SGM41283
70V Boost Converter with APD Current Monitor

GENERAL DESCRIPTION

The SGM41283 is a current-mode boost converter with a wide input voltage range of 2.7V to 5.5V. The device can deliver up to 70V output. The 850kHz fixed switching frequency allows the SGM41283 to offer fast transient response and cycle-by-cycle current limit.

This device integrates the biased avalanche photodiode (APD) current monitor and is capable to provide 50ns APD current monitoring response speed. In addition, the output voltage through the APD optical receivers can be twice of the normal output voltage. The SGM41283 includes a ratio of 10:1 APD current monitoring output and a ratio of 2:1 APD current monitoring output. The current limit function with adjustable resistors prevents APD from the effects of optical power transients.

The SGM41283 integrates various protection features such as over-current protection, over-load protection and thermal shutdown.

The SGM41283 is available in a Green TQFN-3×3-16L package. It operates over an ambient temperature range of -40℃ to +125℃.

FEATURES

- **Input Voltage Range: 2.7V to 5.5V**
- **72V/0.6Ω NFET with 1.1A Limit**
- **70V Peak Output Voltage**
- **50ns APD Current Monitoring Response Speed**
- **850kHz Fixed Switching Frequency**
- **High-side APD Current Monitors with 10:1 and 2:1 Ratios**
- **Internal Compensation and Soft-Start**
- **Thermal Shutdown**
- **Programmable APD Over-Current Limit and Protection**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green TQFN-3×3-16L Package**

APPLICATIONS

APD and PIN Diode Bias
Optical Network Equipment
Optical Receivers and Modules

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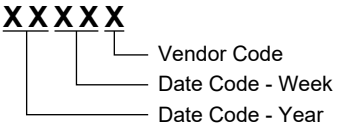
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM41283	TQFN-3×3-16L	-40℃ to +125℃	SGM41283XTQ16G/TR	41283TQ XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Input Voltage Range ..... -0.3V to 6.5V
MONIN, SW, APD..... -0.3V to 76V
EN, FB, RLIM..... -0.3V to 6.5V
MON1, MON2 ..... -0.3V to 4.5V
Package Thermal Resistance
TQFN-3×3-16L, θ_{JA}..... 45℃/W
Junction Temperature.....+150℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering, 10s).....+260℃
ESD Susceptibility
HBM.....4000V
MM.....300V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range .....2.7V to 5.5V
MON1, MON2 .....2.5V
MONIN, SW, APD.....2.7V to 70V
Operating Ambient Temperature Range.....-40℃ to +125℃
Operating Junction Temperature Range.....-40℃ to +125℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

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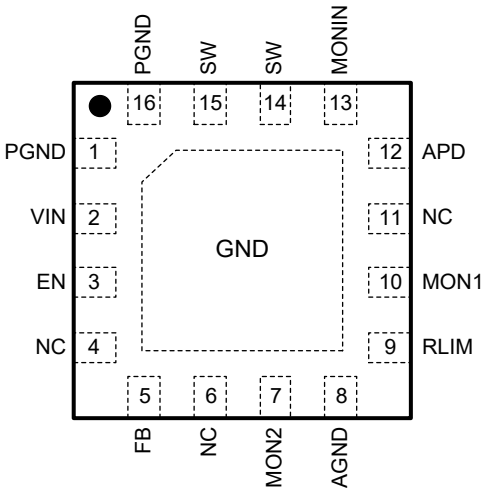
PIN CONFIGURATION

(TOP VIEW)



TQFN-3×3-16L

PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 16	PGND	Power Ground. The PGND pins are connected internally and both are connected to board ground.
2	VIN	Input Supply. Locally bypass this pin.
3	EN	Enable Pin. Pulling this pin above 1.6V enables the device. Pulling this pin below 0.3V disables it.
4, 6, 11	NC	Not Connected.
5	FB	Feedback. Connect to the tap of the output resistor divider.
7	MON2	Current-Monitor Output. It provides a half of the APD current.
8	AGND	Analog Ground.
9	RLIM	Current-Limit Resistor. A resistor putting between RLIM and GND programs the APD current-limit threshold.
10	MON1	Current-Monitor Output. It provides 10% of the APD current.
12	APD	Connect to APD Cathode.
13	MONIN	Current-Monitor Power Supply. An external low-pass filter can be used to reduce the supply voltage ripple.
14, 15	SW	Switch. Connect this pin with the shortest path to reduce EMI.
–	Exposed Pad	GND. Solder to a large copper plane on the PCB.

