



# SGM2079xQ

## Automotive, 1A, Low Noise, Wide Bandwidth, High PSRR, Low Dropout Linear Regulator

### GENERAL DESCRIPTION

The SGM2079xQ is a low noise, high PSRR, low dropout voltage linear regulator. It is capable of supplying 1A output current with typical dropout voltage of only 130mV. The operating input voltage range is from 2.2V to 5.5V and output voltage range is from 0.8V to 5V.

Other features include logic-controlled shutdown mode, short-circuit current limit and thermal shutdown protection. The SGM2079xQ has automatic discharge function to quickly discharge  $V_{OUT}$  in the disabled status.

This device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The SGM2079xQ is available in a Green TDFN-3×3-8JL package. It operates over an operating temperature range of -40°C to +125°C.

### FEATURES

- AEC-Q100 Qualified for Automotive Applications Device Temperature Grade 1  
 $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Operating Input Voltage: 2.2V to 5.5V
- Enable Pin Accept Voltages Higher than the Supply Voltage and up to 5.5V
- Adjustable Output Voltage: 0.8V to 5V
- Output Voltage Accuracy:  $\pm 2\%$  at  $+25^{\circ}\text{C}$
- Low Dropout Voltage: 130mV (TYP) at 1A
- Low Noise at  $V_{OUT(NOM)} = 1.1\text{V}$  (10Hz to 100kHz):  
18 $\mu\text{V}_{\text{RMS}}$  (TYP)
- Power Supply Rejection Ratio at  $V_{OUT(NOM)} = 1.1\text{V}$ :
  - ◆ 74dB (TYP) at 1kHz
  - ◆ 66dB (TYP) at 10kHz
  - ◆ 42dB (TYP) at 1MHz
- Current Limiting and Thermal Protection
- Excellent Load and Line Transient Responses
- With Output Automatic Discharge
- Stable with Small Case Size Ceramic Capacitors
- -40°C to +125°C Operating Temperature Range
- Available in a Green TDFN-3×3-8JL Package

### APPLICATIONS

Automotive Applications  
PLL/VCO/RF Circuit  
Audio Equipment

### TYPICAL APPLICATION

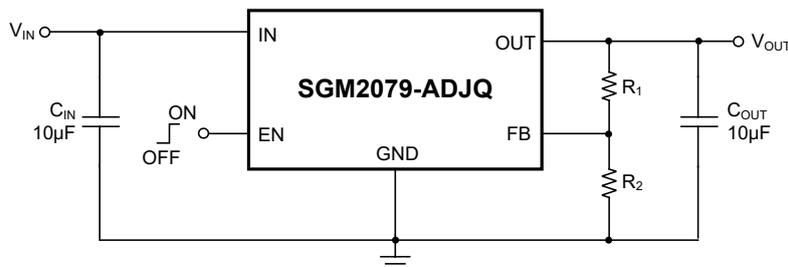


Figure 1. Typical Application Circuit

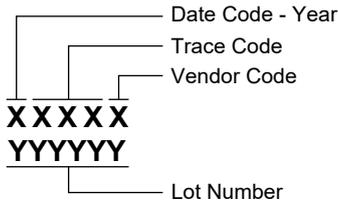
# Automotive, 1A, Low Noise, Wide Bandwidth, SGM2079xQ High PSRR, Low Dropout Linear Regulator

## PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2079-ADJQ	TDFN-3×3-8JL	-40°C to +125°C	SGM2079-ADJQTHI8G/TR	0NFTHI XXXXXX YYYYYY	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

IN to GND .....	-0.3V to 6V
OUT to GND .....	-0.3V to (V <sub>IN</sub> + 0.3V)
FB to GND .....	-0.3V to 6V
EN to GND .....	-0.3V to 6V
Package Thermal Resistance	
TDFN-3×3-8JL, θ <sub>JA</sub> .....	51.3°C/W
TDFN-3×3-8JL, θ <sub>JB</sub> .....	23.4°C/W
TDFN-3×3-8JL, θ <sub>JC(TOP)</sub> .....	50.2°C/W
TDFN-3×3-8JL, θ <sub>JC(BOT)</sub> .....	12.2°C/W
Junction Temperature .....	+150°C
Storage Temperature Range .....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	+260°C
ESD Susceptibility	
HBM .....	8000V
CDM .....	1000V

## RECOMMENDED OPERATING CONDITIONS

Operating Input Voltage Range, V <sub>IN</sub> .....	2.2V to 5.5V
Adjustable Output Voltage Range .....	0.8V to 5V
Enable Voltage Range .....	0V to 5.5V
Input Effective Capacitance, C <sub>IN</sub> .....	2.2μF (MIN)
Output Effective Capacitance, C <sub>OUT</sub> .....	2.2μF to 220μF
Operating Ambient Temperature Range .....	-40°C to +125°C
Operating Junction Temperature Range .....	-40°C to +150°C

## 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.

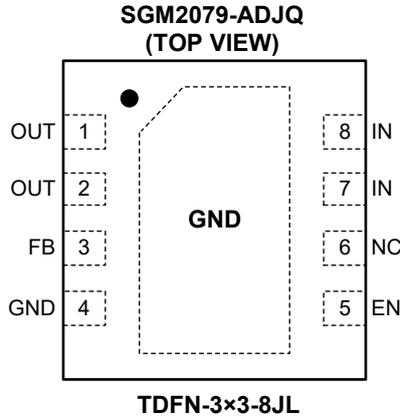
## ESD SENSITIVITY CAUTION

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**



**PIN DESCRIPTION**

PIN	NAME	FUNCTION
1, 2	OUT	Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 2.2μF to 220μF to ensure stability. This ceramic capacitor should be placed as close as possible to OUT pin.
3	FB	Feedback Voltage Input Pin. Connect this pin to the midpoint of an external resistor divider to adjust the output voltage. Place the resistors as close as possible to this pin.
4	GND	Ground.
5	EN	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator. The EN pin has an internal pull-down current source.
6	NC	No Connection.
7, 8	IN	Input Supply Voltage Pin. It is recommended to use a 4.7μF or larger ceramic capacitor from IN pin to ground to get good power supply decoupling. This ceramic capacitor should be placed as close as possible to IN pin.
Exposed Pad	GND	Exposed Pad. Connect it to a large ground plane to maximize thermal performance. This pad is not an electrical connection point.

