



SGM8434-2Q

Automotive, 1.8A Output Current, Dual Power Operational Amplifier

GENERAL DESCRIPTION

The SGM8434-2Q is a dual operational amplifier designed for high voltage, high current output applications. It operates over a supply voltage range of 5V to 36V and provides a maximum short-circuit output current of 2A. For AC performance, the device offers a 3.2MHz bandwidth and a 75° phase margin, ensuring stable operation. An integrated over-temperature protection circuit further enhances device safety.

The SGM8434-2Q power operational amplifier serves as a high-performance driver in applications such as servo amplifiers and power supplies. Its crossover distortion-free design is critical for optimal coil driving.

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

The SGM8434-2Q is available in a Green SOIC-16 (300mil) package. It is specified over the 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 $+125^{\circ}\text{C}$
- **Wide Supply Ranges:**
 - ♦ **Single-Supply:** 5V to 36V
 - ♦ **Dual-Supply:** $\pm 2.5\text{V}$ to $\pm 18\text{V}$
- **Rail-to-Rail Input and Output**
- **Output Current Limit:** 1.8A (TYP) at $V_S = \pm 2.5\text{V}$
- **Wide Bandwidth:** 3.2MHz (TYP)
- **Slew Rate:** 9V/ μs (TYP) at $V_S = \pm 18\text{V}$
- **Excellent Phase Margin:** 75°
- **Free of Deadband Crossover Distortion**
- **Thermal Protection**
- **Available in a Green SOIC-16 (300mil) Package**

APPLICATIONS

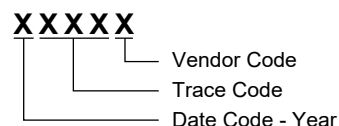
Automotive Applications
Motor Drivers
Industrial Equipment
Laser TVs
Servo Systems
Power Amplifiers

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8434-2Q	SOIC-16 (300mil)	-40°C to +125°C	SGM8434-2QWS16G/TR	2AHWS16 XXXXX	Tape and Reel, 1500

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

Supply Voltage, $+V_S$ to $-V_S$	40V
Input Differential Voltage Range, V_{ID}	See Note 1
Input Voltage Range, V_{IN}	See Note 1
DC Output Current, I_{OUT}	
$V_S = 5V$	1.8A (TYP)
Peak Output Current (Nonrepetitive), I_{PK}	
$V_S = 5V$	2.6A (TYP)
$V_S = 36V$	3.6A (TYP)
Package Thermal Resistance	
SOIC-16 (300mil), θ_{JA}	58.1°C/W
SOIC-16 (300mil), θ_{JB}	19.2°C/W
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility ^{(2) (3)}	
HBM	±4000V
CDM	±1000V

NOTES:

1. Inputs are constrained within the supply rails ($\pm V_S$).
2. For human body model (HBM), all pins comply with AEC-Q100-002 specification.
3. For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range	5V to 36V
Operating Temperature Range	-40°C to +125°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.

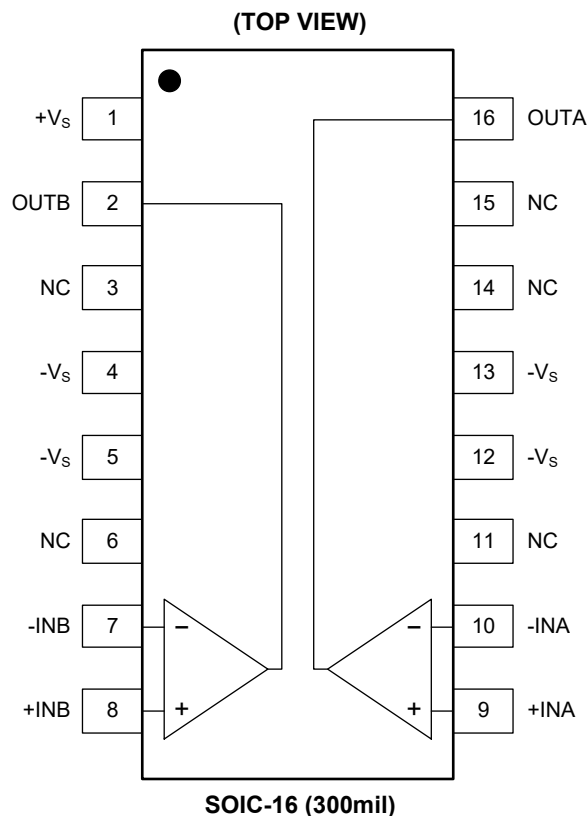
ESD SENSITIVITY CAUTION

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	TYPE	FUNCTION
1	+V _S	—	Positive Power Supply.
2	OUTB	O	Output of Amplifier B.
3, 6, 15	NC	—	No Internal Connection. Do not connect.
11, 14	NC	—	Initial Manufacture Test Pin. Do not connect these two NC pins to any pin other than -V _S , or they can also be left floating.
4, 5, 12, 13	-V _S	—	Negative Power Supply. Both negative supply pins must be used and connected together on board.
7	-INB	I	Inverting Input of Amplifier B.
8	+INB	I	Non-Inverting Input of Amplifier B.
9	+INA	I	Non-Inverting Input of Amplifier A.
10	-INA	I	Inverting Input of Amplifier A.
16	OUTA	O	Output of Amplifier A.

NOTE: PIN 11 and PIN 14 need to be connected to -V_S or left floating.

ELECTRICAL CHARACTERISTICS

(V_S = 5V to 36V, R_L = 2kΩ connected to V_S/2, Full = -40°C to +125°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER		SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Characteristics								
Input Offset Voltage		V _{OS}		+25°C		±0.15	±1.5	mV
				Full			±2	
Input Offset Voltage Drift		ΔV _{OS} /ΔT		Full		±10		μV/°C
Input Bias Current		I _B		+25°C		±30	±500	pA
				Full			±32	nA
Input Offset Current		I _{OS}		+25°C		±30	±500	pA
				Full			±12	nA
Input Common Mode Voltage Range		V _{CM}		Full	-V _S		+V _S	V
Common Mode Rejection Ratio		CMRR	V _S = 5V, V _{CM} = -V _S to +V _S	+25°C	75	92		dB
				Full	72			
			V _S = 36V, V _{CM} = -V _S to +V _S	+25°C	89	108		
				Full	86			
Large-Signal Voltage Gain		A _{VO}	V _S = ±2.5V, V _{OUT} = ±2V	+25°C	104	128		dB
				Full	100			
			V _S = ±18V, V _{OUT} = ±13V	+25°C	115	140		
				Full	112			
Input Impedance	Differential	Z _{ID}		+25°C		100 3.2		GΩ pF
	Common Mode	Z _{IC}		+25°C		500 7		
Output Characteristics								
Output Voltage Swing from Rail		V _{OH}	V _S = ±18V, I _L = 100mA	+25°C		100	150	mV
				Full			200	
		V _{OL}		+25°C		60	100	
				Full			120	
		V _{OH}	V _S = ±12V, I _L = 1A	+25°C		1.1	1.5	V
				Full			1.8	
		V _{OL}		+25°C		0.6	1.0	
				Full			1.2	
Output Short-Circuit Current		I _{LIM}	Sinking, V _S = ±2.5V, V _{OUT} = V _S /2	+25°C	1.6	1.8	2.0	A
			Sourcing, V _S = ±2.5V, V _{OUT} = V _S /2	+25°C	1.6	1.8	2.0	
Power Supply								
Operating Voltage Range		V _S		+25°C	5		36	V
Power Supply Rejection Ratio		PSRR		+25°C	114	134		dB
				Full	110			
Total Quiescent Current		I _Q		+25°C		5.5	7.0	mA
				Full			7.2	

