

Description and Applications

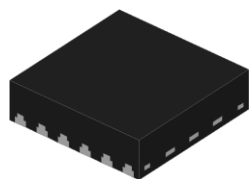
The DML3009LDC load switch provides a component and area-reducing solution for efficient power domain switching with inrush current limit via soft-start. In addition to integrated control functionality with ultra low on-resistance, this device offers system safeguards and monitoring via fault protection 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

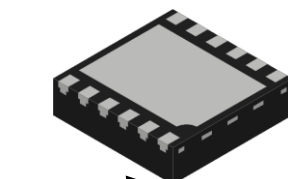
Features and Benefits

- Advanced Controller with ChargePump
- Integrated N-Channel MOSFET with Ultra Low R_{ON}
- Input Voltage Range 0.5V to 13.5V
- Soft-Start via Controlled SlewRate
- 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)**

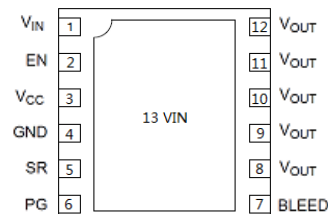
V-DFN3030-12 (Type B)



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

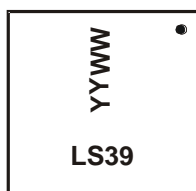
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- 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 $\geq 1k\Omega$ 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 $\leq 1k\Omega$
8 to 12	V_{OUT}	Source of MOSFET connected to load

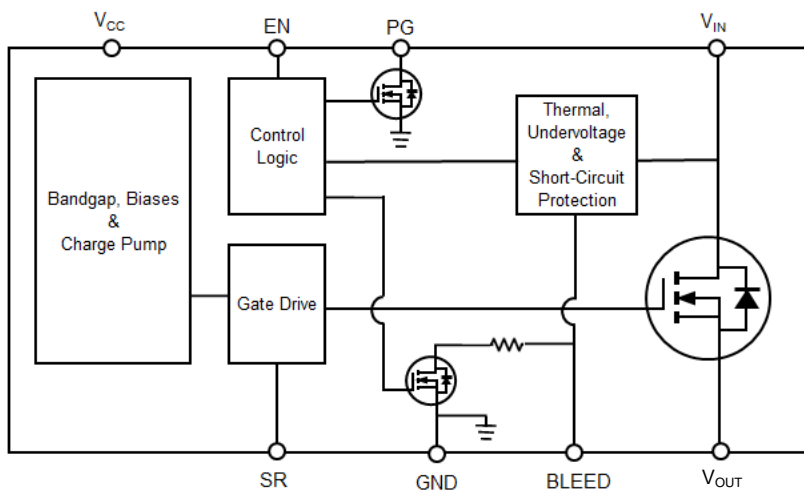
Marking Information

V-DFN3030-12 (Type B)