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## FUNCTIONAL BLOCK DIAGRAM

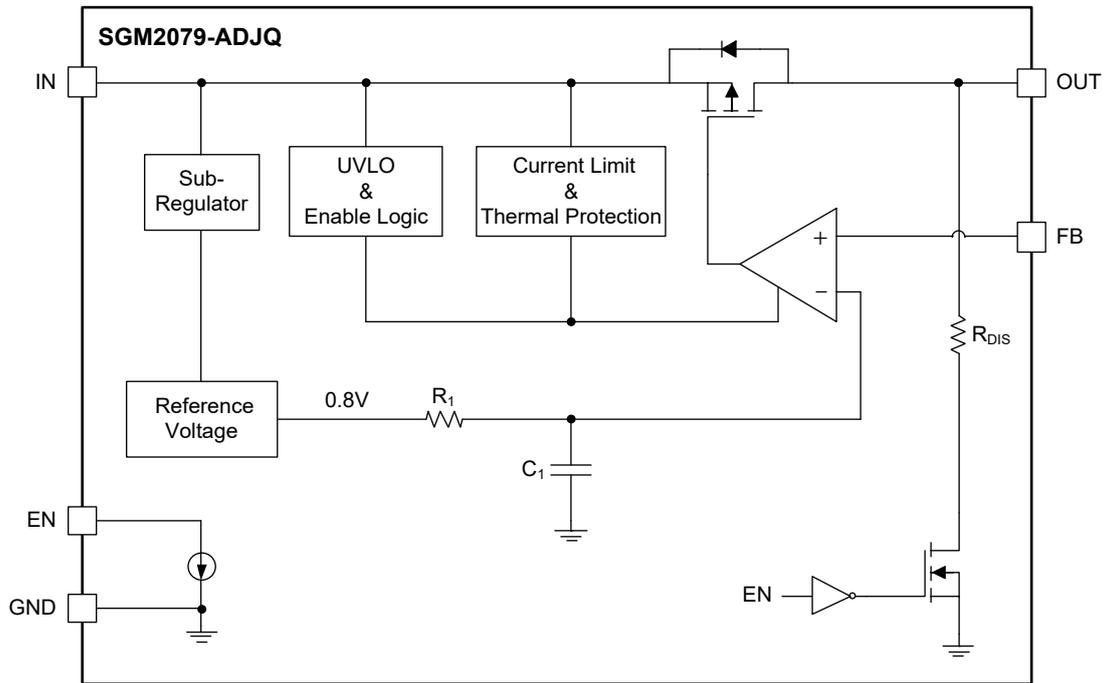


Figure 2. Adjustable Output Voltage Internal Block Diagram

# Automotive, 1A, Low Noise, Wide Bandwidth, SGM2079xQ High PSRR, Low Dropout Linear Regulator

## ELECTRICAL CHARACTERISTICS

( $V_{IN} = (V_{OUT(NOM)} + 0.5V)$  or 2.2V (whichever is greater),  $V_{EN} = 2.2V$ ,  $I_{OUT} = 1mA$ ,  $C_{IN} = 4.7\mu F$ ,  $C_{OUT} = 4.7\mu F$ . For SGM2079-ADJQ, tested at  $V_{OUT} = 0.8V$ ,  $T_J = -40^\circ C$  to  $+125^\circ C$  <sup>(1)</sup>, typical values are at  $T_J = +25^\circ C$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage Range	$V_{OUT}$		0.8		5	V
Feedback Voltage	$V_{FB}$	$T_J = +25^\circ C$	0.784	0.8	0.816	V
		$T_J = -40^\circ C$ to $+125^\circ C$	0.776		0.824	
Feedback Pin Current	$I_{FB}$	$V_{IN} = 5.5V$ , $V_{FB} = 0.9V$	-100		100	nA
Under-Voltage Lockout Thresholds	$V_{UVLO}$	$V_{IN}$ rising	1.65	1.8	1.9	V
		Hysteresis		200		mV
Line Regulation	$\Delta V_{OUT\_LNR}$	$V_{IN} = (V_{OUT(NOM)} + 0.5V)$ to 5.5V, $V_{IN} \geq 2.2V$ , $I_{OUT} = 1mA$		0.3	1	mV
Load Regulation	$\Delta V_{OUT\_LDR}$	$I_{OUT} = 1mA$ to 1A		1.4	5	mV
Dropout Voltage	$V_{DROP}$	$V_{FB} = GND$ , $I_{OUT} = 1A$ , $V_{IN} = 2.5V$		130	260	mV
Output Current Limit	$I_{LIMIT}$	$V_{OUT} = 90\% \times V_{OUT(NOM)}$ , $V_{IN} = (V_{OUT(NOM)} + 1V)$	1.2	1.75	2.4	A
Short Current Limit	$I_{SHORT}$	$V_{OUT} = 0V$		1.58		A
Ground Pin Current	$I_{GND}$	No load, $V_{IN} = 5.5V$		90	200	$\mu A$
		$I_{OUT} = 1A$		680	900	
Shutdown Current	$I_{SHDN}$	$V_{EN} \leq 0.4V$		0.03	3	$\mu A$
EN Pin High-Level Input Voltage	$V_{EN(H)}$	$2.2V \leq V_{IN} \leq 5.5V$	1.2		5.5	V
EN Pin Low-Level Input Voltage	$V_{EN(L)}$		0		0.4	V
EN Pin Current	$I_{EN}$	$V_{IN} = 5.5V$ , $V_{EN} = 0V$		0.01	1	$\mu A$
		$V_{IN} = 5.5V$ , $V_{EN} = 5.5V$		0.11	1	
Turn-On Time	$t_{ON}$	From assertion of $V_{EN}$ to $V_{OUT} = 90\% \times V_{OUT(NOM)}$		150	240	$\mu s$
Rising Time	$t_R$	$V_{OUT} = 10\%$ to $90\% \times V_{OUT(NOM)}$		80	140	$\mu s$
Power Supply Rejection Ratio	PSRR	$V_{IN} = 2.5V$ , $V_{OUT(NOM)} = 1.1V$ , $I_{OUT} = 1A$	$f = 1kHz$		74	dB
			$f = 10kHz$		66	
			$f = 1MHz$		42	
Output Voltage Noise	$e_n$	$I_{OUT} = 100mA$ , $f = 10Hz$ to $100kHz$ , $R_2 = 80k\Omega$	$V_{OUT(NOM)} = 1.1V$		18	$\mu V_{RMS}$
			$V_{OUT(NOM)} = 3.3V$		40	
			$V_{OUT(NOM)} = 5V$		51	
Output Discharge Resistance	$R_{DIS}$	$V_{IN} = 2.2V$		100	200	$\Omega$
Thermal Shutdown Temperature	$T_{SHDN}$			165		$^\circ C$
Thermal Shutdown Hysteresis	$\Delta T_{SHDN}$			30		$^\circ C$

