SGM2035C
500mA, Ultra Low Dropout, Low Power, RF Linear Regulator

GENERAL DESCRIPTION

The SGM2035C is a low-power, low-noise, low-dropout, CMOS linear voltage regulator that operates from a 2.5V to 5.5V input voltage.

The SGM2035C is the perfect choice for low voltage, low power applications. A low ground current makes this part attractive for battery operated power systems. The SGM2035C also offers ultra low dropout voltage to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the SGM2035C's ultra low output noise ($30\mu V_{RMS}$) and high PSRR. An external noise bypass capacitor connected to the device's BP pin can further reduce the noise level.

Other features include a 110kΩ pull down resistor at EN pin, current limit and thermal shutdown protection.

The SGM2035C is available in Green UTDFN-1.6×1.6-6L and TDFN-2×2-6L packages. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **500mA Guaranteed Output Current**
- **Ultra Low Dropout Voltage**
- **Low Output Noise**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **High PSRR (73dB at 1kHz)**
- **1.8V Logic-Controlled Shutdown**
- **110kΩ Pull Down Resistor at EN Pin**
- **Fixed Output Voltages: 2.8V, 3.0V and 3.3V**
- **Adjustable Output from 1.2V to 5.0V**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green UTDFN-1.6×1.6-6L and TDFN-2×2-6L Packages**

APPLICATIONS

Cellular Telephones
Cordless Telephones
PCMCIA Cards
Modems
MP3 Player
Hand-Held Instruments
Palmtop Computers
Electronic Planners
Portable/Battery-Powered Equipment

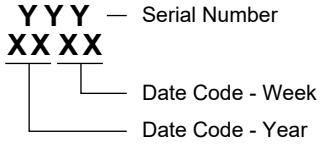
PACKAGE/ORDERING INFORMATION

MODEL	V_{OUT} (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2035C-3.3	3.3V	TDFN-2×2-6L	-40℃ to +85℃	SGM2035C-3.3YTDI6G/TR	SHA XXXX	Tape and Reel, 3000
SGM2035C-3.3	3.3V	UTDFN-1.6×1.6-6L	-40℃ to +85℃	SGM2035C-3.3YUDN6G/TR	HBX	Tape and Reel, 3000
SGM2035C-3.0	3.0V	UTDFN-1.6×1.6-6L	-40℃ to +85℃	SGM2035C-3.0YUDN6G/TR	TEX	Tape and Reel, 3000
SGM2035C-2.8	2.8V	UTDFN-1.6×1.6-6L	-40℃ to +85℃	SGM2035C-2.8YUDN6G/TR	S0X	Tape and Reel, 3000
SGM2035C-ADJ	ADJ	UTDFN-1.6×1.6-6L	-40℃ to +85℃	SGM2035C-ADJYUDN6G/TR	M7X	Tape and Reel, 3000

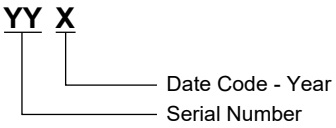
MARKING INFORMATION

NOTE: XXXX = Date Code, X = Date Code.

TDFN-2×2-6L



UTDFN-1.6×1.6-6L



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

IN to GND ..... -0.3V to 6V
Output Short-Circuit Duration..... Infinite
EN to GND..... -0.3V to (V_{IN} + 0.3V)
OUT, BP/FB to GND ..... -0.3V to (V_{IN} + 0.3V)
Power Dissipation, P_D @ T_A = +25℃
TDFN-2×2-6L..... 0.91W
UTDFN-1.6×1.6-6L 0.88W
Package Thermal Resistance
TDFN-2×2-6L,θ_{JA}..... 138℃/W
UTDFN-1.6×1.6-6L, θ_{JA} ..... 142℃/W
Junction Temperature .....+150℃
Storage Temperature Range.....-65℃ to +150℃
Lead Temperature (Soldering, 10s) .....+260℃
ESD Susceptibility
HBM.....4000V
MM.....400V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .....-40℃ to +85℃

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

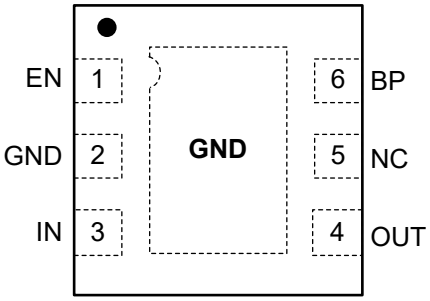
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