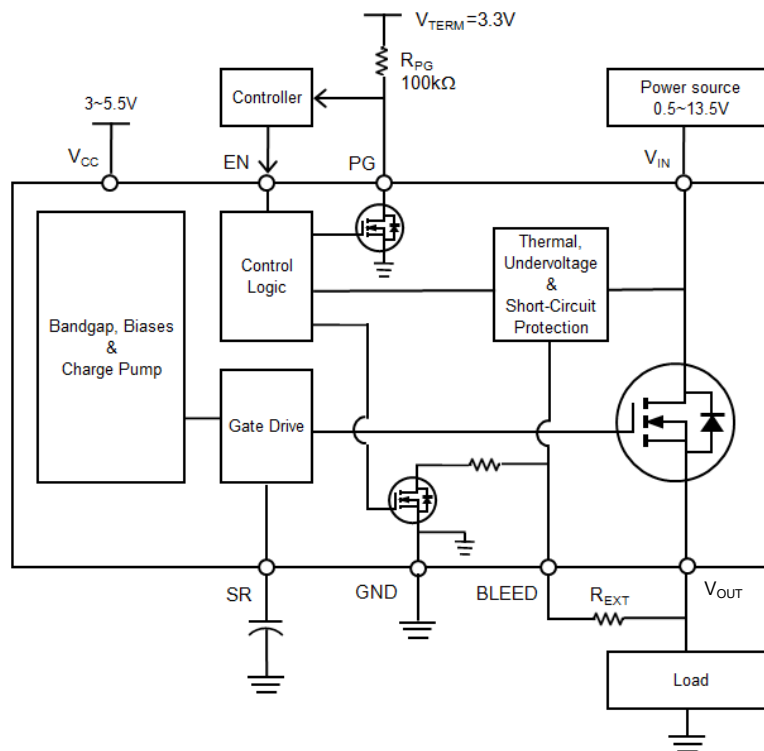


LS39 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

Functional Block Diagram



Application Circuit



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

Switching Characteristics ($T_J = +25^\circ\text{C}$, $V_{\text{TERM}} = V_{\text{CC}}$; $R_{\text{PG}} = 100\text{k}\Omega$; $R_L = 10\Omega$; $C_L = 0.1\mu\text{F}$, unless otherwise specified).

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIN = 1.8V						
tON	Output Turn-On Delay time	VCC=3.3V	—	375	—	μs
		VCC=5V	—	370	—	
tOFF	Output Turn-Off Delay time	VCC=3.3V	—	0.5	—	
		VCC=5V	—	0.5	—	
tPGON	Power Good Turn-on Time	VCC=3.3V	—	1.4	—	ms
		VCC=5V	—	1.3	—	
tPGOFF	Power Good Turn-off Time	VCC=3.3V	—	10	—	ns
		VCC=5V	—	6	—	
SR	Output Slew Rate	VCC=3.3V	—	9	—	kV/s
		VCC=5V	—	9	—	
VIN = 12V						
tON	Output Turn-On Delay time	VCC=3.3V	—	340	—	μs
		VCC=5V	—	330	—	
tOFF	Output Turn-Off Delay time	VCC=3.3V	—	0.5	—	
		VCC=5V	—	0.4	—	
tPGON	Power Good Turn-on Time	VCC=3.3V	—	1.6	—	ms
		VCC=5V	—	1.5	—	
tPGOFF	Power Good Turn-off Time	VCC=3.3V	—	10	—	ns
		VCC=5V	—	8	—	
SR	Output Slew Rate	VCC=3.3V	—	30	—	kV/s
		VCC=5V	—	31	—	

