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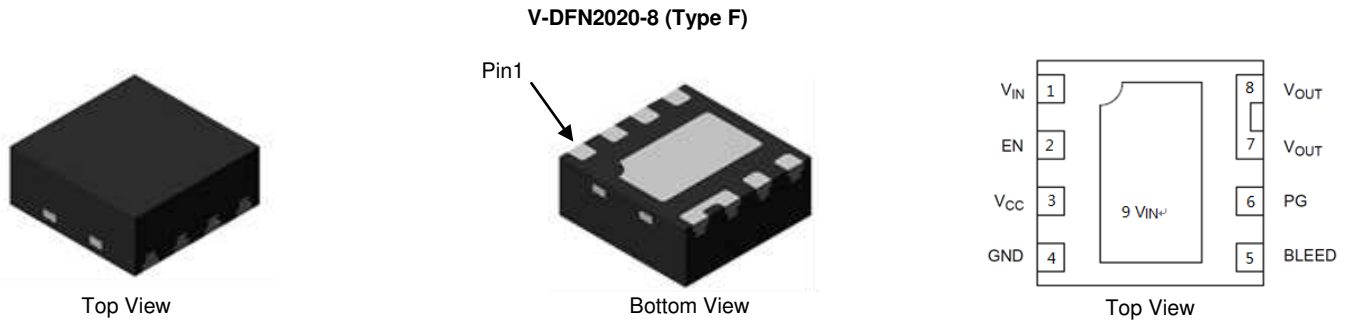
## Description and Applications

The DML3006LFDS 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
- 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)**



## Ordering Information (Note 4)

Part Number	Case	Packaging
DML3006LFDS-7	V-DFN2020-8 (Type F)	3,000/Tape & Reel

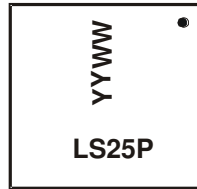
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. 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, 9	$V_{IN}$	Drain of MOSFET (0.5V to 13.5V), Pin 1 must be connected to Pin 9
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	BLEED	Load bleed connection, must be tied to $V_{OUT}$ through a resistor $\leq 1k\Omega$
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, 8	$V_{OUT}$	Source of MOSFET connected to load

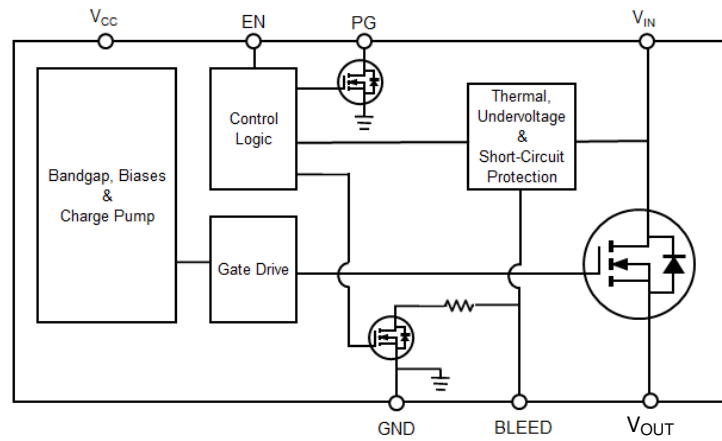
**Marking Information**

V-DFN2020-8 (Type F)

