



SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

GENERAL DESCRIPTION

The SGM2239xQ is a high voltage, low quiescent current and low dropout voltage linear regulator. It is capable of supplying 300mA output current with typical dropout voltage of 900mV. The operating input voltage range is from 2.5V to 40V and output voltage range is from 1.215V to 35V.

Other features include current limit and thermal shutdown protection. The SGM2239xQ is suitable for various automotive applications.

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

The SGM2239xQ is available in Green TDFN-2×2-6AL and TDFN-3×3-8JL packages. It operates over an operating temperature range of -40°C to +125°C.

APPLICATIONS

Industrial Equipment
Automotive Applications
Battery-Powered Equipment
Medical Equipment

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 Range: 2.5V to 40V
- Enable Pin Accept Voltages Higher than the Supply Voltage and up to 40V
- Fixed Output from 1.8V to 12V
- Adjustable Output from 1.215V to 35V
- 300mA Output Current
- Output Voltage Accuracy: $\pm 1\%$ at $+25^{\circ}\text{C}$
- Low Quiescent Current: 3.2 μA (TYP)
- Low Dropout Voltage:
900mV (TYP) at 300mA, $V_{\text{OUT}} = 5.0\text{V}$
- Current Limiting and Thermal Protection
- With Output Automatic Discharge
- Stable with Small Case Size Ceramic Capacitors
- -40°C to $+125^{\circ}\text{C}$ Operating Temperature Range
- Available in Green TDFN-2×2-6AL and TDFN-3×3-8JL Packages

TYPICAL APPLICATION

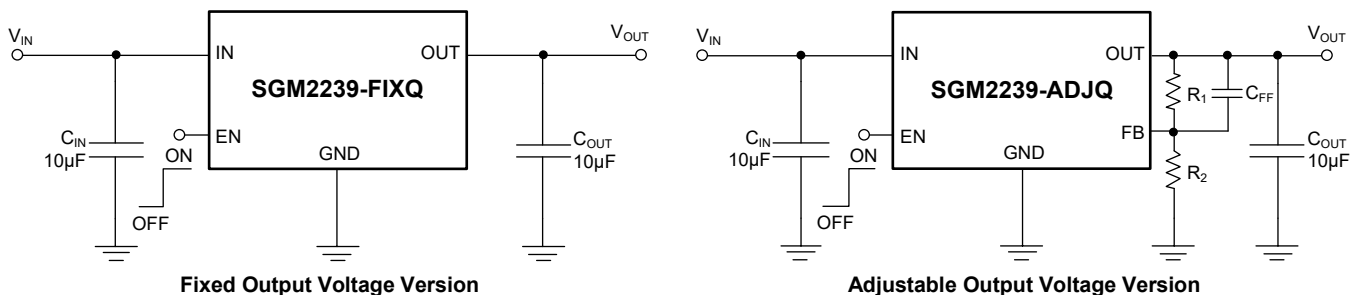


Figure 1. Typical Application Circuits

Automotive 40V, 300mA, Low Quiescent SGM2239xQ Current and Low Dropout Voltage Linear Regulator

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2239-1.8Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-1.8QTDI6G/TR	1CI XXXX	Tape and Reel, 3000
SGM2239-2.5Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-2.5QTDI6G/TR	1CJ XXXX	Tape and Reel, 3000
SGM2239-3.0Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-3.0QTDI6G/TR	1CK XXXX	Tape and Reel, 3000
SGM2239-3.3Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-3.3QTDI6G/TR	1CL XXXX	Tape and Reel, 3000
SGM2239-3.6Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-3.6QTDI6G/TR	1CM XXXX	Tape and Reel, 3000
SGM2239-4.2Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-4.2QTDI6G/TR	1CN XXXX	Tape and Reel, 3000
SGM2239-5.0Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-5.0QTDI6G/TR	1CO XXXX	Tape and Reel, 3000
SGM2239-8.0Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-8.0QTDI6G/TR	1CP XXXX	Tape and Reel, 3000
SGM2239-9.0Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-9.0QTDI6G/TR	1CQ XXXX	Tape and Reel, 3000
SGM2239-12Q	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-12QTDI6G/TR	1CR XXXX	Tape and Reel, 3000
SGM2239-ADJQ	TDFN-2×2-6AL	-40°C to +125°C (T _A)	SGM2239-ADJQTDI6G/TR	1CS XXXX	Tape and Reel, 3000
SGM2239-1.8Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-1.8QTHI8G/TR	1CTTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-2.5Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-2.5QTHI8G/TR	1CUTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-3.0Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-3.0QTHI8G/TR	1CVTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-3.3Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-3.3QTHI8G/TR	1AZTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-3.6Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-3.6QTHI8G/TR	1CWTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-4.2Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-4.2QTHI8G/TR	1CXTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-5.0Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-5.0QTHI8G/TR	0X7THI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-8.0Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-8.0QTHI8G/TR	1CYTHI XXXXX YYYYYY	Tape and Reel, 4000
SGM2239-9.0Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-9.0QTHI8G/TR	1CZTHI XXXXX YYYYYY	Tape and Reel, 4000

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PACKAGE/ORDERING INFORMATION (continued)

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2239-12Q	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-12QTHI8G/TR	1D0THI XXXXXX YYYYYY	Tape and Reel, 4000
SGM2239-ADJQ	TDFN-3×3-8JL	-40°C to +125°C (T _A)	SGM2239-ADJQTHI8G/TR	0X6THI XXXXXX YYYYYY	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXX = Date Code, Trace Code and Vendor Code. XXXXX = Date Code, Trace Code and Vendor Code.

TDFN-2×2-6AL

Y Y Y — Serial Number
 X X X X
 Vendor Code
 Trace Code
 Date Code - Year

TDFN-3×3-8JL

Date Code - Year
 Trace Code
 Vendor Code
 X X X X X
 Y Y Y Y Y
 Lot Number

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, EN to GND -0.3V to 45V
 OUT to GND -0.3V to 45V
 FB to GND -0.3V to 45V
 Package Thermal Resistance
 TDFN-2×2-6AL, θ_{JA} 62.9°C/W
 TDFN-2×2-6AL, θ_{JB} 28.9°C/W
 TDFN-2×2-6AL, $\theta_{JC(TOP)}$ 77.8°C/W
 TDFN-2×2-6AL, $\theta_{JC(BOT)}$ 11.6°C/W
 TDFN-3×3-8JL, θ_{JA} 50.2°C/W
 TDFN-3×3-8JL, θ_{JB} 22.5°C/W
 TDFN-3×3-8JL, $\theta_{JC(TOP)}$ 52.2°C/W
 TDFN-3×3-8JL, $\theta_{JC(BOT)}$ 11°C/W
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility ^{(1) (2)}
 HBM ±6000V
 CDM ±1000V

NOTES:

- For human body model (HBM), all pins comply with AEC-Q100-002 specification.
- For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{IN} 2.5V to 40V

Enable Input Voltage Range 0V to 40V
 Input Effective Capacitance, C_{IN} 0.5μF (MIN)
 Output Effective Capacitance, C_{OUT} 1μF to 100μF
 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.

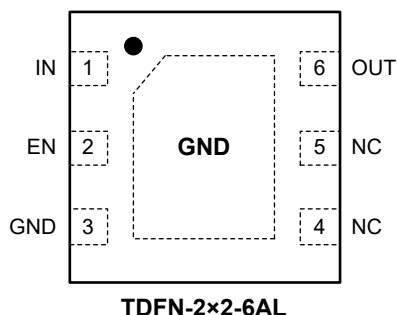
DISCLAIMER

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

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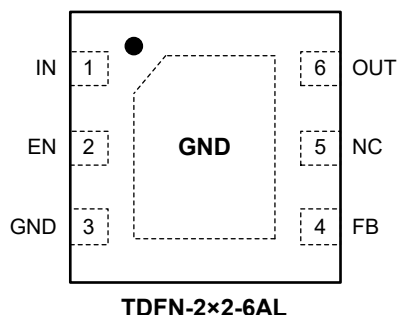
PIN CONFIGURATIONS

SGM2239-FIXQ (TOP VIEW)



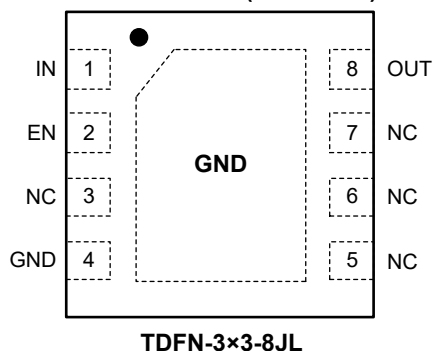
TDFN-2x2-6AL

SGM2239-ADJQ (TOP VIEW)



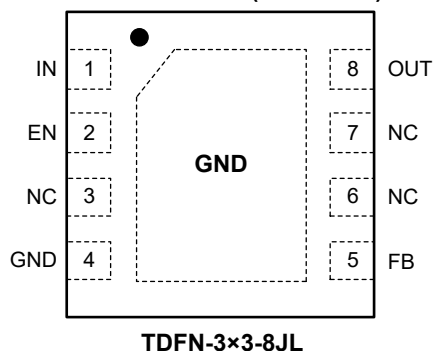
TDFN-2x2-6AL

SGM2239-FIXQ (TOP VIEW)