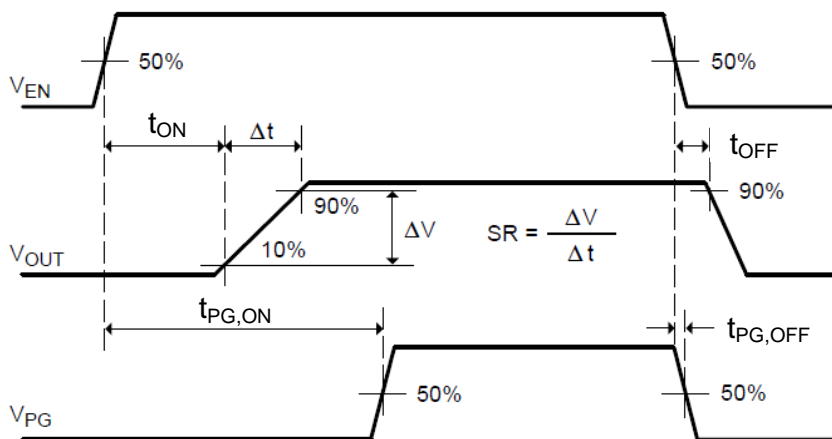
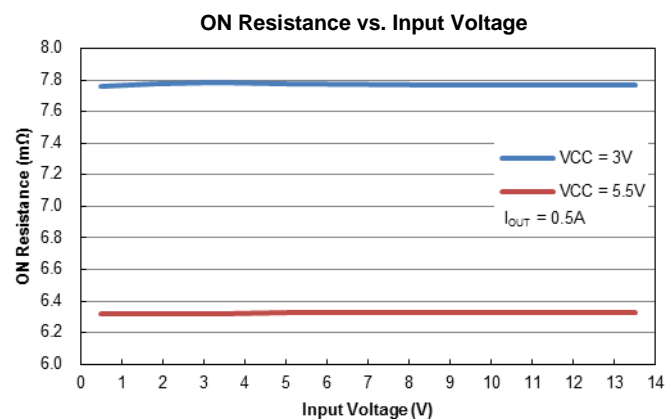
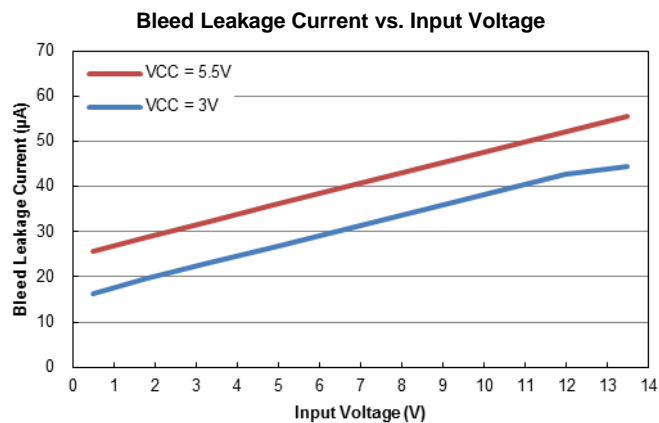
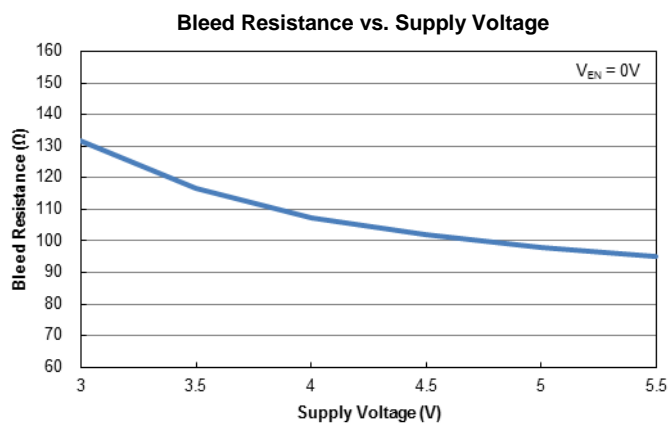
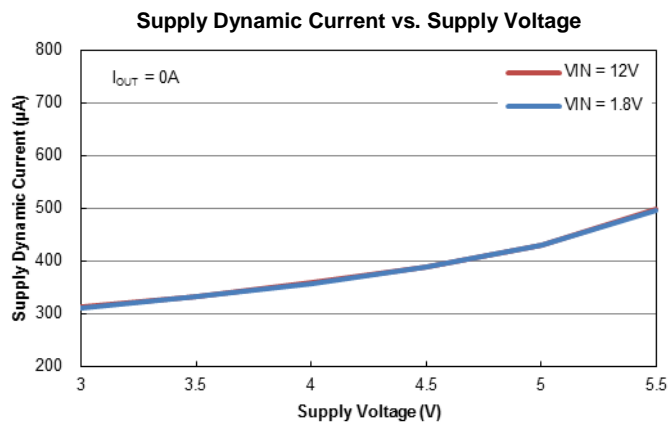
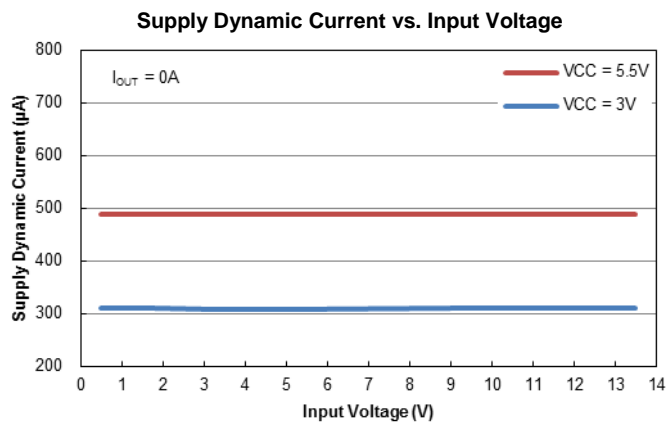