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ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.3V, V_{EN} = 3.3V, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Supply Voltage Range	V_{IN}		Full	2.7		5.5	V
Supply Current	I_{SUPPLY}	V_{FB} = 1V, not switching	Full		0.2	0.28	mA
		V_{EN} = 0V	Full		0.01	1	μA
Under-Voltage Lockout Threshold	V_{UVLO}		Full	2.4	2.5	2.6	V
Under-Voltage Lockout Hysteresis	V_{UVLO_HYS}		+25℃		200		mV
EN Logic High Threshold	V_{IH}		Full	1.6			V
EN Logic Low Threshold	V_{IL}		Full			0.3	V
Feedback Voltage	V_{FB}		Full	0.775	0.795	0.815	V
Feedback Line Regulation			+25℃		0.15	0.42	%/V
FB Input-Bias Current	I_{FB}	V_{FB} = 0.795V	Full		10	400	nA
Switching Frequency	f_{SW}		Full	710	850	960	kHz
Maximum Duty Cycle	D_{MAX}		Full	85.5	90	92.0	%
Switch Current Limit	I_{LIM_SW}		+25℃	0.87	1.1	1.35	A
Internal Switch On-Resistance	R_{ON}	I_{SW} = 150mA	Full		0.6	1.1	Ω
Switch Leakage Current		V_{SW} = 72V, V_{EN} = 0V	Full		0.05	1	μA
EN Pin Pull-Down Current	I_{ENP}	V_{EN} = 0V	Full		0.1	0.4	μA
APD Current-Monitor Output1 Gain	G_{CM1}	I_{APD} = 250nA, 10V ≤ V_{MONIN} ≤ 70V	Full	0.08	0.10	0.12	mA/mA
		I_{APD} = 2.5mA, 10V ≤ V_{MONIN} ≤ 70V	Full	0.096	0.10	0.105	
APD Current-Monitor Output2 Gain	G_{CM2}	I_{APD} = 250nA, 10V ≤ V_{MONIN} ≤ 70V	Full	0.43	0.5	0.56	mA/mA
		I_{APD} = 2.5mA, 10V ≤ V_{MONIN} ≤ 70V	Full	0.489	0.5	0.522	
Monitor-Output1 Voltage Clamp	V_{MOC1}	250nA < I_{APD} < 2.5mA	Full	3.8	4.10	4.4	V
Monitor-Output2 Voltage Clamp	V_{MOC2}	250nA < I_{APD} < 2.5mA	Full	3.8	4.10	4.4	V
APD Monitor-Voltage Drop	V_{DROP}	V_{MONIN} - V_{APD} at I_{APD} = 1mA, V_{MONIN} = 40V	Full	1.3	1.5	1.7	V
APD Monitor-Current Response Speed	t_{DELAY1}	10μA to 1mA step APD current input	+25℃		50		ns
	t_{DELAY2}	250nA to 10μA step APD current input	+25℃		7		μs
APD Input Current Limit	I_{LIM_APD}	V_{APD} = 0V, V_{MONIN} = 40V, R_{LIM} = 16.9kΩ	Full	3.75		4.50	mA
APD Current Limit Adjustment Range		R_{LIM} = 27.2kΩ, V_{MONIN} = 10V	Full	2.29		2.80	mA
		R_{LIM} = 137kΩ, V_{MONIN} = 10V	Full	0.435		0.575	
		R_{LIM} = 27.2kΩ, V_{MONIN} = 70V	Full	2.25		2.95	
		R_{LIM} = 137kΩ, V_{MONIN} = 70V	Full	0.435		0.595	
Thermal Shutdown	T_{SHDN}				170		℃
Thermal Shutdown Hysteresis	T_{HYS}				20		℃

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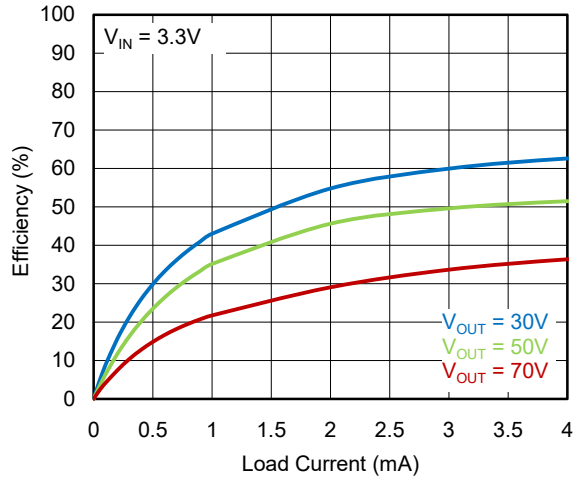
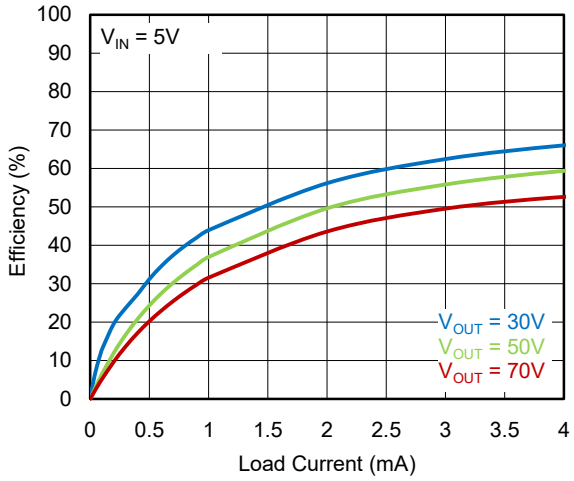
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = V_{EN} = 3.3V, V_{OUT} = 50V, T_A = +25℃, unless otherwise noted.

