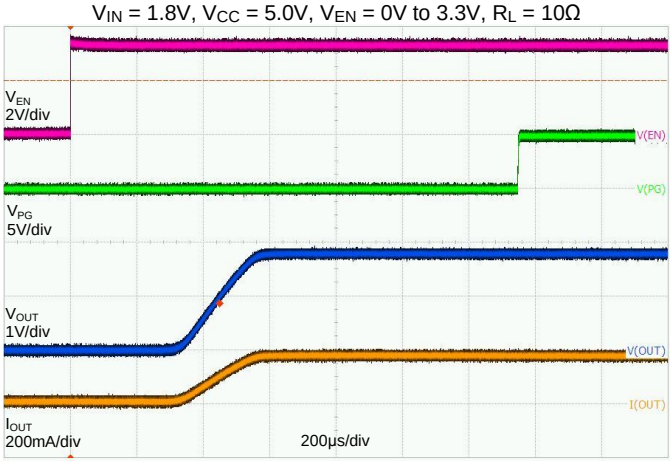
Performance Characteristics (@T_A = +25°C, unless otherwise specified. Cont.)

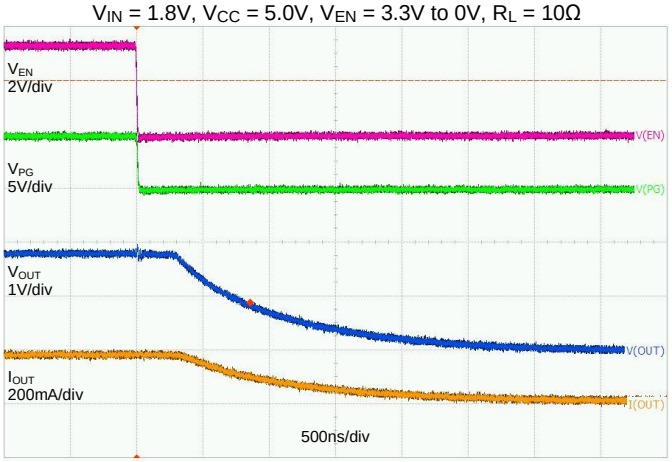
Turn ON Response

V_{IN} = 1.8V, V_{CC} = 5.0V, V_{EN} = 0V to 3.3V, R_L = 10Ω



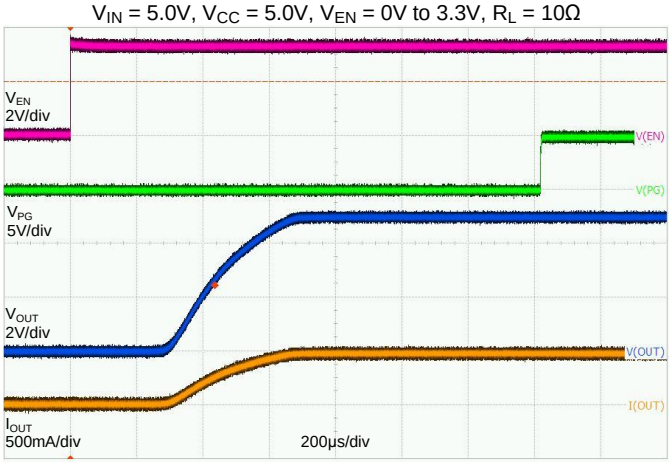
Turn OFF Response

V_{IN} = 1.8V, V_{CC} = 5.0V, V_{EN} = 3.3V to 0V, R_L = 10Ω



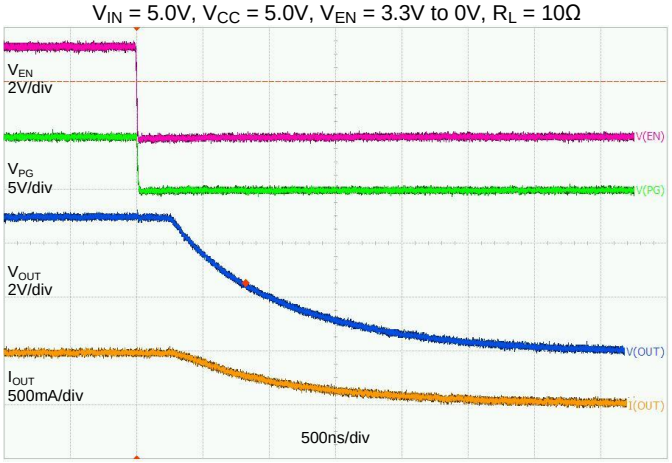
Turn ON Response

V_{IN} = 5.0V, V_{CC} = 5.0V, V_{EN} = 0V to 3.3V, R_L = 10Ω



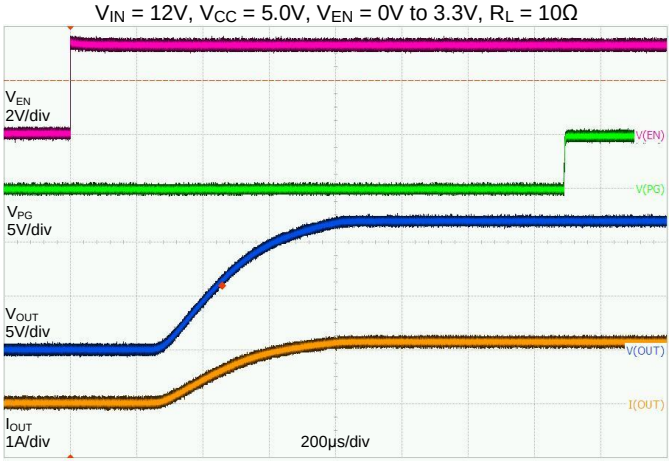
Turn OFF Response

V_{IN} = 5.0V, V_{CC} = 5.0V, V_{EN} = 3.3V to 0V, R_L = 10Ω



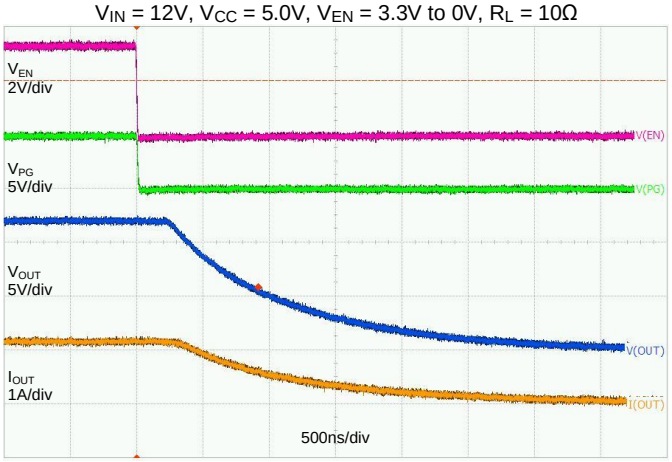
Turn ON Response

V_{IN} = 12V, V_{CC} = 5.0V, V_{EN} = 0V to 3.3V, R_L = 10Ω



Turn OFF Response

V_{IN} = 12V, V_{CC} = 5.0V, V_{EN} = 3.3V to 0V, R_L = 10Ω