ELECTRICAL CHARACTERISTICS (continued)(V_S = 5V to 36V, R_L = 2kΩ connected to V_S/2, Full = -40°C to +125°C, typical values are at T_A = +25°C, unless otherwise noted.)⁽¹⁾

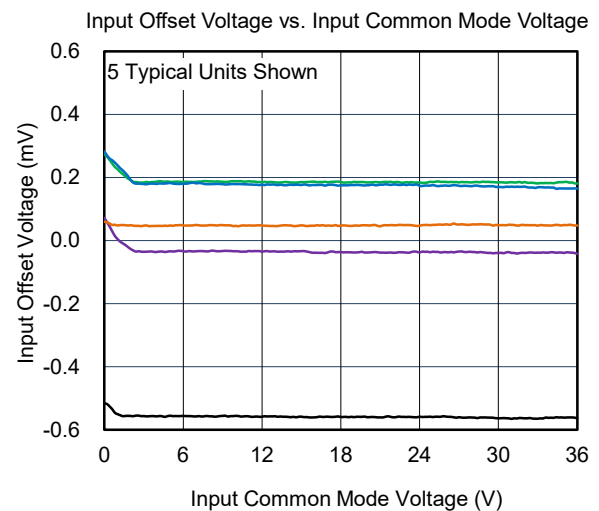
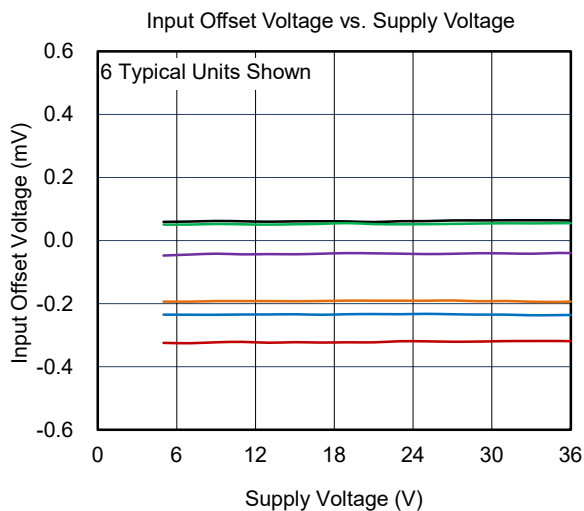
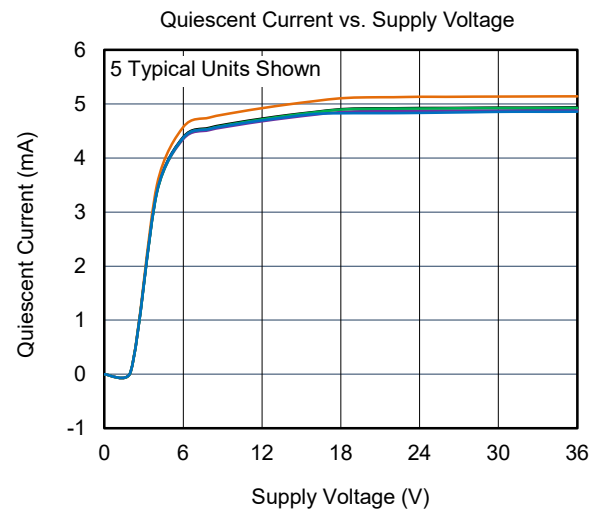
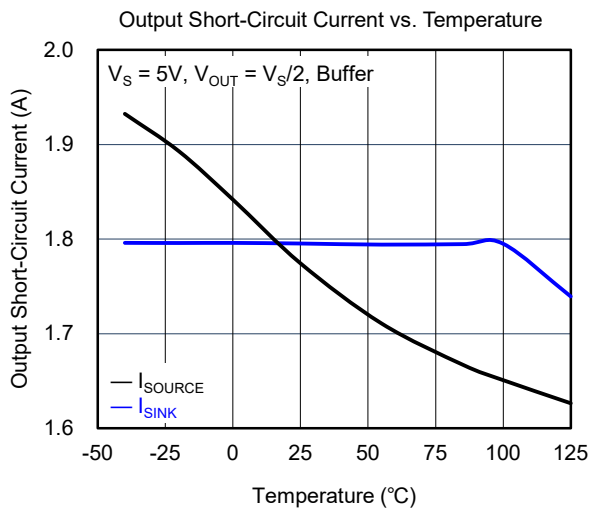
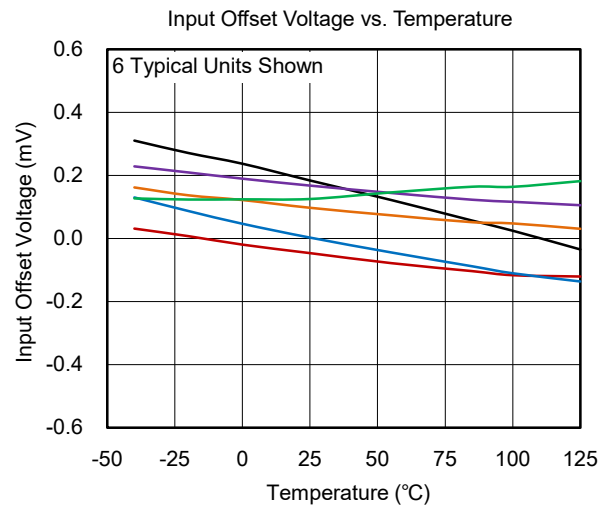
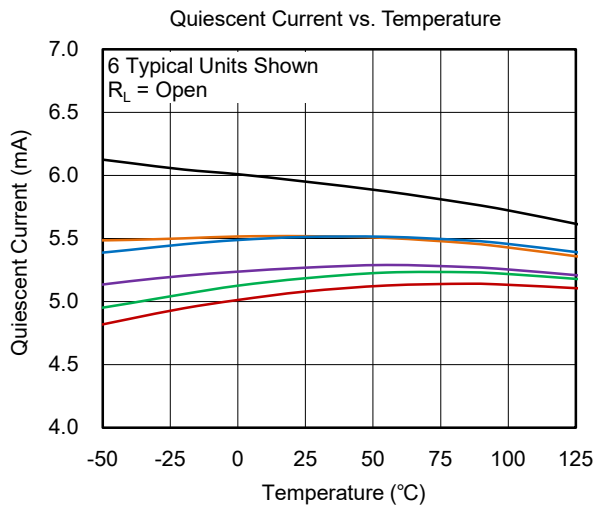
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN ⁽²⁾	TYP	MAX	UNITS
Dynamic Performance							
Gain-Bandwidth Product	GBP	f = 100kHz, C _L = 100pF	+25°C	2	3.2		MHz
			Full	1.8			
Phase Margin	φ _O	V _S = ±18V, C _L = 100pF	+25°C		75		°
Gain Margin	G _M	C _L = 100pF	+25°C		17		dB
Slew Rate	SR	V _S = ±18V, V _{IN} = -10V to +10V, G = -1, C _L = 100pF	Full	4.5	9		V/μs
		V _S = ±2.5V, V _{IN} = -1V to +1V, G = -1, C _L = 100pF	Full	1.5	5		
Settling Time to 0.1%	t _S	V _{IN} = -10V to +10V, G = -1, C _L = 100pF	+25°C		3		μs
Overload Recovery Time	ORT	V _{IN} × G > V _S	+25°C		3		μs
Total Harmonic Distortion + Noise	THD+N	V _{OUT} = 0.5V _{RMS} , G = -1, f = 1kHz, R _L = 50Ω	+25°C		103		dB
Channel Separation		f = 10kHz	+25°C		110		dB
Noise							
Input Voltage Noise		f = 0.1Hz to 10Hz	+25°C		1.3		μV _{RMS}
Equivalent Input Noise Voltage Density	e _n	f = 1kHz to 100kHz, R _S = 100Ω	+25°C		22		nV/√Hz
Input Current Noise Density	i _n	f = 1kHz	+25°C		20		fA/√Hz
Thermal Protection							
Thermal Shutdown					160		°C
Thermal Shutdown Recovery					135		°C

