

Dual μ Cap 80 mA LDO Regulator

Features

- Stable with Low-Value Ceramic or Tantalum Capacitors
- 2.5V to 16V Input Range
- Independent Logic Controls
- Low Quiescent Current
- Low Dropout Voltage
- Mixed Voltages Available
- Tight Load and Line Regulation
- Low Temperature Coefficient
- Current and Thermal Limiting
- Reversed Input Polarity Protection
- Zero Off-Mode Current
- Dual Regulator in Tiny SOT-23 package

Applications

- Cellular Telephones
- Laptop, Notebook, and Palmtop Computers
- Battery-Powered Equipment
- Barcode Scanners
- SMPS Post Regulator/DC-to-DC Modules
- High-Efficiency Linear Power Supplies

General Description

The MIC5211 is a dual μ Cap 80 mA linear voltage regulator with very low dropout voltage (typically 20 mV at light loads), very low ground current (225 μ A at 20 mA output current), and better than 3% initial accuracy. This dual device comes in the miniature SOT23-6 package, featuring independent logic control inputs.

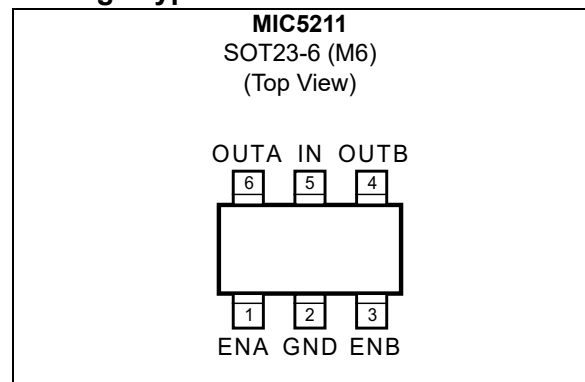
The μ Cap regulator design is optimized to work with low-value, low-cost ceramic capacitors. The outputs typically require only 0.1 μ F of output capacitance for stability.

Designed especially for handheld, battery-powered devices, ground current is minimized to prolong battery life. When disabled, power consumption drops nearly to zero.

Key features include SOT23-6 packaging, current limiting, overtemperature shutdown, and protection against reversed battery conditions.

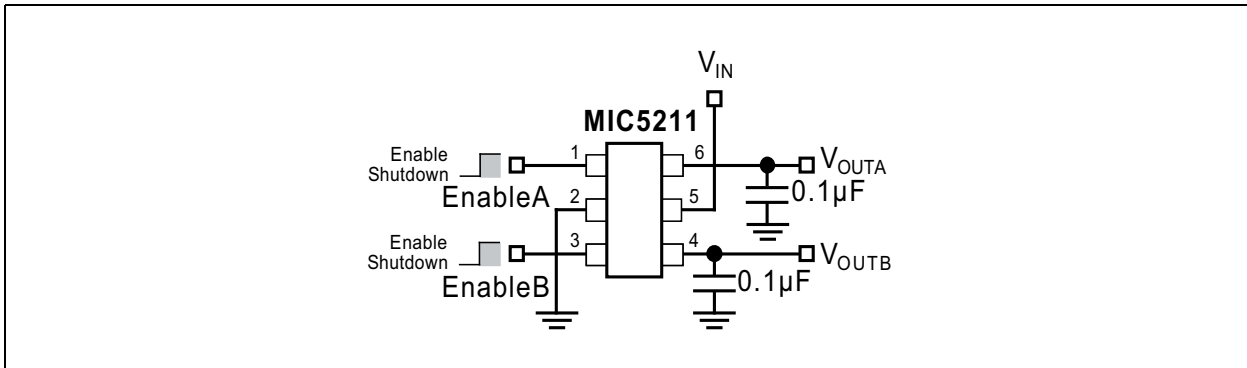
The MIC5211 is available in dual 1.8V, 2.5V, 2.7V, 2.8V, 3.0V, 3.3V, 3.6V, and 5.0V versions. Certain mixed voltages are also available. Contact Microchip for details.

Package Type



MIC5211

Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Input Voltage (V_{IN})	.....	-20V to +20V
Enable Input Voltage (V_{EN})	.....	-20V to +20V
Power Dissipation (P_D)	.....	Internally Limited
ESD Rating	.....	Note 1

Operating Ratings ††

Supply Input Voltage (V_{IN})	.....	2.5V to +16V
Enable Input Voltage (V_{EN})	.....	0V to +16V

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

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

Note 1: Devices are ESD sensitive. Handling precautions are recommended.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: $V_{IN} = V_{OUT} + 1V$; $I_L = 1\text{ mA}$; $C_L = 0.1\ \mu\text{F}$, and $V_{EN} \geq 2.0V$; $T_J = 25^\circ\text{C}$, **bold** values indicate -40°C to $+125^\circ\text{C}$ (except $V_R = 1.8V$; 0°C to $+125^\circ\text{C}$); for one-half of dual MIC5211; unless noted.