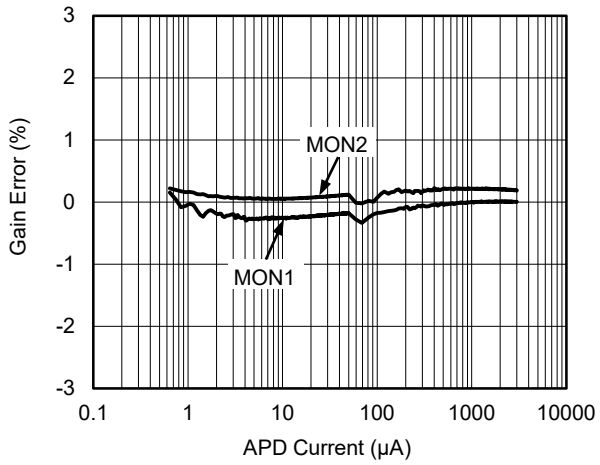
Efficiency vs. Load Current



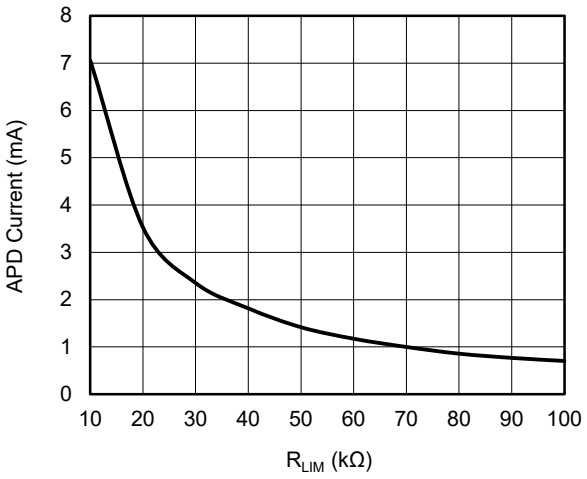
Efficiency vs. Load Current



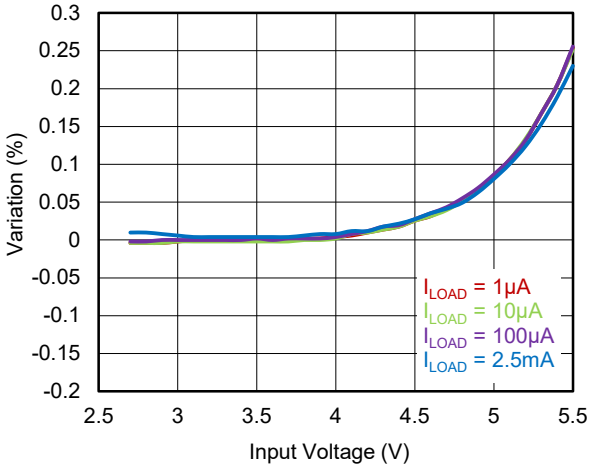
Gain Error vs. APD Current



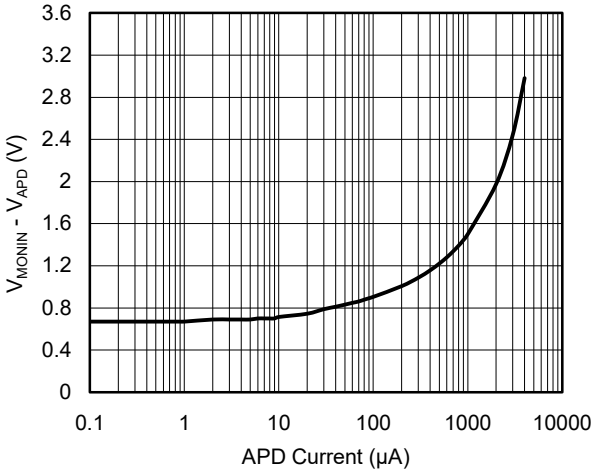
APD Current Limit vs. R_{LIM}



Line Regulation



APD Monitor-Voltage Drop vs. APD Current



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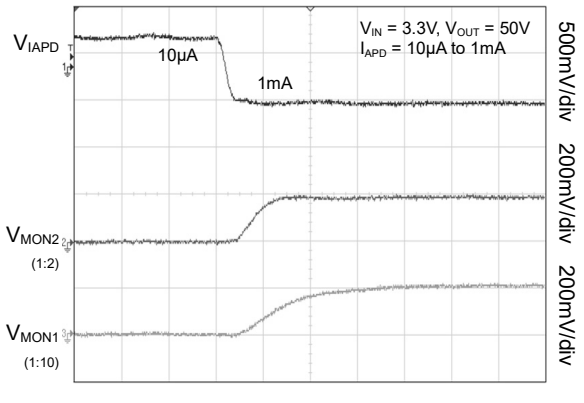