Figure 1 Timing Diagram

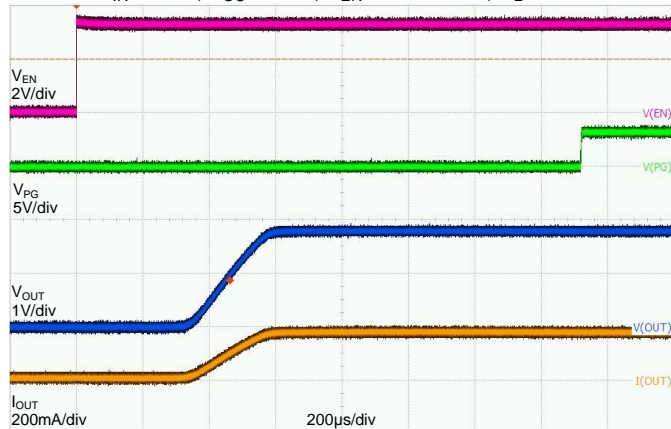
Performance Characteristics (@T_A = +25°C, unless otherwise specified.)



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

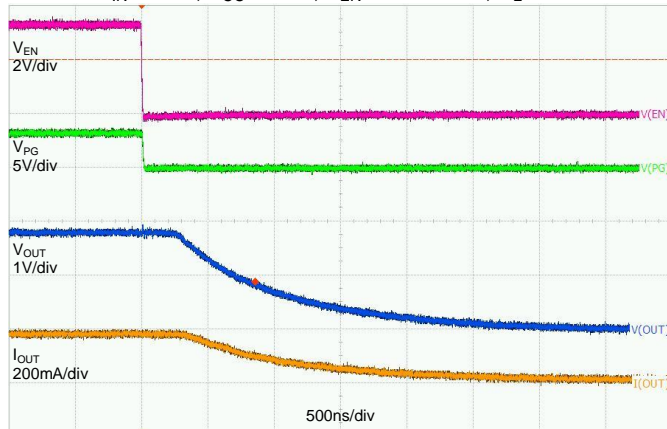
Turn ON Response

$V_{IN} = 1.8\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 0\text{V to } 3.3\text{V}$, $R_L = 10\Omega$



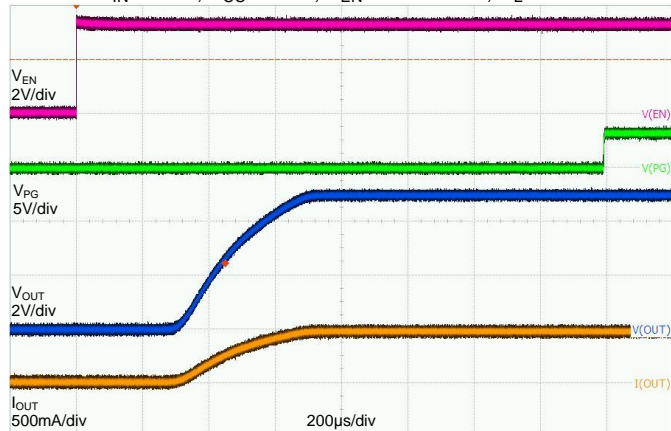
Turn OFF Response

$V_{IN} = 1.8\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 3.3\text{V to } 0\text{V}$, $R_L = 10\Omega$



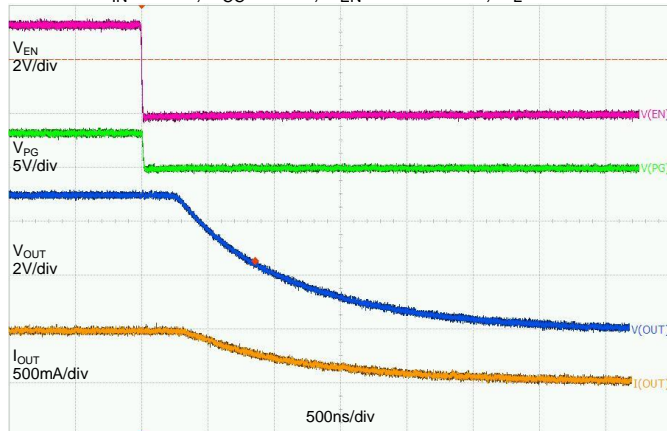
Turn ON Response

$V_{IN} = 5.0\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 0\text{V to } 3.3\text{V}$, $R_L = 10\Omega$