TDFN-3x3-8JL

SGM2239-ADJQ (TOP VIEW)



TDFN-3x3-8JL

PIN DESCRIPTION

PIN		NAME	FUNCTION
TDFN-2x2-6AL	TDFN-3x3-8JL		
1	1	IN	Input Supply Voltage Pin. It is recommended to use a 1 μ F 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.
2	2	EN	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.
3	4	GND	Ground.
4	5	FB	Feedback Voltage Input Pin (adjustable voltage version only). 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.
		NC	No Connection (Fixed Version Only).
6	8	OUT	Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 1 μ F to 100 μ F to ensure stability. This ceramic capacitor should be placed as close as possible to OUT pin.
5	3, 6, 7	NC	No Connection.
Exposed Pad	Exposed Pad	GND	Exposed Pad. Connect it to GND internally. 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 DIAGRAMS

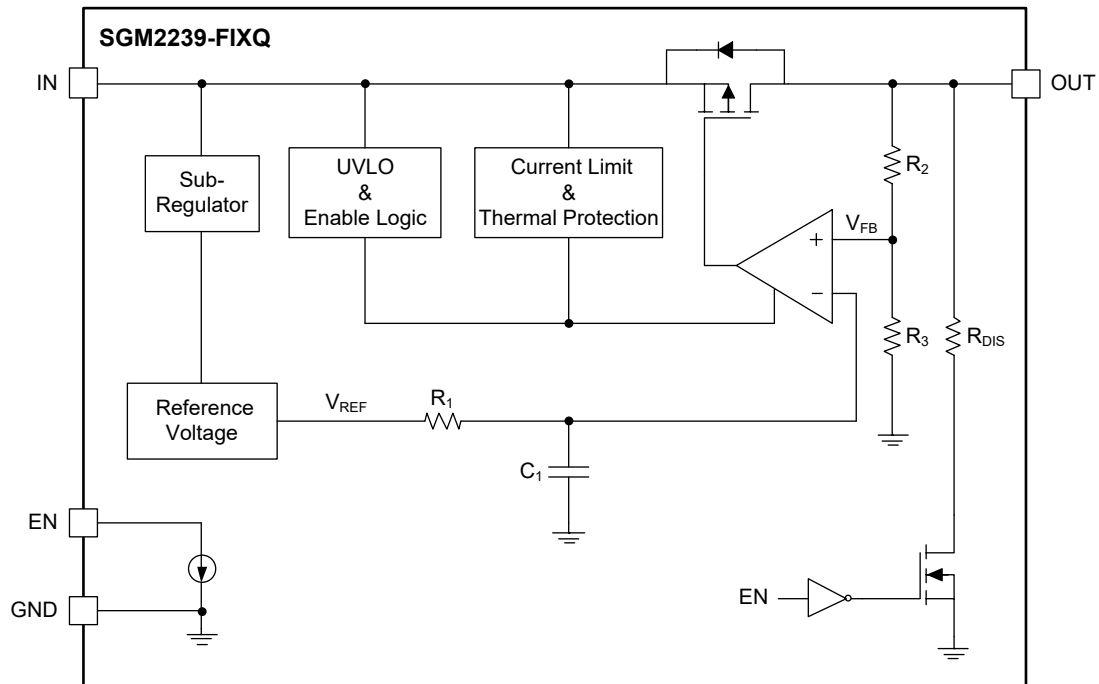


Figure 2. Block Diagram of Fixed Output Version

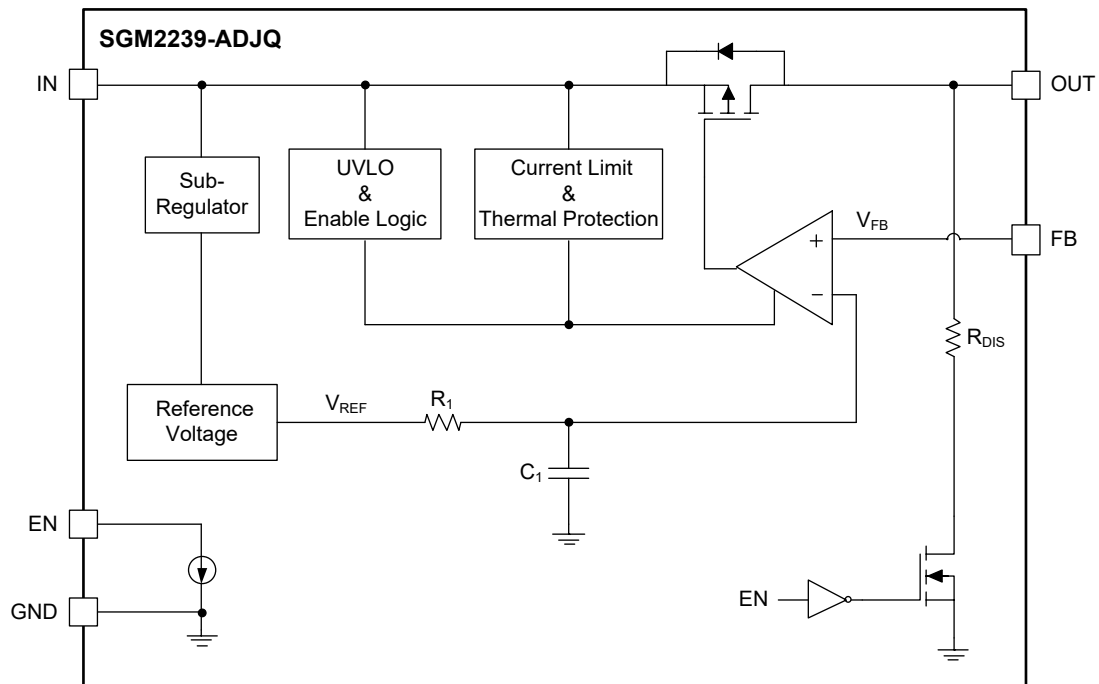


Figure 3. Block Diagram of Adjustable Output Version

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ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT(NOM)} + 2V$, $C_{IN} = 10\mu F$, $C_{OUT} = 10\mu F$, $C_{FF} = 0nF$, $T_J = -40^\circ C$ to $+125^\circ C$ ⁽¹⁾, typical values are at $T_J = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range	V_{IN}		2.5		40	V
Output Voltage Range	V_{OUT}		1.215		35	V
Output Voltage Accuracy	V_{OUT}	$V_{IN} = (V_{OUT(NOM)} + 2V)$ to 40V, $I_{OUT} = 1mA$	$T_J = +25^\circ C$	-1	+1	%
			$T_J = -40^\circ C$ to $+125^\circ C$	-2	+1.5	
Feedback Voltage	V_{FB}	$V_{IN} = (V_{OUT(NOM)} + 2V)$ to 40V, $I_{OUT} = 1mA$	$T_J = +25^\circ C$	1.203	1.215	V
			$T_J = -40^\circ C$ to $+125^\circ C$	1.191	1.215	
FB Pin Input Current	I_{FB}	$V_{FB} = 1.3V$		0.1	100	nA
Under-Voltage Lockout	V_{UVLO}	V_{IN} rising		2.1	2.48	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$V_{IN} = (V_{OUT(NOM)} + 2V)$ to 40V, $I_{OUT} = 0.1mA$		0.0002	0.02	%/V
Load Regulation	$\frac{\Delta V_{OUT}}{\Delta I_{OUT} \times V_{OUT}}$	$I_{OUT} = 0.1mA$ to 300mA		0.0002	0.005	%/mA
Dropout Voltage	V_{DROP}	$V_{OUT(NOM)} \geq 1.8V$, $V_{OUT} = 95\% \times V_{OUT(NOM)}$, $I_{OUT} = 300mA$		900	2200	mV
Output Current Limit	I_{LIMIT}	$V_{IN} = V_{OUT} + 4V$, $V_{OUT} = 90\% \times V_{OUT(NOM)}$	300	755		mA
Short-Circuit Current Limit	I_{SHORT}	$V_{IN} = V_{OUT(NOM)} + 3V$, $V_{OUT} = 0V$		265		mA
Ground Pin Current	I_{GND}	$I_{OUT} = 0mA$		3.2	8	μA
		$I_{OUT} = 300mA$		125	260	
Shutdown Supply Current	I_{SHDN}	$V_{EN} = 0V$, $V_{IN} = 2.5$ to 40V		0.3	1.5	μA
EN Pin High-Level Input Voltage	V_{IH}	$V_{IN} = 2.5$ to 40V	1.8		40	V
EN Pin Low-Level Input Voltage	V_{IL}	$V_{IN} = 2.5$ to 40V	0		1	V
EN Pin Input Current	I_{EN}	$V_{EN} = 0V$, $V_{IN} = 40V$		5	500	nA
		$V_{EN} = 40V$, $V_{IN} = 40V$		50	1000	
Output Discharge Resistance	R_{DIS}	$V_{EN} = 0V$		215		Ω
Turn-On Time	t_{ON}	From assertion of V_{EN} to $V_{OUT} = 90\% \times V_{OUT(NOM)}$	$V_{OUT(NOM)} = 1.215V$		0.8	ms
			$V_{OUT(NOM)} = 2.5V$		0.9	
			$V_{OUT(NOM)} = 3.3V$		1.0	
			$V_{OUT(NOM)} = 5.0V$		1.3	
			$V_{OUT(NOM)} = 12V$		2.8	
Power Supply Ripple Rejection	PSRR	$V_{IN} = 2.5V$, $V_{OUT} = 1.215V$, $I_{OUT} = 10mA$, $C_{OUT} = 4.7\mu F$	$f = 100Hz$		61	dB
			$f = 1kHz$		45	
			$f = 100kHz$		40	
		$V_{IN} = 5.3V$, $V_{OUT} = 3.3V$, $I_{OUT} = 10mA$, $C_{OUT} = 4.7\mu F$	$f = 100Hz$		61	
			$f = 1kHz$		45	
			$f = 100kHz$		45	
Output Voltage Noise	e_n	$I_{OUT} = 10mA$, $C_{OUT} = 4.7\mu F$, $f = 10Hz$ to 100kHz	$V_{OUT} = 1.215V$		55	μV_{RMS}
			$V_{OUT} = 3.3V$		105	
Thermal Shutdown Temperature	T_{SHDN}	T_J rising		160		$^\circ C$
Thermal Shutdown Hysteresis	ΔT_{SHDN}	Hysteresis		20		$^\circ C$