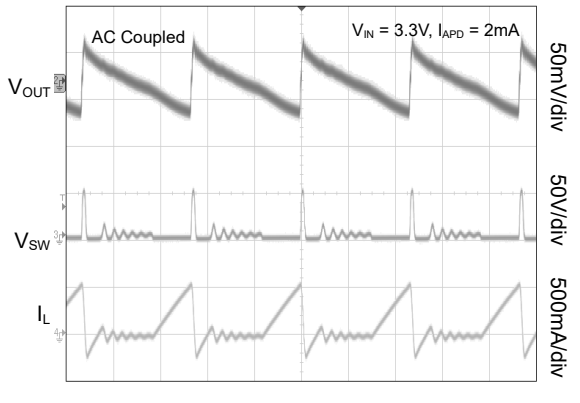
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

V_{IN} = V_{EN} = 3.3V, V_{OUT} = 50V, T_A = +25℃, unless otherwise noted.

APD Monitor-Current Response



Steady State



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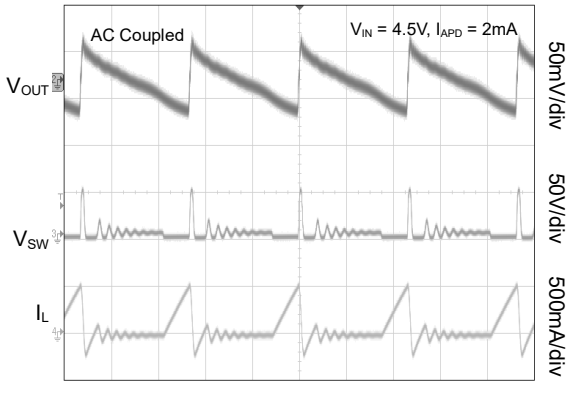
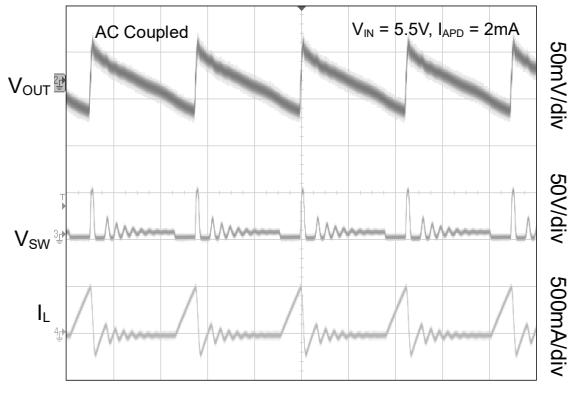
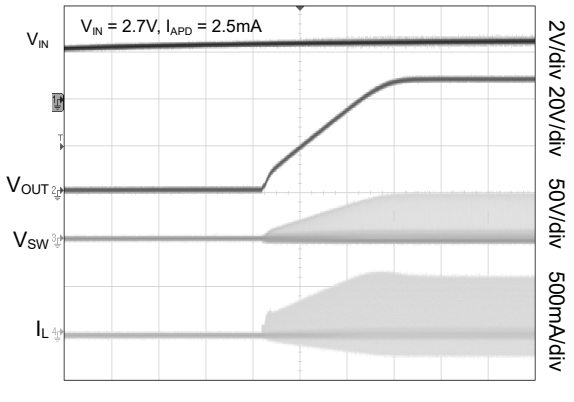


