SGM41288

4-Channel APD Bias and Monitoring Unit

GENERAL DESCRIPTION

SGM41288 is a 4-channel Boost bias and monitoring unit, which consists of 4-channel bias supplies, 4-channel 1×/1.8× dual-gain current mirrors with a track-and-hold output buffer circuit, a continuous current monitor output with configurable functions, a shared Boost circuit, and an I^{2}C compatible communication interface. The device provides 4 channels of APD bias power, each channel allowing precise output voltage adjustment via its dedicated pin. Each APD bias integrates a current mirror circuit and outputs current sensing information through its corresponding RESIx pins. In addition, each APD bias channel has independently adjustable over-current protection, and excellent precise output load regulation characteristics. The Boost circuit incorporates soft start, cycle-by-cycle peak current limiting, and over-temperature protection. The Boost converter's output voltage can be configured via internal registers. The chip can switch between two slave addresses using the ADDR pin.

The SGM41288 is available in a Green TQFN-3×4-24AL package.

FEATURES

- **Input Voltage Range: 2.8V to 5.5V**
- **1M, 1.8V to 5.5V Wide Voltage I^{2}C Compatible Interface**
- **APD Bias Supply**
  - **4-Channel up to 60V, 2mA Outputs with Analog Voltage Regulation**
  - **16 Selectable Current Limiting Settings**
- **Boost Converter**
  - **Digital Adjustable Voltage Source (15V to 66V, 0.2V/Step)**
  - **Total Load Current: 12mA (MAX)**
  - **Inductance Range:2.2μH to 4.7μH**
  - **4-Channel 3.3V Input 48V/6mA Output Boost Efficiency 50%**
- **RESIx and TRC Outputs**
  - **RESI Settle Time: 250ns**
  - **TRC Settle Time: 100ns**
- **Junction Temperature Multi-Level Alarm**
- **Over-Temperature Protection**
- **Rising Threshold: +150℃ Hysteresis: 20℃**

APPLICATIONS

Multi-Channel APD Bias

Current Monitor

SIMPLIFIED SCHEMATIC

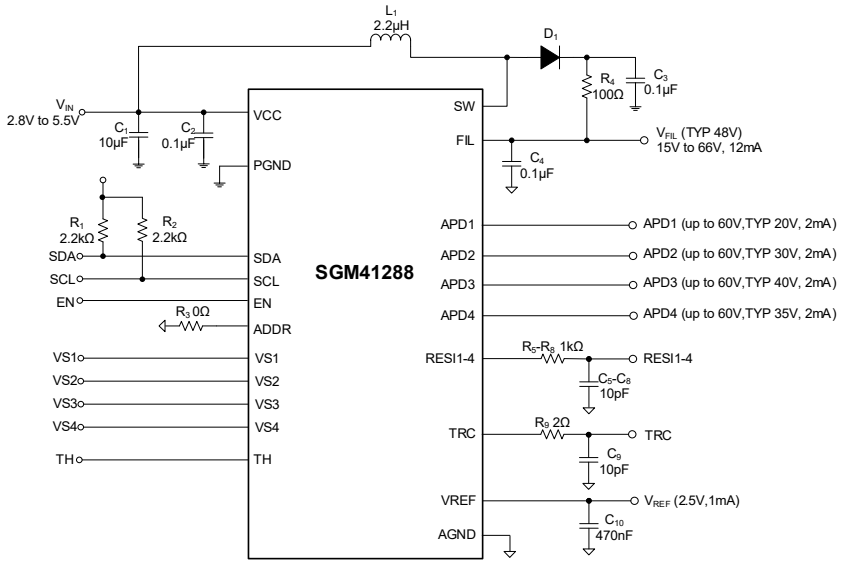


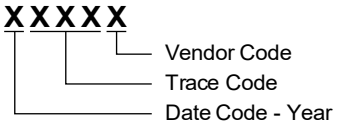
Figure 1. Simplified Schematic

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM41288	TQFN-3×4-24AL	-40℃ to +125℃	SGM41288XTYI24G/TR	SGM 41288TYI XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace 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