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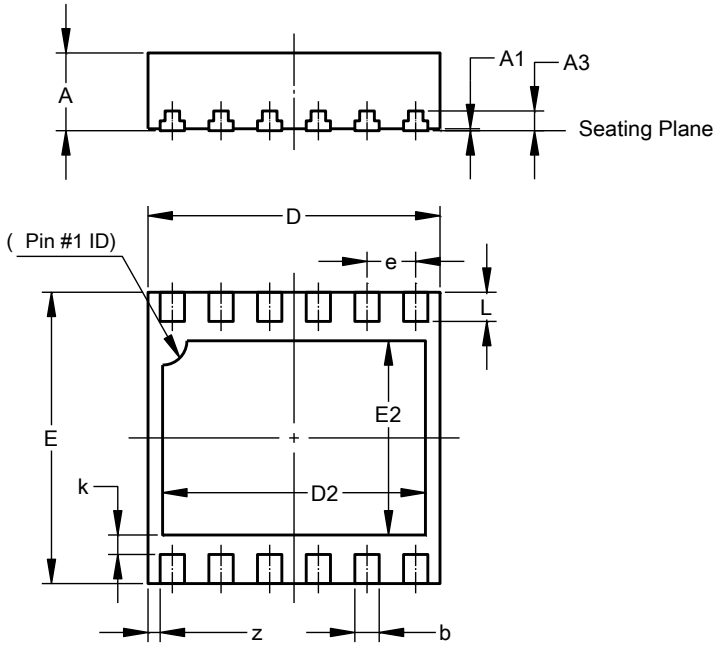
Package Outline Dimensions

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

V-DFN3030-12 (Type B)

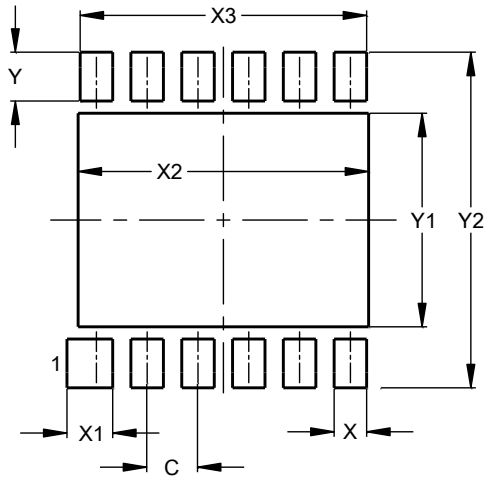


V-DFN3030-12 Type B			
Dim	**Min**	**Max**	**Typ**
A	0.77	0.85	0.80
A1	0.00	0.05	0.02
A3	--	--	0.203
b	0.20	0.30	0.25
D	2.95	3.05	3.00
D2	2.60	2.80	2.70
E	2.95	3.05	3.00
E2	1.90	2.10	2.00
e	0.50BSC		
k	--	--	0.20
L	0.25	0.35	0.30
z	--	--	0.125
All Dimensions in mm			

Suggested Pad Layout

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

V-DFN3030-12 (Type B)



Dimensions	Value (in mm)
C	0.50
X	0.32
X1	0.45
X2	2.86
X3	2.82
Y	0.48
Y1	2.10
Y2	3.30

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A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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