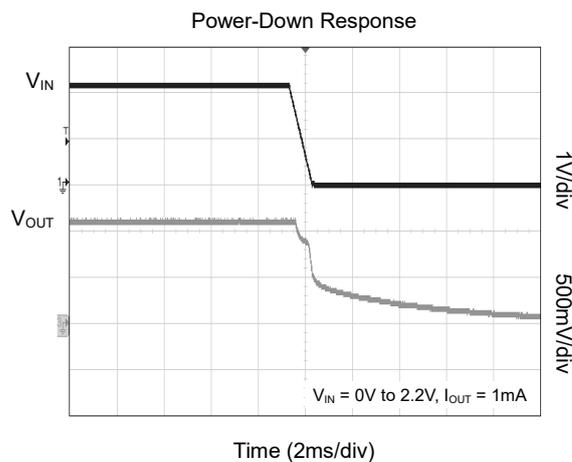
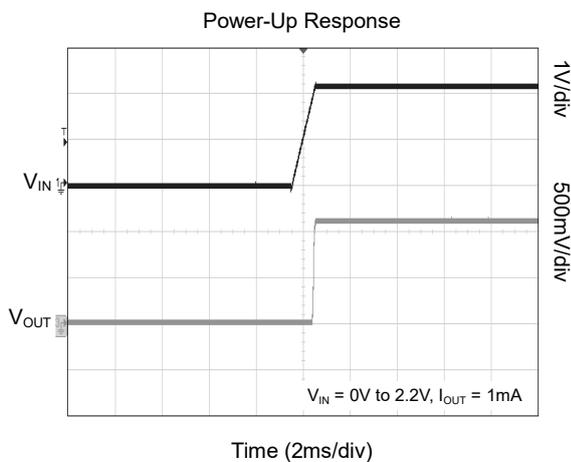
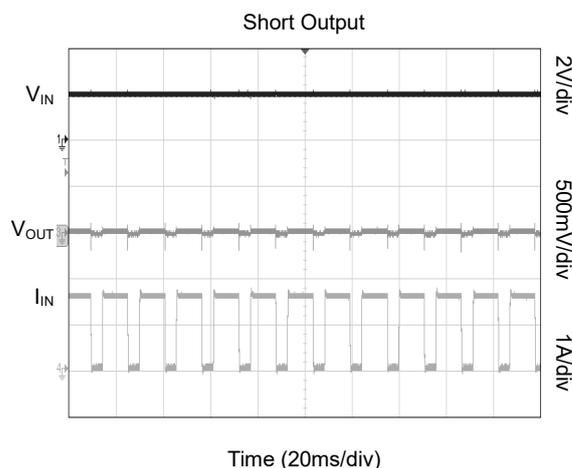
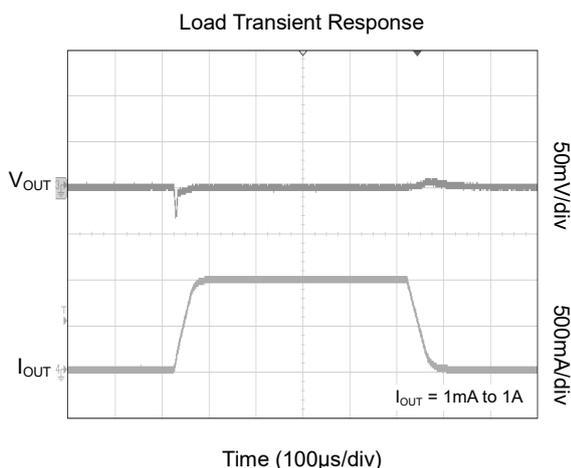
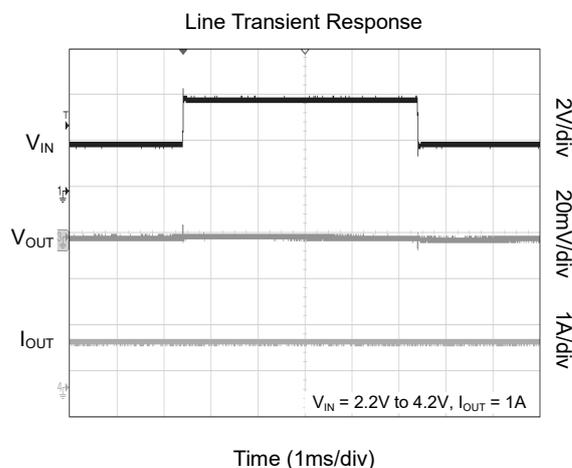
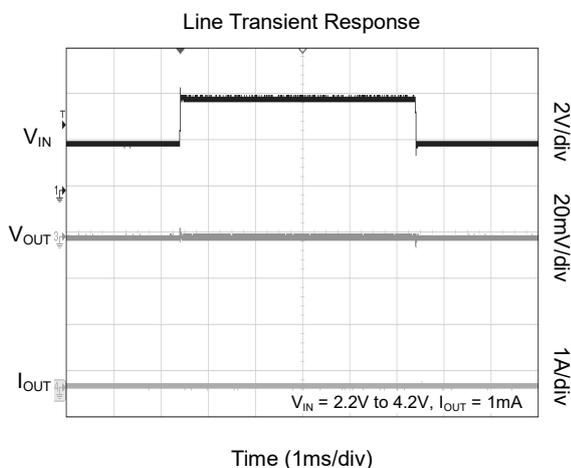
**NOTE:**