SW (1), FIL, APD1~APD4 (2) ..... -0.4V to 76V
SW (Transient, 10ns) ..... -2.2V to 88V
Other Pins ..... -0.4V to 6V
Package Thermal Resistance
TQFN-3×4-24AL, θ_{JA} ..... 44.4℃/W
TQFN-3×4-24AL, θ_{JB} ..... 3.9℃/W
TQFN-3×4-24AL, θ_{JC} ..... 18.8℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃

ESD Susceptibility (3) (4)
HBM ..... ±2000V
CDM ..... ±1000V

NOTES:

1. After APD is enabled and APDx_PG = 1, the external pre-bias voltage cannot exceed the set voltage.

2. Do not apply an external pre-bias voltage when APD is disabled.

3. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.

4. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 2.8V to 5.5V
V_{APD} Range ..... 5V to 60V
I_{APD} ..... <2mA
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

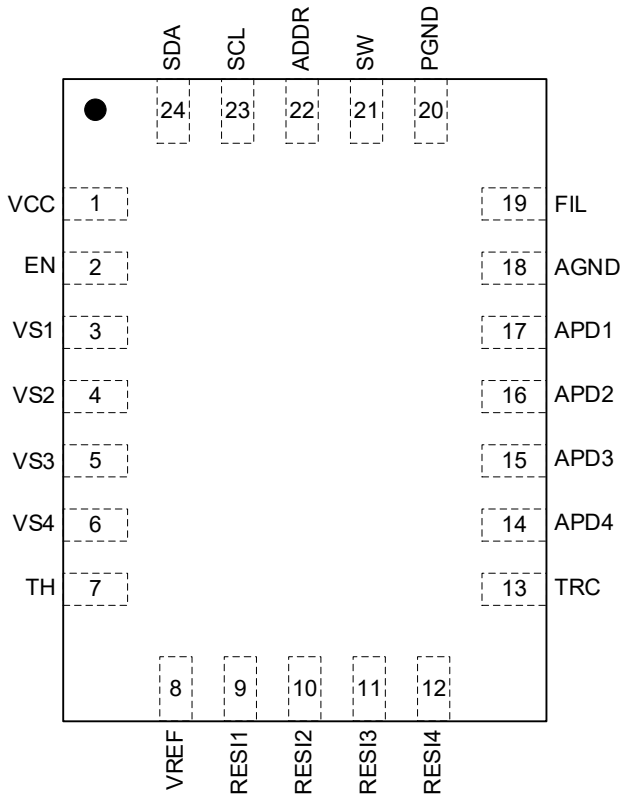
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

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

PIN CONFIGURATION

(TOP VIEW)



