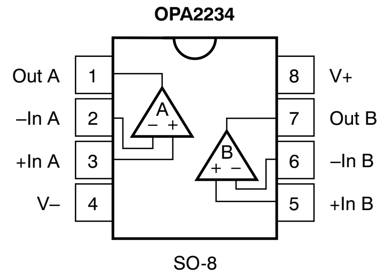
低功耗、精密 单电源运算放大器

查询样品: **OPA2234M**

特性

- 宽电源范围:
  - 单电源: **V_S = 2.7 V** 至 **36 V**
  - 双电源: **V_S = ±1.35 V** 至 **±18 V**
- 规定性能:
  - **2.7 V**、**5 V**、和 **±15 V**
- 低静态电流: 每个放大器为 **250 μA**
- 低输入偏置电流: **35 nA**（最大值）
- 低失调电压: **100 μV**（典型值）
- 高 **CMRR**、**PSRR**、和 **A_{OL}**
- 双通道版本



说明

OPA2234 系列低成本运算放大器非常适合于单电源、低电压、低功耗应用。 该系列的静态电流低于较早的老式 "1013" 型产品，并采用现行的业界标准封装及引出脚配置。 低失调电压、高共模抑制、高电源抑制比和宽泛的电源范围可提供卓越的准确度及通用性。 双通道版本具有相同的规格指标，以实现最大的设计灵活性。 这些通用型运算放大器非常适合于便携式及电池供电式应用。

OPA2234 系列运算放大器可采用单工作电源或双工作电源。 采用单工作电源时，输入共模范围扩展至地电位以下，而且输出能摆动至地电位的 50mV 以内。 极佳的相位裕度使 OPA2234 系列非常适合于要求苛刻的应用，包括高负载电容。 双通道设计具有完全独立的电路，旨在实现极低的串扰并彻底消除相互干扰。

单通道及双通道器件采用 SO-8 表面贴装型封装，并具有 –55°C 至 125°C 的规定工作温度范围。

订购信息(1)

产品	封装	封装标识
OPA2234MDR	SO-8 表面贴装型封装	2234M

(1) 有关最新的封装和订购信息，请参阅本数据手册末尾的“封装选择方案附录”。

This integrated circuit can be damaged by ESD. Texas Instruments 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 very small parametric changes could cause the device not to meet its published specifications.

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted)

		VALUE	UNIT
Supply Voltage, V+ to V–			
Input Voltage		(V–) – 0.7 to (V+) + 0.7	V
Output Short-Circuit[(1)]		Continuous	
Operating Temperature		–55 to 125	°C
Storage Temperature		–55 to 125	°C
Junction Temperature	T_{JA}	150	°C/W
	T_{JC}	39	
Lead Temperature (soldering, 10 s)		300	°C

(1) Short-circuit to ground, one amplifier per package.

ELECTRICAL CHARACTERISTICS: V_S = 5 V

At T_A = –55°C to 125°C, V_S = 5 V, R_L = 10 kΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFFSET VOLTAGE						
Input Offset Voltage	V_{OS}	T_A = 25°C, V_{CM} = 2.5 V		±40	±100	μV
		V_{CM} = 2.5 V			±600	μV
vs Temperature(1)	dV_{OS}/dT	Operating Temperature Range		±3		μV/°C
vs Power Supply	PSRR	V_S = 2.7 V to 30 V, V_{CM} = 1.7 V		3	20	μV/V
vs Time				0.2		μV/mo
Channel Separation (Dual)				0.3		μV/V
INPUT BIAS CURRENT						
Input Bias Current(2)	I_B	V_{CM} = 2.5 V		–15	–35	nA
Input Offset Current	I_{OS}	V_{CM} = 2.5 V		±1	±12	nA
NOISE		f = 1 kHz				
Input Voltage Noise Density	V_n			25		nV/√Hz
Current Noise Density	I_n			80		fA/√Hz
INPUT VOLTAGE RANGE						
Common-Mode Voltage Range			0.5		(V+) – 1	V
Common-Mode Rejection	CMRR	V_{CM} = 0.5 V to 4 V	86	106		dB
INPUT IMPEDANCE						
Differential				10^7 || 5		Ω || pF
Common-Mode		V_{CM} = 2.5 V		10^{10} || 6		Ω || pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A_{OL}	R_L = 10 kΩ, V_O = 0.25 V to 4 V	78	120		dB
		R_L = 2 kΩ, V_O = 0.5 V to 4 V	75	96		dB
FREQUENCY RESPONSE						
Gain-Bandwidth Product	GBW	C_L = 100 pF		0.35		MHz
Slew Rate	SR			0.2		V/μs
Settling Time:						
0.1%		G = 1, 3 V Step, C_L = 100 pF		15		μs
0.01%		G = 1, 3 V Step, C_L = 100 pF		25		μs
Overload Recovery Time		(V_{IN}) (Gain) = V_S		16		μs
OUTPUT						
Voltage Output:						
Positive		R_L = 10 kΩ to V_S/2	(V+) – 1	(V+) – 0.65		V
Negative		R_L = 10 kΩ to V_S/2	0.25	0.05		V
Positive		R_L = 10 kΩ to Ground	(V+) – 1	(V+) – 0.65		V
Negative		R_L = 10 kΩ to Ground	0.1	0.05		V
Short-Circuit Current	I_{SC}			±11		mA
Capacitive Load Drive (Stable Operation)(3)		G = 1		1000		pF
POWER SUPPLY						
Specified Operating Voltage				5		V
Operating Voltage Range			2.7		36	V
Quiescent Current (per amplifier)	I_Q	I_O = 0		250	550	μA