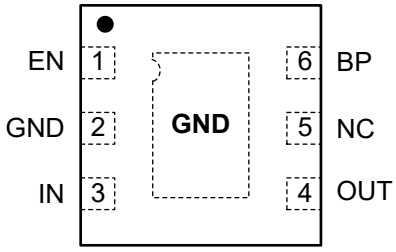
PIN CONFIGURATIONS

SGM2035C- Fixed Output



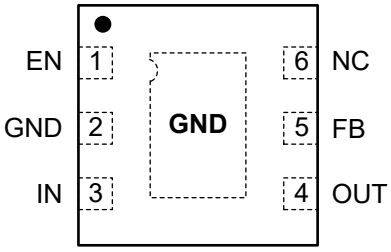
TDFN-2×2-6L

SGM2035C-Fixed Output



UTDFN-1.6×1.6-6L

SGM2035C-ADJ



UTDFN-1.6×1.6-6L

PIN DESCRIPTION

PIN		NAME	FUNCTION
TDFN-2×2-6L	UTDFN-1.6×1.6-6L		
1	1	EN	Shutdown Input. A logic low reduces the supply current to 10nA. 110kΩ pull down resistor at EN pin.
2	2	GND	Ground.
3	3	IN	Regulator Input. Supply voltage can range from 2.5V to 5.5V. Bypass with a 1μF capacitor to GND.
4	4	OUT	Regulator Output.
5	5	NC	No Connection (fixed voltage version only).
–		FB	Feedback Pin (adjustable voltage version only). This is used to set the output voltage of the device.
6	6	BP	Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01μF ceramic capacitor for reduced noise at the output.
–		NC	No Connection (adjustable voltage version only).
Exposed Pad	Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

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ELECTRICAL CHARACTERISTICS

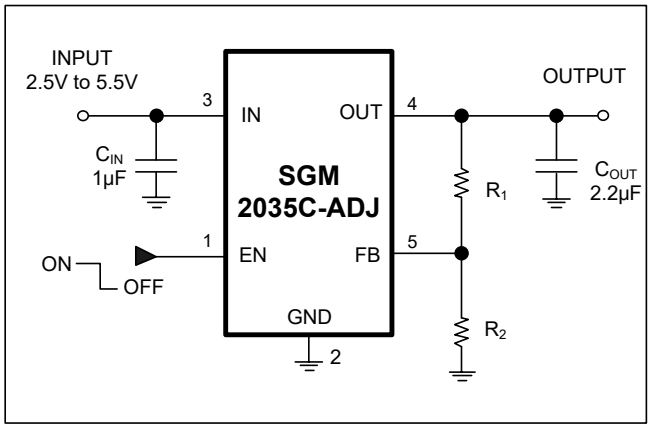
(V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V, whichever is greater, Full = -40℃ to +85℃, unless otherwise noted. For SGM2035C-ADJ, V_{OUT} = 3.3V.)

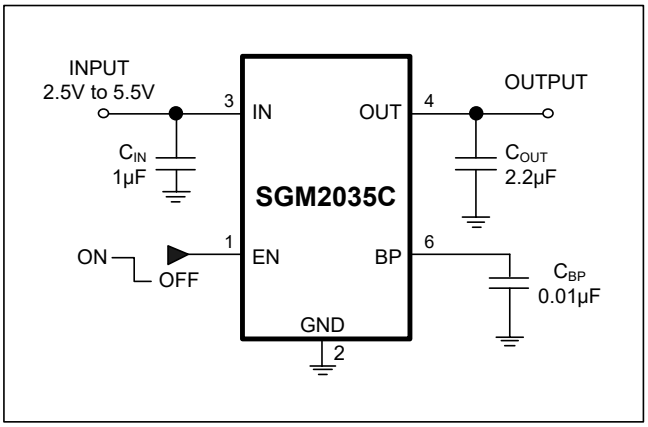
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			+25℃	2.5		5.5	V
Output Voltage Accuracy		I_{OUT} = 0.1mA		+25℃	-3		+3	%
Maximum Output Current (1)				+25℃	500			mA
Current Limit	I_{LIM}			+25℃	510			mA
Ground Pin Current	I_Q	No Load, V_{EN} = 2V		+25℃		115	220	μA
Dropout Voltage (2)		I_{OUT} = 100mA		+25℃		50	90	mV
		I_{OUT} = 300mA				150	250	
		I_{OUT} = 500mA				250	400	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	V_{IN} = 2.5V to 5.5V, I_{OUT} = 1mA		+25℃		0.02	0.095	%/V
Load Regulation	$\frac{\Delta V_{OUT}}{\Delta I_{LOAD} \times V_{OUT}}$	I_{OUT} = 0.1mA to 500mA, C_{OUT} = 1μF		+25℃		0.0025	0.0075	%/mA
Output Voltage Noise	e_n	f = 10Hz to 100kHz, C_{BP} = 0.01μF, C_{OUT} = 10μF		+25℃		30		μV_{RMS}
Power Supply Rejection Ratio	PSRR	C_{BP} = 0.1μF, I_{OUT} = 50mA, C_{OUT} = 1μF, V_{IN} = V_{OUT} + 1V	f = 217Hz	+25℃		77		dB
			f = 1kHz	+25℃		73		dB
SHUTDOWN								
EN Input Threshold	V_{IH}	V_{IN} = 2.5V to 5.5V		Full	1.5			V
	V_{IL}			Full			0.3	
Pull Down Resistor	$R_{PULL\ DOWN}$			+25℃		110		kΩ
Shutdown Supply Current	$I_{Q(SHDN)}$	V_{EN} = 0.3V		Full		0.01		μA
Shutdown Exit Delay (3)		C_{BP} = 0.01μF, C_{OUT}=1μF, No Load		+25℃		30		μs
THERMAL PROTECTION								
Thermal Shutdown Temperature	T_{SHDN}					150		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}					15		℃