1. Tested under pulse load conditions, so  $T_J \approx T_A$ .

# SGM2079xQ Automotive, 1A, Low Noise, Wide Bandwidth, High PSRR, Low Dropout Linear Regulator

## TYPICAL PERFORMANCE CHARACTERISTICS

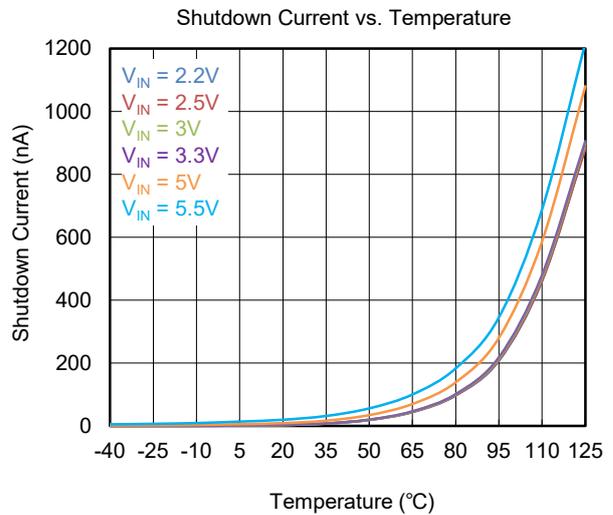
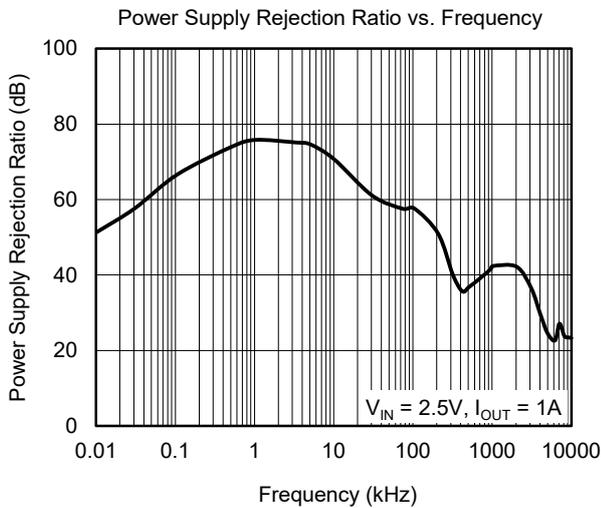
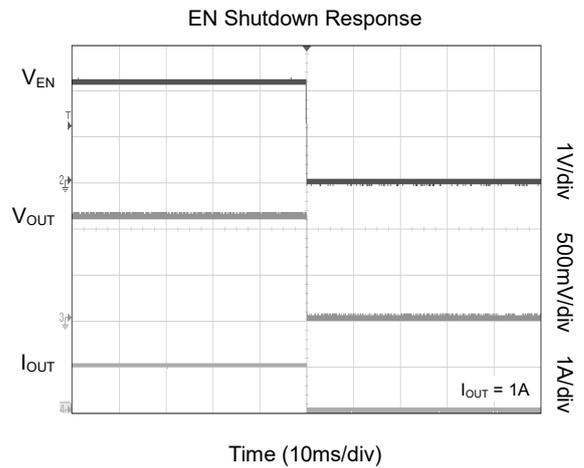
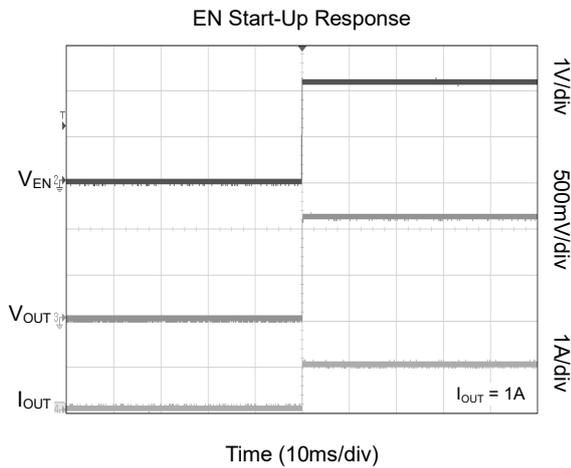
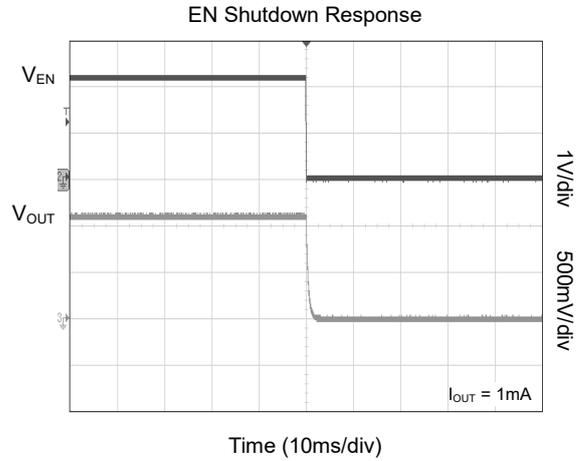
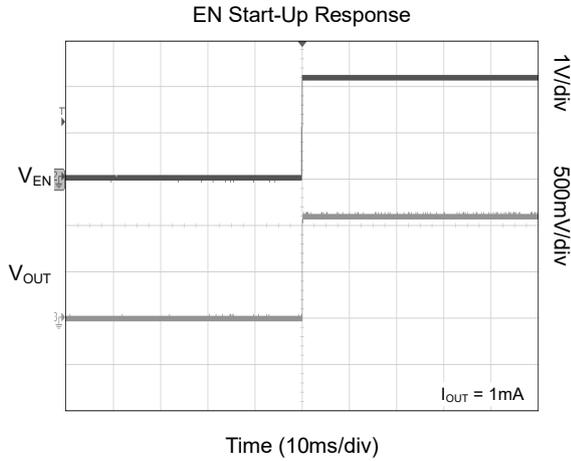
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# Automotive, 1A, Low Noise, Wide Bandwidth, SGM2079xQ High PSRR, Low Dropout Linear Regulator