(1) Wafer-level tested to 95% confidence level.
(2) Positive conventional current flows into the input terminals.
(3) See *Small-Signal Overshoot vs Load Capacitance* typical curve.

ELECTRICAL CHARACTERISTICS: V_S = 5 V (continued)

At T_A = –55°C to 125°C, V_S = 5 V, R_L = 10 kΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
TEMPERATURE RANGE						
Specified Range			–55		125	°C
Operating Range			–55		125	°C
Storage			–55		125	°C
Thermal Resistance	θ_{JA}			150		°C/W

ELECTRICAL CHARACTERISTICS: V_S = 2.7 V

At T_A = –55°C to 125°C, V_S = 2.7 V, R_L = 10 kΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFFSET VOLTAGE						
Input Offset Voltage	V_{OS}	T_A = 25°C, V_{CM} = 1.35 V		±40	±100	μV
		V_{CM} = 1.35 V			±600	μV
vs Temperature[1]	dV_{OS}/dT	Operating Temperature Range		±3		μV/°C
vs Power Supply	PSRR	V_S = 2.7 V to 30 V, V_{CM} = 1.7 V		3	20	μV/V
vs Time				0.2		μV/mo
Channel Separation (Dual)				0.3		μV/V
INPUT BIAS CURRENT						
Input Bias Current[2]	I_B	V_{CM} = 1.35 V		–15	–35	nA
Input Offset Current	I_{OS}	V_{CM} = 1.35 V		±1	±12	nA
NOISE		f = 1 kHz				
Input Voltage Noise Density	V_n			25		nV/√Hz
Current Noise Density	I_n			80		fA/√Hz
INPUT VOLTAGE RANGE						
Common-Mode Voltage Range			0.5		(V+) – 1.1	V
Common-Mode Rejection	CMRR	V_{CM} = 0.5 V to 1.6 V	86	106		dB
INPUT IMPEDANCE						
Differential				10^7 ‖ 5		Ω ‖ pF
Common-Mode		V_{CM} = 1.35 V		10^{10} ‖ 6		Ω ‖ pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A_{OL}	R_L = 10 kΩ, V_O = 0.25 V to 1.7 V	78	125		dB
		R_L = 2 kΩ, V_O = 0.5 V to 1.7 V	69	96		dB
FREQUENCY RESPONSE						
Gain-Bandwidth Product	GBW	C_L = 100 pF		0.35		MHz
Slew Rate	SR			0.2		V/μs
Settling Time:						
0.1%		G = 1, 1 V Step, C_L = 100 pF		6		μs
0.01%		G = 1, 1 V Step, C_L = 100 pF		16		μs
Overload Recovery Time		(V_{IN}) (Gain) = V_S		8		μs
OUTPUT						
Voltage Output:						
Positive		R_L = 10 kΩ to V_S/2	(V+) – 1	(V+) – 0.6		V
Negative		R_L = 10 kΩ to V_S/2	0.25	0.05		V
Positive		R_L = 10 kΩ to Ground	(V+) – 1	(V+) – 0.65		V
Negative		R_L = 10 kΩ to Ground	0.1	0.05		V
Short-Circuit Current	I_{SC}			±8		mA
Capacitive Load Drive (Stable Operation)[3]		G = 1		1000		pF
POWER SUPPLY						
Specified Operating Voltage				2.7		V
Operating Voltage Range			2.7		36	V
Quiescent Current (per amplifier)	I_Q	I_O = 0		250	550	μA

(1) Wafer-level tested to 95% confidence level.
(2) Positive conventional current flows into the input terminals.
(3) See *Small-Signal Overshoot vs Load Capacitance* typical curve.

