MIC7111

1.8V to 11V, 15 µA, 25 kHz GBW, Rail-to-Rail Input and Output Operational Amplifier

Features

- 1.8V to 11V Single Supply Operation
- ±0.9V to ±5.5V Dual Supply Operation
- Low 15 µA Supply Current at 1.8V
- 25 kHz Gain Bandwidth
- 1 mV Input Offset Voltage (Typical)
- 1 pA Input Bias Current (Typical)
- 0.01 pA Input Offset Current (Typical)
- Input-Referred Noise is 110 nV/√Hz at 1 kHz
- Output Swing to within 1 mV of Rails with 1.8V Supply And 100 kΩ Load
- Suitable for Driving Capacitive Loads
- Cost Effective SOT23-5 Package

Applications

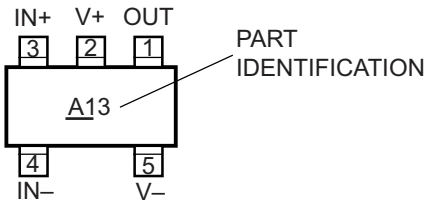
- Wireless and Cellular Communications
- Gaas RF Bias Amplifier
- Current Sensing for Battery Chargers
- Transducer Linearization and Interface
- Portable Computing

General Description

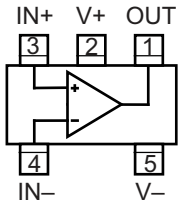
The MIC7111 is a low-power operational amplifier with rail-to-rail inputs and outputs. The device operates from a 1.8V to 11V single supply or an ±0.9V to ±5.5V dual supply. The device consumes a low 15 µA of current from a 1.8V supply and 25 µA from a 10V supply. The device features a unity gain bandwidth of 25 kHz and swings within 1 mV of either the supply rail with a 100 kΩ load. The device is capable of sinking and sourcing 25 mA of current from a 1.8V supply and up to 200 mA from a 10V supply. The device is available in the cost effective SOT23-5 package.

Package Type

MIC7111
SOT23-5 (M5)
(Top View)



MIC7111
Functional Configuration



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage, (V_{V+} –$V_{V–}$) ..... +12V
Differential Input Voltage, (V_{IN+} –$V_{IN–}$) ..... ±(V_{V+} –$V_{V–}$)
I/O Pin Voltage, (V_{IN}, V_{OUT}), (Note 1) ..... V_{V+} +0.3V to $V_{V–}$–0.3V
ESD Protection On All Pins, (Note 2) ..... ±2 kV

Operating Ratings ††

Supply Voltage, (V_{V+} –$V_{V–}$) ..... +1.8V to +11V
Maximum Power Dissipation ..... Note 3

† Notice: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside its recommended operating ratings.

†† Notice: The device is not guaranteed to function outside its operating ratings.

Note 1: I/O pin voltage is any external voltage to which an input or output is referenced.

2: Devices are ESD protected, however, handling precautions are recommended. All limits guaranteed by testing on statistical analysis. Human body model, 1.5 kΩ in series with 100 pF.

3: The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(MAX)}$; the junction-to-ambient thermal resistance, θ_{JA}; and the ambient temperature, T_A. The maximum allowable power dissipation at any ambient temperature is calculated using $P_D = (T_{J(MAX)} – T_A) \div \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature. See Temperature Specifications section.

DC ELECTRICAL CHARACTERISTICS (1.8V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +1.8V; $V_{V–}$ = 0V; V_{CM} = V_{OUT} = V_{V+}/2; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Offset Voltage	V_{OS}	—	0.9	7	mV	—
		—	—	9	mV	–40°C ≤ T_J ≤ +85°C
Input Offset Voltage Temperature Drift	TCV_{OS}	—	2.0	—	µV/°C	—
Input Bias Current	I_B	—	1	10	pA	—
		—		500		–40°C ≤ T_J ≤ +85°C
Input Offset Current	I_{OS}	—	0.01	0.5	pA	—
		—		75		–40°C ≤ T_J ≤ +85°C
Input Resistance	R_{IN}	—	>10	—	TΩ	—
Positive Power Supply Rejection Ratio	+PSRR	60	85	—	dB	1.8V ≤ V_{V+} ≤ 5V, $V_{V–}$ = 0V, V_{CM} = V_{OUT} = 0.9V
Negative Power Supply Rejection Ratio	–PSRR	60	85	—	dB	–1.8V ≤ $V_{V–}$ ≤ –5V, V_{V+} = 0V, V_{CM} = V_{OUT} = –0.9V
Common-Mode Rejection Ratio	CMRR	50	70	—	dB	V_{CM} = –0.2V to +2.0V
Common-Mode Input Capacitance	C_{IN}	—	3	—	pF	—