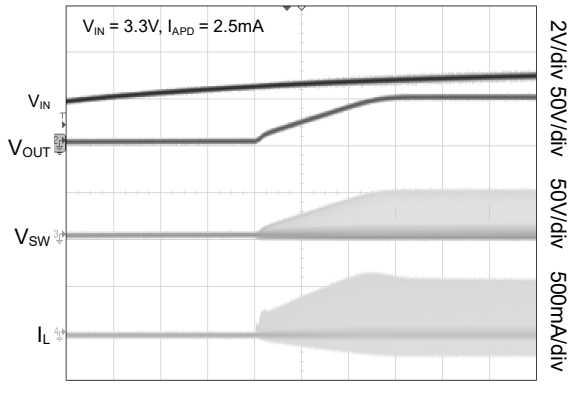
Steady State



Power Startup



Power Startup



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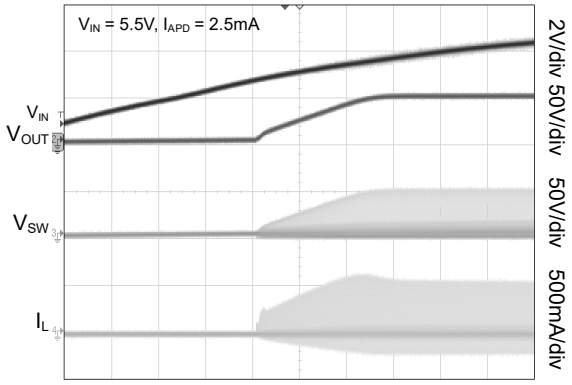
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

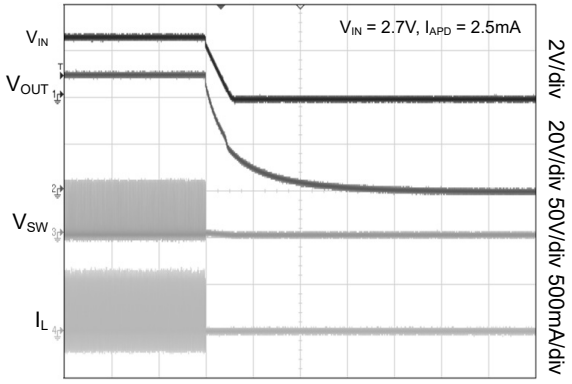
V_{IN} = V_{EN} = 3.3V, V_{OUT} = 50V, T_A = +25℃, unless otherwise noted.

Power Startup



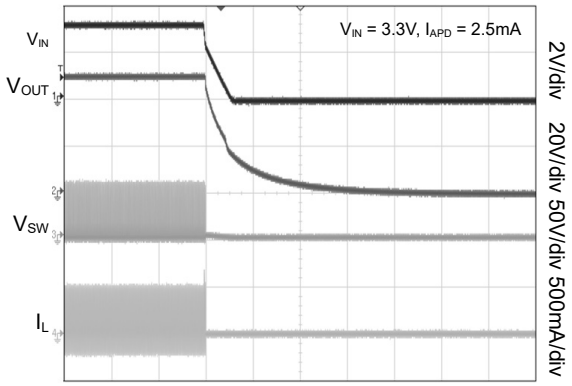
Time (1ms/div)

Power Shutdown



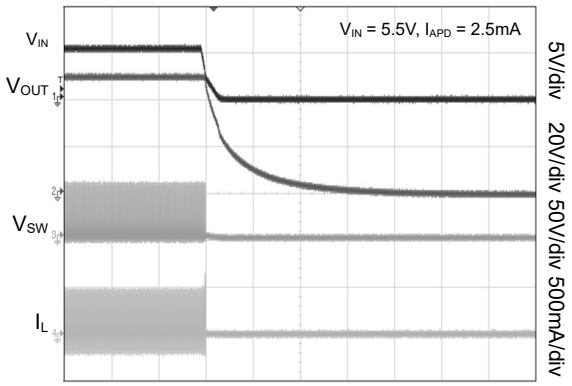
Time (100ms/div)

Power Shutdown



Time (100ms/div)

Power Shutdown



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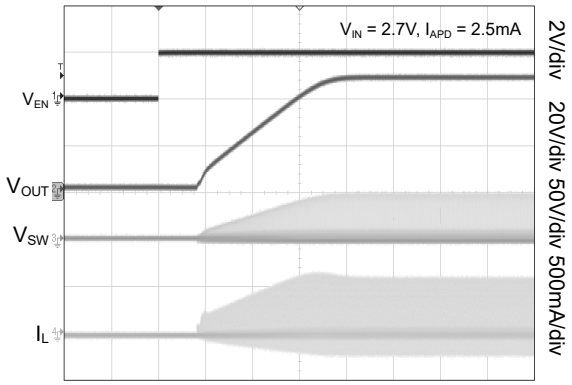

Time (1ms/div)