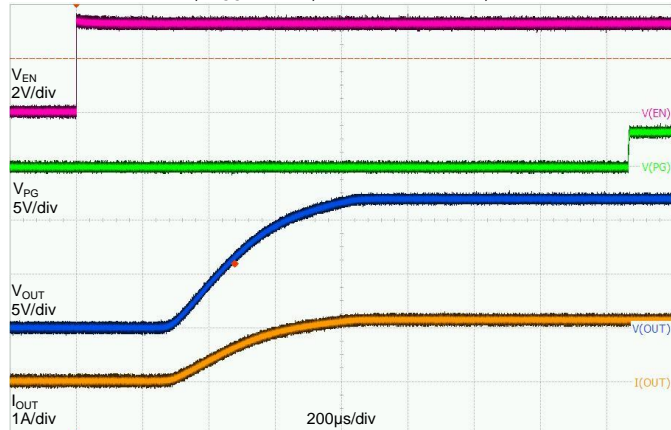
Turn OFF Response

$V_{IN} = 5.0\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 3.3\text{V to } 0\text{V}$, $R_L = 10\Omega$



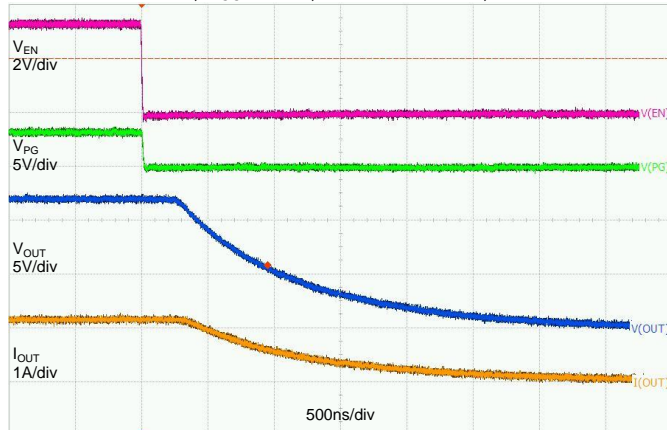
Turn ON Response

$V_{IN} = 12\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 0\text{V to } 3.3\text{V}$, $R_L = 10\Omega$



Turn OFF Response

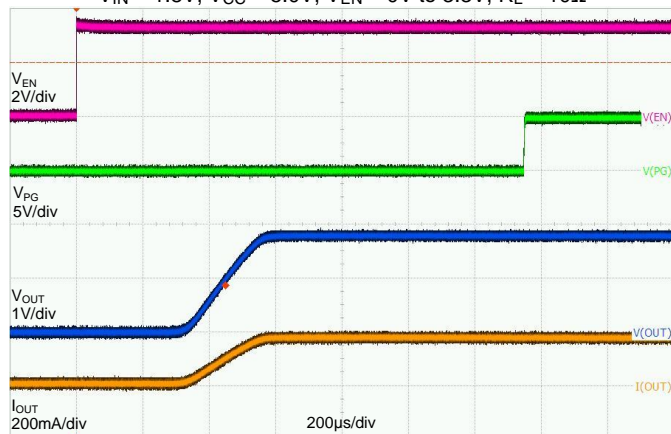
$V_{IN} = 12\text{V}$, $V_{CC} = 3.3\text{V}$, $V_{EN} = 3.3\text{V to } 0\text{V}$, $R_L = 10\Omega$