NOTES:

1. A diode between -V_S and ground is recommended to protect the device if -V_S is disconnected before +V_S.
2. Specified by design and characterization, not production tested.

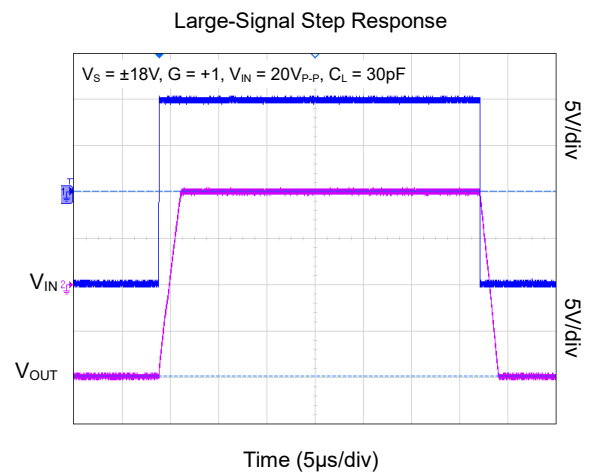
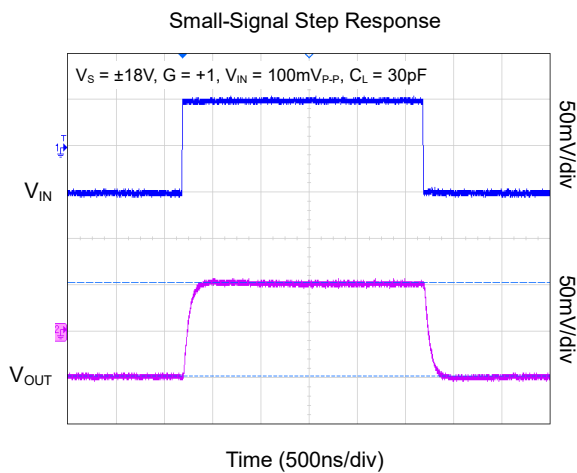
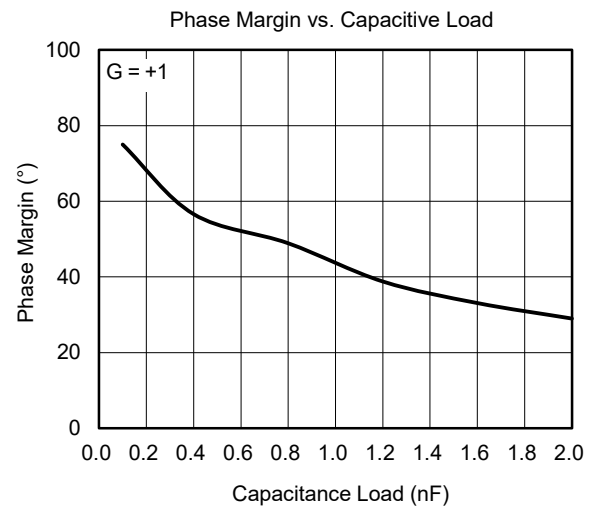
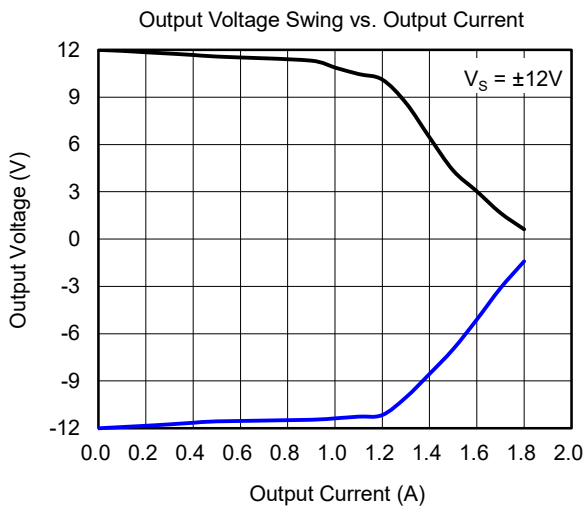
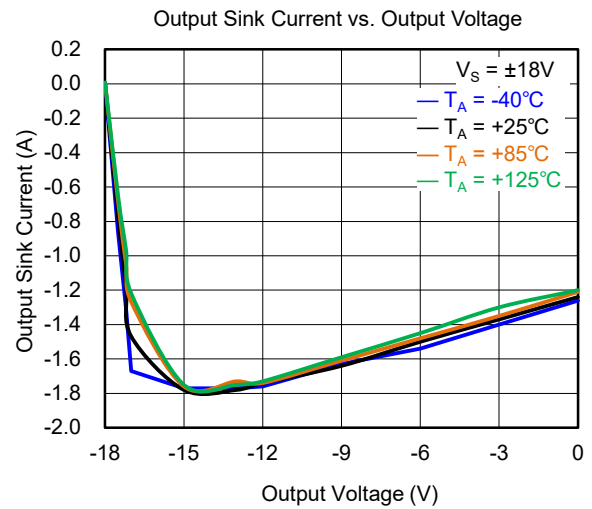
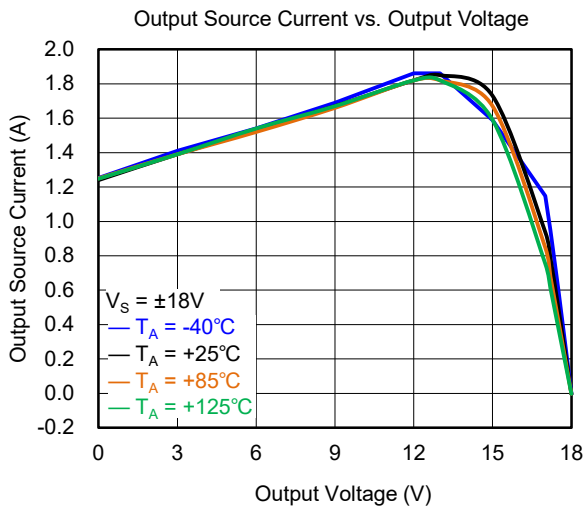
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = 36\text{V}$, $V_{CM} = V_S/2$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