NOTES:

1. Maximum output current is affected by PCB layout, size of metal trace, the thermal conduction path between metal layers and the environment of the system.
2. The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} is 100mV below the value of V_{OUT} for V_{IN} = V_{OUT} + 0.5V. (Only applicable for V_{OUT} = +2.5V to +5.0V.)
3. Time needed for V_{OUT} to reach 90% of final value.

TYPICAL APPLICATION CIRCUITS





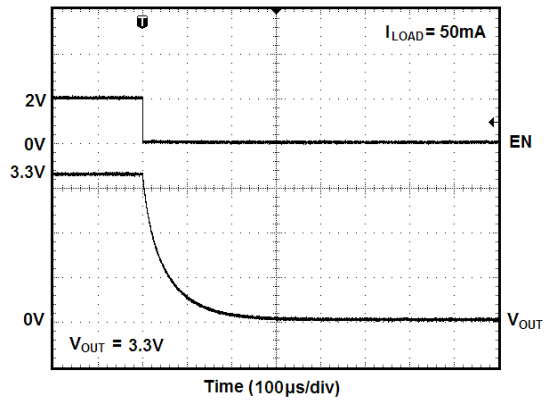
NOTE: Choose R_2 = 47kΩ to maintain a 26μA minimum load.
Calculate the value for R_1 using the following equation:

$$R_1 = R_2 \times \left(\frac{V_{OUT}}{1.206V} - 1 \right)$$

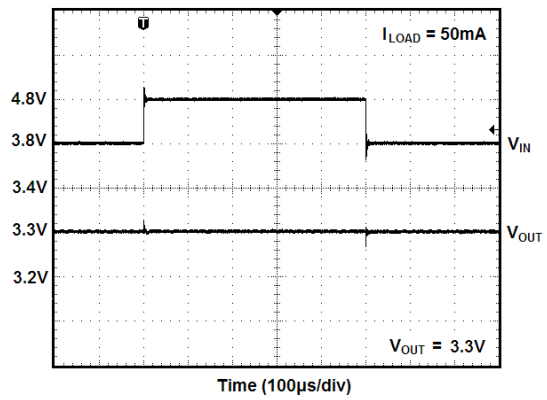
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, unless otherwise noted.