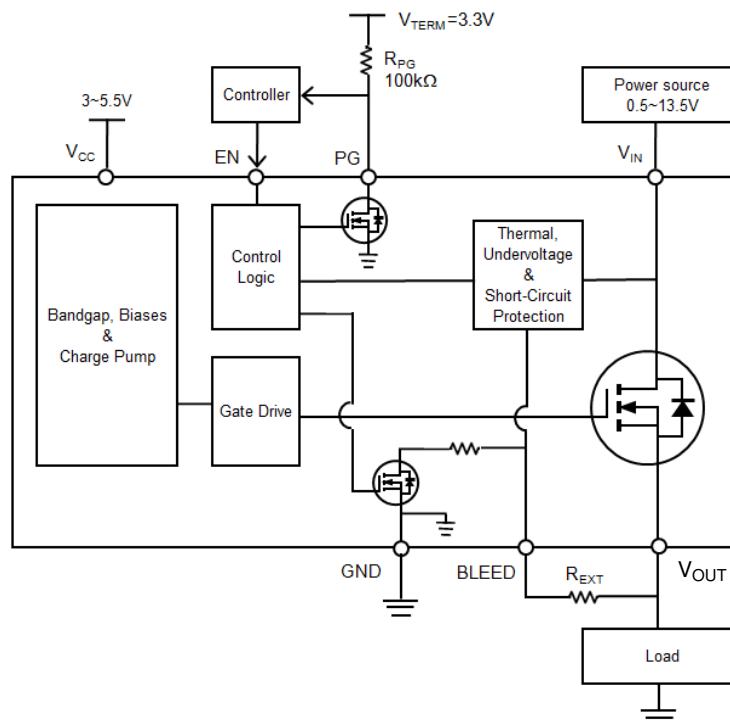


LS25P = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 18 = 2018)  
 WW = Week Code (01 to 53)

**Functional Block Diagram**



**Application Circuit**



NEW PRODUCT

**Absolute Maximum Ratings**

Parameter	Rating
V <sub>IN</sub> , BLEED, V <sub>OUT</sub> to GND	-0.3V to 18V
EN, V <sub>CC</sub> , PG to GND	-0.3V to 6V
I <sub>MAX</sub>	10.5A
Junction Temperature (T <sub>J</sub> )	+150°C
Storage Temperature (T <sub>S</sub> )	-65°C to +150°C