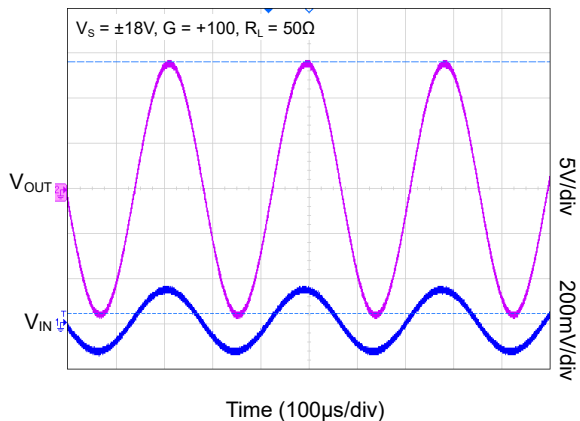
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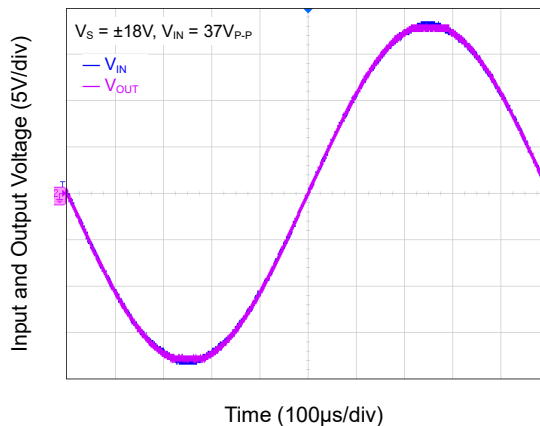
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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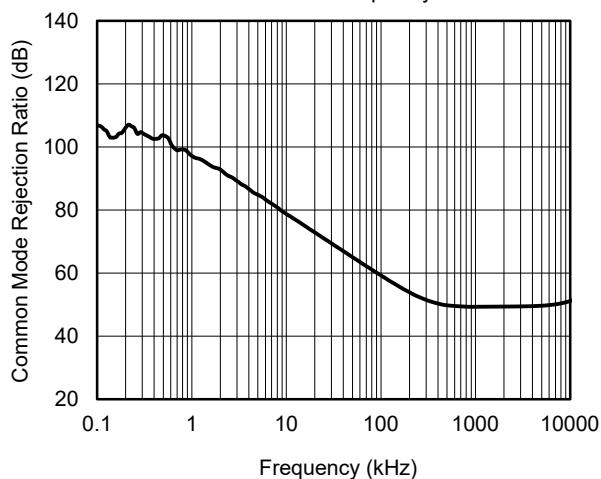
Sine Wave Response