ELECTRICAL CHARACTERISTICS: V_S = 2.7 V (continued)

At T_A = –55°C to 125°C, V_S = 2.7 V, R_L = 10 kΩ connected to $V_S/2$, and V_{OUT} = $V_S/2$, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
TEMPERATURE RANGE						
Specified Range			–55		125	°C
Operating Range			–55		125	°C
Storage			–55		125	°C
Thermal Resistance	θ_{JA}			150		°C/W

ELECTRICAL CHARACTERISTICS: V_S = ±15 V

At T_A = –55°C to 125°C, V_S = ±15 V, R_L = 10 kΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFFSET VOLTAGE						
Input Offset Voltage	V_{OS}	T_A = 25°C, V_{CM} = 0 V		±70	±250	μV
		V_{CM} = 0 V			±750	
vs Temperature(1)	dV_{OS}/dT	Operating Temperature Range		±3		μV/°C
vs Power Supply	PSRR	V_S = ±1.35 V to ±18 V, V_{CM} = 0 V		3	20	μV/V
vs Time				0.2		μV/mo
Channel Separation (Dual)				0.3		μV/V
INPUT BIAS CURRENT						
Input Bias Current(2)	I_B	V_{CM} = 0 V		–12	–30	nA
Input Offset Current	I_{OS}	V_{CM} = 0 V		±1	±12	nA
NOISE		f = 1 kHz				
Input Voltage Noise Density	V_n			25		nV/√Hz
Current Noise Density	I_n			80		fA/√Hz
INPUT VOLTAGE RANGE						
Common-Mode Voltage Range			(V–) + 1		(V+) – 1	V
Common-Mode Rejection	CMRR	V_{CM} = –14 V to 14 V	86	106		dB
INPUT IMPEDANCE						
Differential				10^7 || 5		Ω || pF
Common-Mode		V_{CM} = 0 V		10^{10} || 6		Ω || pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A_{OL}	V_O = –13.5 V to 13 V	87	120		dB
FREQUENCY RESPONSE						
Gain-Bandwidth Product	GBW	C_L = 100 pF		0.35		MHz
Slew Rate	SR			0.2		V/μs
Settling Time:						
0.1%		G = 1, 10 V Step, C_L = 100 pF		41		μs
0.01%		G = 1, 10 V Step, C_L = 100 pF		47		μs
Overload Recovery Time		(V_{IN}) (Gain) = V_S		22		μs
OUTPUT						
Voltage Output:						
Positive			(V+) – 2	(V+) – 0.7		V
Negative			(V–) + 1.5	(V–) + 0.15		V
Short-Circuit Current	I_{SC}			±22		mA
Capacitive Load Drive (Stable Operation)(3)		G = 1		1000		pF
POWER SUPPLY						
Specified Operating Voltage				±15		V
Operating Voltage Range			±1.35		±18	V
Quiescent Current (per amplifier)	I_Q	I_O = 0		±275	±550	μA

(1) Wafer-level tested to 95% confidence level.
(2) Positive conventional current flows into the input terminals.
(3) See *Small-Signal Overshoot vs Load Capacitance* typical curve.

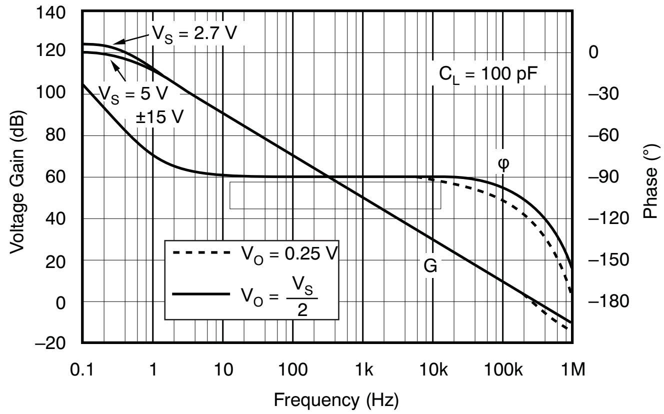
ELECTRICAL CHARACTERISTICS: V_S = ±15 V (continued)

At T_A = –55°C to 125°C, V_S = ±15 V, R_L = 10 kΩ connected to $V_S/2$, and $V_{OUT} = V_S/2$, unless otherwise noted.