DC ELECTRICAL CHARACTERISTICS (1.8V) (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +1.8V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Output Voltage Swing	V_{OUT}	—	0.14	1	mV	Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	1		Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	0.14	1		Output LOW, R_L = 100 kΩ
		—	—	1		Output LOW, R_L = 100 kΩ –40°C ≤ T_J ≤ +85°C
		—	6.8	23		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	34		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	6.8	23		Output LOW, R_L = 2 kΩ
		—	—	34		Output LOW, R_L = 2 kΩ –40°C ≤ T_J ≤ +85°C
Output Short-Circuit Current (Note 1)	I_{SC}	15	25	—	mA	Sourcing, V_{OUT} = 0V
		15	25	—		Sinking, V_{OUT} = 1.8V
Voltage Gain	A_{VOL}	—	400	—	V/mV	Sourcing
		—	400	—		Sinking
Supply Current	I_S	—	15	35	µA	V_{V+} = 1.8V, $V_{OUT} = V_{V+}/2$

Note 1: Short circuit may cause device to exceed maximum allowable power dissipation.

AC ELECTRICAL CHARACTERISTICS (1.8V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +1.8V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Slew Rate	SR	—	0.015	—	V/µs	Voltage follower, 1V step, R_L = 100 kΩ at 0.9V, $V_{OUT} = 1V_{PP}$
Gain Bandwidth Product	GBWP	—	25	—	kHz	—

DC ELECTRICAL CHARACTERISTICS (2.7V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +2.7V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Offset Voltage	V_{OS}	—	0.9	7	mV	—
		—	—	9	mV	–40°C ≤ T_J ≤ +85°C
Input Offset Voltage Temperature Drift	TCV_{OS}	—	2.0	—	µV/°C	—

Note 1: Short circuit may cause device to exceed maximum allowable power dissipation.

DC ELECTRICAL CHARACTERISTICS (2.7V) (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +2.7V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Bias Current	I_B	—	1	10	pA	—
		—		500		–40°C ≤ T_J ≤ +85°C
Input Offset Current	I_{OS}	—	0.01	0.5	pA	—
		—		75		–40°C ≤ T_J ≤ +85°C
Input Resistance	R_{IN}	—	>10	—	TΩ	—
Positive Power Supply Rejection Ratio	+PSRR	60	90	—	dB	2.7V ≤ V_{V+} ≤ 5V, V_{V-} = 0V, $V_{CM} = V_{OUT}$ = 1.35V
Negative Power Supply Rejection Ratio	–PSRR	60	90	—	dB	–2.7V ≤ V_{V-} ≤ –5V, V_{V+} = 0V, $V_{CM} = V_{OUT}$ = –1.35V
Common-Mode Rejection Ratio	CMRR	52	75	—	dB	V_{CM} = –0.2V to +2.9V
Common-Mode Input Capacitance	C_{IN}	—	3	—	pF	—
Output Voltage Swing	V_{OUT}	—	0.2	1	mV	Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	1		Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	0.2	1		Output LOW, R_L = 100 kΩ
		—	—	1		Output LOW, R_L = 100 kΩ –40°C ≤ T_J ≤ +85°C
		—	10	33		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	50		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	10	33		Output Low, R_L = 2 kΩ
		—	—	50		Output Low, R_L = 2 kΩ –40°C ≤ T_J ≤ +85°C
Output Short-Circuit Current (Note 1)	I_{SC}	30	50	—	mA	Sourcing, V_{OUT} = 0V
		30	50	—		Sinking, V_{OUT} = 2.7V
Voltage Gain	A_{VOL}	—	400	—	V/mV	Sourcing
		—	400	—		Sinking
Supply Current	I_S	—	17	42	µA	V_{V+} = 2.7V, $V_{OUT} = V_{V+}/2$

Note 1: Short circuit may cause device to exceed maximum allowable power dissipation.