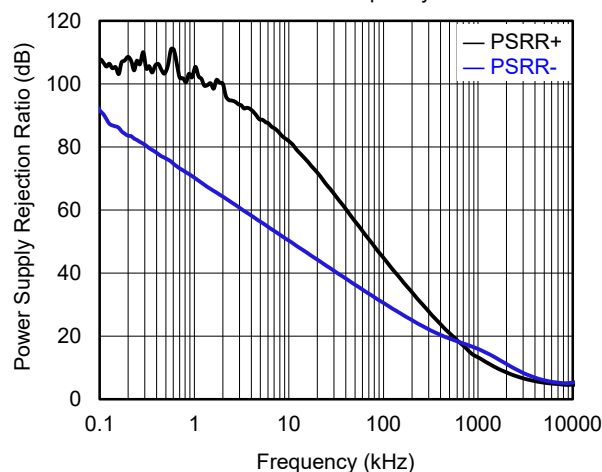
No Phase Reversal



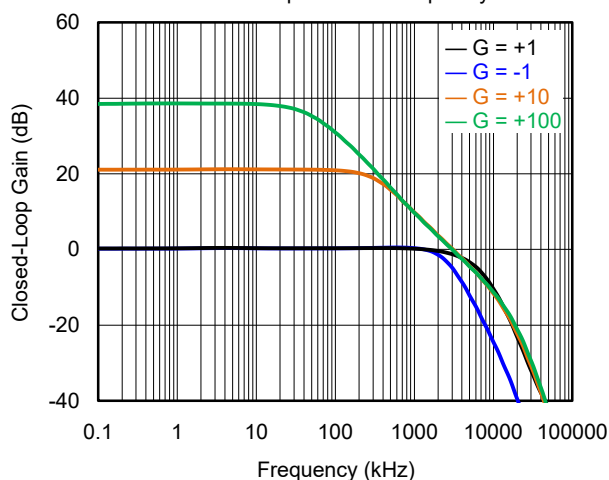
CMRR vs. Frequency



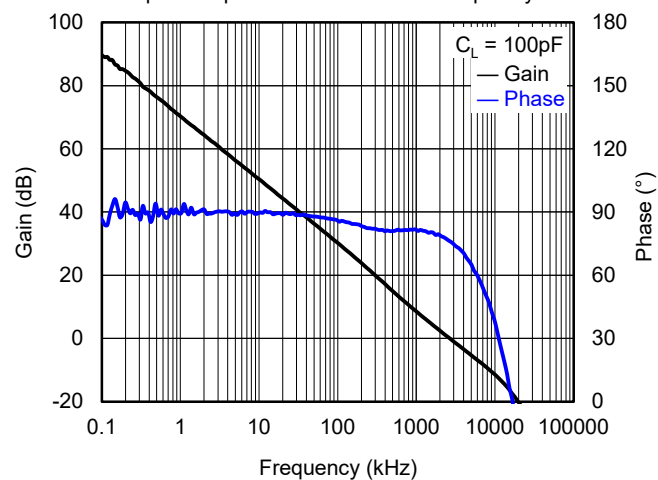
PSRR vs. Frequency



Closed-Loop Gain vs. Frequency

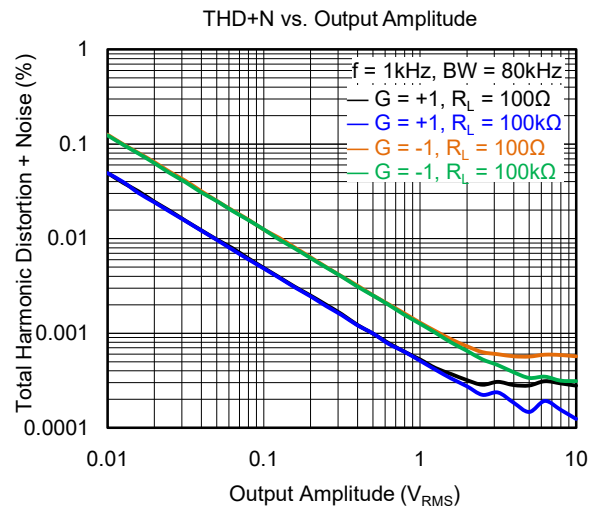
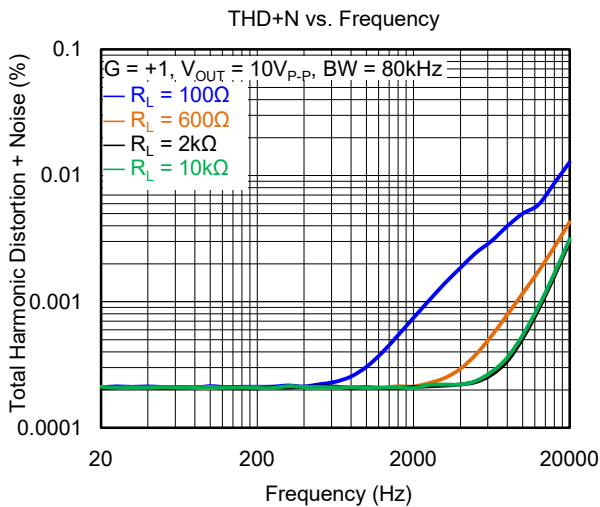
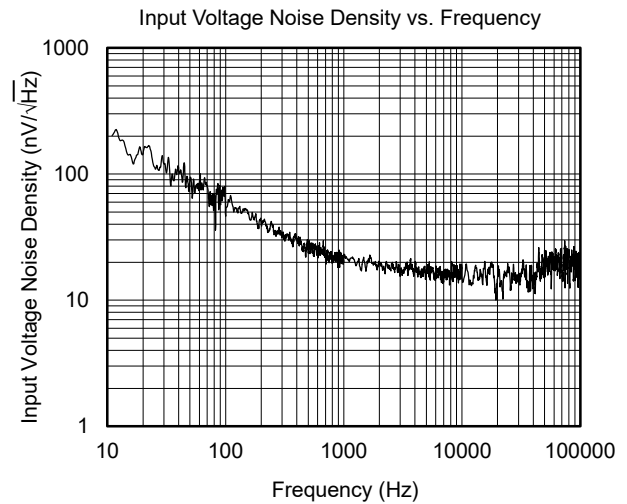
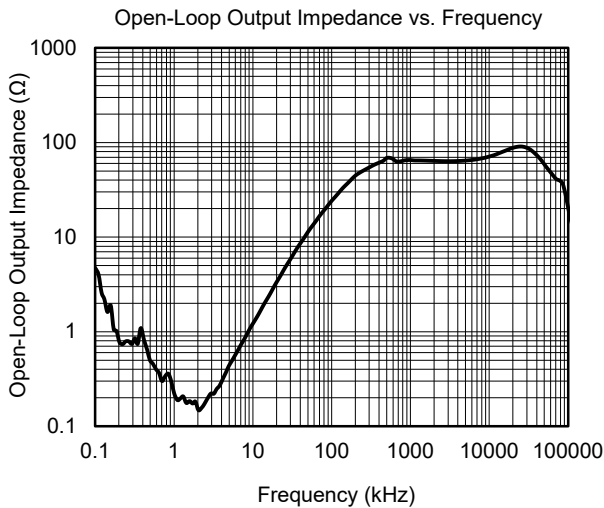
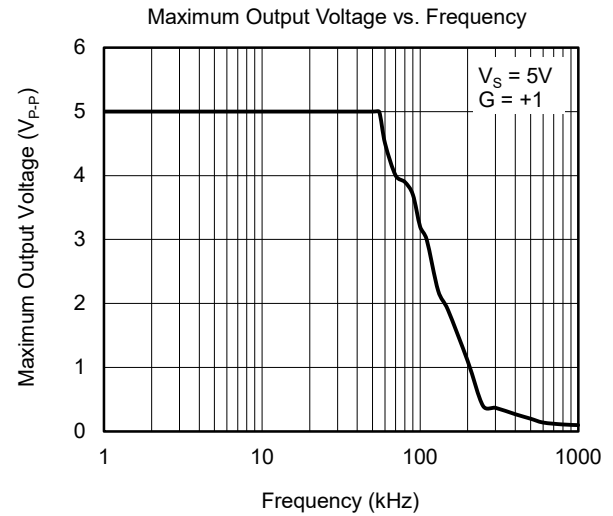
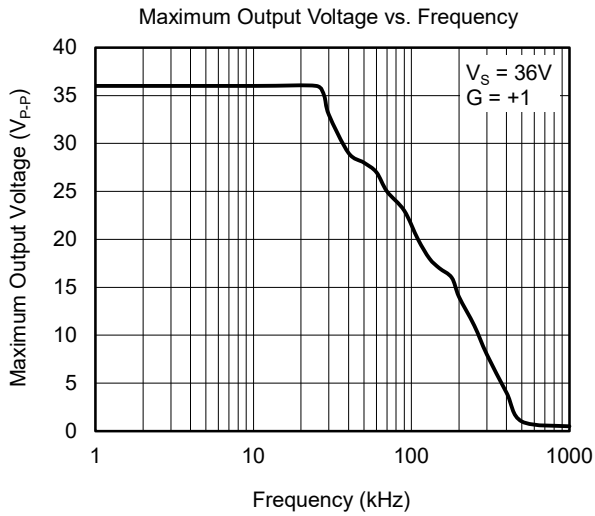