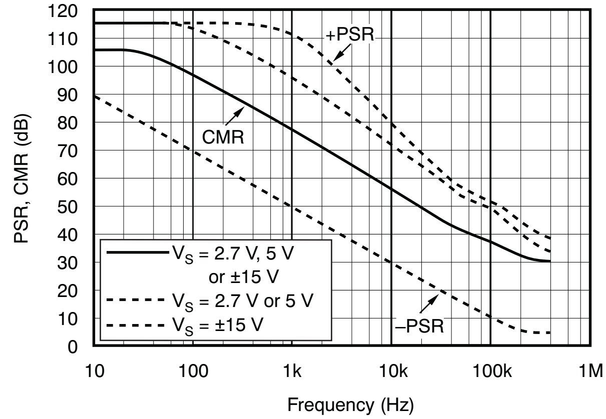
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
TEMPERATURE RANGE						
Specified Range			–55		125	°C
Operating Range			–55		125	°C
Storage			–55		125	°C
Thermal Resistance	θ_{JA}			150		°C/W

TYPICAL CHARACTERISTICS

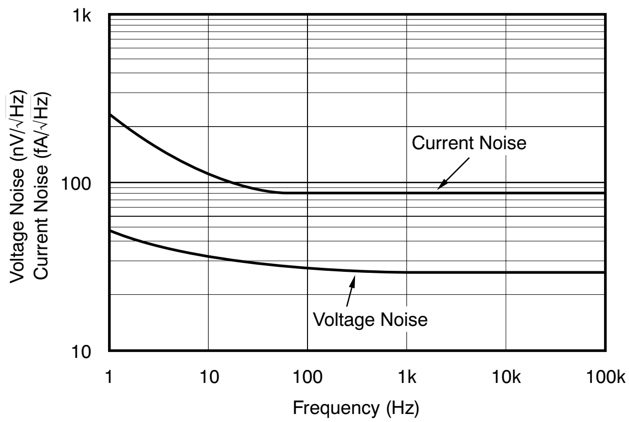
OPEN-LOOP GAIN/PHASE vs FREQUENCY



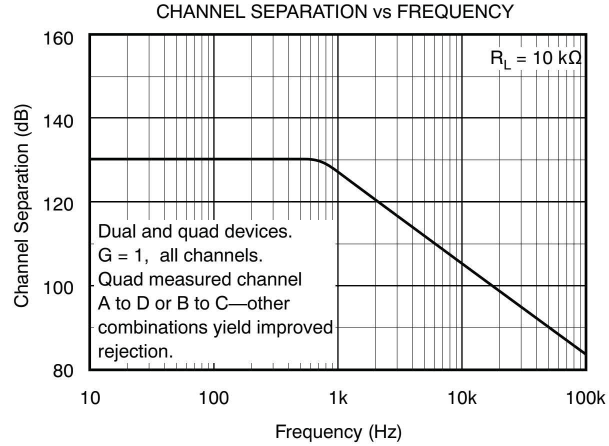
POWER-SUPPLY AND COMMON-MODE REJECTION vs FREQUENCY