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

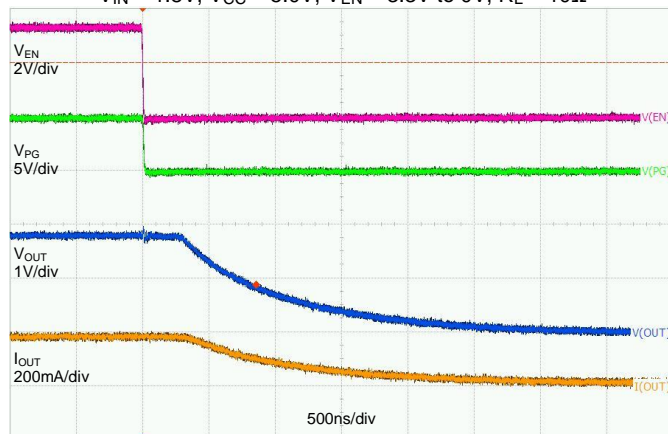
Turn ON Response

$V_{IN} = 1.8\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 0\text{V}$ to 3.3V , $R_L = 10\Omega$



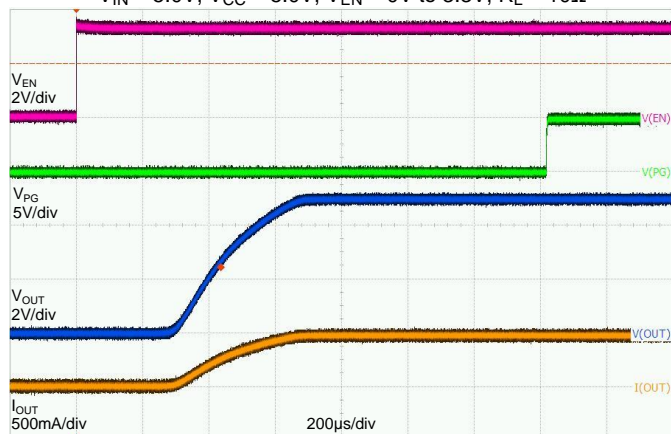
Turn OFF Response

$V_{IN} = 1.8\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 3.3\text{V}$ to 0V , $R_L = 10\Omega$



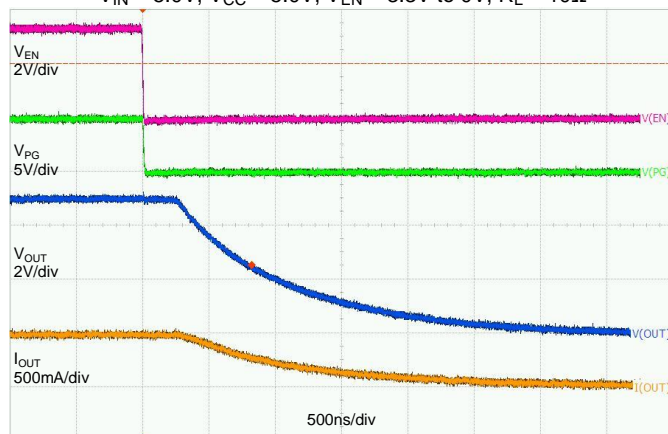
Turn ON Response

$V_{IN} = 5.0\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 0\text{V}$ to 3.3V , $R_L = 10\Omega$



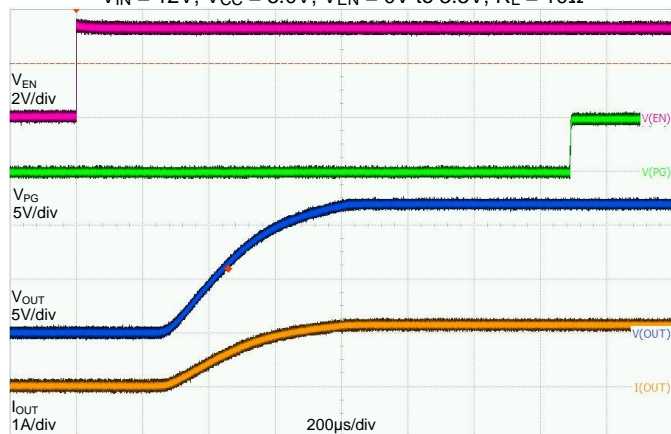
Turn OFF Response

$V_{IN} = 5.0\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 3.3\text{V}$ to 0V , $R_L = 10\Omega$