Open-Loop Gain and Phase vs. Frequency



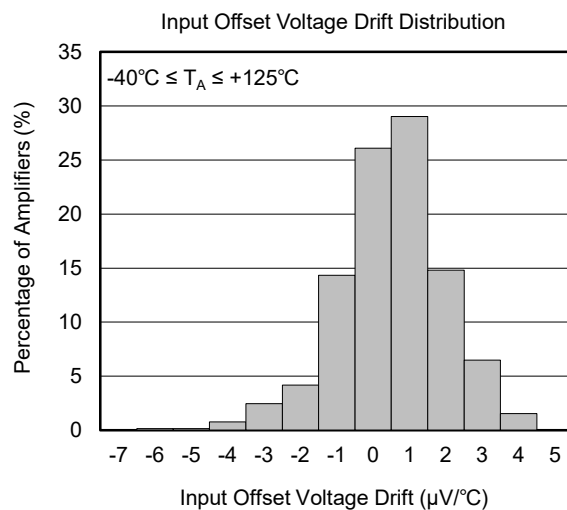
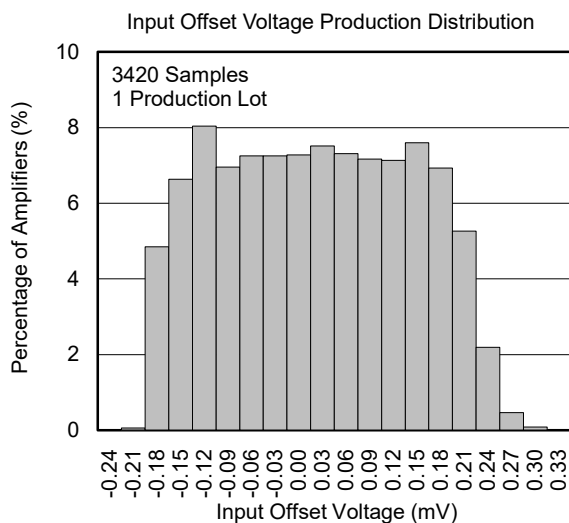
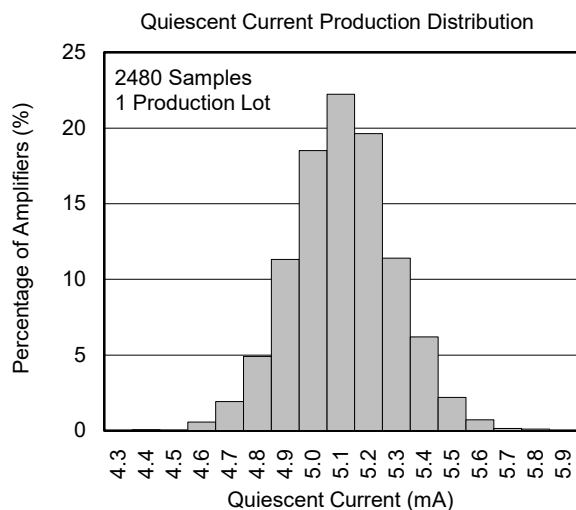
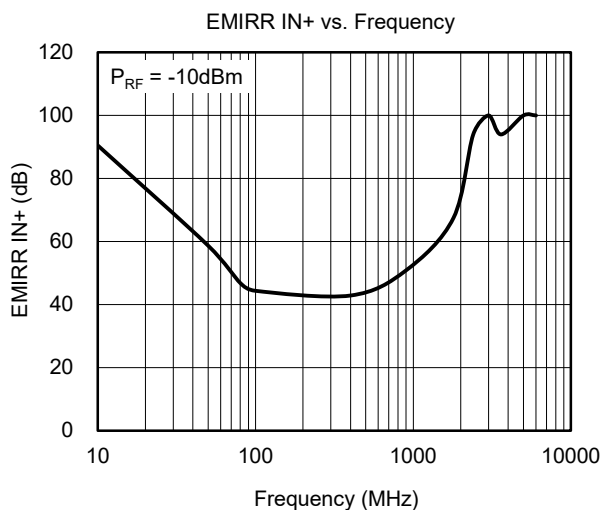
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 36\text{V}$, $V_{CM} = V_S/2$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = 36\text{V}$, $V_{CM} = V_S/2$ and $R_L = 2\text{k}\Omega$, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