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

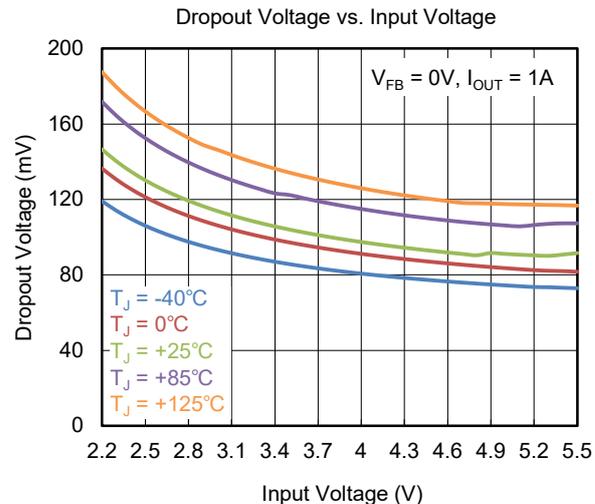
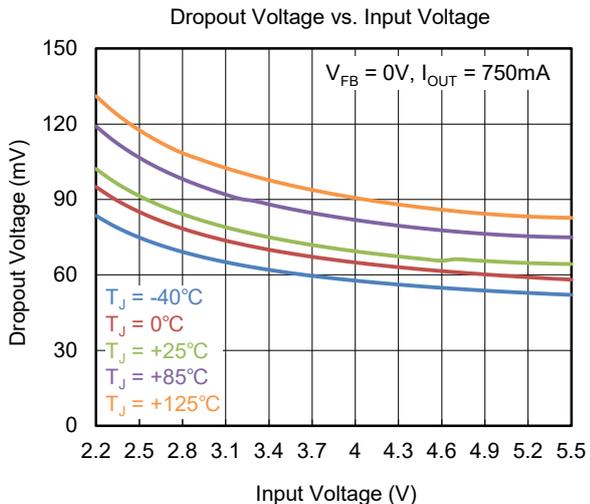
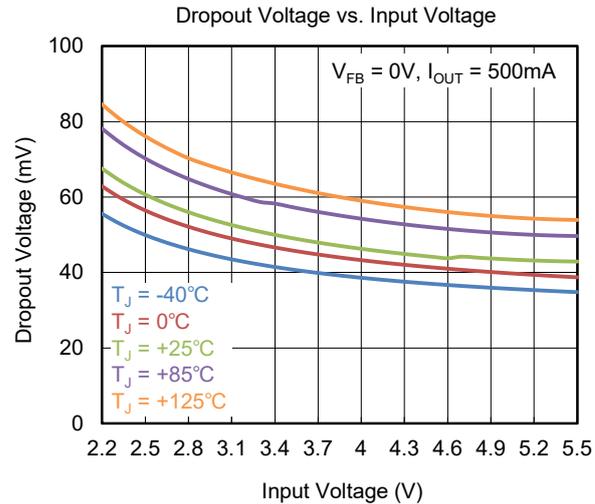
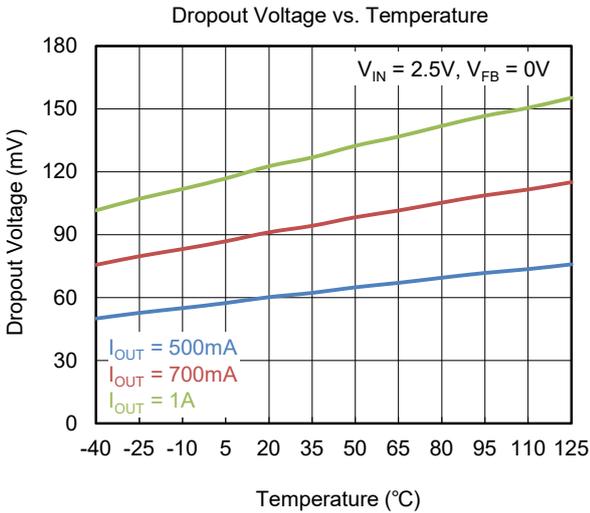
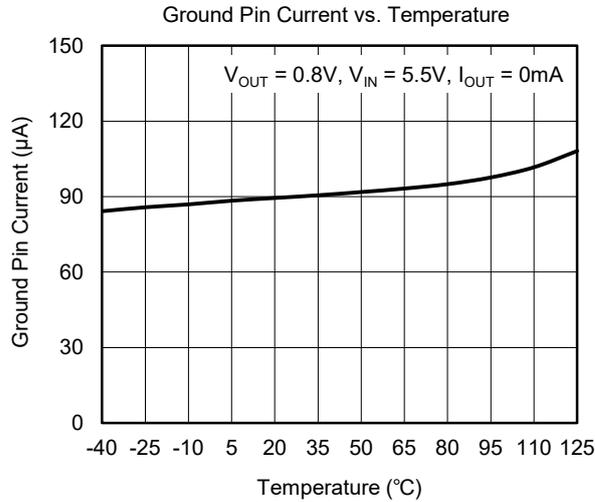
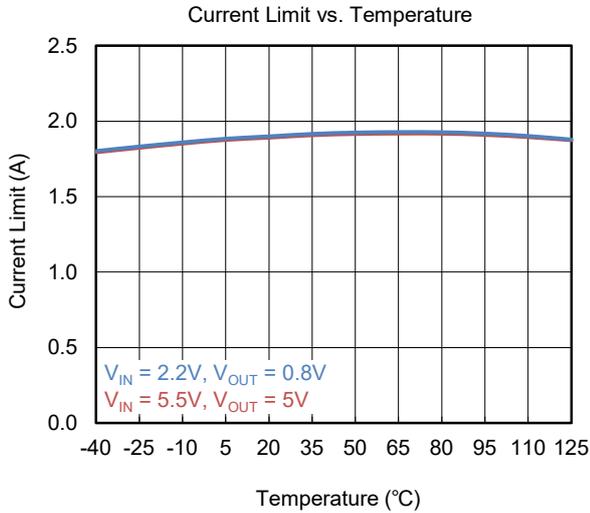
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## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