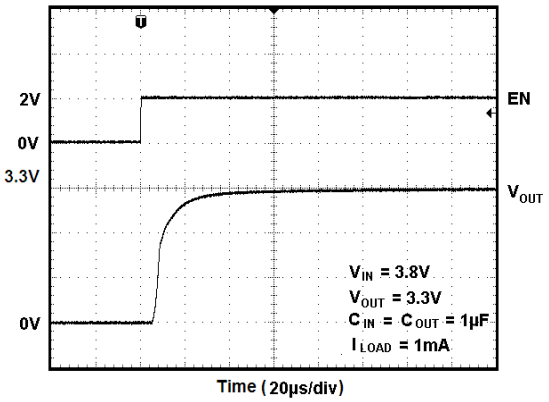
Entering Shutdown



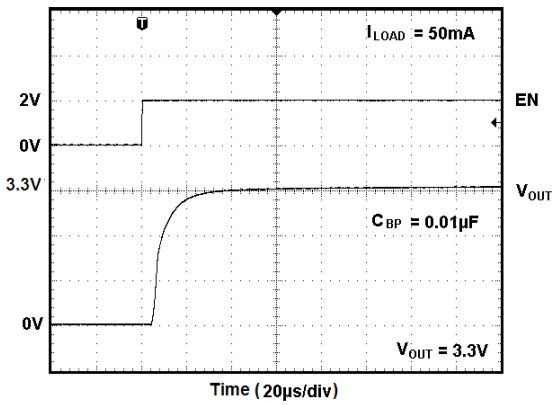
Line-Transient Response



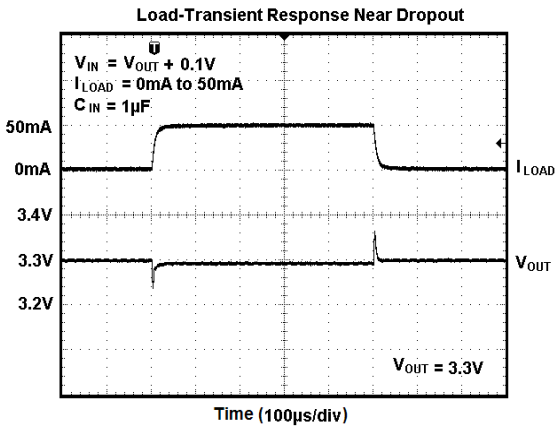
Start Up



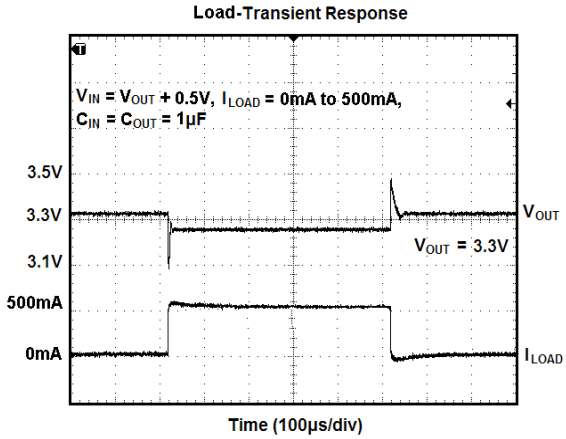
Shutdown Exit Delay



Load-Transient Response Near Dropout



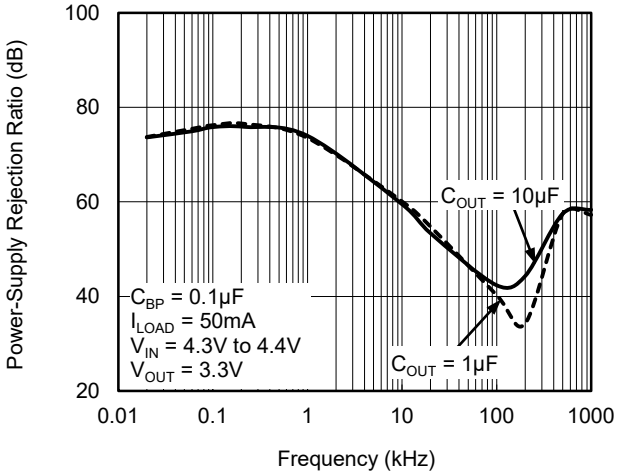
Load-Transient Response



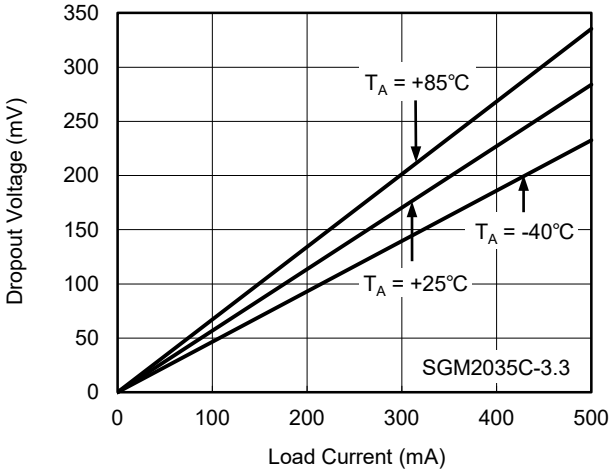
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, unless otherwise noted.

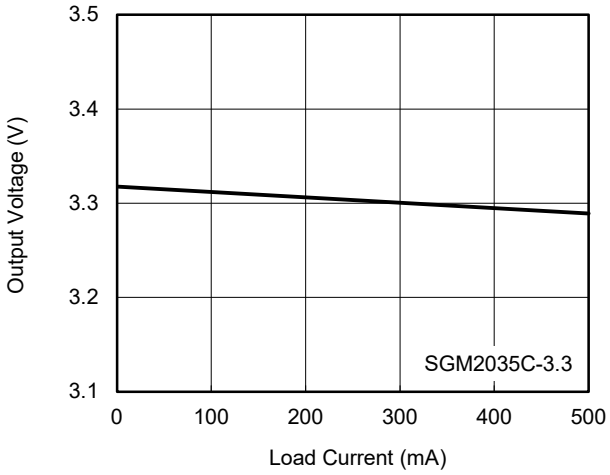
Power-Supply Rejection Ratio vs. Frequency