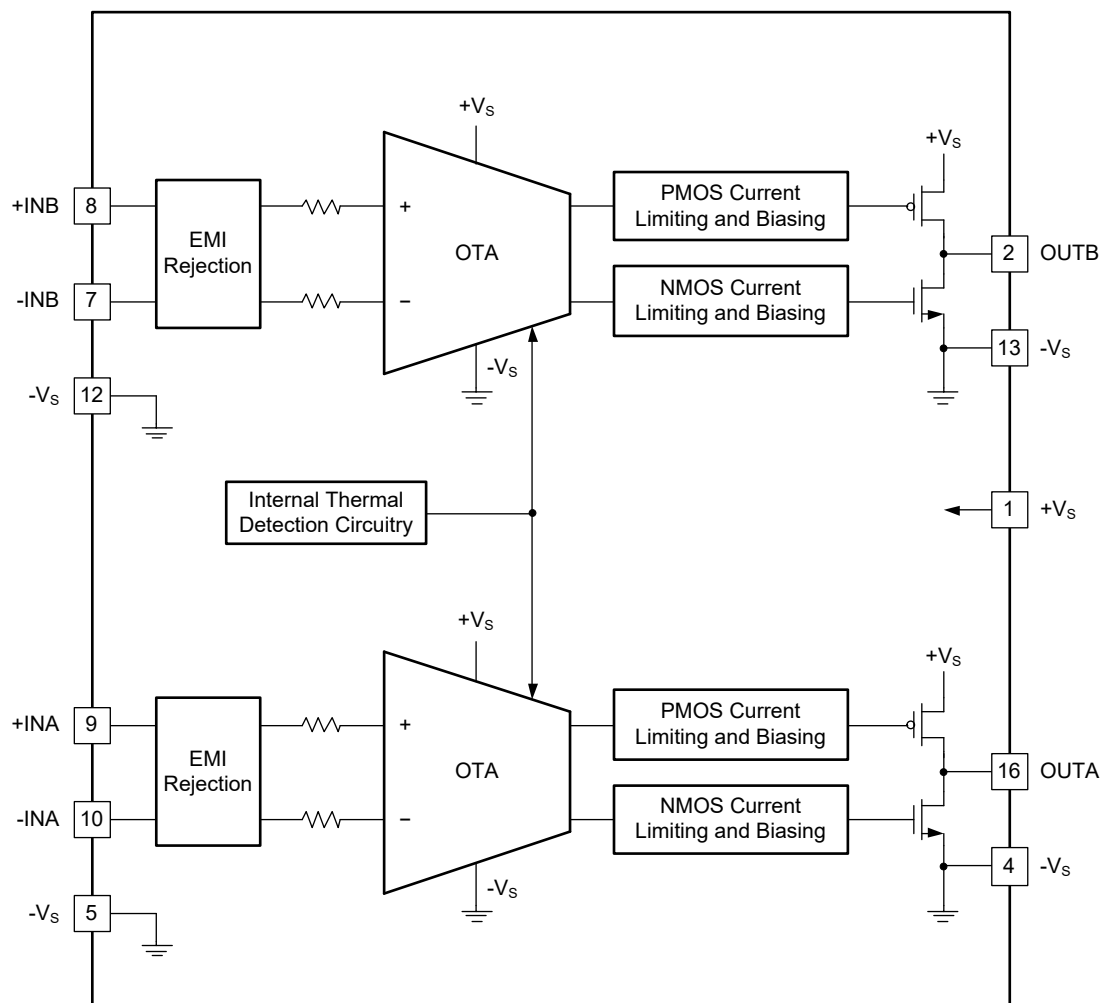


Figure 1. Block Diagram

APPLICATION INFORMATION

Rail-to-Rail Input

When SGM8434-2Q works at the power supply between 5V and 36V, the input common mode voltage range is from $-V_S$ to $+V_S$. In Figure 2, the ESD diodes between the inputs and the power supply rails will clamp the input voltage so that it does not exceed the rails.

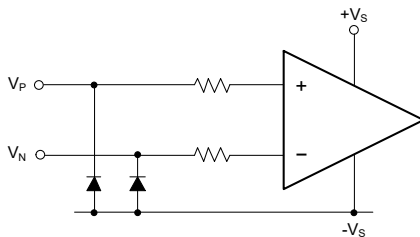


Figure 2. Input Equivalent Circuit

Rail-to-Rail Output

The SGM8434-2Q supports rail-to-rail output operation. In single power supply application, for example, when $+V_S = 36V$, $-V_S = GND$, 2k Ω load resistor is tied from OUT pin to $V_S/2$, the typical output swing range is from 0.06V to 35.9V.

Driving Capacitive Loads

The SGM8434-2Q is unity-gain stable with heavy capacitive load. If greater capacitive load must be driven in application, the circuit in Figure 3 can be used. In this circuit, the IR drop voltage generated by R_{ISO} is compensated by feedback loop.

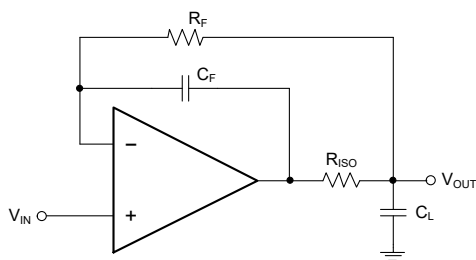


Figure 3. Circuit to Drive Heavy Capacitive Load

Power Supply Decoupling and Layout

A clean and low noise power supply is very important in amplifier circuit design. Besides of input signal noise, the power supply is one of important source of noise to the amplifier through $+V_S$ and $-V_S$ pins. Power supply bypassing is an effective method to clear up the noise at power supply, and the low impedance path to ground of decoupling capacitor will bypass the noise to GND. In application, 10 μF ceramic capacitor paralleled with 0.1 μF or 0.01 μF ceramic capacitor is used in Figure 4. The ceramic capacitors should be placed as close as possible to $+V_S$ and $-V_S$ power supply pins.

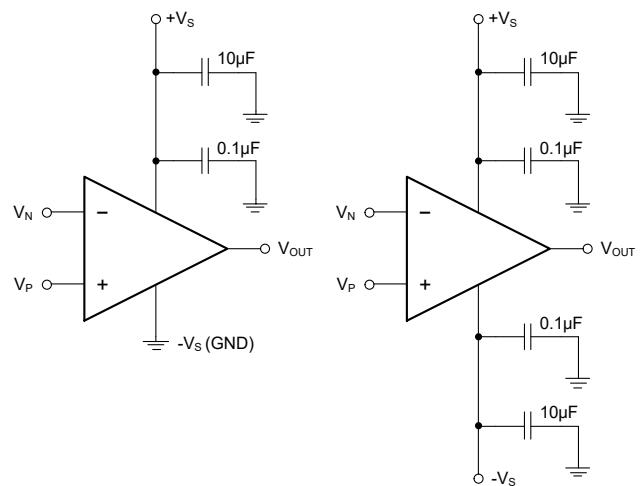


Figure 4. Amplifier Power Supply Bypassing

Grounding

In low speed application, one node grounding technique is the simplest and most effective method to eliminate the noise generated by grounding. In high speed application, the general method to eliminate noise is to use a complete ground plane technique, and the whole ground plane will help distribute heat and reduce EMI noise pickup.

Reduce Input-to-Output Coupling

To reduce the input-to-output coupling, the input traces must be placed as far away from the power supply or output traces as possible. The sensitive trace must not be placed in parallel with the noisy trace in the same layer. They must be placed perpendicularly in different layers to reduce the crosstalk. These PCB layout techniques will help to reduce unwanted positive feedback and noise.

APPLICATION INFORMATION (continued)

Typical Application Circuits

Difference Amplifier

The circuit in Figure 5 is a design example of classical difference amplifier. If $R_4/R_3 = R_2/R_1$, then $V_{OUT} = (V_P - V_N) \times R_2/R_1 + V_{REF}$.

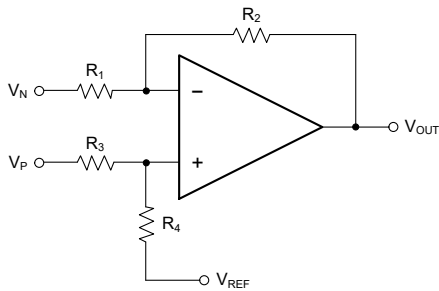


Figure 5. Difference Amplifier

High Input Impedance Difference Amplifier

The circuit in Figure 6 is a design example of high input impedance difference amplifier. The added amplifiers at the input are used to increase the input impedance and eliminate drawback of low input impedance in Figure 5.

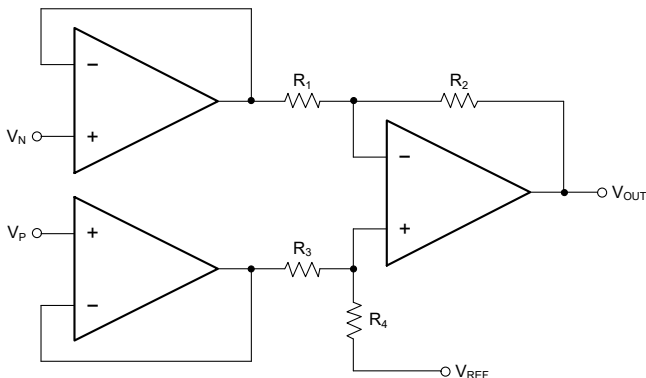


Figure 6. High Input Impedance Difference Amplifier

Active Low-Pass Filter

The circuit in Figure 7 is a design example of active low-pass filter, the DC gain is equal to $-R_2/R_1$ and the -3dB corner frequency is equal to $1/(2\pi R_2 C)$. In this design, the filter bandwidth must be less than the bandwidth of the amplifier, and the resistor values must be selected as low as possible to reduce ringing or oscillation generated by the parasitic parameters in PCB layout.