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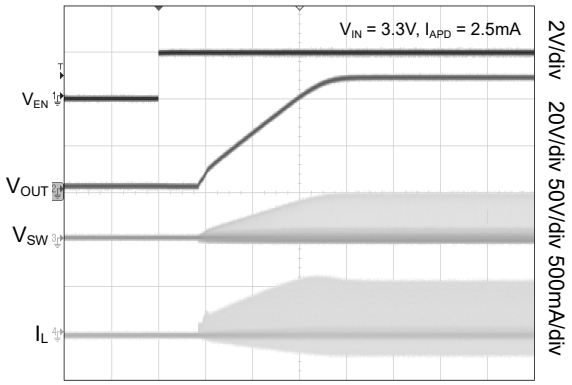

Time (1ms/div)

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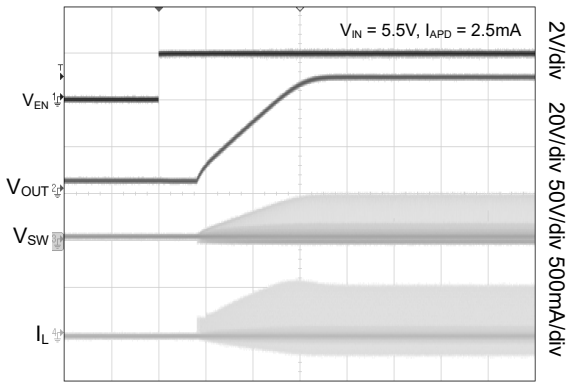
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

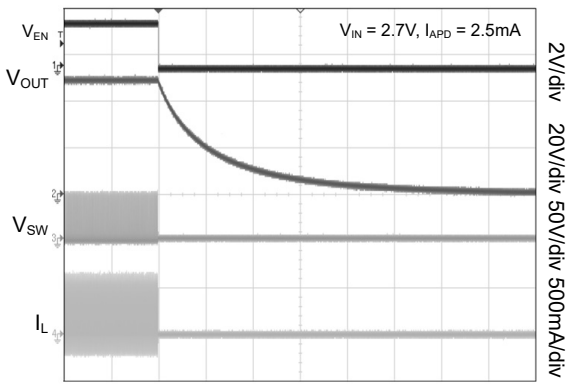
V_{IN} = V_{EN} = 3.3V, V_{OUT} = 50V, T_A = +25℃, unless otherwise noted.

Enable Startup



Time (1ms/div)

Enable Shutdown



Time (50ms/div)

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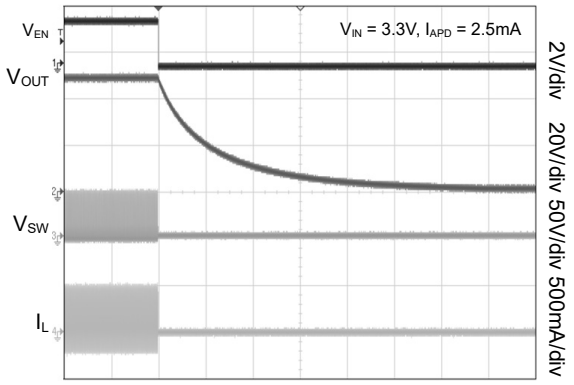
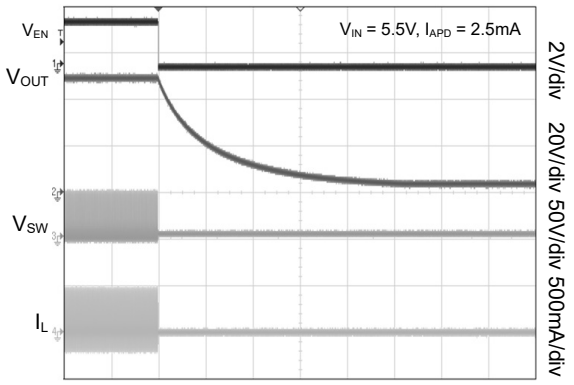


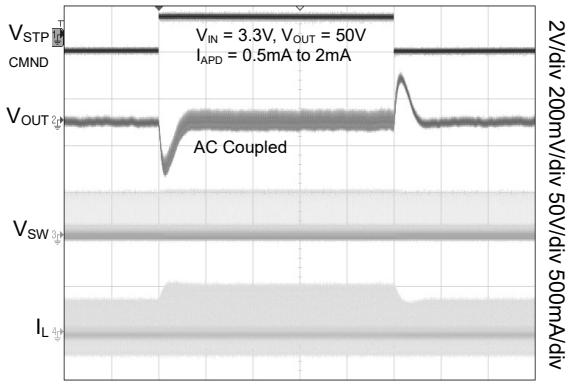
Time (50ms/div)