**Recommended Operating Ratings**

Parameter	Rating
Supply Voltage (V <sub>CC</sub> )	3V to 5.5V
Input Voltage (V <sub>IN</sub> )	0.5V to 13.5V
Ambient Temperature (T <sub>A</sub> )	-40°C to +85°C
Package Thermal Resistance (θ <sub>JC</sub> )	5.3°C/W
Package Thermal Resistance (θ <sub>JA</sub> )	40°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IN</sub>	Input Voltage	—	0.5	—	13.5	V
V <sub>CC</sub>	Supply Voltage	—	3.0	—	5.5	V
I <sub>DYN</sub>	V <sub>CC</sub> Dynamic Supply Current	V <sub>EN</sub> = V <sub>CC</sub> = 3V, V <sub>IN</sub> = 12V	—	310	400	μA
		V <sub>EN</sub> = V <sub>CC</sub> = 5.5V, V <sub>IN</sub> = 1.8V	—	510	750	μA
I <sub>STBY</sub>	V <sub>CC</sub> Shutdown Supply Current	V <sub>CC</sub> = 3V, V <sub>EN</sub> = 0V	—	0.1	1	μA
		V <sub>CC</sub> = 5.5V, V <sub>EN</sub> = 0V	—	0.1	2	μA
V <sub>ENH</sub>	EN High Level Voltage	V <sub>CC</sub> = 3V to 5.5V	2.0	—	—	V
V <sub>ENL</sub>	EN Low Level Voltage	V <sub>CC</sub> = 3V to 5.5V	—	—	0.8	V
R <sub>BLEED</sub>	Bleed Resistance	V <sub>CC</sub> = 3V, V <sub>EN</sub> = 0V	86	108	130	Ω
		V <sub>CC</sub> = 5.5V, V <sub>EN</sub> = 0V	64	80	100	Ω
I <sub>BLEED</sub>	Bleed Pin Leakage Current	V <sub>CC</sub> = V <sub>EN</sub> = 3V, V <sub>IN</sub> = 1.8V	—	20	45	μA
		V <sub>CC</sub> = V <sub>EN</sub> = 3V, V <sub>IN</sub> = 12V	—	50	70	μA
V <sub>PGL</sub>	PG Output Low Voltage	V <sub>CC</sub> = 3V; I <sub>SINK</sub> = 5mA	—	—	0.2	V
I <sub>PG</sub>	PG Output Leakage Current	V <sub>CC</sub> = 3V; V <sub>TERM</sub> = 3.3V	—	—	100	nA
<b>Switching Device</b>						
R <sub>ON</sub>	Switch On-State Resistance	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = 1.8V	—	10.8	12.5	mΩ
		V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = 5V	—	10.8	12.5	mΩ
		V <sub>CC</sub> = 3.3V, V <sub>IN</sub> = 12V	—	10.8	12.5	mΩ
		V <sub>CC</sub> = 5V, V <sub>IN</sub> = 1.8V	—	8.6	10.5	mΩ
		V <sub>CC</sub> = 5V, V <sub>IN</sub> = 5V	—	8.6	10.5	mΩ
		V <sub>CC</sub> = 5V, V <sub>IN</sub> = 12V	—	8.6	10.5	mΩ
I <sub>LEAK</sub>	Input Shutdown Supply Current	V <sub>EN</sub> = 0V, V <sub>IN</sub> = 13.5V	—	—	1	μA
R <sub>PDEN</sub>	EN Pull Down Resistance	—	76	100	124	kΩ
<b>Fault Protection</b>						
OTP	Thermal Shutdown Threshold	V <sub>CC</sub> = 3V to 5.5V	—	145	—	°C
OTPHYS	Thermal Shutdown Hysteresis	V <sub>CC</sub> = 3V to 5.5V	—	20	—	°C
UVLO	V <sub>IN</sub> Lockout Threshold	V <sub>CC</sub> = 3V	0.25	0.35	0.45	V
UVLOHYS	V <sub>IN</sub> Lockout Hysteresis	V <sub>CC</sub> = 3V	20	40	70	mV
SCP	Short-Circuit Protection Threshold	V <sub>CC</sub> = 3.3V; V <sub>IN</sub> = 0.5V	180	265	350	mV
		V <sub>CC</sub> = 3.3V; V <sub>IN</sub> = 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
<b><math>V_{\text{IN}} = 1.8\text{V}</math></b>						
$t_{\text{ON}}$	Output Turn-On Delay time	$V_{\text{CC}}=3.3\text{V}$	—	200	—	$\mu\text{s}$
		$V_{\text{CC}}=5\text{V}$	—	190	—	
$t_{\text{OFF}}$	Output Turn-Off Delay time	$V_{\text{CC}}=3.3\text{V}$	—	0.4	—	$\mu\text{s}$
		$V_{\text{CC}}=5\text{V}$	—	0.4	—	
$t_{\text{PGON}}$	Power Good Turn-on Time	$V_{\text{CC}}=3.3\text{V}$	—	1.25	—	ms
		$V_{\text{CC}}=5\text{V}$	—	1.05	—	
$t_{\text{PGOFF}}$	Power Good Turn-off Time	$V_{\text{CC}}=3.3\text{V}$	—	10	—	ns
		$V_{\text{CC}}=5\text{V}$	—	8	—	
SR	Output Slew Rate	$V_{\text{CC}}=3.3\text{V}$	—	23	—	kV/s
		$V_{\text{CC}}=5\text{V}$	—	24	—	
<b><math>V_{\text{IN}} = 12\text{V}</math></b>						
$t_{\text{ON}}$	Output Turn-On Delay time	$V_{\text{CC}}=3.3\text{V}$	—	190	—	$\mu\text{s}$
		$V_{\text{CC}}=5\text{V}$	—	180	—	
$t_{\text{OFF}}$	Output Turn-Off Delay time	$V_{\text{CC}}=3.3\text{V}$	—	0.4	—	$\mu\text{s}$
		$V_{\text{CC}}=5\text{V}$	—	0.4	—	
$t_{\text{PGON}}$	Power Good Turn-on Time	$V_{\text{CC}}=3.3\text{V}$	—	1.3	—	ms
		$V_{\text{CC}}=5\text{V}$	—	1.25	—	
$t_{\text{PGOFF}}$	Power Good Turn-off Time	$V_{\text{CC}}=3.3\text{V}$	—	10	—	ns
		$V_{\text{CC}}=5\text{V}$	—	8	—	
SR	Output Slew Rate	$V_{\text{CC}}=3.3\text{V}$	—	80	—	kV/s
		$V_{\text{CC}}=5\text{V}$	—	81	—	