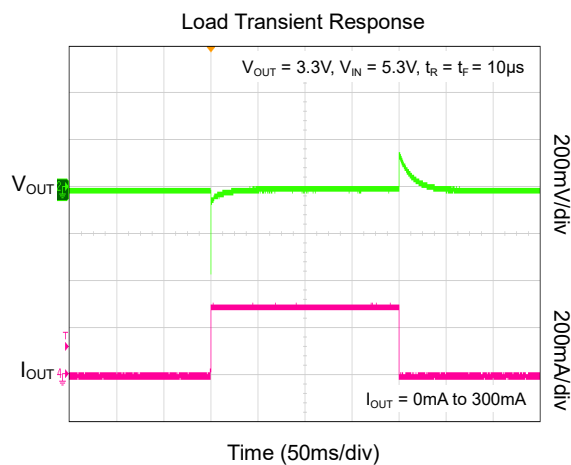
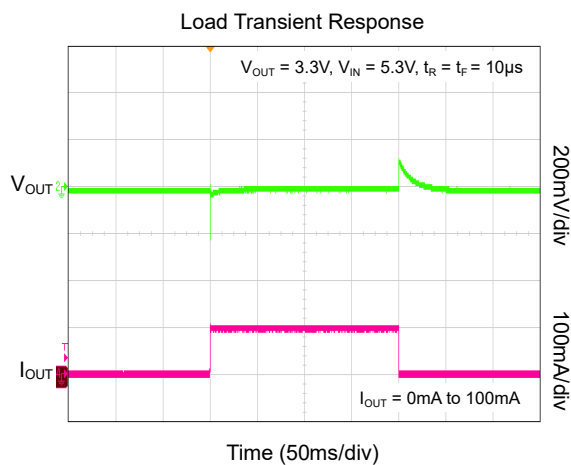
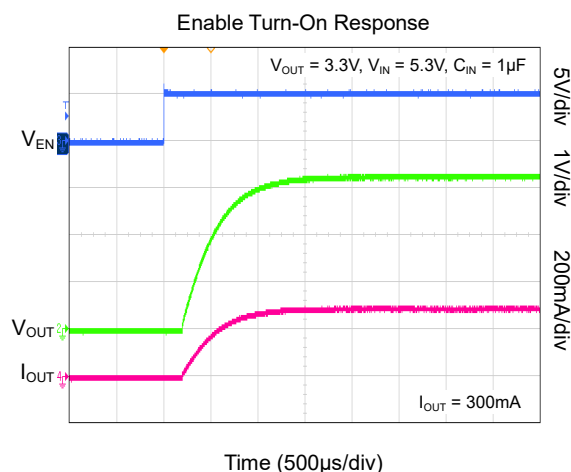
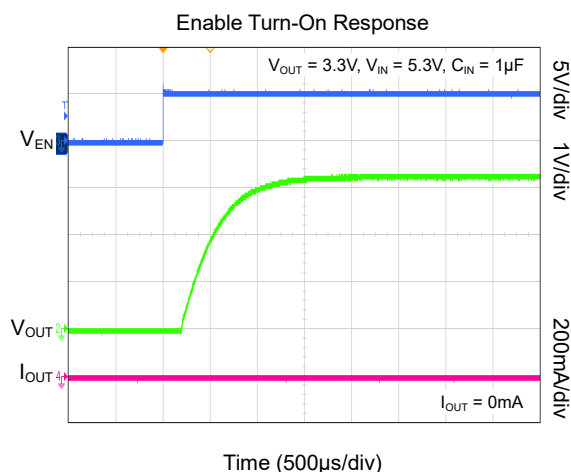
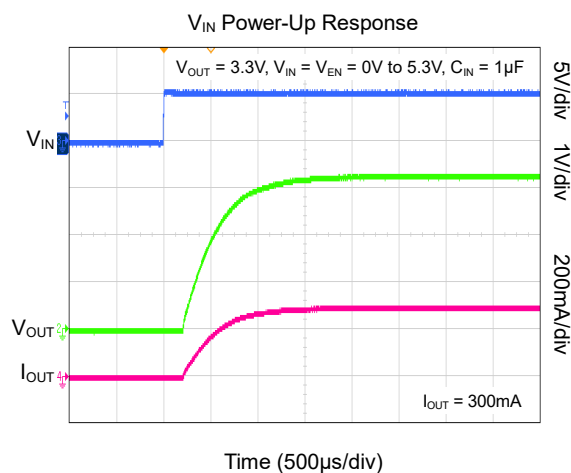
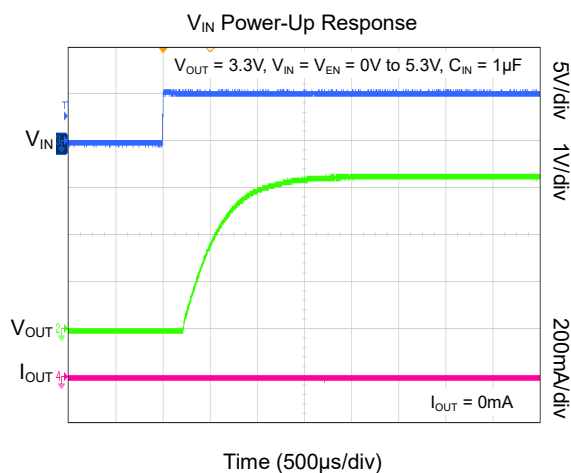
NOTE:

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

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TYPICAL PERFORMANCE CHARACTERISTICS