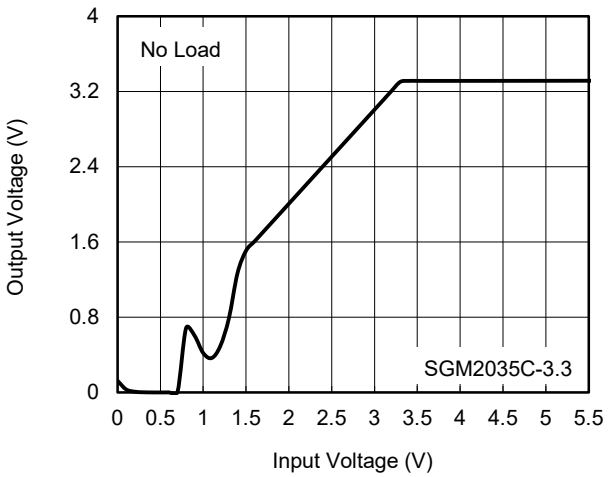
Dropout Voltage vs. Load Current



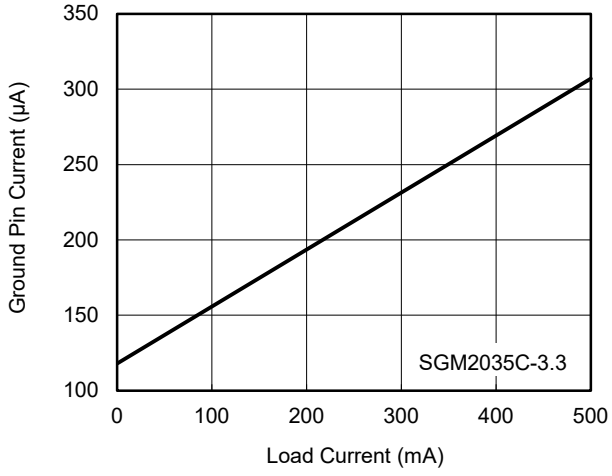
Output Voltage vs. Load Current



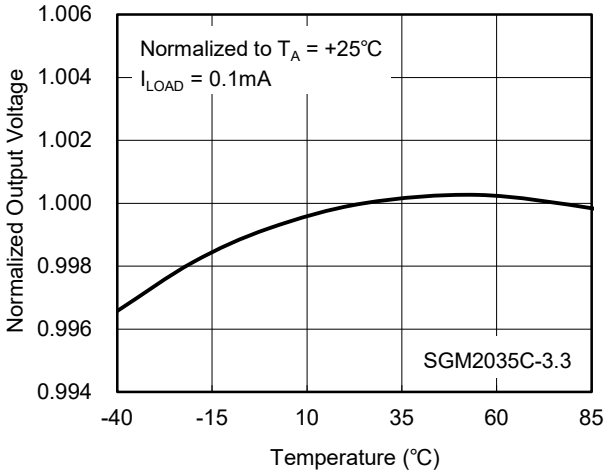
Output Voltage vs. Input Voltage



Ground Pin Current vs. Load Current



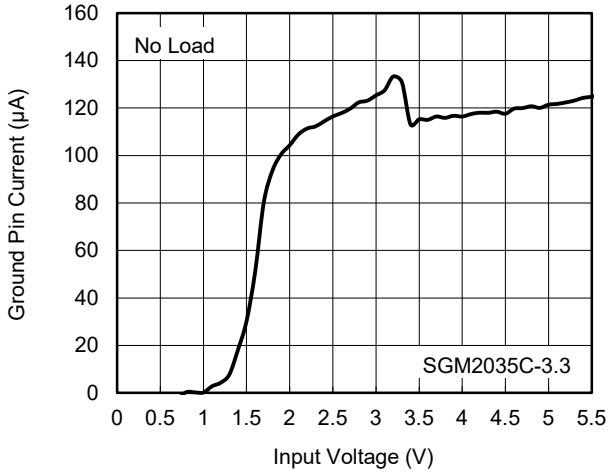
Normalized Output Voltage vs. Temperature



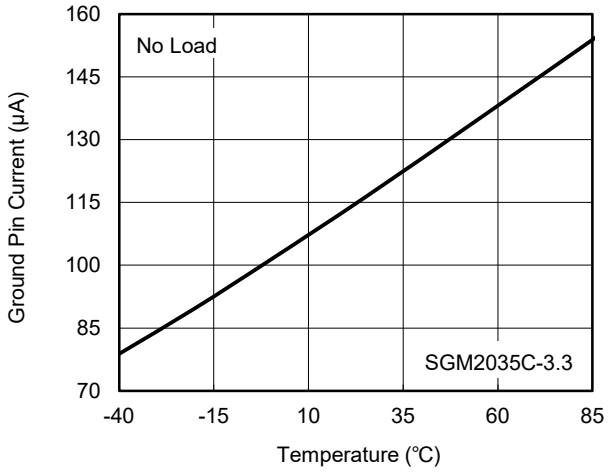
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, unless otherwise noted.