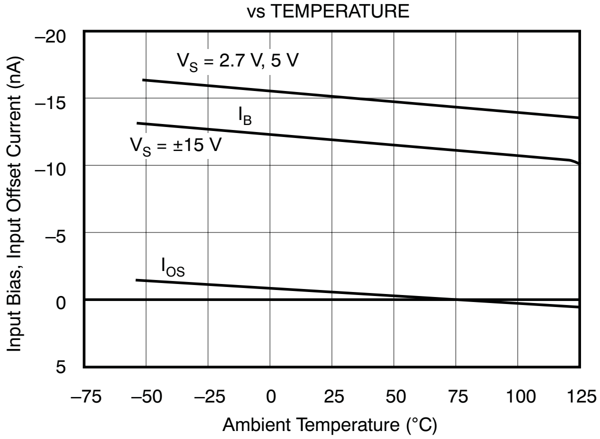
INPUT NOISE AND CURRENT NOISE SPECTRAL DENSITY vs FREQUENCY



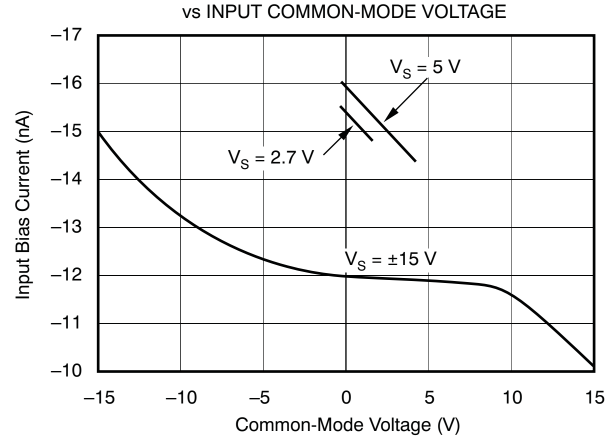
CHANNEL SEPARATION vs FREQUENCY



INPUT BIAS AND INPUT OFFSET CURRENT vs TEMPERATURE

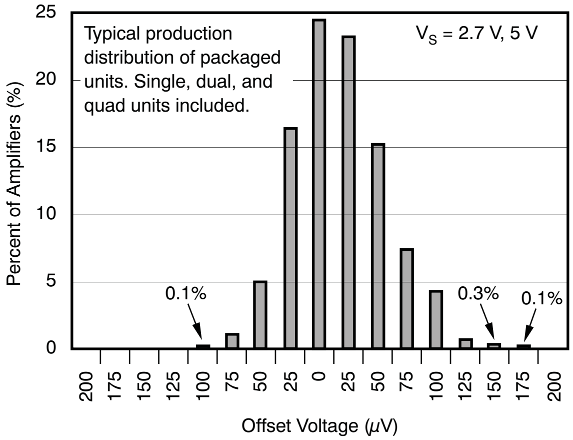


INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE

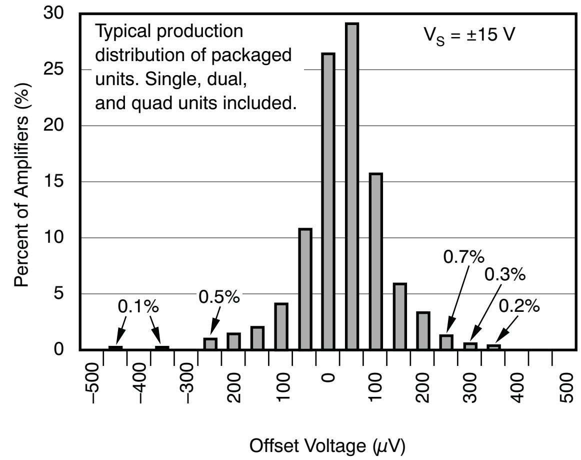


TYPICAL CHARACTERISTICS (continued)

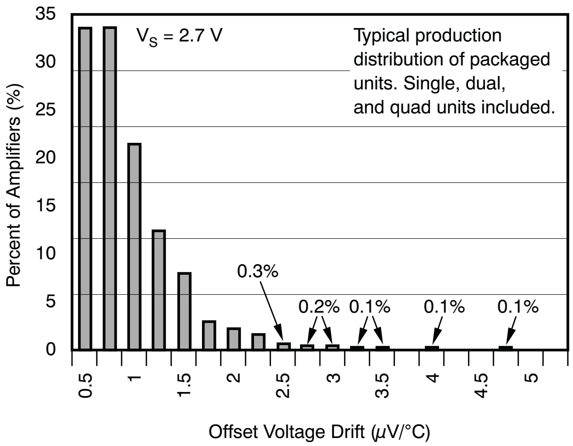
OFFSET VOLTAGE
PRODUCTION DISTRIBUTION



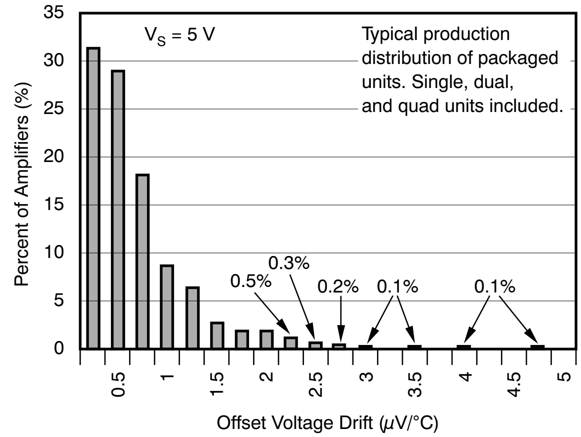
OFFSET VOLTAGE
PRODUCTION DISTRIBUTION



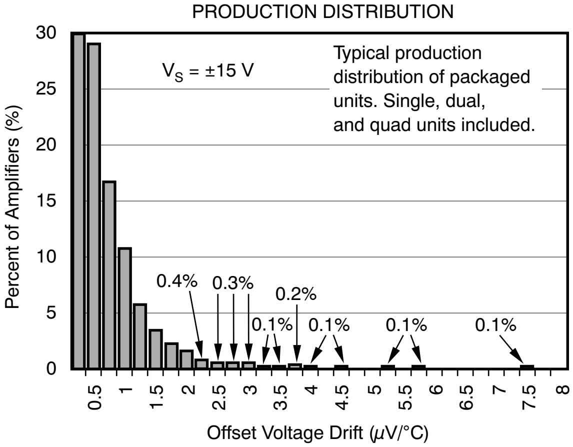
OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION



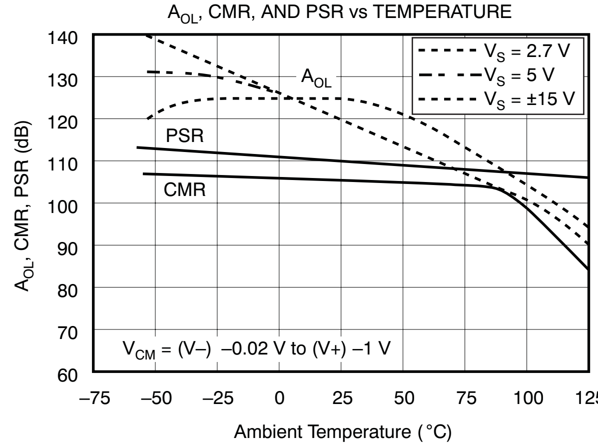
OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION



OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION

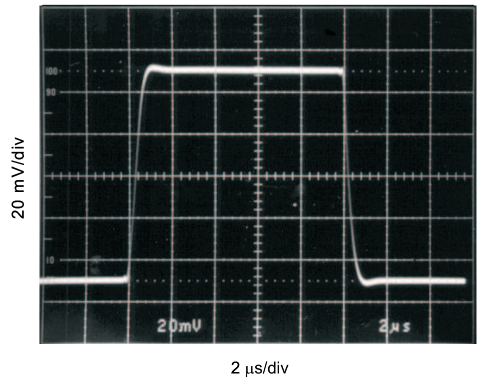


A_{OL}, CMR, AND PSR vs TEMPERATURE

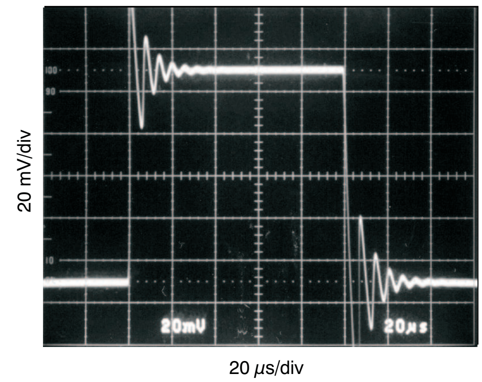


TYPICAL CHARACTERISTICS (continued)

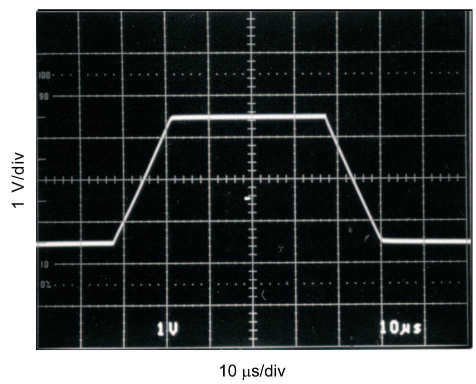
SMALL-SIGNAL STEP RESPONSE
G = 1, C_L = 100 pF, V_S = 5 V



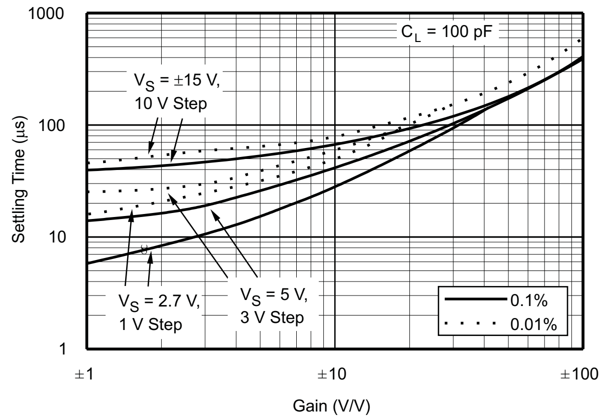
SMALL-SIGNAL STEP RESPONSE
G = 1, C_L = 10,000 pF, V_S = 5 V