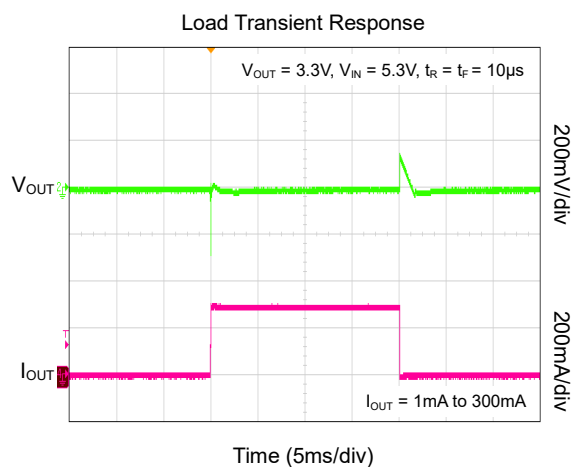
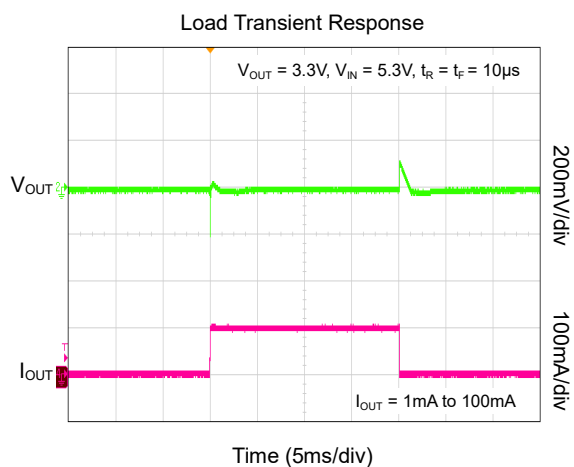
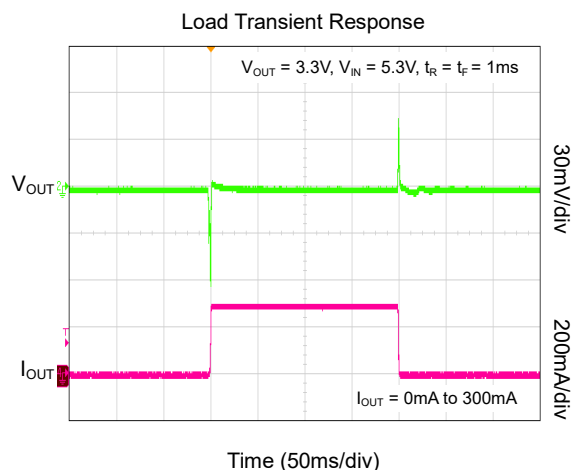
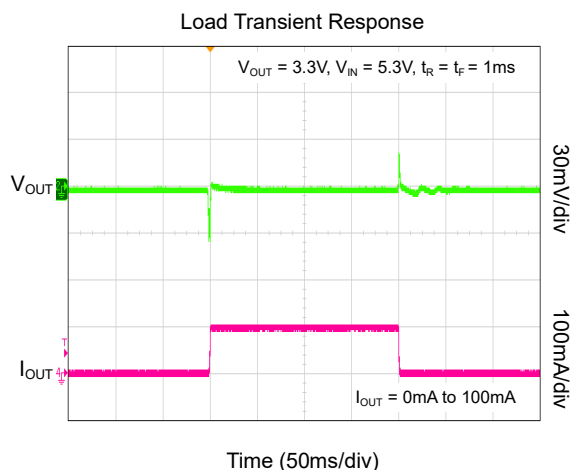
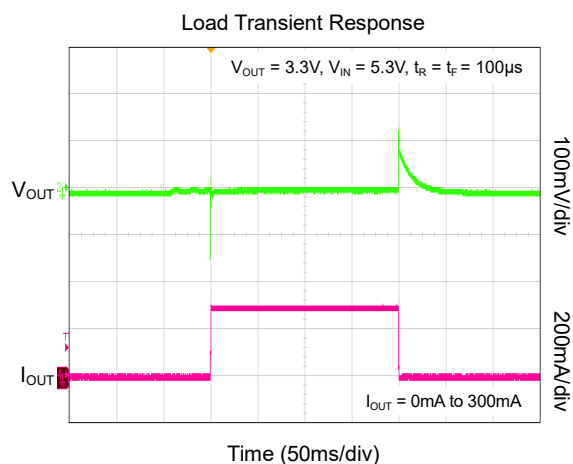
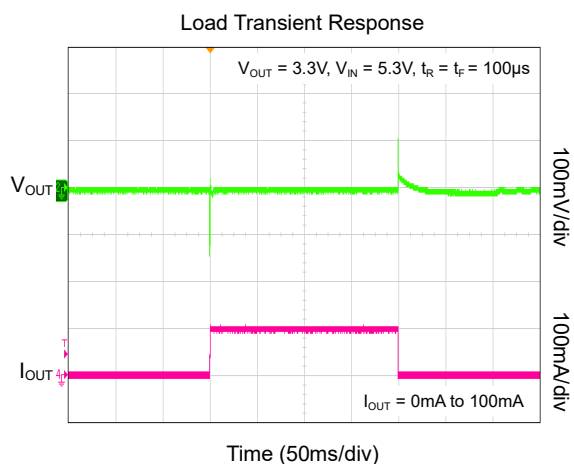
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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

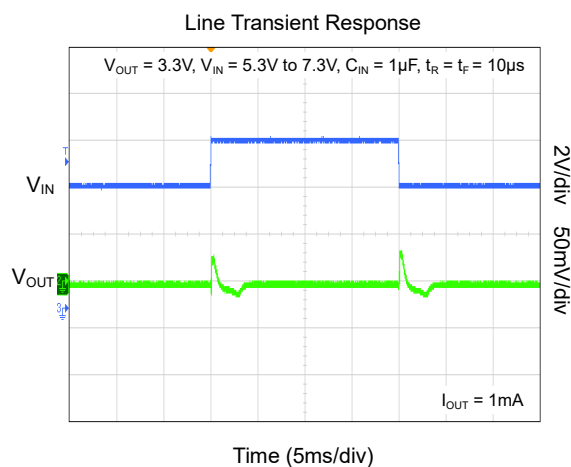
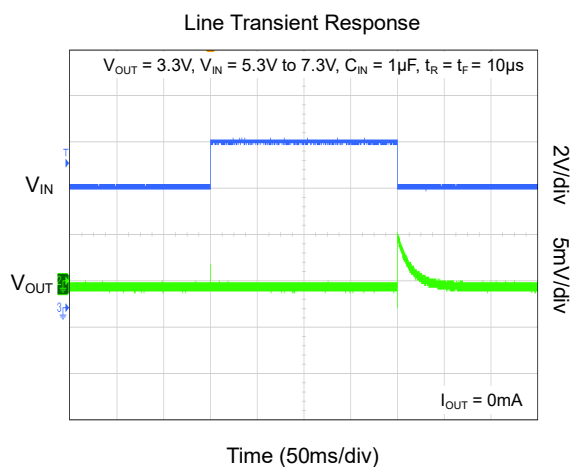
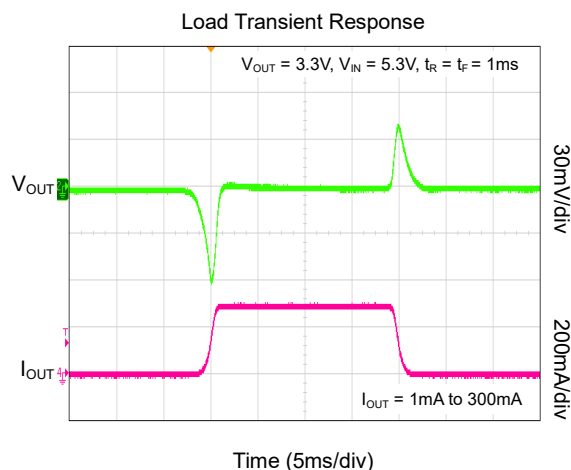
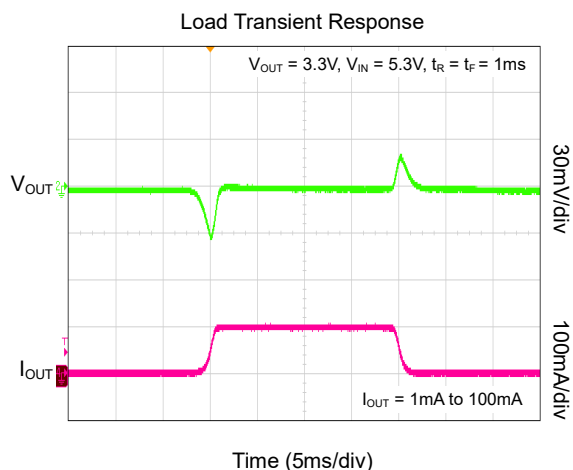
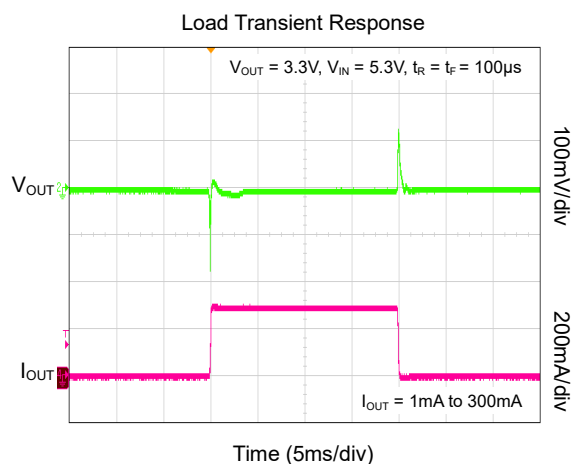
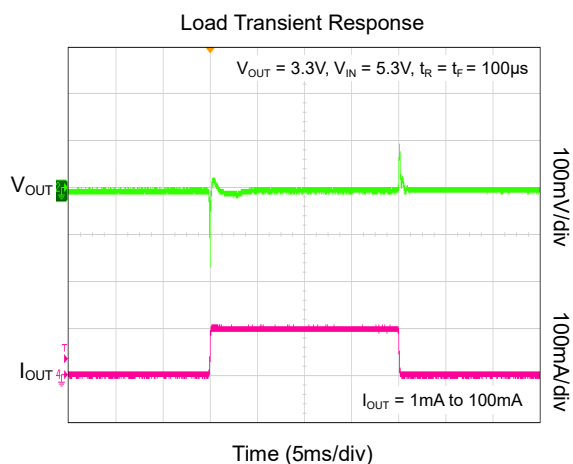
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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$, $V_{EN} = V_{IN}$, $C_{IN} = 10\mu\text{F}$, $C_{OUT} = 10\mu\text{F}$, $C_{FF} = 0\text{nF}$, unless otherwise noted.