AC ELECTRICAL CHARACTERISTICS (2.7V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +2.7V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Slew Rate	SR	—	0.015	—	V/µs	Voltage follower, 1V step, R_L = 100 kΩ @ 1.35V, $V_{OUT} = 1V_{PP}$
Gain Bandwidth Product	GBWP	—	25	—	kHz	—

DC ELECTRICAL CHARACTERISTICS (5.0V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +5.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Offset Voltage	V_{OS}	—	0.9	7	mV	—
		—	—	9	mV	–40°C ≤ T_J ≤ +85°C
Input Offset Voltage Temperature Drift	TCV_{OS}	—	2.0	—	µV/°C	—
Input Bias Current	I_B	—	1	10	pA	—
		—		500		–40°C ≤ T_J ≤ +85°C
Input Offset Current	I_{OS}	—	0.01	0.5	pA	—
		—		75		–40°C ≤ T_J ≤ +85°C
Input Resistance	R_{IN}	—	>10	—	TΩ	—
Positive Power Supply Rejection Ratio	+PSRR	65	95	—	dB	5V ≤ V_{V+} ≤ 10V, V_{V-} = 0V, $V_{CM} = V_{OUT}$ = 2.5V
Negative Power Supply Rejection Ratio	–PSRR	65	95	—	dB	–5V ≤ V_{V-} ≤ –10V, V_{V+} = 0V, $V_{CM} = V_{OUT}$ = –2.5V
Common-Mode Rejection Ratio	CMRR	57	80	—	dB	V_{CM} = –0.2V to +5.2V
Common-Mode Input Capacitance	C_{IN}	—	3	—	pF	—
Output Voltage Swing	V_{OUT}	—	0.3	1.5	mV	Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	1.5		Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	0.3	1.5		Output LOW, R_L = 100 kΩ
		—	—	1.5		Output LOW, R_L = 100 kΩ –40°C ≤ T_J ≤ +85°C
		—	15	50		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	75		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	15	50		Output LOW, R_L = 2 kΩ
		—	—	75		Output LOW, R_L = 2 kΩ –40°C ≤ T_J ≤ +85°C

DC ELECTRICAL CHARACTERISTICS (5.0V) (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +5.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Output Short-Circuit Current (Note 1)	I_{SC}	80	100	—	mA	Sourcing, V_{OUT} = 0V
		80	100	—		Sinking, V_{OUT} = 5V
Voltage Gain	A_{VOL}	—	500	—	V/mV	Sourcing
		—	500	—		Sinking
Supply Current	I_S	—	20	50	µA	V_{V+} = 5V, $V_{OUT} = V_{V+}/2$

Note 1: Short circuit may cause device to exceed maximum allowable power dissipation.

AC ELECTRICAL CHARACTERISTICS (5.0V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +5.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Slew Rate	SR	—	0.02	—	V/µs	Voltage follower, 1V step, R_L = 100 kΩ @ 1.5V, $V_{OUT} = 1V_{PP}$
Gain Bandwidth Product	GBWP	—	25	—	kHz	Sourcing

DC ELECTRICAL CHARACTERISTICS (10.0V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +10.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Offset Voltage	V_{OS}	—	0.9	7	mV	—
		—	—	9	mV	–40°C ≤ T_J ≤ +85°C
Input Offset Voltage Temperature Drift	TCV_{OS}	—	2.0	—	µV/°C	—
Input Bias Current	I_B	—	1	10	pA	—
		—		500		–40°C ≤ T_J ≤ +85°C
Input Offset Current	I_{OS}	—	0.01	0.5	pA	—
		—		75		–40°C ≤ T_J ≤ +85°C
Input Resistance	R_{IN}	—	>10	—	TΩ	—
Positive Power Supply Rejection Ratio	+PSRR	65	95	—	dB	5V ≤ V_{V+} ≤ 10V, V_{V-} = 0V, $V_{CM} = V_{OUT}$ = 2.5V
Negative Power Supply Rejection Ratio	–PSRR	65	95	—	dB	–5V ≤ V_{V-} ≤ –10V, V_{V+} = 0V, $V_{CM} = V_{OUT}$ = –2.5V
Common-Mode Rejection Ratio	CMRR	60	85	—	dB	V_{CM} = –0.2V to +10.2V
Common-Mode Input Capacitance	C_{IN}	—	3	—	pF	—