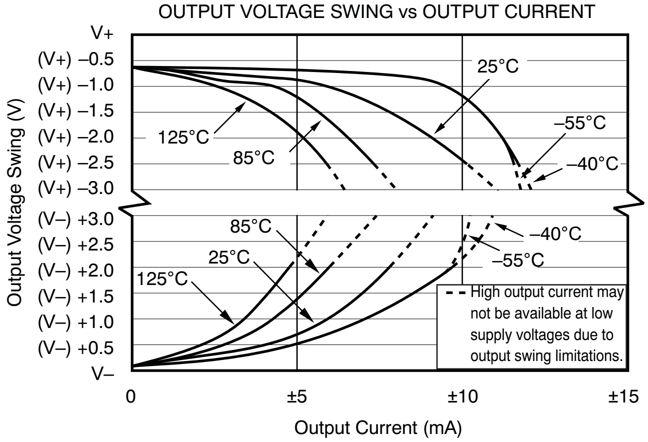
LARGE-SIGNAL STEP RESPONSE
G = 1, C_L = 100 pF, V_S = 5 V



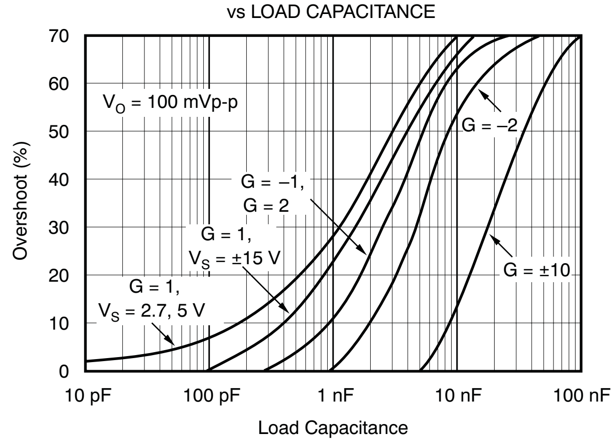
SETTLING TIME vs CLOSED-LOOP GAIN



OUTPUT VOLTAGE SWING vs OUTPUT CURRENT

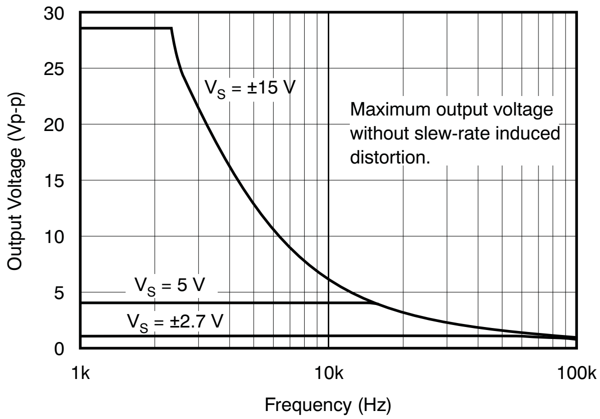


SMALL-SIGNAL OVERSHOOT
vs LOAD CAPACITANCE

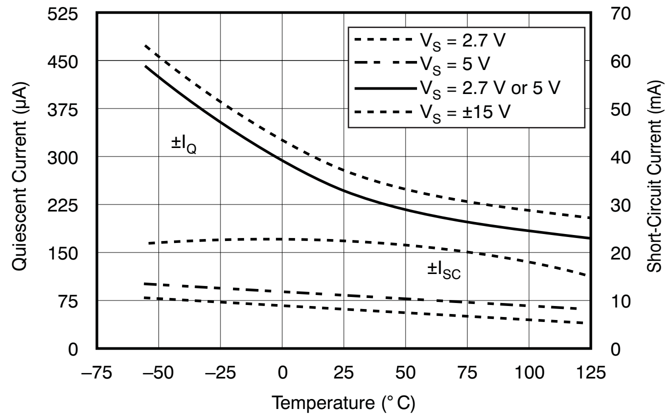


TYPICAL CHARACTERISTICS (continued)

MAXIMUM OUTPUT VOLTAGE
vs FREQUENCY



QUIESCENT CURRENT AND SHORT-CIRCUIT CURRENT
vs TEMPERATURE



APPLICATION INFORMATION

The OPA2234 series op amps are unity-gain stable and suitable for a wide range of general-purpose applications. Power-supply pins should be bypassed with 10 nF ceramic capacitors.