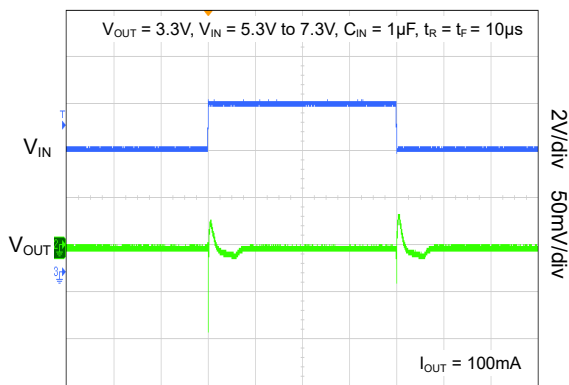


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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

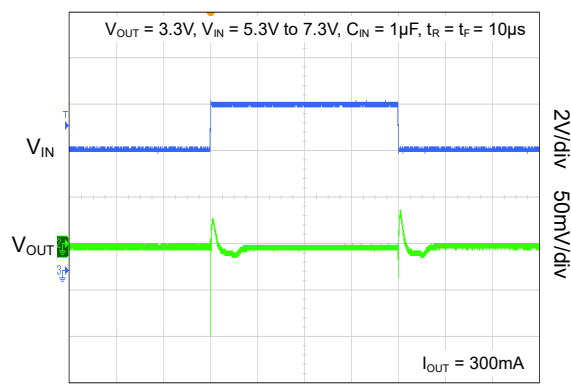
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Line Transient Response



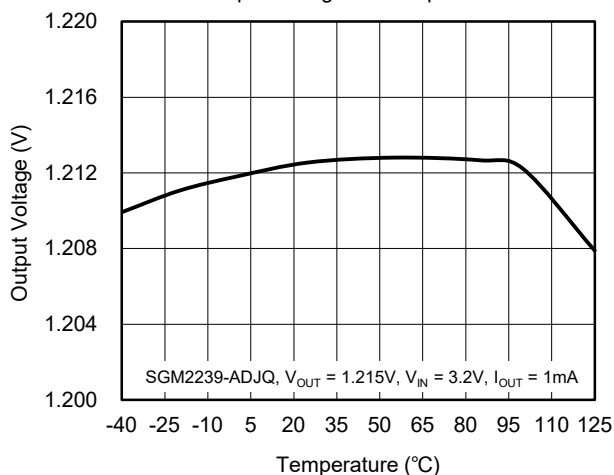
Time (5ms/div)

Line Transient Response

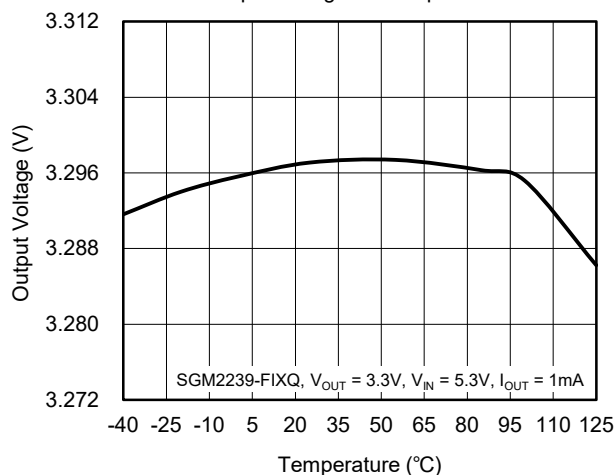


Time (5ms/div)

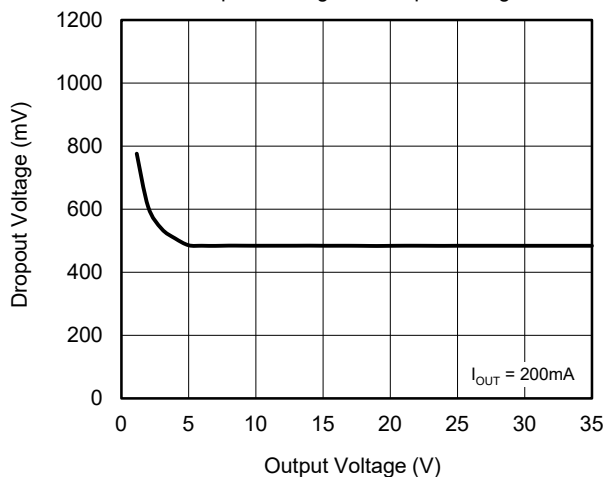
Output Voltage vs. Temperature



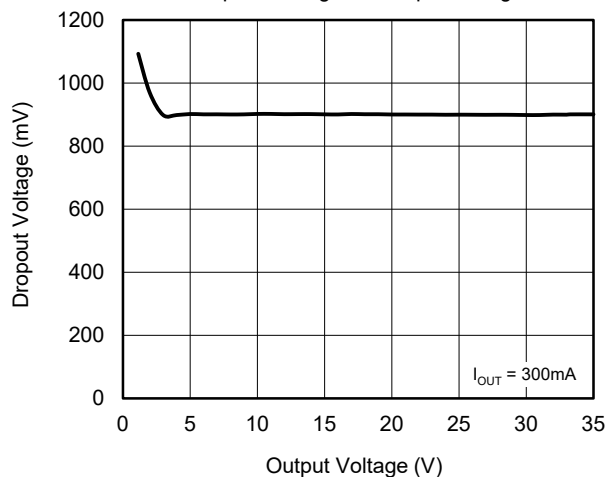
Output Voltage vs. Temperature



Dropout Voltage vs. Output Voltage



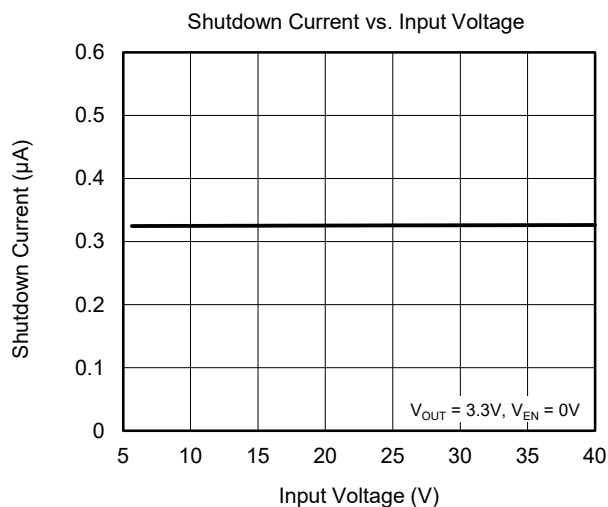
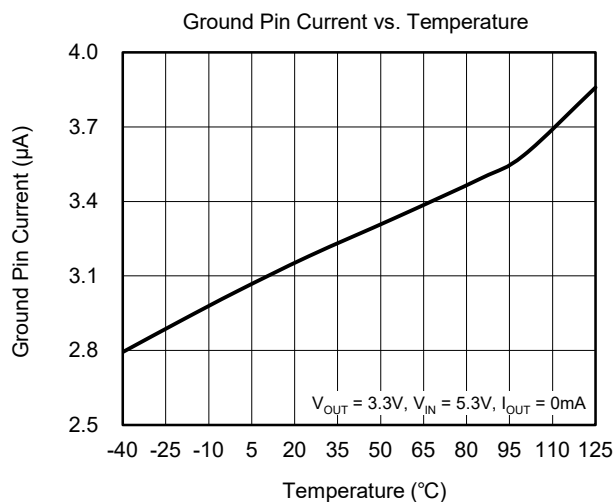
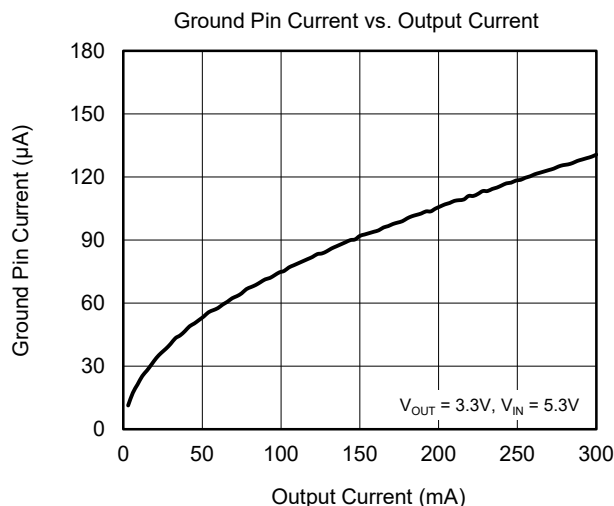
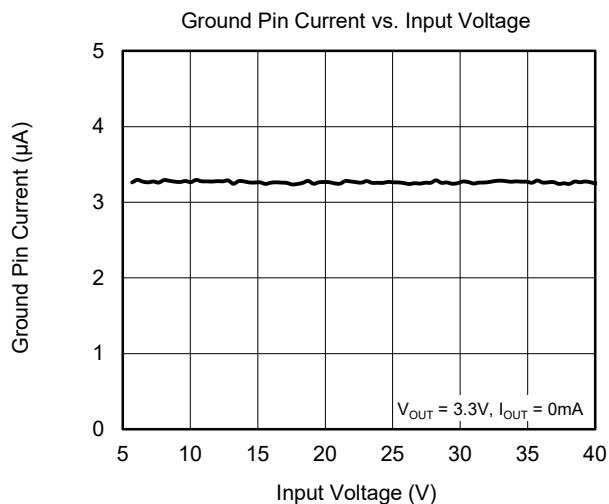
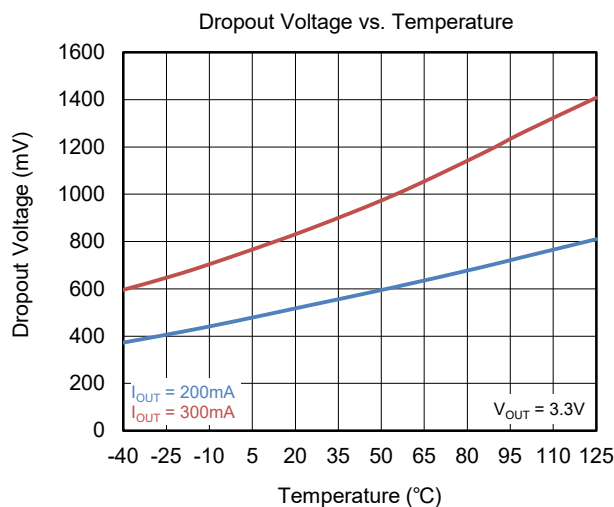
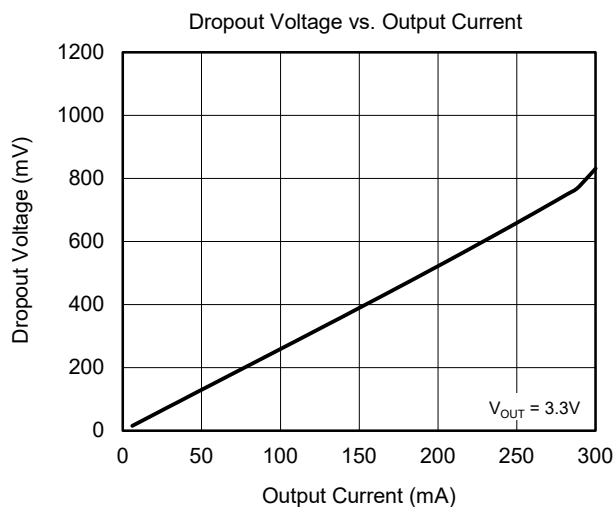
Dropout Voltage vs. Output Voltage



SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

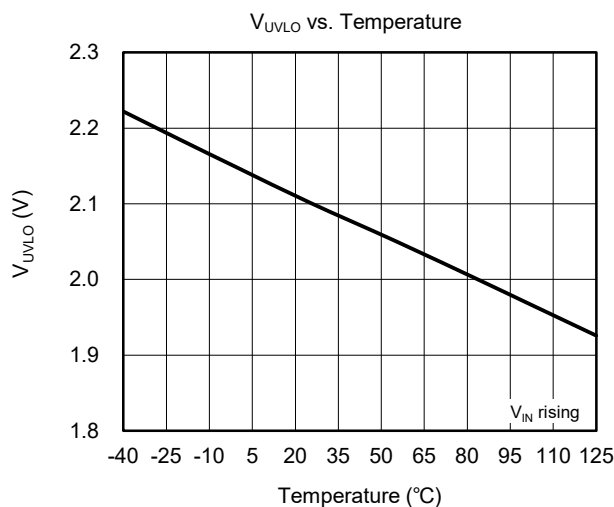
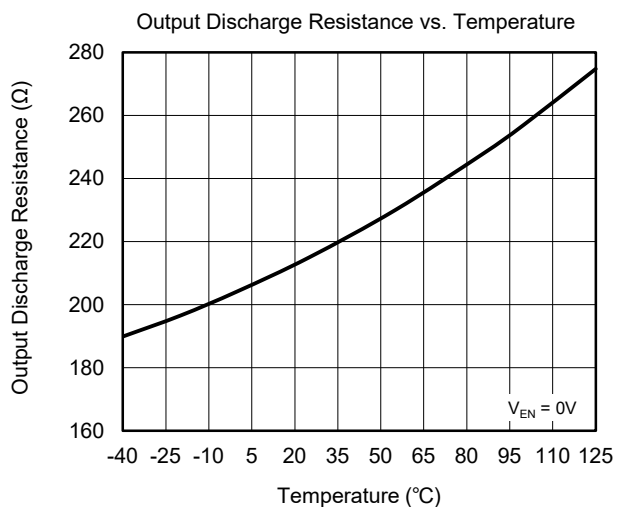
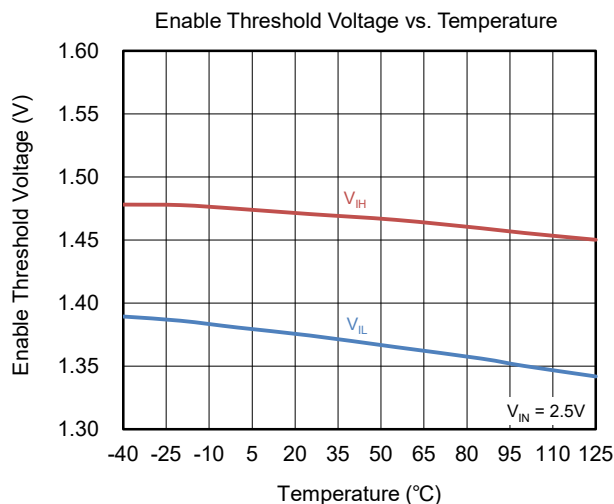
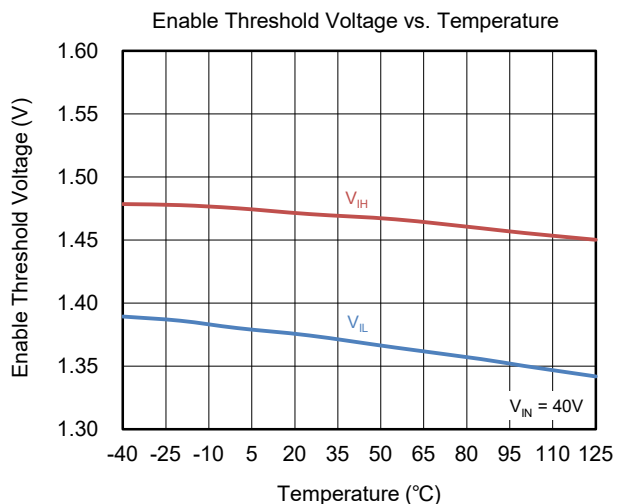
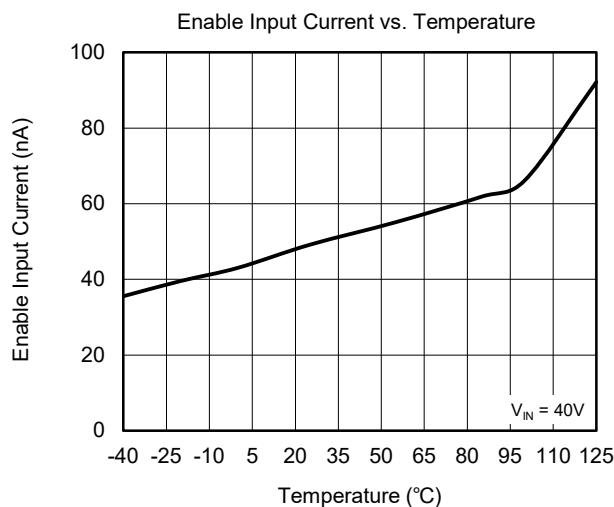
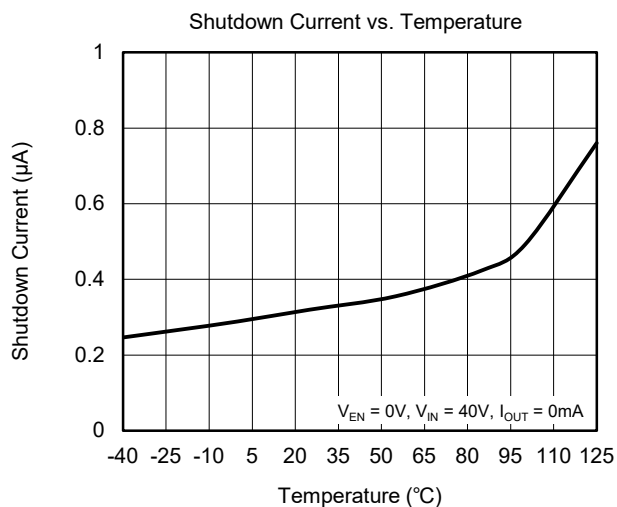
$T_J = +25^\circ\text{C}$, $V_{EN} = V_{IN}$, $C_{IN} = 10\mu\text{F}$, $C_{OUT} = 10\mu\text{F}$, $C_{FF} = 0\text{nF}$, unless otherwise noted.



SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

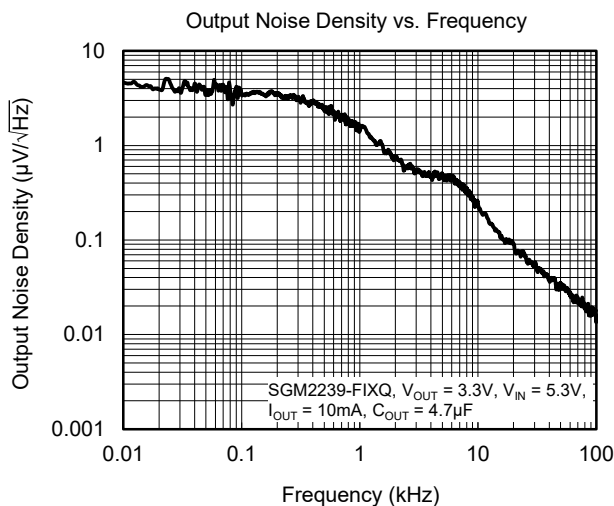
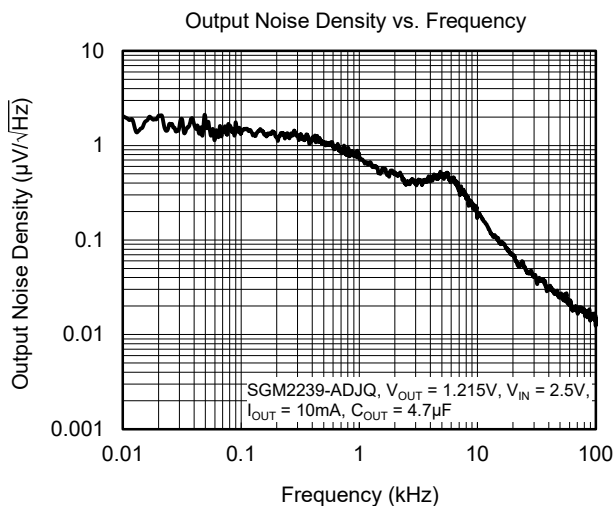
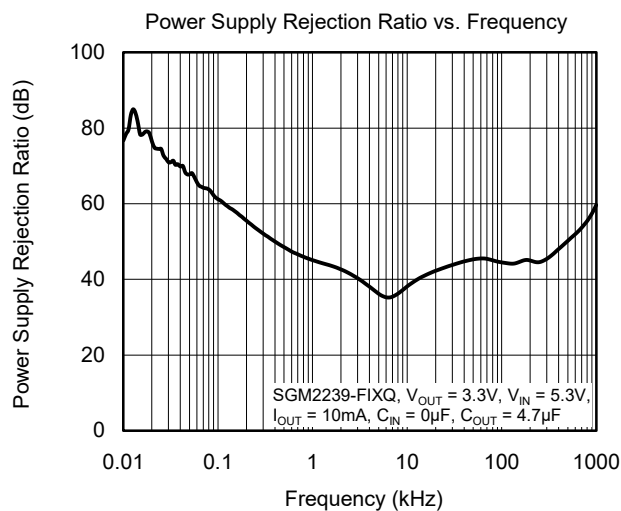
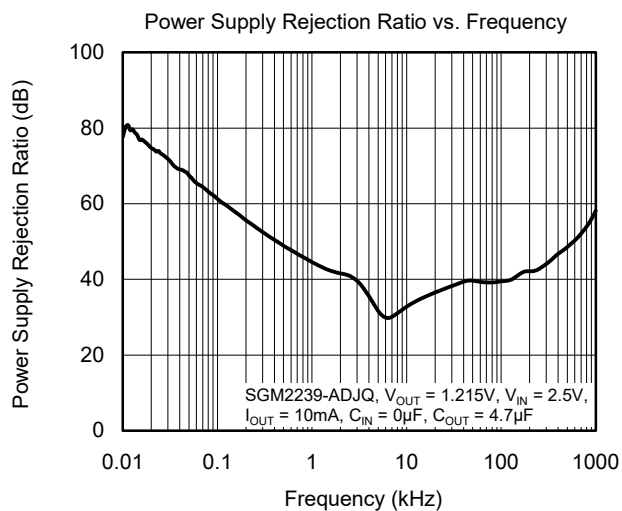
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Automotive 40V, 300mA, Low Quiescent SGM2239xQ Current and Low Dropout Voltage Linear Regulator

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$, $V_{EN} = V_{IN}$, $C_{IN} = 10\mu\text{F}$, $C_{OUT} = 10\mu\text{F}$, $C_{FF} = 0\text{nF}$, unless otherwise noted.



SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

APPLICATION INFORMATION

The SGM2239xQ is a high voltage, low quiescent current and low dropout LDO and provides 300mA 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 SGM2239xQ useful in a variety of applications. The SGM2239xQ provides protection functions for output overload and overheating.

Input Capacitor Selection (C_{IN})

The input decoupling capacitor should be placed as close as possible to the IN pin to ensure the device stability. 1 μ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When V_{IN} 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 to keep it below the device absolute maximum ratings. For C_{OUT} with larger capacitance, it is recommended to choose the larger capacitance C_{IN} .

Output Capacitor Selection (C_{OUT})

One or more output capacitors are required to maintain the stability of the LDO, and the output capacitors should be placed as close as possible to the OUT pin. In addition, in order to obtain the best transient performance, it is recommended to use X7R and X5R ceramic capacitors as output capacitors. Ceramic capacitors have low equivalent series resistance (ESR), excellent temperature and DC bias characteristics. However, it cannot be ignored that the effective capacitance of ceramic capacitors is affected by temperature, DC bias and package size.

For example, Figure 4 shows the capacitance and DC bias and temperature characteristics of 0805, 10V, 10 μ F $\pm$ 10%, X7R capacitor. Therefore, it is necessary to evaluate whether the effective capacitance of the output capacitor can meet the stability requirements of the LDO in practical applications. In general, a capacitor in higher voltage rating and a larger package exhibits better stability, and the effective capacitance can be obtained from the manufacturer datasheet.

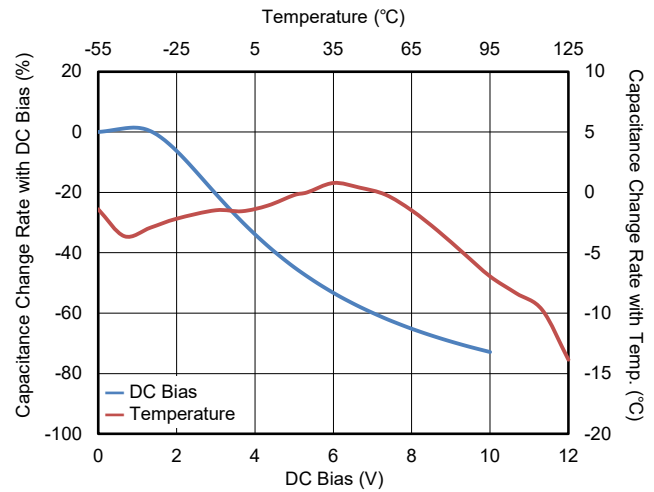


Figure 4. Capacitance vs. DC Bias and Temperature Characteristics

The SGM2239xQ requires a minimum effective capacitance of 1 μ F for C_{OUT} to ensure stability. Additionally, C_{OUT} with larger capacitance and lower ESR will help increase the high frequency PSRR and improve the load transient response.

Adjustable Regulator

The output voltage of the SGM2239-ADJQ can be adjusted from 1.215V to 35V. The FB pin will be connected to two external resistors as shown in Figure 5. 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_{OUT} is output voltage and V_{FB} is the internal voltage reference, $V_{FB} = 1.215V$. One parallel capacitor (C_{FF}) with R_1 can be used to improve the feedback loop stability and PSRR, increase the transient response and reduce the output noise. R_1 and R_2 can be calculated for any output voltage range using equation 1. Choose $R_2 \leq 1M\Omega$ to maintain a 1.215 μ A minimum load.

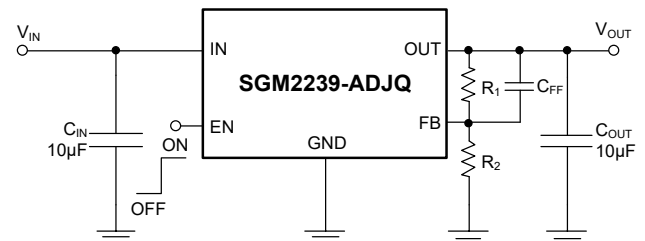


Figure 5. Adjustable Output Voltage Application

SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

APPLICATION INFORMATION (continued)

Enable Operation

The EN pin of the SGM2239xQ is used to enable/disable the device and to deactivate/activate the output automatic discharge function.

When the EN pin voltage is lower than 1V, 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 215Ω (TYP) resistor.

When the EN pin voltage is higher than 1.8V, the device is in active state. The output voltage is regulated to the expected value and the automatic discharge transistor is turned off.

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 SGM2239xQ. 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 SGM2239xQ.