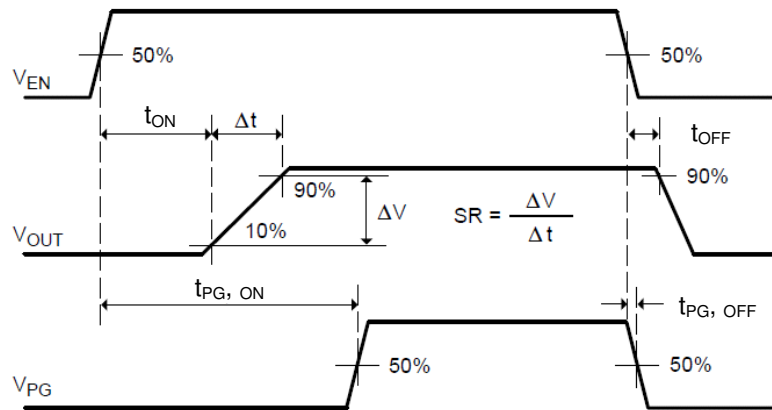
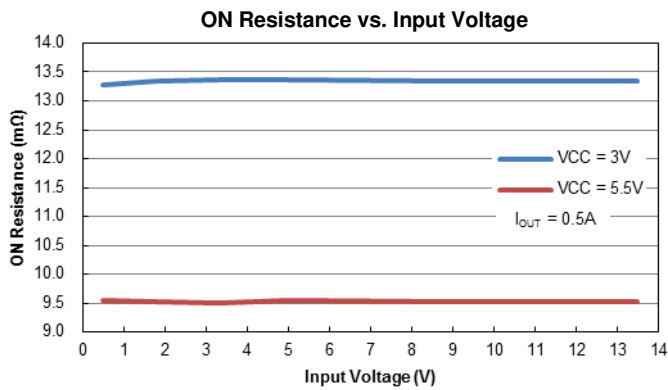
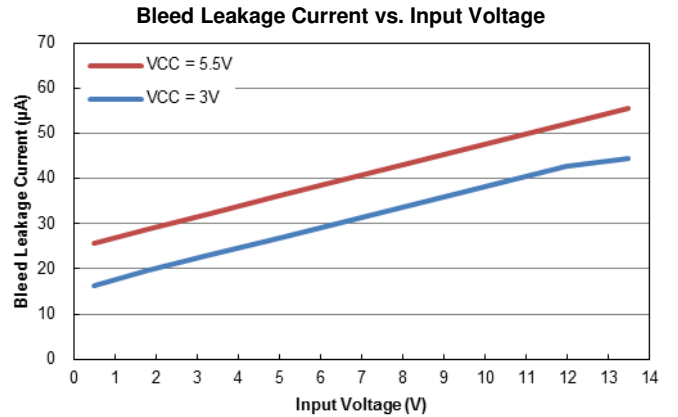
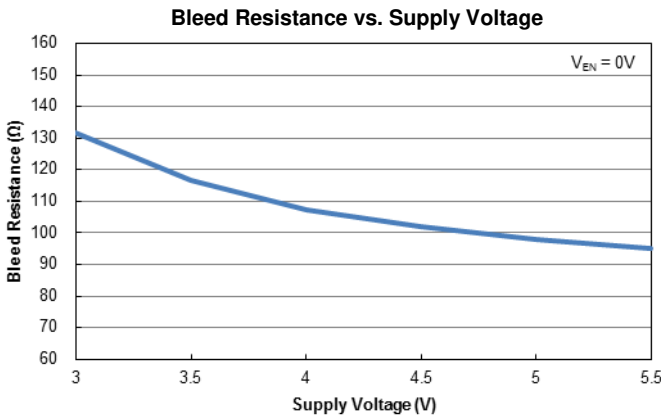
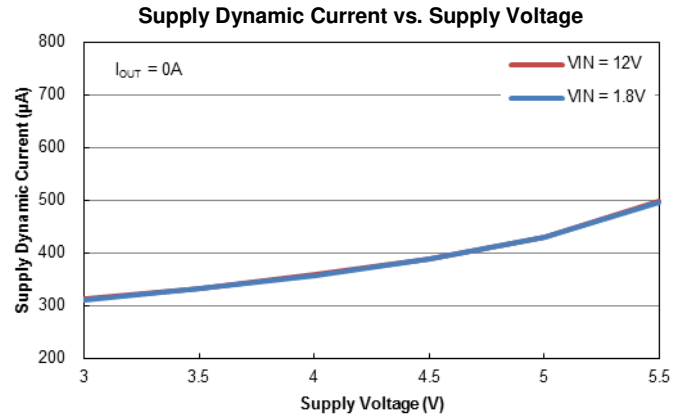
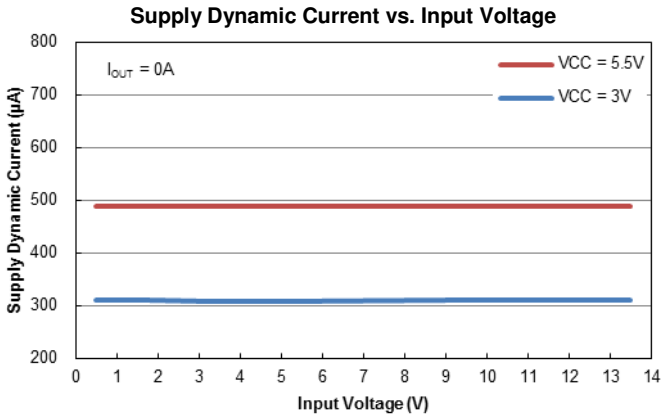