OPERATING VOLTAGE

The OPA2234 series op amps operate from single (2.7 V to 36 V) or dual (±1.35 V to ±18 V) supplies with excellent performance. Specifications are production tested with 2.7 V, 5 V, and ±15 V supplies. Most behavior remains unchanged throughout the full operating voltage range. Parameters which vary significantly with operating voltage are shown in the Typical Characteristic curves.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
OPA2234MDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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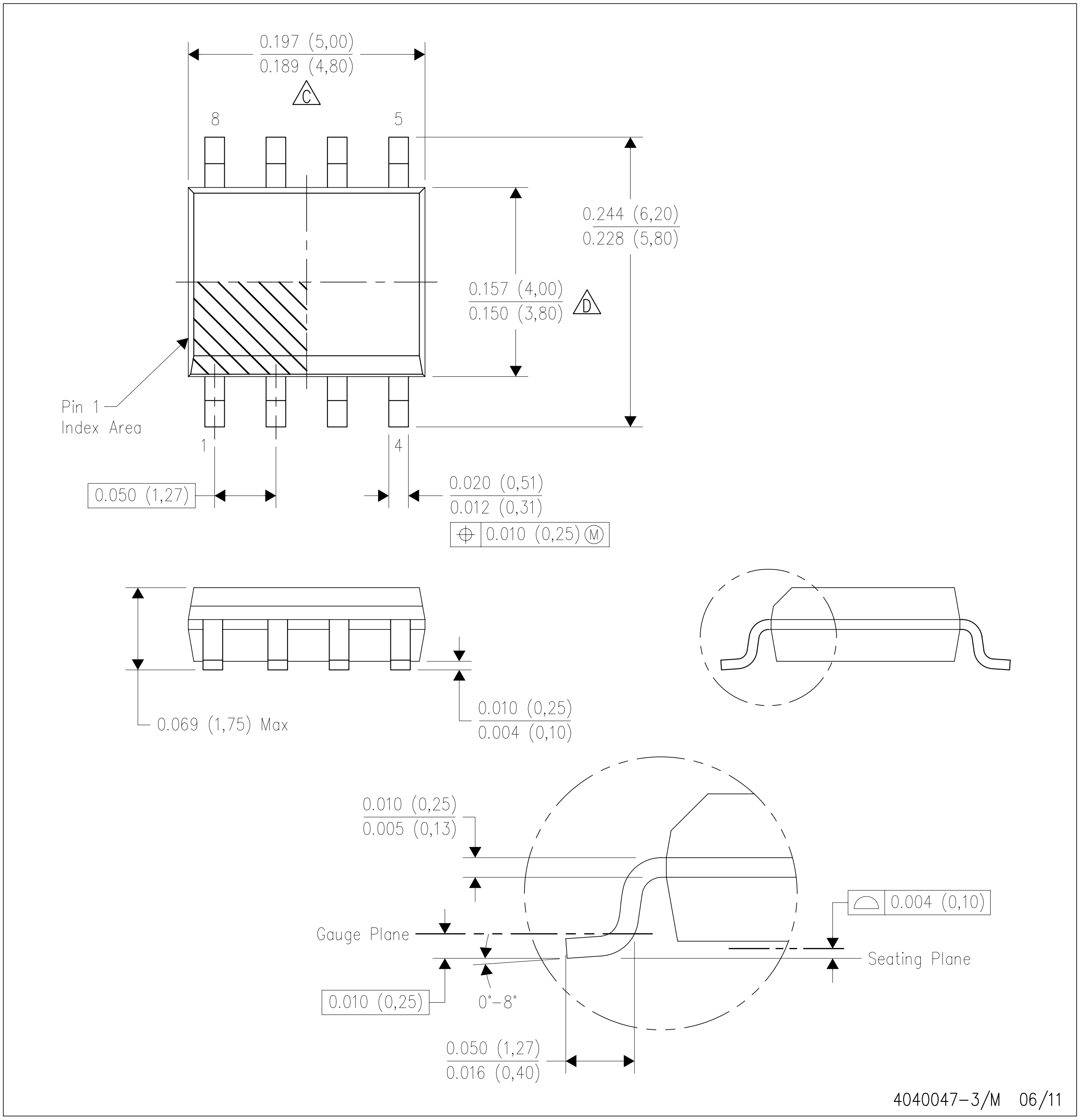
OTHER QUALIFIED VERSIONS OF OPA2234M :

- Catalog: OPA2234

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

D (R-PDSO-G8) PLASTIC SMALL OUTLINE



NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AA.