Ground Pin Current vs. Input Voltage



Ground Pin Current vs. Temperature



FUNCTIONAL BLOCK DIAGRAM

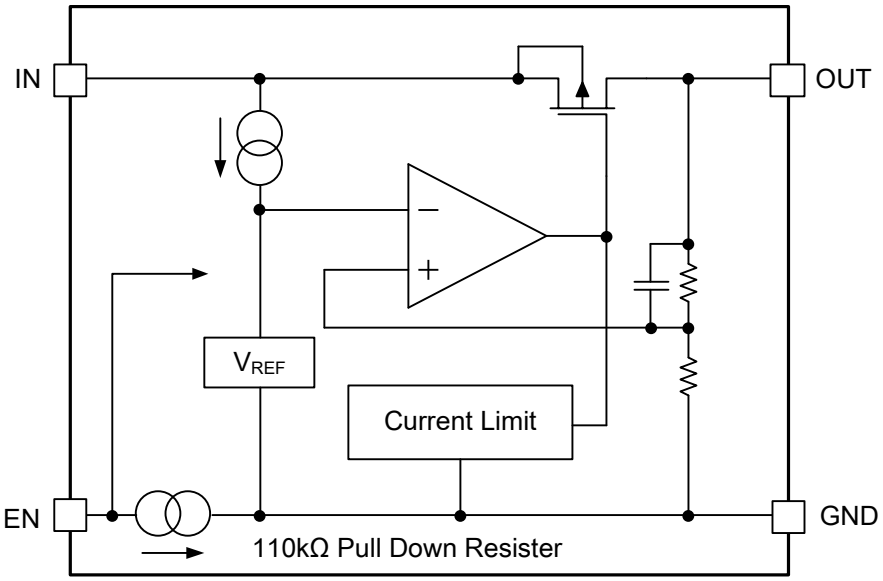
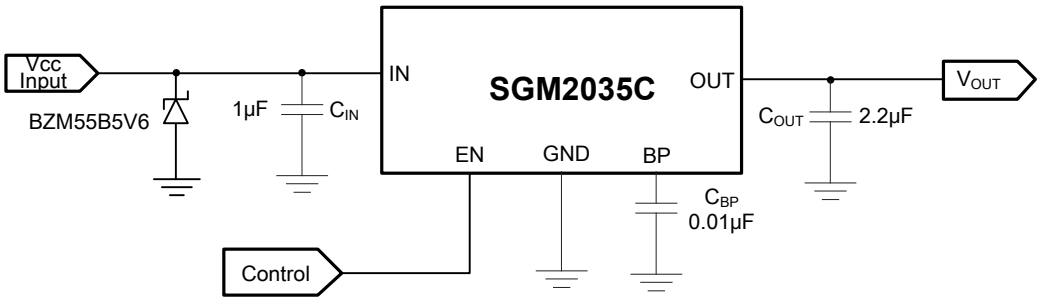


Figure 1. Block Diagram

APPLICATION INFORMATION

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage SGM2035C. In such applications, voltage spikes will be generated at charger interface and V_{BUS} pin of USB interface when charger adapters and USB equipments are hot-plugged. Besides this, handheld products will be tested on the production line without battery. Test engineer will apply power from the connector pin which connects with positive pole of the battery. When external power supply is turned on suddenly, the voltage spikes will be generated at the battery connector. The voltage spikes will be very high, and it always exceeds the absolute maximum input voltage (6.0V) of LDO. In order to get robust design, design engineer needs to clear up this voltage spike. Zener diode is a cheap and effective solution to eliminate such voltage spike. For example, BZM55B5V6 is a 5.6V small package Zener diode which can be used to remove voltage spikes in cell phone designs. The schematic is shown below.