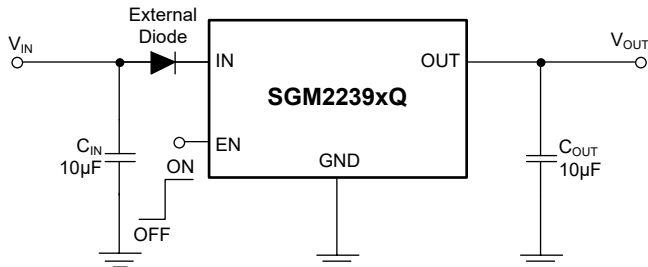


Figure 6. Reverse Protection Reference Design

Output Current Limit Protection

When overload events happen, the output current is internally limited to 755mA (TYP). When the OUT pin is shorted to ground, the output current is internally limited to 265mA (TYP).

Thermal Shutdown

When the die temperature exceeds the threshold value of thermal shutdown, the SGM2239xQ will be in shutdown state and it will remain in this state until the die temperature decreases to +140°C.

Power Dissipation (P_D)

Power dissipation (P_D) of the SGM2239xQ 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 SGM2239xQ 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 (θ_{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.

SGM2239xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

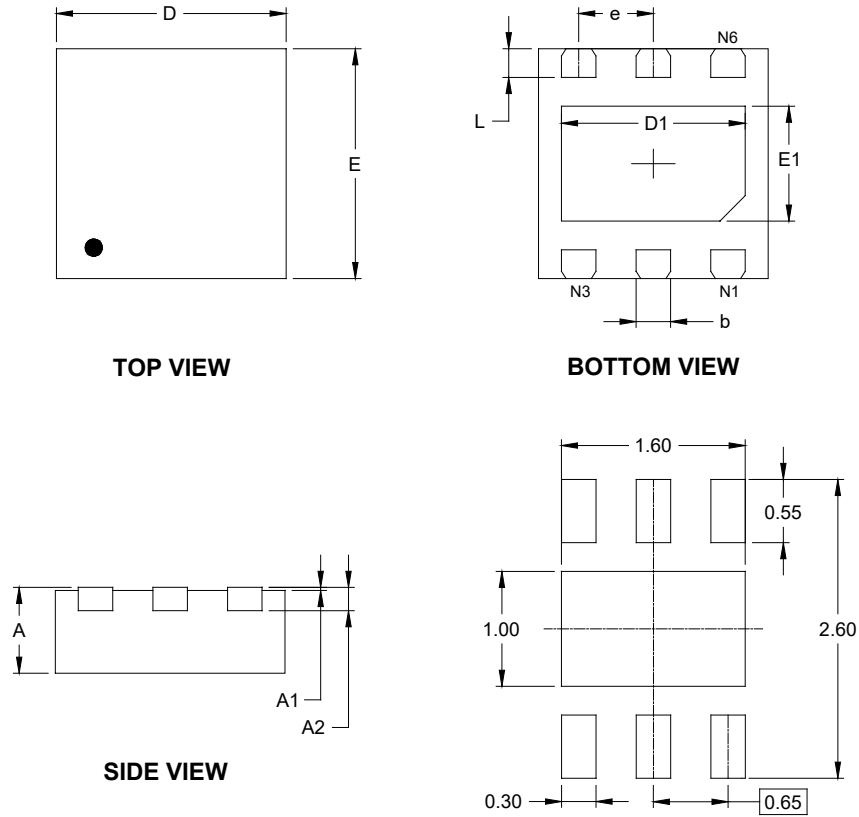
REVISION HISTORY

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

MAY 2025 – REV.A.1 to REV.A.2	Page
Updated Electrical Characteristics section	6
Updated Typical Performance Characteristics section	10, 12
Updated Application Information section	15
APRIL 2025 – REV.A to REV.A.1	Page
Updated Electrical Characteristics section	6
Changes from Original (MARCH 2025) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

TDFN-2×2-6AL

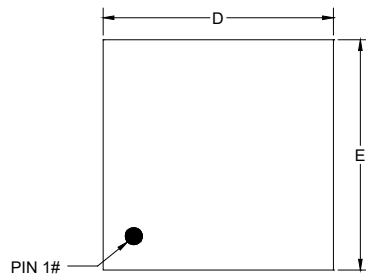


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.500	1.700	0.059	0.067
E	1.900	2.100	0.075	0.083
E1	0.900	1.100	0.035	0.043
b	0.250	0.350	0.010	0.014
e	0.650 BSC		0.026 BSC	
L	0.174	0.326	0.007	0.013

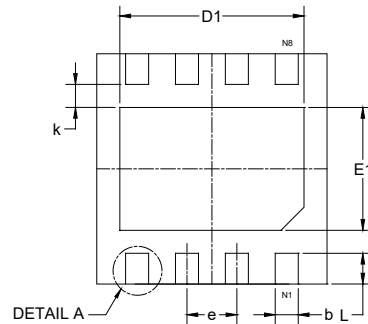
NOTE: This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

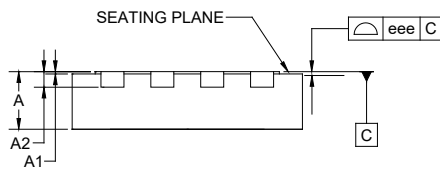
TDFN-3×3-8JL



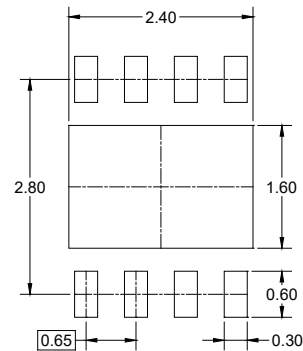
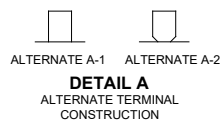
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

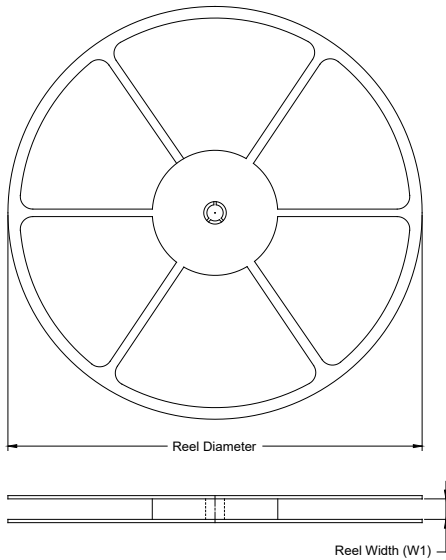
Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.250	-	0.350
D	2.900	-	3.100
D1	2.300	-	2.500
E	2.900	-	3.100
E1	1.500	-	1.700
e	0.650 BSC		
k	0.300 REF		
L	0.300	-	0.500
eee	0.080		

NOTE: This drawing is subject to change without notice.

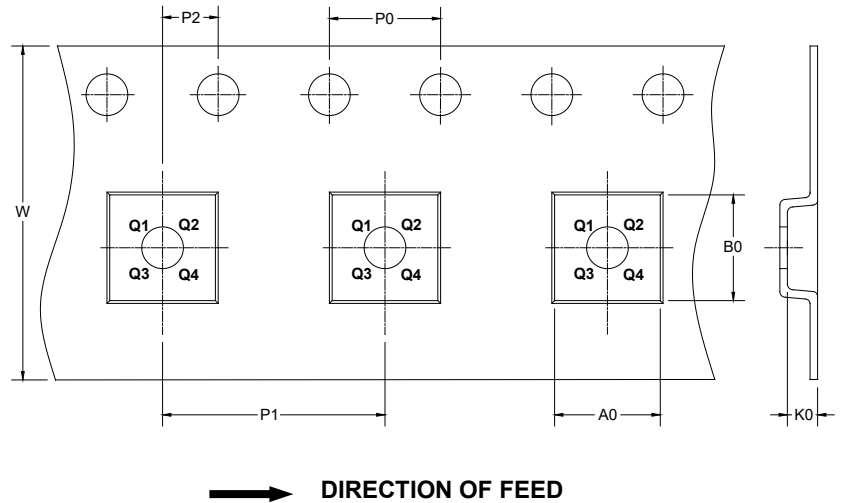
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

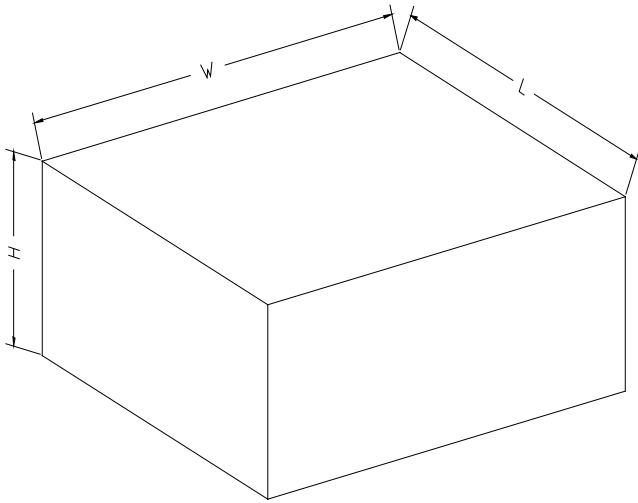
KEY PARAMETER LIST OF TAPE AND REEL

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-2×2-6AL	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1
TDFN-3×3-8JL	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD00001

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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002