DC ELECTRICAL CHARACTERISTICS (10.0V) (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +10.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Output Voltage Swing	V_{OUT}	—	0.45	2.5	mV	Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	2.5		Output HIGH, R_L = 100 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	0.45	2.5		Output LOW, R_L = 100 kΩ
		—	—	2.5		Output LOW, R_L = 100 kΩ –40°C ≤ T_J ≤ +85°C
		—	24	80		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$
		—	—	120		Output HIGH, R_L = 2 kΩ, Specified as $V_{V+} - V_{OUT}$ –40°C ≤ T_J ≤ +85°C
		—	24	80		Output LOW, R_L = 2 kΩ
		—	—	120		Output LOW, R_L = 2 kΩ –40°C ≤ T_J ≤ +85°C
Output Short-Circuit Current (Note 1)	I_{SC}	100	200	—	mA	Sourcing, V_{OUT} = 0V
		100	200	—		Sinking, V_{OUT} = 10V
Voltage Gain	A_{VOL}	—	500	—	V/mV	Sourcing
		—	500	—		Sinking
Supply Current	I_S	—	25	65	µA	V_{V+} = 10V, $V_{OUT} = V_{V+}/2$

Note 1: Short circuit may cause device to exceed maximum allowable power dissipation.

AC ELECTRICAL CHARACTERISTICS (10.0V)

Electrical Characteristics: Unless otherwise indicated, V_{V+} = +10.0V; V_{V-} = 0V; $V_{CM} = V_{OUT} = V_{V+}/2$; R_L = 1 MΩ; T_J = +25°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Slew Rate	SR	—	0.02	—	V/µs	Voltage follower, 1V step, R_L = 100 kΩ @ 1.35V, $V_{OUT} = 1V_{PP}$
Gain Bandwidth Product	GBWP	—	25	—	kHz	—
Phase Margin	ϕ_M	—	50	—	°	—
Gain Margin	G_M	—	15	—	dB	—
Input-Referred Voltage Noise	e_N	—	110	—	nV/√Hz	f = 1 kHz, V_{CM} = 1.0V
Input-Referred Current Noise	i_N	—	0.03	—	pA/√Hz	f = 1 kHz

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Junction Operating Temperature	T_J	–40	—	+85	°C	—
Storage Temperature Range	T_A	–65	—	+150	°C	—
Lead Temperature	T_S	—	+260	—	°C	Soldering, 10s
Package Thermal Resistances						
Thermal Resistance, SOT-23-5Ld	θ_{JA}	—	252	—	°C/W	—

2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	OUT	Amplifier Output.
2	V+	Positive Supply.
3	IN+	Non-inverting Input.
4	IN–	Inverting Input.
5	V–	Negative Supply.

3.0 APPLICATION INFORMATION

3.1 Input Common Mode Voltage

The MIC7111 tolerates input overdrive by at least 300 mV beyond either rail without producing phase inversion.

If the absolute maximum input voltage is exceeded, the input current should be limited to ±5 mA maximum to prevent reducing reliability. A 10 kΩ series input resistor, used as a current limiter, will protect the input structure from voltages as large as 50V above the supply or below ground. See Figure 3-1.

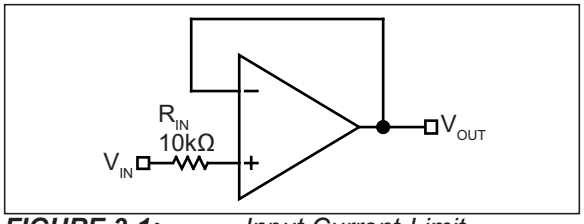


FIGURE 3-1: *Input Current-Limit Protection.*

3.2 Output Voltage Swing

Sink and source output resistances of the MIC7111 are equal. Maximum output voltage swing is determined by the load and the approximate output resistance. The output resistance is presented in Equation 3-1:

EQUATION 3-1:

$$R_{OUT} = \frac{V_{DROP}}{I_{LOAD}}$$

V_{DROP} is the voltage dropped within the amplifier output stage. V_{DROP} and I_{LOAD} can be determined from the V_O (output swing) portion of the appropriate electrical characteristics table. I_{LOAD} is equal to the typical output high voltage minus V+/2 and divided by R_{LOAD}. For example, using the DC Electrical Characteristics (5.0V) table, the typical output voltage drop using a 2 kΩ load (connected to V+/2) is 0.015V, which produces an I_{LOAD} of:

EQUATION 3-2:

$$\frac{2.5V - 0.015V}{2k\Omega} = 1.243mA$$

Then:

EQUATION 3-3:

$$R_{OUT} = \frac{15mV}{1.243mA} = 12.1 = 12\Omega$$

3.3 Driving Capacitative Loads

Driving a capacitive load introduces phase-lag into the output signal, and this, in turn, reduces op-amp system phase margin. The application that is least forgiving of reduced phase margin is a unity gain amplifier. The MIC7111 can typically drive a 500 pF capacitive load connected directly to the output when configured as a unity-gain amplifier.

3.4 Using Large-Value Feedback Resistors

A large-value feedback resistor (>500 kΩ) can reduce the phase margin of a system. This occurs when the feedback resistor acts in conjunction with input capacitance to create phase lag in the feedback signal. Input capacitance is usually a combination of input circuit components and other parasitic capacitance, such as amplifier input capacitance and stray printed circuit board capacitance.

Figure 3-2 illustrates a method of compensating phase lag caused by using a large-value feedback resistor. Feedback capacitor C_{FB} introduces sufficient phase lead to overcome the phase lag caused by feedback resistor R_{FB} and input capacitance C_{IN}. The value of C_{FB} is determined by first estimating C_{IN} and then applying the following formula:

EQUATION 3-4:

$$R_{IN} \times C_{IN} \leq R_{FB} \times C_{FB}$$

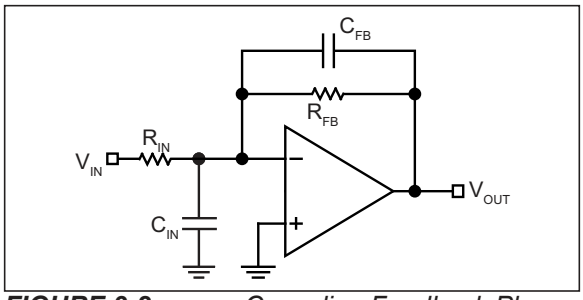


FIGURE 3-2: *Canceling Feedback Phase Lag.*

Because a significant percentage of C_{IN} may be caused by board layout, it is important to note that the correct value of C_{FB} may change when changing from a breadboard to the final circuit layout.

3.5 Typical Circuits

Some single-supply, rail-to-rail applications for which the MIC7111 is well suited are shown in the circuit diagrams of Figure 3-3 through Figure 3-8.