REVISION HISTORY

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

SEPTEMBER 2020 – REV.A.4 to REV.B **Page**

Updated Absolute Maximum Ratings 2

MAY 2016 – REV.A.3 to REV.A.4 **Page**

Changed Typical Performance Characteristics 8

DECEMBER 2014 – REV.A.2 to REV.A.3 **Page**

Added SGM2035C-3.0 ..... 1, 2

DECEMBER 2013 – REV.A.1 to REV.A.2 **Page**

Added SGM2035C-ADJ 3
Added SGM2035C-2.8 ..... All
Updated Electrical Characteristics 5
Changed Typical Performance Characteristics 8, 9
Changed Absolute Maximum Ratings 2

DECEMBER 2012 – REV.A to REV.A.1 **Page**

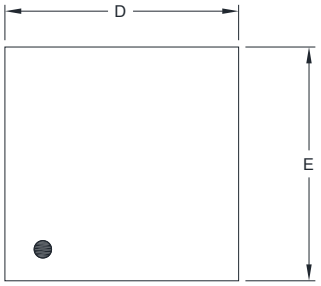
Updated Electrical Characteristics 5

Changes from Original (AUGUST 2012) to REV.A **Page**

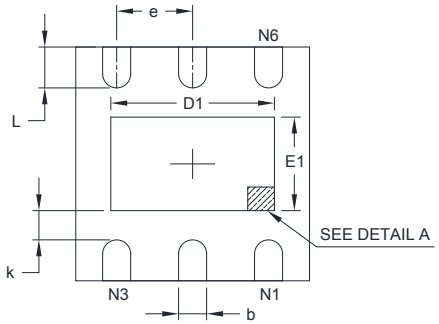
Changed from product preview to production data ..... All