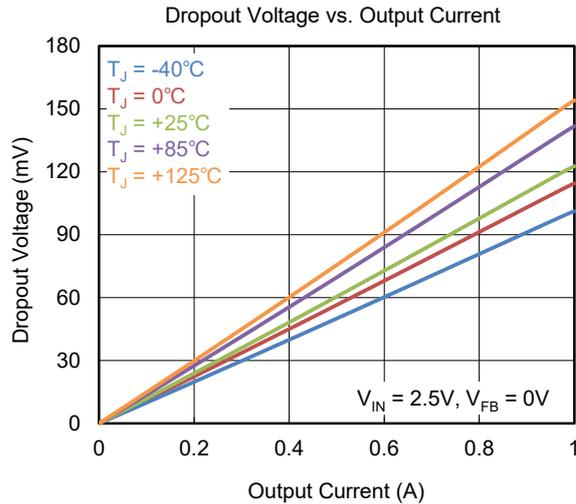
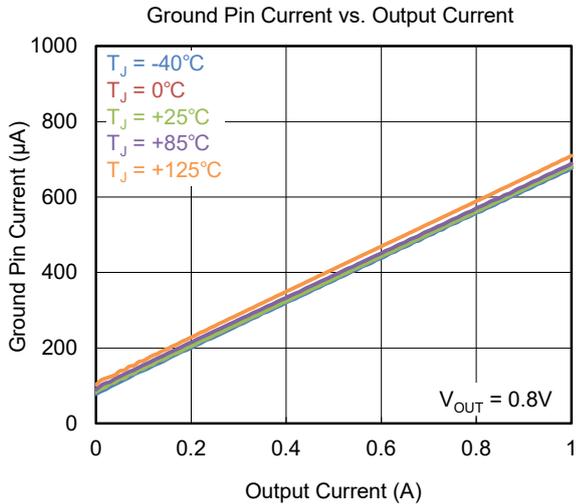
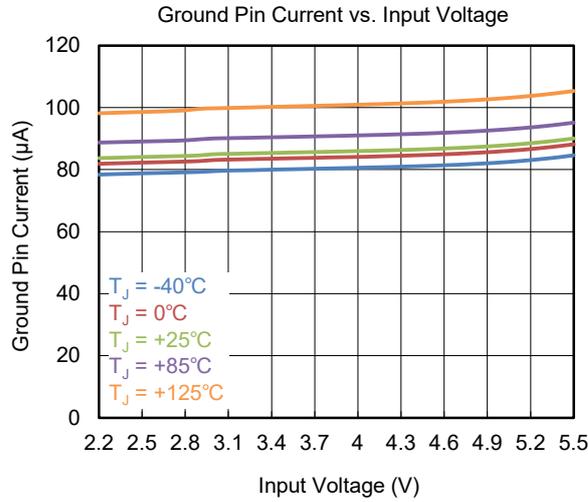
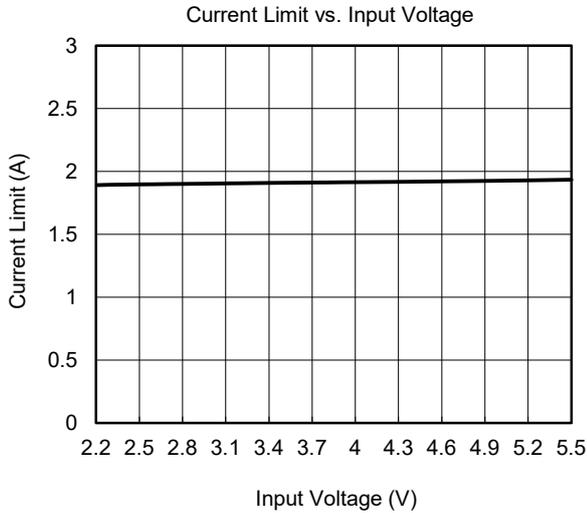
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# Automotive, 1A, Low Noise, Wide Bandwidth, SGM2079xQ High PSRR, Low Dropout Linear Regulator

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$ ,  $V_{OUT} = 1.1\text{V}$ ,  $V_{EN} = V_{IN} = 2.2\text{V}$ ,  $C_{IN} = 2.2\mu\text{F}$ ,  $C_{OUT} = 4.7\mu\text{F}$ , unless otherwise noted.



# SGM2079xQ Automotive, 1A, Low Noise, Wide Bandwidth, High PSRR, Low Dropout Linear Regulator

## APPLICATION INFORMATION

The SGM2079xQ is a low noise, high PSRR and fast transient response LDO and provides 1A output current. These features make the device a reliable solution to solve many challenging problems in the generation of clean and accurate power supply. The high performance also makes the SGM2079xQ useful in a variety of applications. The SGM2079xQ provides the protection function for output overload, output short-circuit condition and overheating.