Enable Shutdown



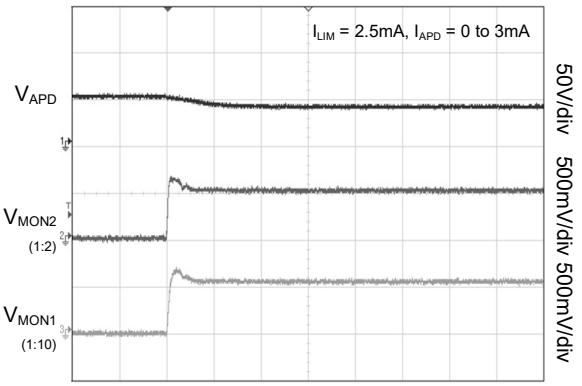
Time (50ms/div)

APD Transient Response



Time (200μs/div)

OCP Response



Time (1μs/div)

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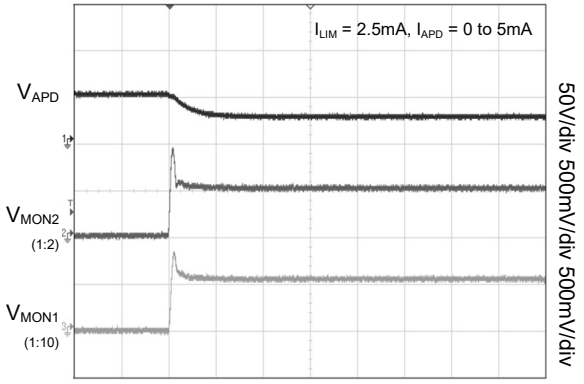
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

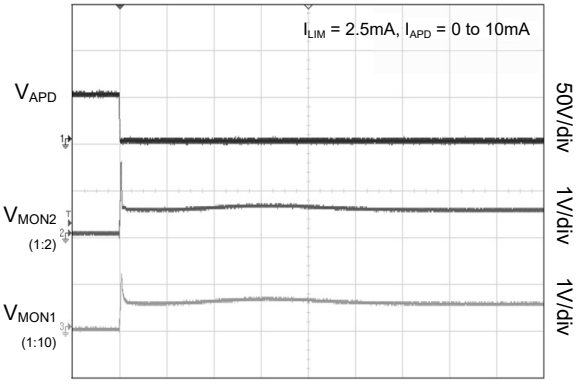
V_{IN} = V_{EN} = 3.3V, V_{OUT} = 50V, T_A = +25℃, unless otherwise noted.

OCP Response



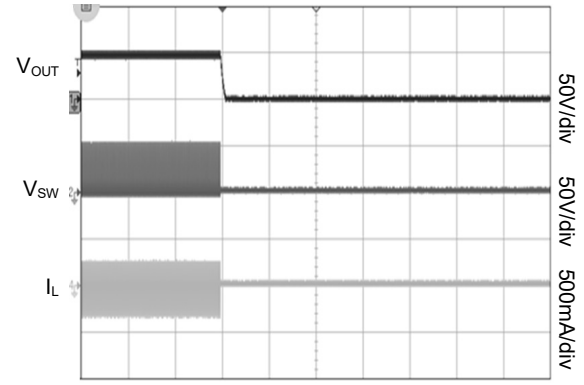
Time (1μs/div)

OCP Response



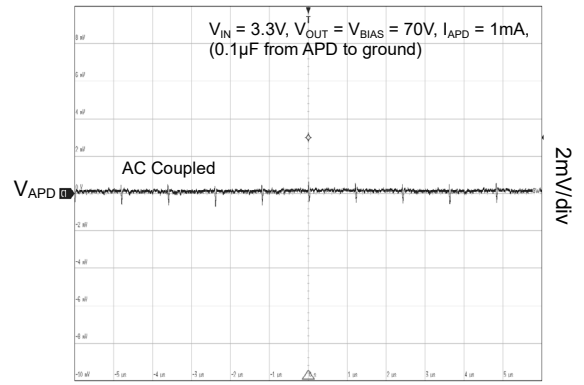
Time (2μs/div)

Temperature Shutdown at +148℃



Time (400ms/div)

APD Output Ripple Voltage



Time (1μs/div)

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REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

FEBRUARY 2019 – REV.A.1 to REV.A.2

Updated Electrical Characteristics 4

JANUARY 2019 – REV.A to REV.A.1

Updated operating temperature range and Electrical Characteristics 4
Added APD Output Ripple Voltage curve 9

Changes from Original (DECEMBER 2018) to REV.A

Changed from product preview to production data ..... All

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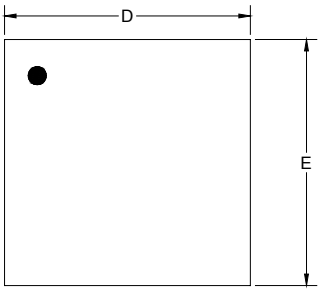
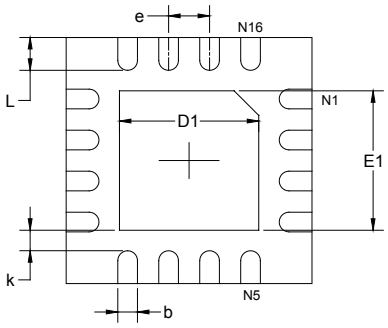
PACKAGE OUTLINE DIMENSIONS