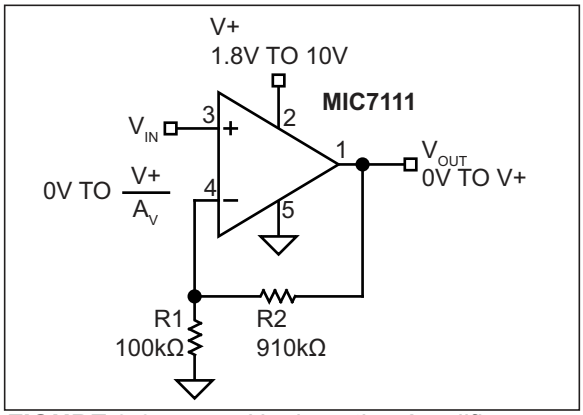


FIGURE 3-3: *Noninverting Amplifier.*

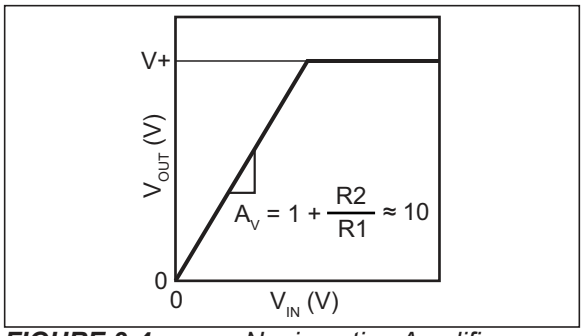


FIGURE 3-4: *Noninverting Amplifier Behavior.*

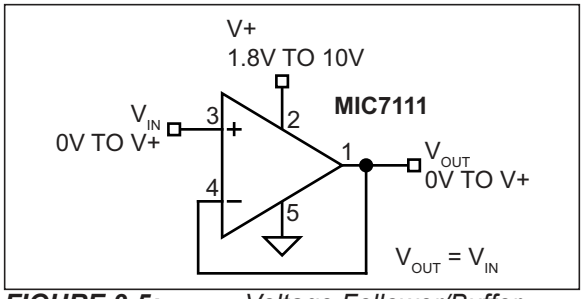


FIGURE 3-5: *Voltage Follower/Buffer.*

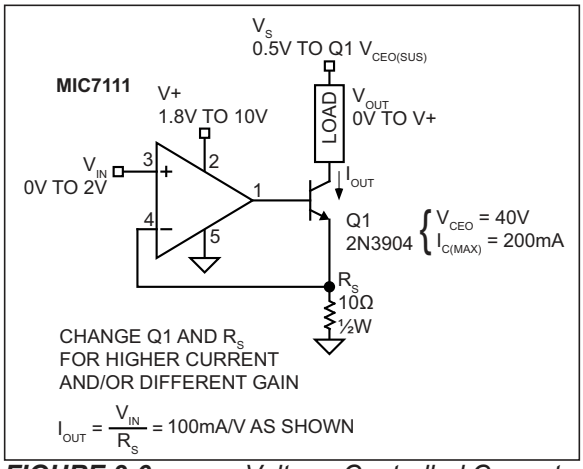


FIGURE 3-6: *Voltage-Controlled Current Sink.*

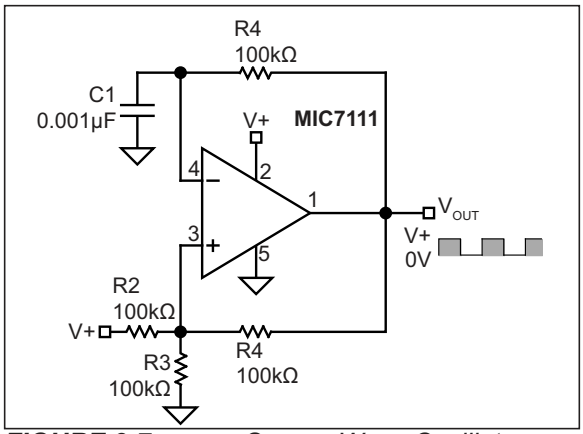


FIGURE 3-7: *Square Wave Oscillator.*

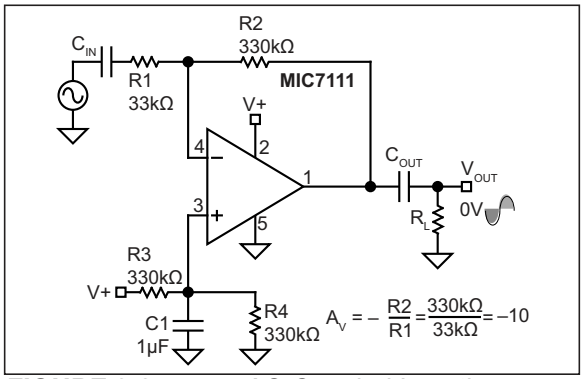
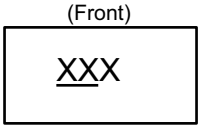


FIGURE 3-8: *AC-Coupled Inverting Amplifier.*

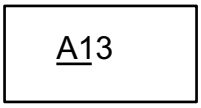
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

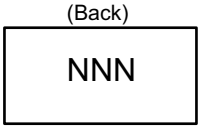
5-Lead SOT-23* (Front)



Example



5-Lead SOT-23* (Back)