The SGM2079xQ provides an EN pin as an external chip enable control to enable/disable the device. When the regulator is in shutdown state, the shutdown current consumes as low as 0.03µA (TYP).

### Input Capacitor Selection (C<sub>IN</sub>)

The input decoupling capacitor should be placed as close as possible to the IN pin to ensure the device stability. 4.7µF or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When V<sub>IN</sub> is required to provide large current instantaneously, a large effective input capacitor is required. Multiple input capacitors can limit the input tracking inductance. Adding more input capacitors is available to restrict the ringing and keep it below the device absolute maximum ratings. For C<sub>OUT</sub> with larger capacitance, it is recommended to choose the larger capacitance C<sub>IN</sub>.

### Output Capacitor Selection (C<sub>OUT</sub>)

The output capacitor should be placed as close as possible to the OUT pin. 4.7µF or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of C<sub>OUT</sub> that SGM2079xQ can remain stable is 2.2µF. For ceramic capacitor, temperature, DC bias and package size will change the effective capacitance, thus, enough margin of C<sub>OUT</sub> must be considered in design. Additionally, C<sub>OUT</sub> with larger capacitance and lower ESR will help increase the high frequency PSRR and improve the load transient response.

### Dropout Voltage and V<sub>IN</sub>

The SGM2079xQ features low dropout voltage due to low R<sub>DS(ON)</sub> PMOSFET power transistor. For Linear

regulator, when (V<sub>IN</sub> - V<sub>OUT</sub>) < dropout voltage (V<sub>DROP</sub>), the PMOSFET power transistor will be turned on like a switch, the parameter of linear regulator, such as PSRR, load and input transient responses, will be degraded so much. To get good performance in application, the V<sub>IN</sub> must be larger than (V<sub>OUT</sub> + V<sub>DROP</sub>).

### Adjustable Regulator

The output voltage of the SGM2079-ADJQ can be adjusted from 0.8V to 5V. The FB pin will be connected to two external resistors as shown in Figure 3. The output voltage is determined by the following equation:

$$V_{OUT} = V_{FB} \times \left(1 + \frac{R_1}{R_2}\right) \quad (1)$$

where:

V<sub>OUT</sub> is output voltage and V<sub>FB</sub> is the internal voltage reference, V<sub>FB</sub> = 0.8V. R<sub>1</sub> and R<sub>2</sub> can be calculated for any output voltage range using equation 1. To ensure stability, R<sub>2</sub> must not exceed 80kΩ with a minimum load of 10µA.

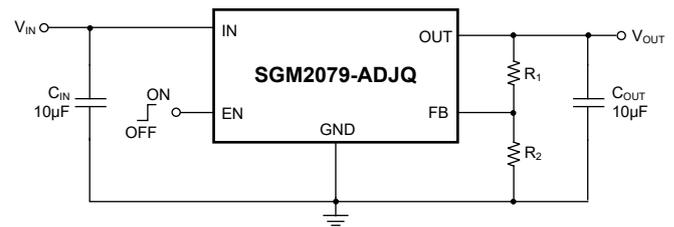


Figure 3. Adjustable Output Voltage Application

### Enable Operation

The SGM2079xQ uses the EN pin to enable/disable the device and to deactivate/activate the output automatic discharge function.

When the EN pin voltage is lower than 0.4V, the device is in shutdown state. There is no current flowing from IN to OUT pins. In this state, the automatic discharge transistor is active to discharge the output voltage through a 100Ω (TYP) resistor.

When the EN pin voltage is higher than 1.2V, the device is in active state. The output voltage is regulated to the expected value and the automatic discharge transistor is turned off.

# Automotive, 1A, Low Noise, Wide Bandwidth, SGM2079xQ High PSRR, Low Dropout Linear Regulator

## APPLICATION INFORMATION (continued)

### Under-Voltage Lockout (UVLO)

The UVLO circuit monitors the input voltage to prevent the device from turning on before  $V_{IN}$  rises above the  $V_{UVLO}$  threshold. The UVLO circuit responds quickly to glitches on the IN pin and attempts to disable the output of the device if any of these rails collapses. The local input capacitance prevents severe brownouts in most applications.

### Reverse Current Protection

The power transistor has an inherent body diode. This body diode will be forward biased when  $V_{OUT} > (V_{IN} + 0.3V)$ . When  $V_{OUT} > (V_{IN} + 0.3V)$ , the reverse current flowing from the OUT pin to the IN pin will damage the SGM2079xQ. If  $V_{OUT} > (V_{IN} + 0.3V)$  event would happen in system, one external Schottky diode will be added between OUT pin and IN pin in circuit design to protect the SGM2079xQ.

### Negatively Biased Output

When the output voltage is negative, the chip may not start up due to parasitic effects. Ensure that the output is greater than  $-0.3V$  under all conditions. If negatively biased output is excessive and expected in the application, a Schottky diode can be added between the OUT pin and GND pin.

### Output Current Limit and Short-Circuit Protection

When overload events happen, the output current is internally limited to 1.75A (TYP). When the OUT pin is shorted to ground, the short-circuit protection will limit the output current to 1.58A (TYP).

### Thermal Shutdown

When the die temperature exceeds the threshold value of thermal shutdown, the SGM2079xQ will be in shutdown state and remain in this state until the die temperature decreases to  $+135^{\circ}C$ .

### Power Dissipation ( $P_D$ )

Power dissipation ( $P_D$ ) of the SGM2079xQ can be calculated by the equation  $P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$ . The maximum allowable power dissipation ( $P_{D(MAX)}$ ) of the SGM2079xQ is affected by many factors, including the difference between junction temperature and ambient temperature ( $T_{J(MAX)} - T_A$ ), package thermal resistance from the junction to the ambient environment ( $\theta_{JA}$ ), the rate of ambient airflow and PCB layout.  $P_{D(MAX)}$  can be approximated by the following equation:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA} \quad (2)$$

### Layout Guidelines

To get good PSRR, low output noise and high transient response performance, the input and output bypass capacitors must be placed as close as possible to the IN pin and OUT pin separately.