TQFN-3×4-24AL

PIN DESCRIPTION

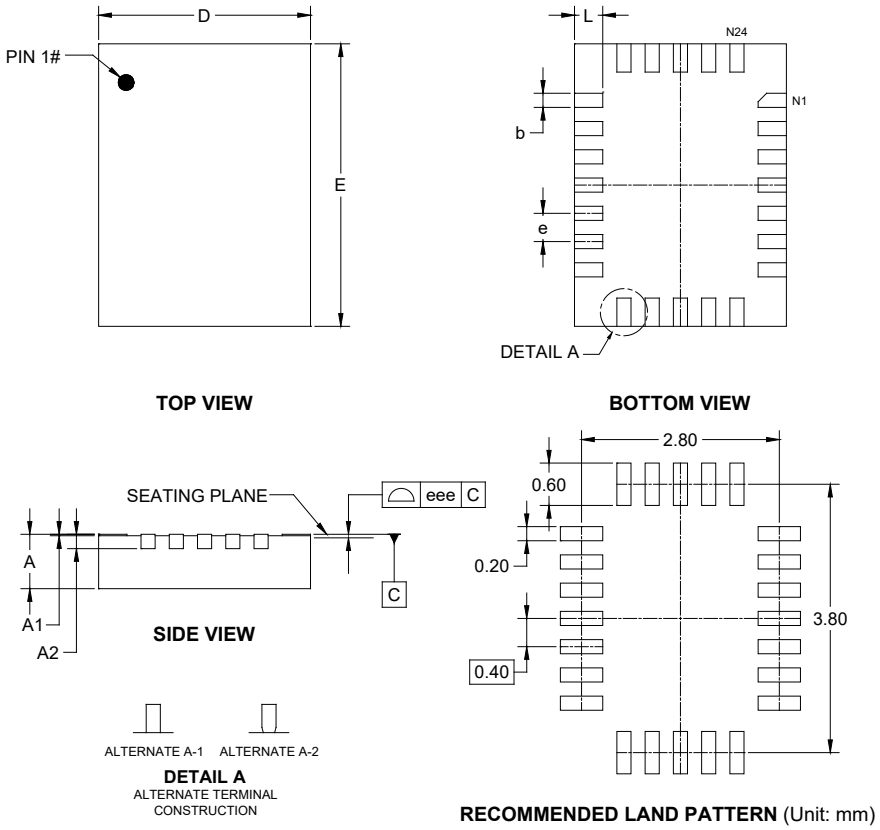
PIN	NAME	TYPE	FUNCTION
B1	VCC	P	2.8V to 5.5V Power Supply.
2	EN	I	Active High Enable Pin.
3	VS1	I	APD1 Voltage Regulation Control Input. Proportional input for programming the APD1 voltage with an increment gain of 1:16, $V_{APD1} = V_{FIL} - 5.1 - 16 \times V_{S1}$.
4	VS2	I	APD2 Voltage Regulation Control Input. Proportional input for programming the APD2 voltage with an increment gain of 1:16, $V_{APD2} = V_{FIL} - 5.1 - 16 \times V_{S2}$.
5	VS3	I	APD3 Voltage Regulation Control Input. Proportional input for programming the APD3 voltage with an increment gain of 1:16, $V_{APD3} = V_{FIL} - 5.1 - 16 \times V_{S3}$.
6	VS4	I	APD4 Voltage Regulation Control Input. Proportional input for programming the APD4 voltage with an increment gain of 1:16, $V_{APD4} = V_{FIL} - 5.1 - 16 \times V_{S4}$.
7	TH	I	Track or Hold Input. Input high for tracking, where the RESIx follows the current output of the APDx simultaneously. Input low for holding where the RESIx outputs a snapshot of APDx current captured right after the following edge of the signal applied on the TH pin, in which the APD current snapshot is converted into a voltage and is stored in an internal capacitor.
8	VREF	O	Voltage Reference (2.49V). Voltage reference for external ADC.
9	RESI1	O	APD1 Current Track & Hold Monitor Output.

PIN	NAME	TYPE	FUNCTION
10	RESI2	O	APD2 Current Track & Hold Monitor Output.
11	RESI3	O	APD3 Current Track & Hold Monitor Output.
12	RESI4	O	APD4 Current Track & Hold Monitor Output.
13	TRC	O	APDx (x = 1, 2, 3 or 4) Continuous Current Monitor Output.
14	APD4	O	Output for Biasing the APD Device. The current out of this pin is sampled with a mirror circuit for current monitoring via RESI4 and over-current protection.
15	APD3	O	Output for Biasing the APD Device. The current out of this pin is sampled with a mirror circuit for current monitoring via RESI3 and over-current protection.
16	APD2	O	Output for Biasing the APD Device. The current out of this pin is sampled with a mirror circuit for current monitoring via RESI2 and over-current protection.
17	APD1	O	Output for Biasing the APD Device. The current out of this pin is sampled with a mirror circuit for current monitoring via RESI1 and over-current protection.
18	AGND	G	Analog Ground.
19	FIL	I	Boost Converter Voltage Filter Input.
20	PGND	G	Power Ground. The input bypass and output capacitors of the Boost converter should be connected to this pin.
21	SW	P	Switching Node of the Boost Converter.
22	ADDR	O	I^2C Slave Address Configuration Pin. Slave address can be selected by connecting this pin to ground or leaving it open.
23	SCL	I/O	I^2C Clock.
24	SDA	I/O	I^2C Data Port.