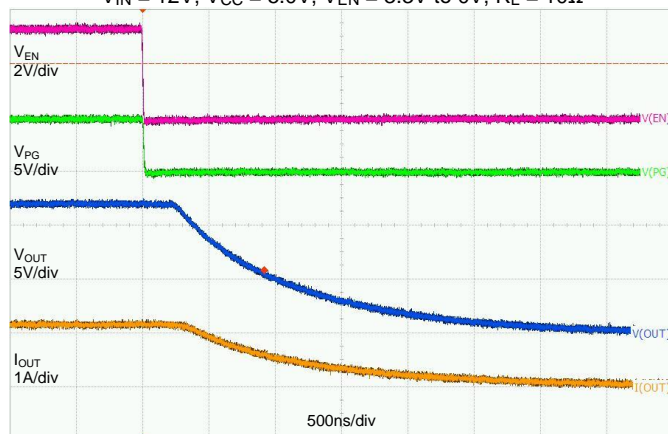
Turn ON Response

$V_{IN} = 12\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 0\text{V}$ to 3.3V , $R_L = 10\Omega$



Turn OFF Response

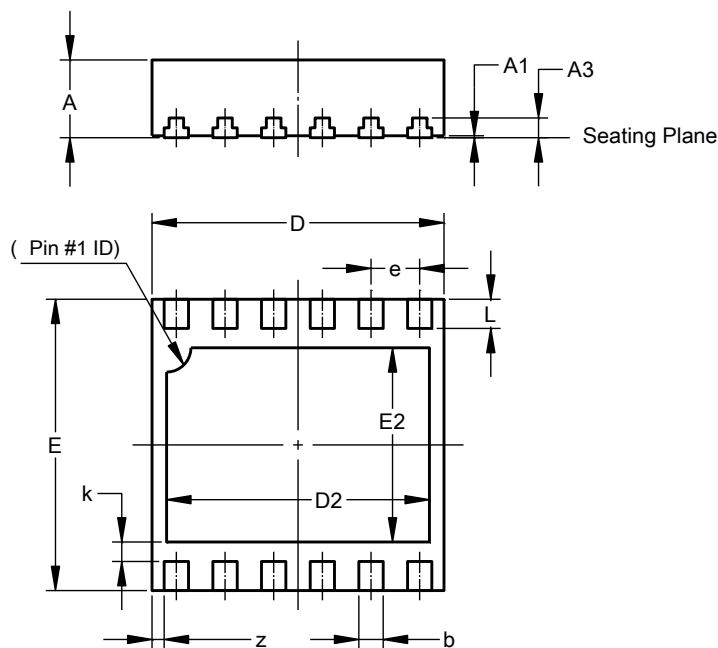
$V_{IN} = 12\text{V}$, $V_{CC} = 5.0\text{V}$, $V_{EN} = 3.3\text{V}$ to 0V , $R_L = 10\Omega$



Package Outline Dimensions

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

V-DFN3030-12 (Type B)

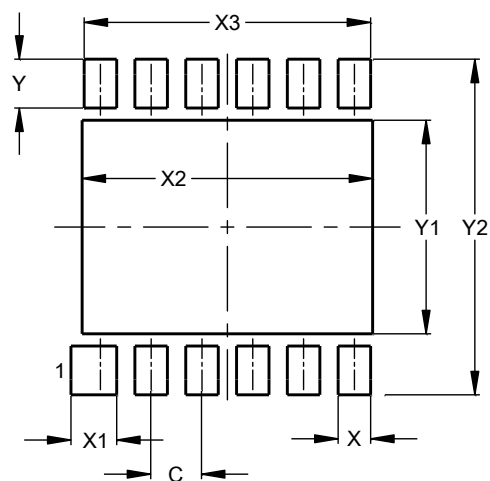


V-DFN3030-12 Type B			
Dim	Min	Max	Typ
A	0.77	0.85	0.80
A1	0.00	0.05	0.02
A3	--	--	0.203
b	0.20	0.30	0.25
D	2.95	3.05	3.00
D2	2.60	2.80	2.70
E	2.95	3.05	3.00
E2	1.90	2.10	2.00
e	0.50BSC		
k	--	--	0.20
L	0.25	0.35	0.30
z	--	--	0.125
All Dimensions in mm			

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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