Figure 1 Timing Diagram

NEW PRODUCT

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

NEW PRODUCT

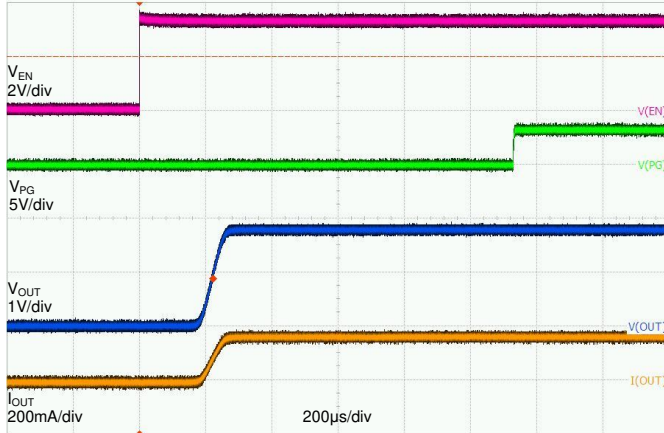


**Performance Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified. Cont.)

NEW PRODUCT

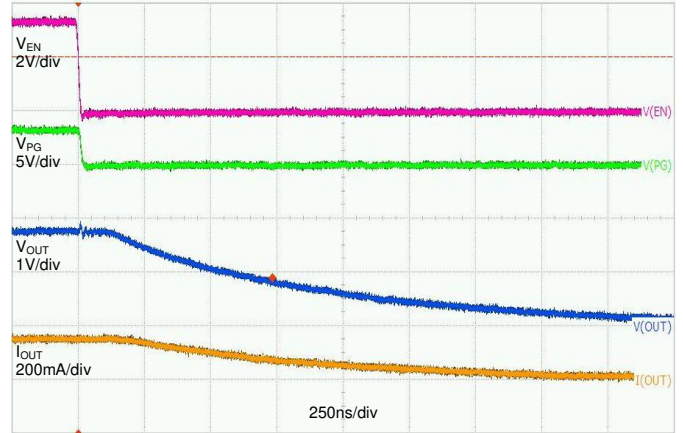
**Turn ON Response**

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



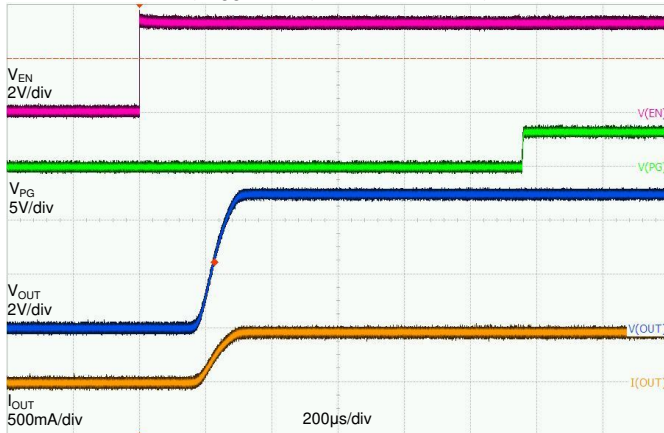
**Turn OFF Response**

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



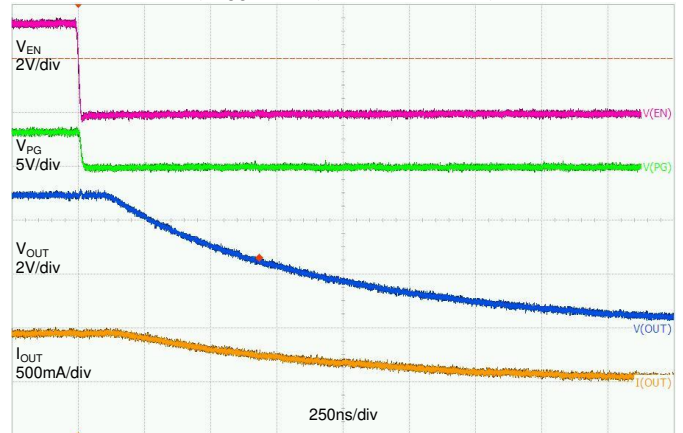
**Turn ON Response**

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



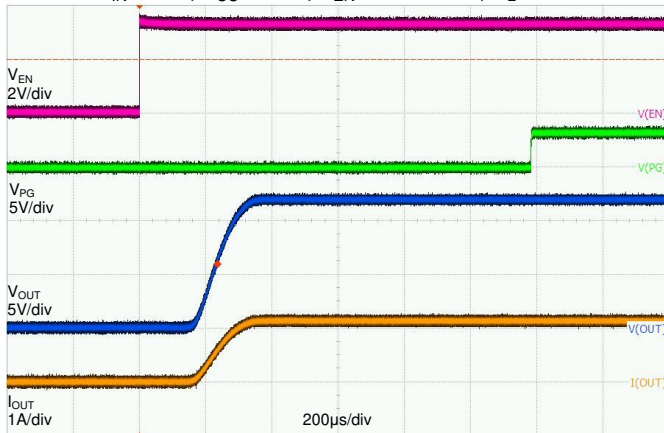