NOTE: I: input, O: output, I/O = input/output, G: ground, P: power for the circuit.

PACKAGE OUTLINE DIMENSIONS

TQFN-3×4-24AL

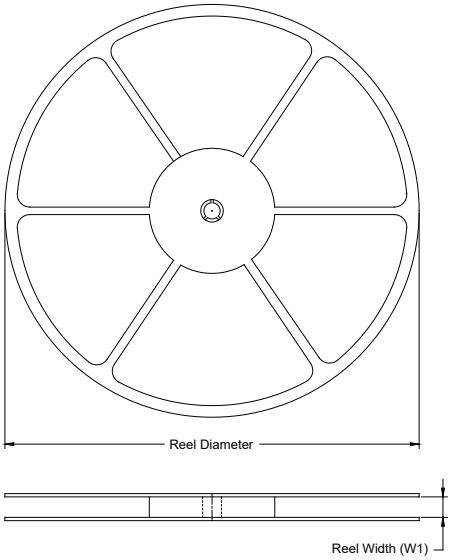


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.150	-	0.250
D	2.900	-	3.100
E	3.900	-	4.100
e	0.400 BSC		
L	0.300	-	0.500
eee	0.080		

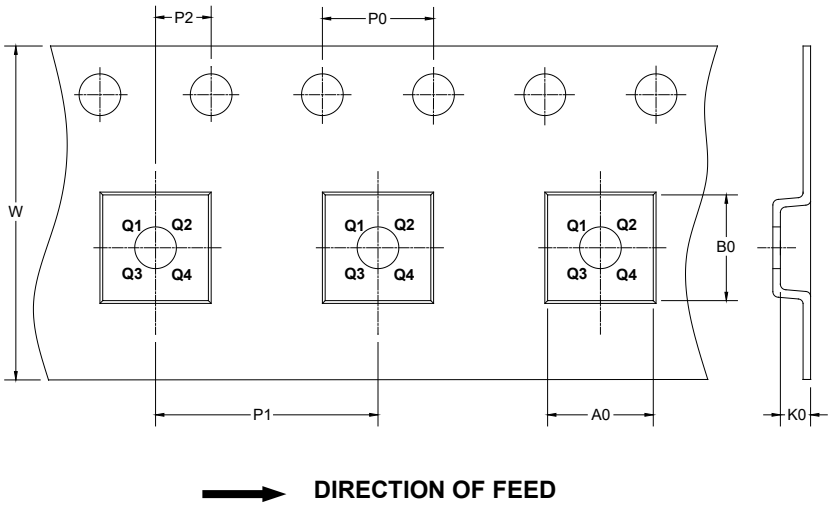
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



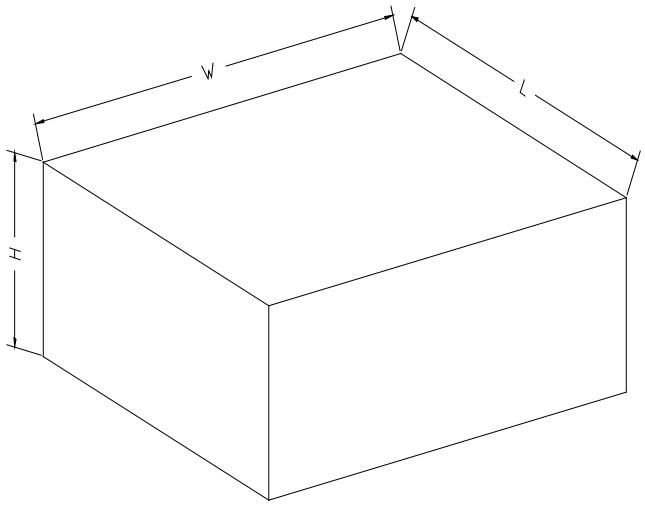
NOTE: The picture is only for reference. Please make the object as the standard.

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-3×4-24AL	13″	12.4	3.40	4.40	1.10	4.0	8.0	2.0	12.0	Q1

DD0001

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