PACKAGE OUTLINE DIMENSIONS

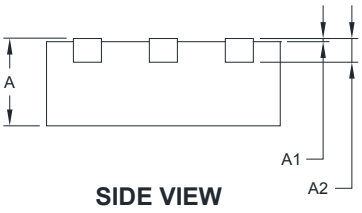
TDFN-2×2-6L



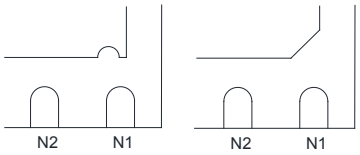
TOP VIEW



BOTTOM VIEW



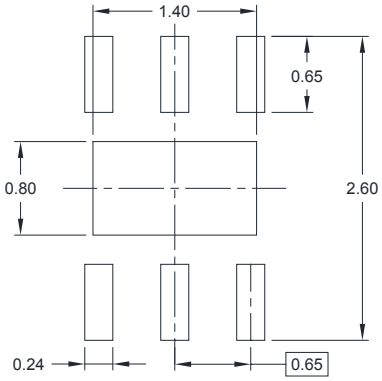
SIDE VIEW



DETAIL A

Pin #1 ID and Tie Bar Mark Options

NOTE: The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

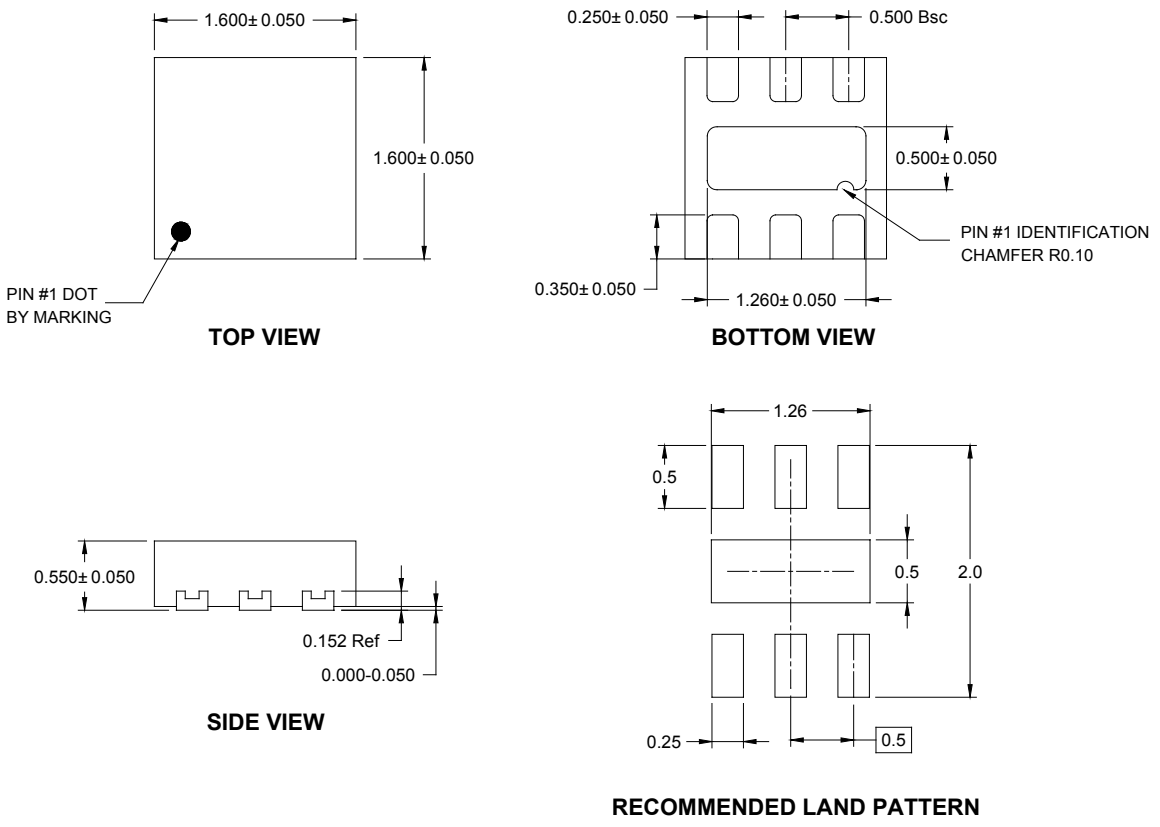


RECOMMENDED LAND PATTERN (Unit: mm)

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	1.900	2.100	0.075	0.083
D1	1.100	1.450	0.043	0.057
E	1.900	2.100	0.075	0.083
E1	0.600	0.850	0.024	0.034
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.250	0.450	0.010	0.018

PACKAGE OUTLINE DIMENSIONS

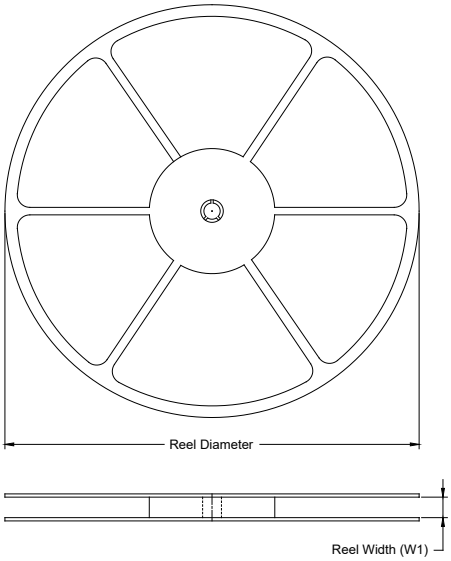
UTDFN-1.6×1.6-6L



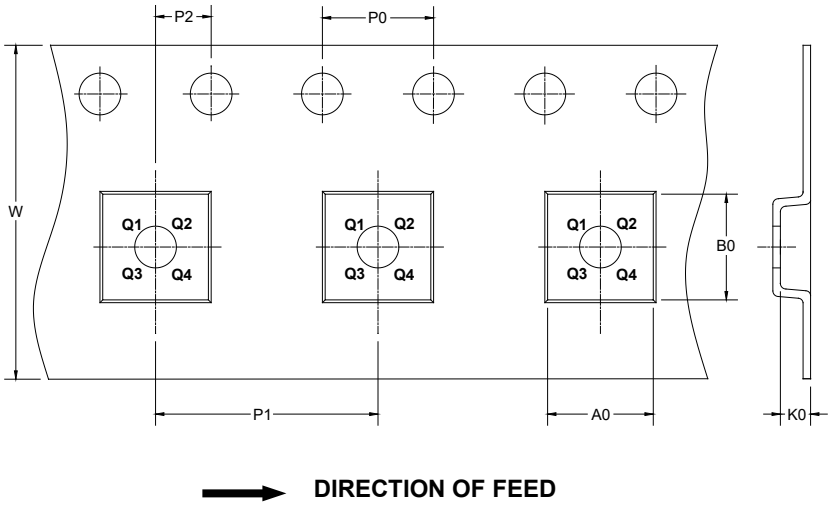
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

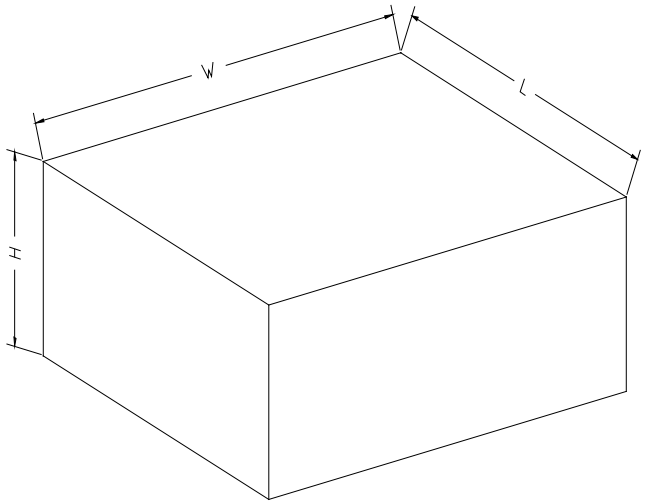
NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-2×2-6L	7″	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1
UTDFN-1.6×1.6-6L	7″	9.0	1.78	1.78	0.69	4.0	4.0	2.0	8.0	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
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002