**Turn OFF Response**

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



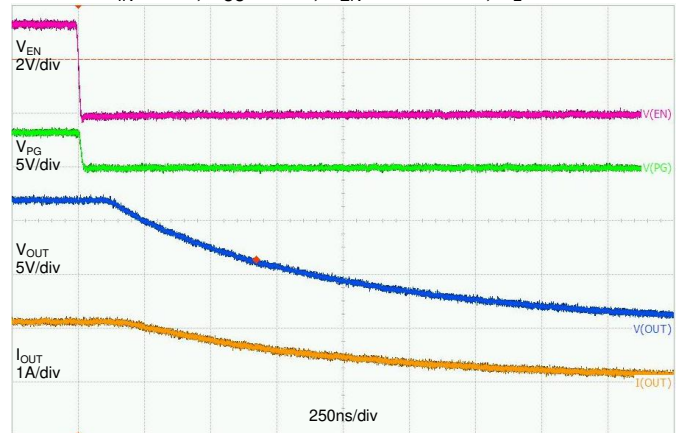
**Turn ON Response**

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



**Turn OFF Response**

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

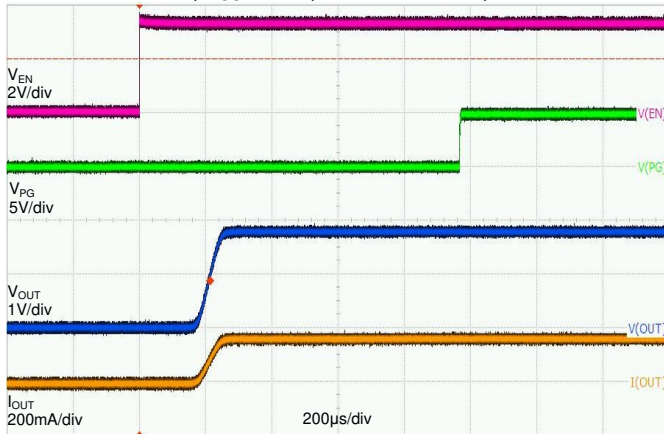


**Performance Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified. Cont.)

NEW PRODUCT

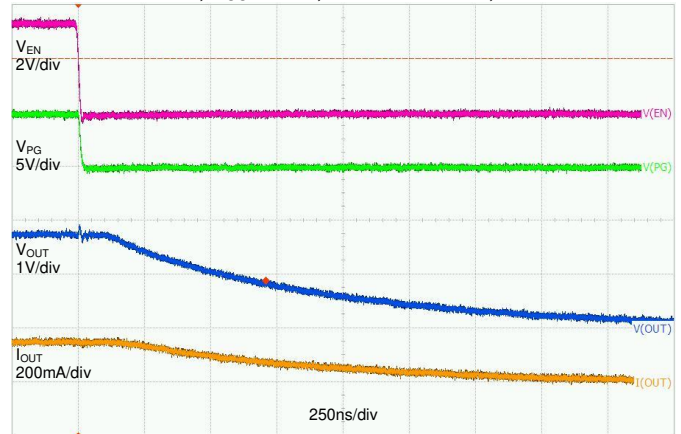
**Turn ON Response**

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



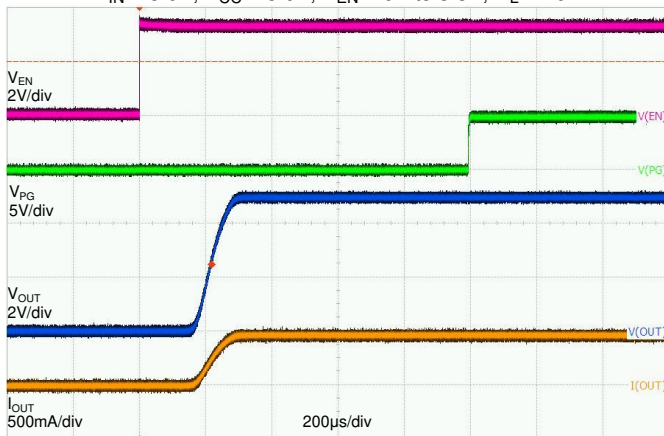
**Turn OFF Response**

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