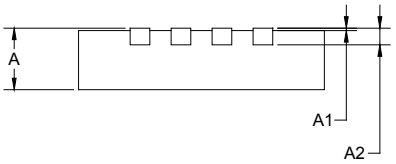
TQFN-3×3-16L



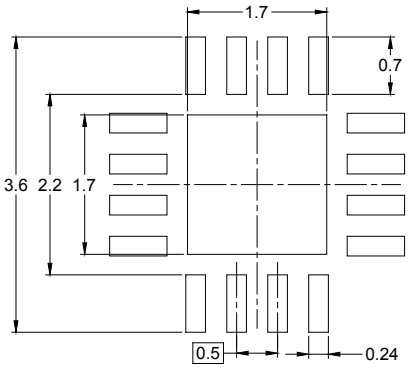
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

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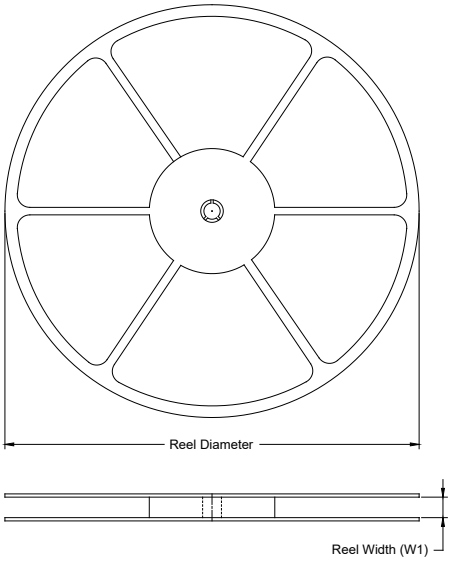
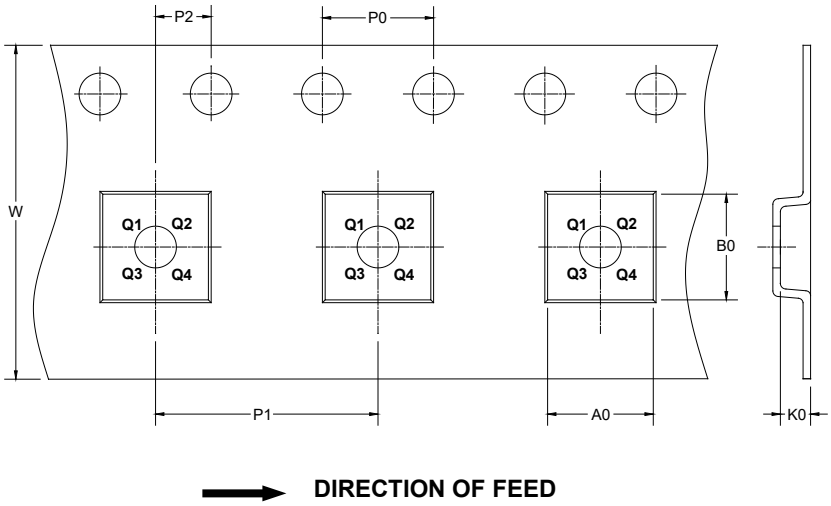
TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TQFN-3×3-16L	13″	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q2

DD0001

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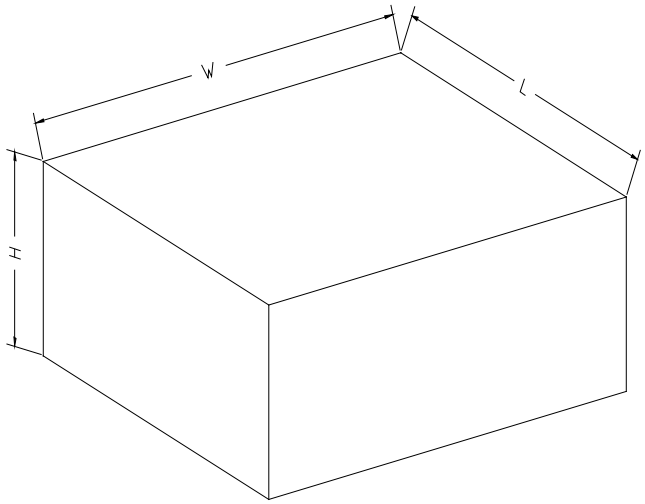
CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5

DD0002

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单击下面可查看定价，库存，交付和生命周期等信息

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