## REVISION HISTORY

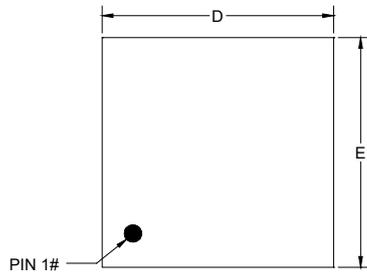
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

APRIL 2025 – REV.A.1 to REV.A.2	Page
Changed $V_{ADJ}/I_{ADJ}$ to $V_{FB}/I_{FB}$ .....	All
<hr/>	
JUNE 2024 – REV.A to REV.A.1	Page
Update Features.....	1
Update Typical Performance Characteristics section .....	9
Update Application Information section.....	11
<hr/>	
Changes from Original (MAY 2024) to REV.A	Page
Changed from product preview to production data.....	All

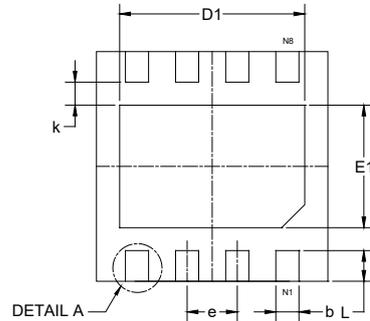
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

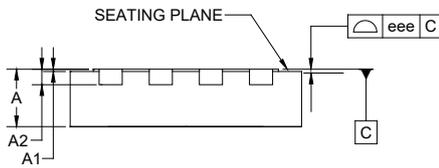
### TDFN-3×3-8JL



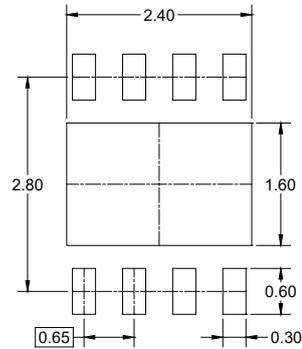
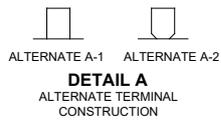
TOP VIEW



BOTTOM VIEW



SIDE VIEW



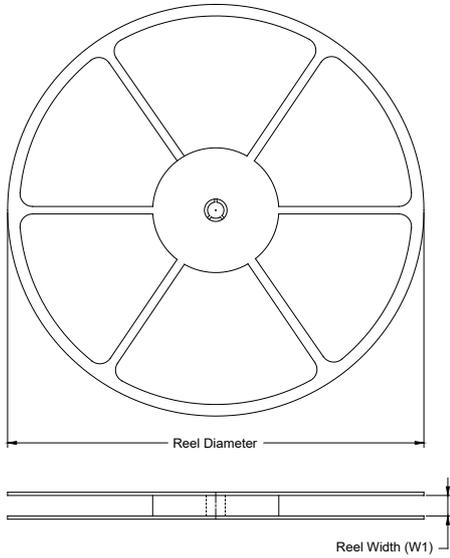
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.250	-	0.350
D	2.900	-	3.100
D1	2.300	-	2.500
E	2.900	-	3.100
E1	1.500	-	1.700
e	0.650 BSC		
k	0.300 REF		
L	0.300	-	0.500
eee	0.080		

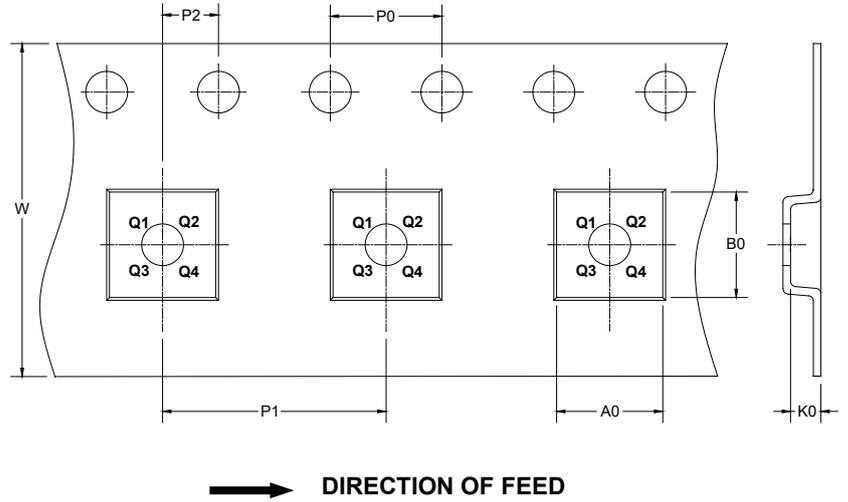
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

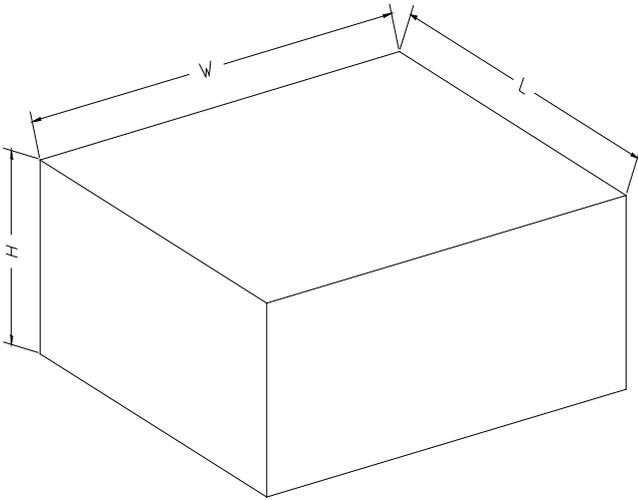
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TDFN-3×3-8JL	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

# PACKAGE INFORMATION

## 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