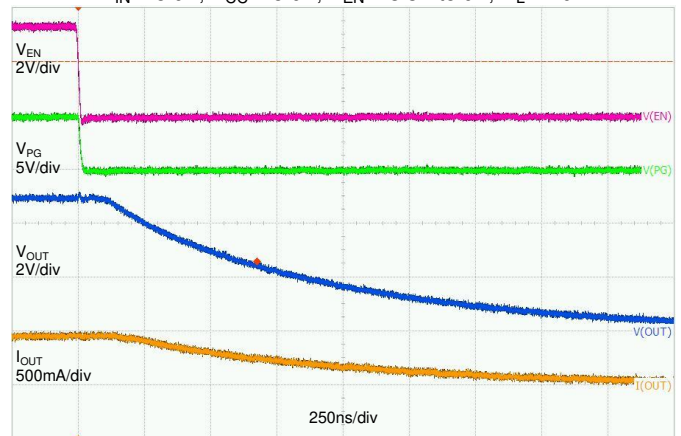
**Turn ON Response**

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



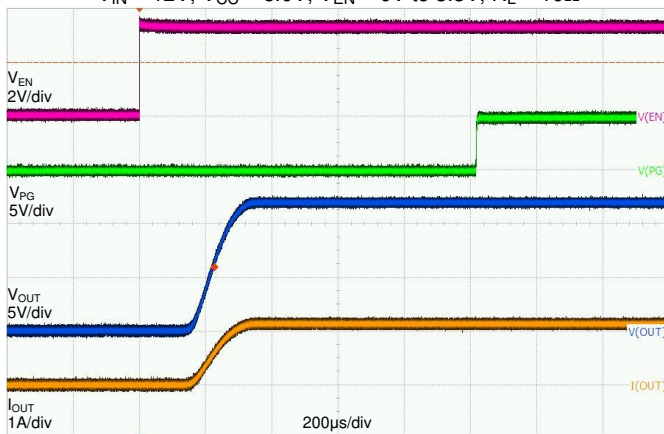
**Turn OFF Response**

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



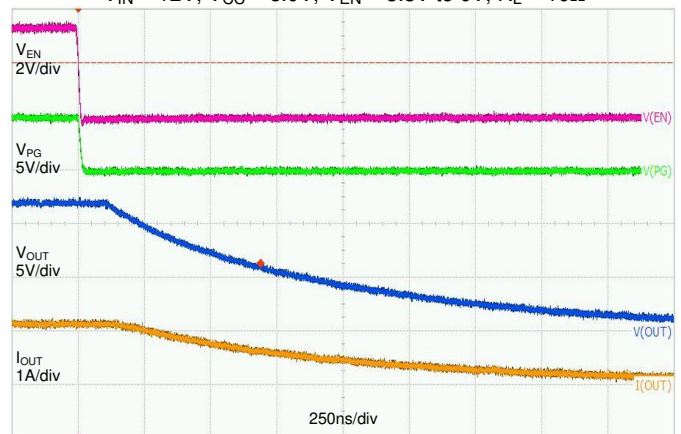
**Turn ON Response**

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



**Turn OFF Response**

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

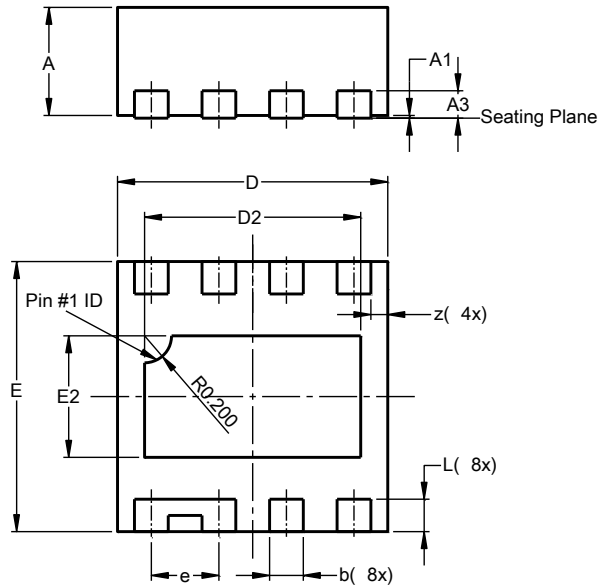




**Package Outline Dimensions**

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

V-DFN2020-8 (Type F)



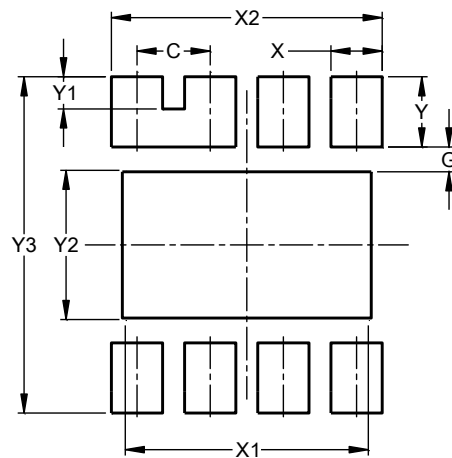
V-DFN2020-8 (Type F)			
Dim	Min	Max	Typ
A	0.77	0.85	0.80
A1	0.00	0.05	0.02
A3	--	--	0.203
b	0.20	0.30	0.25
D	1.95	2.05	2.00
D2	1.50	1.70	1.60
E	1.95	2.05	2.00
E2	0.80	1.00	0.90
e	--	--	0.50
L	0.19	0.29	0.24
z	--	--	0.125
All Dimensions in mm			

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**Suggested Pad Layout**

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

V-DFN2020-8 (Type F)



Dimensions	Value (in mm)
C	0.500
G	0.170
X	0.350
X1	1.660
X2	1.850
Y	0.480
Y1	0.220
Y2	1.020
Y3	2.300

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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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