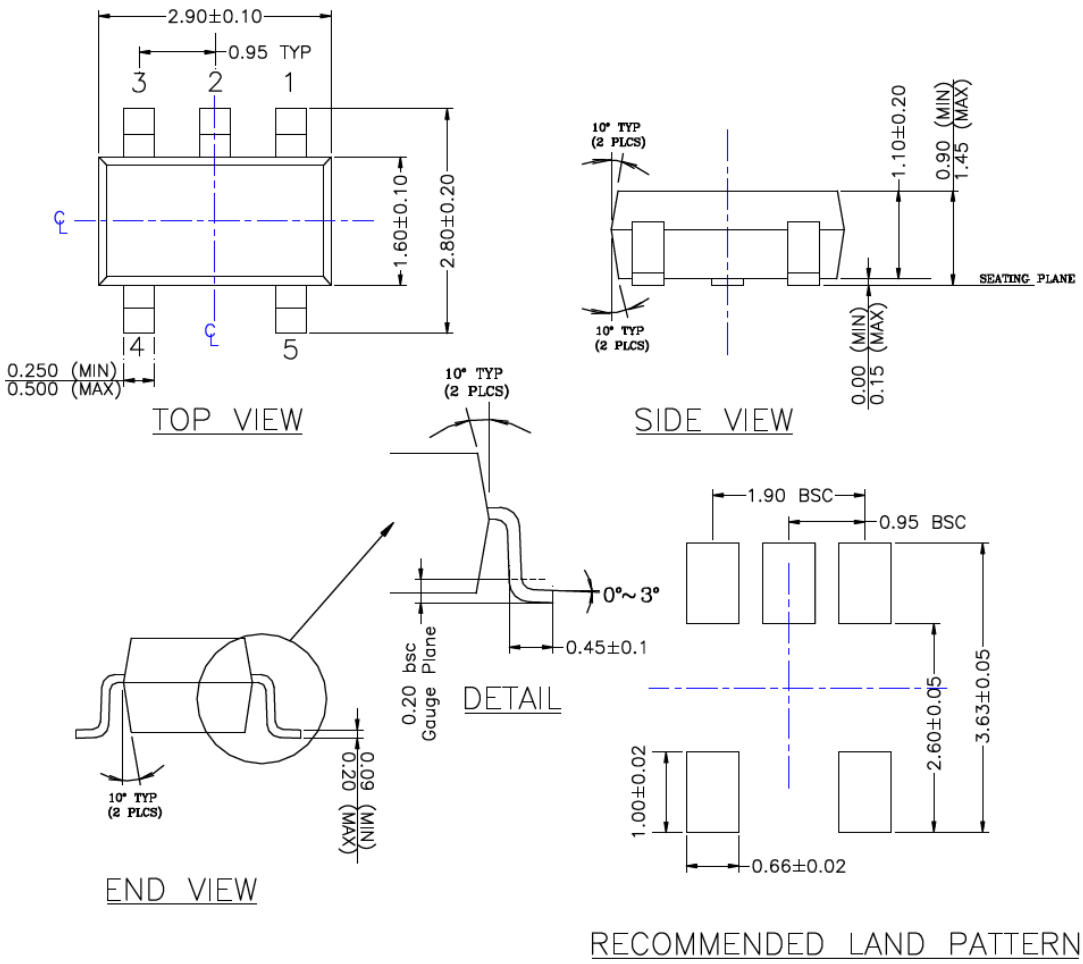
Example

Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:		In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.
		Underbar (_) and/or Overbar (¯) symbol may not be to scale.

5-Lead SOT23-5 Package Outline & Recommended Land Pattern

TITLE
5 LEAD SOT23 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOT23-5LD-PL-1	UNIT	MM



NOTE:
1. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & BURR.
2. PACKAGE OUTLINE INCLUSIVE OF SOLER PLATING.
3. DIMENSION AND TOLERANCE PER ANSI Y14.5M, 1982.
4. FOOT LENGTH MEASUREMENT BASED ON GAUGE PLANE METHOD.
5. DIE FACES UP FOR MOLD, AND FACES DOWN FOR TRIM/FORM.
6. ALL DIMENSIONS ARE IN MILLIMETERS.

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging.

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (March 2020)

- Converted Micrel document MIC7111 to Microchip data sheet template DS20006316A.
- Minor grammatical text changes throughout.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	X	XX	-XX
Device	Temperature Range	Package	Media Type

Device:	MIC7111:	1.8V to 11V, 15 µA, 25 kHz GBW, Rail-to-Rail Input and Output Operational Amplifier	
Temperature Range:	Y	=	–40°C to +85°C (Industrial)
Packages:	M5	=	5-Lead SOT-23
Media Type:	TR	=	3,000/Reel

Examples:

a) MIC7111YM5-TR: MIC7111, –40°C to +85°C Temperature Range, 5-Lead SOT-23, 3,000/Reel

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

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- Microchip is willing to work with the customer who is concerned about the integrity of their code.
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