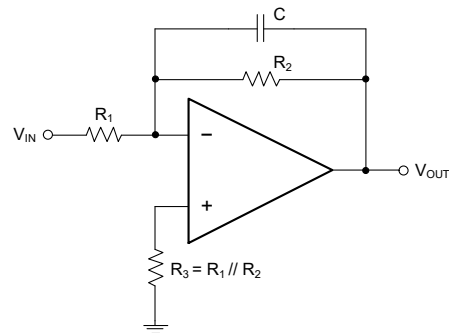


Figure 7. Active Low-Pass Filter

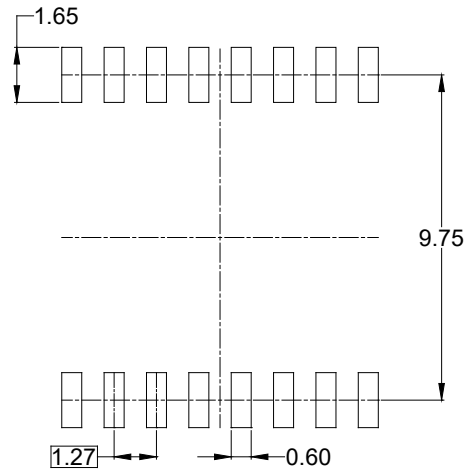
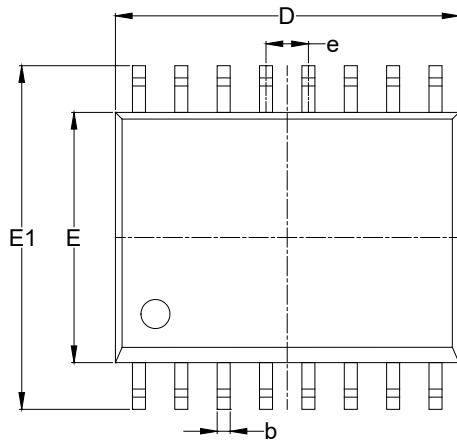
REVISION HISTORY

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

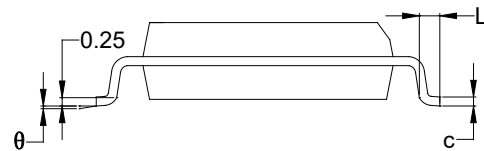
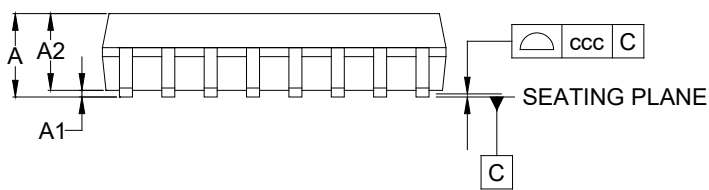
Changes from Original to REV.A (OCTOBER 2026)	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

SOIC-16 (300mil)



RECOMMENDED LAND PATTERN (Unit: mm)



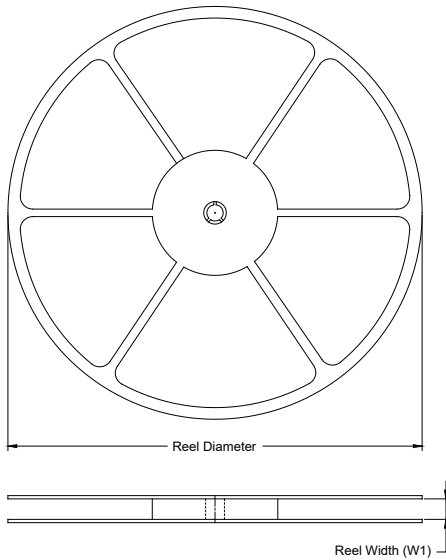
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	MIN	NOM	MAX
A	-	-	2.650
A1	0.100	-	0.300
A2	2.300 REF		
b	0.310	-	0.510
c	0.200	-	0.330
D	10.200	-	10.400
E	7.400	-	7.600
E1	10.000	-	10.600
e	1.270 BSC		
L	0.400	-	1.270
θ	0°	-	8°
ccc	0.100		

NOTES:

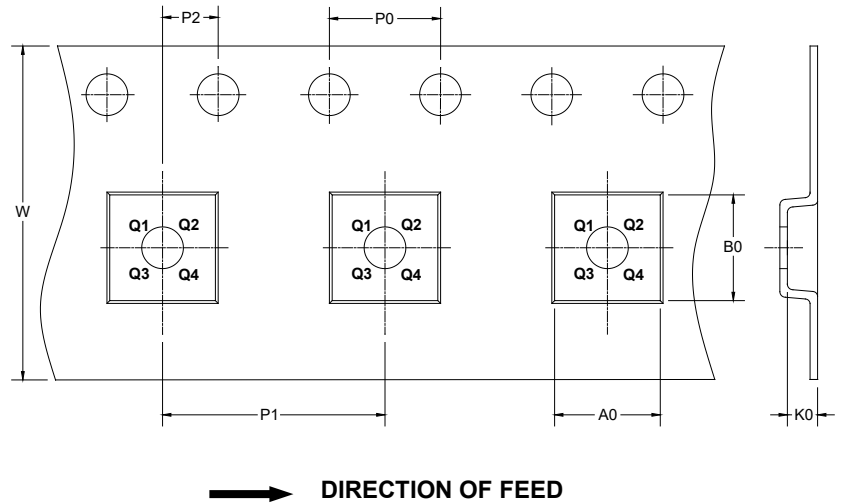
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MS-13F.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

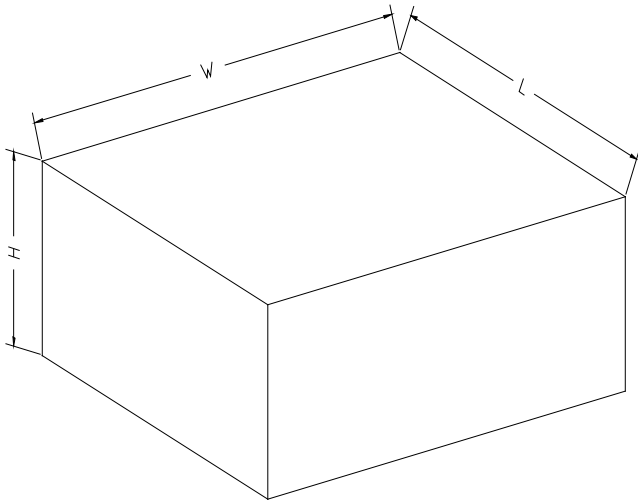
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-16 (300mil)	13"	16.4	10.90	10.80	3.00	4.0	12.0	2.0	16.0	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
13"	386	280	370	5

DD0002