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Output Voltage Accuracy	V_O	-3	—	3	%	Variation from nominal V_{OUT}
		-4	—	4	%	
Output Voltage Temperature Coefficient	$\Delta V_O/\Delta T$	—	50	200	ppm/ $^\circ\text{C}$	Note 1
Line Regulation	$\Delta V_O/V_O$	—	0.008	0.3	%	$V_{IN} = V_{OUT} + 1V$ to 16V
		—	—	0.5	%	
Load Regulation	$\Delta V_O/V_O$	—	0.08	0.3	%	$I_L = 0.1\text{ mA}$ to 50 mA, Note 2
		—	—	0.5	%	
Dropout Voltage	$V_{IN} - V_O$	—	20	—	mV	$I_L = 100\ \mu\text{A}$, Note 3
		—	200	450	mV	$I_L = 20\text{ mA}$, Note 3
		—	250	500	mV	$I_L = 50\text{ mA}$, Note 3
Quiescent Current	I_Q	—	0.01	10	—	$V_{EN} \leq 0.4V$ (shutdown)
Ground Pin Current	I_{GND}	—	90	—	μA	$V_{EN} \geq 2.0V$, $I_L = 100\ \mu\text{A}$ (active), Note 4
		—	225	450	μA	$I_L = 20\text{ mA}$ (active), Note 4
		—	750	1200	μA	$I_L = 50\text{ mA}$ (active), Note 4
Current Limit	I_{LIMIT}	—	140	250	mA	$V_{OUT} = 0V$
Thermal Regulation	$\Delta V_O/\Delta P_D$	—	0.05	—	%/W	Note 5

MIC5211

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: $V_{IN} = V_{OUT} + 1V$; $I_L = 1 \text{ mA}$; $C_L = 0.1 \mu\text{F}$, and $V_{EN} \geq 2.0V$; $T_J = 25^\circ\text{C}$, **bold** values indicate -40°C to $+125^\circ\text{C}$ (except $V_R = 1.8V$; 0°C to $+125^\circ\text{C}$); for one-half of dual MIC5211; unless noted.

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Enable Input						
Enable Input Voltage Level	V_{IL}	—	—	0.6	V	Logic low (off)
	V_{IH}	2.0	—	—		Logic high (on)
Enable Input Current	I_{IL}	—	0.01	1	μA	$V_{IL} \leq 0.6V$
	I_{IH}	—	3	50		$V_{IH} \geq 2.0V$

- 1: Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.
- 2: Regulation is measured at constant junction temperature using low duty cycle pulse testing. Parts are tested for load regulation in the load range from 0.1 mA to 50 mA. Changes in output voltage due to heating effects are covered by the thermal regulation specification.
- 3: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at 1V differential. For output voltages below 2.5V, dropout voltage is the input-to-output voltage differential with the minimum voltage being 2.5V. Minimum input operating voltage is 2.5V.
- 4: Ground pin current is the regulator quiescent current plus pass transistor base current. The total current drawn from the supply is the sum of the load current plus the ground pin current.
- 5: Thermal regulation is defined as the change in output voltage at a time "t" after a change in power dissipation is applied, excluding load or line regulation effects. Specifications are for a 50 mA load pulse at $V_{IN} = 16V$ for $t = 10 \text{ ms}$.

TEMPERATURE SPECIFICATIONS (Note 1)

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Storage Temperature Range	T_A	-60	—	+150	$^\circ\text{C}$	—
Lead Temperature	T_J	—	—	+260	$^\circ\text{C}$	Soldering, 5 sec.
Junction Temperature	T_J	-40	—	+125	$^\circ\text{C}$	Except 1.8V option
Junction Temperature	T_J	0	—	+125	$^\circ\text{C}$	For 1.8V option
Package Thermal Resistance						
Thermal Resistance, SOT23-6	θ_{JA}	—	220	—	$^\circ\text{C}/\text{W}$	Note 2

- Note 1:** The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A , T_J , θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum $+125^\circ\text{C}$ rating. Sustained junction temperatures above $+125^\circ\text{C}$ can impact the device reliability.
- 2:** The maximum allowable power dissipation of any T_A (ambient temperature) is $P_{D(\text{MAX})} = (T_{J(\text{MAX})} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

2.0 TYPICAL PERFORMANCE CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

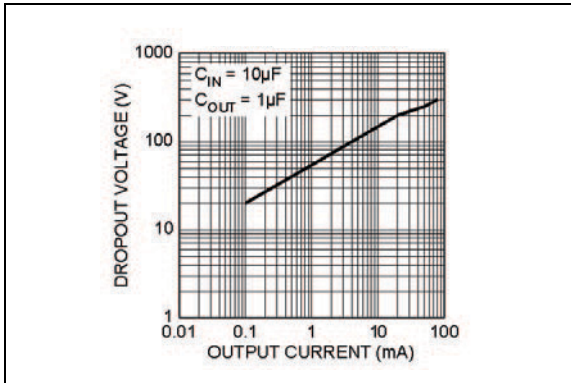


FIGURE 2-1: Dropout Voltage vs. Output Current.

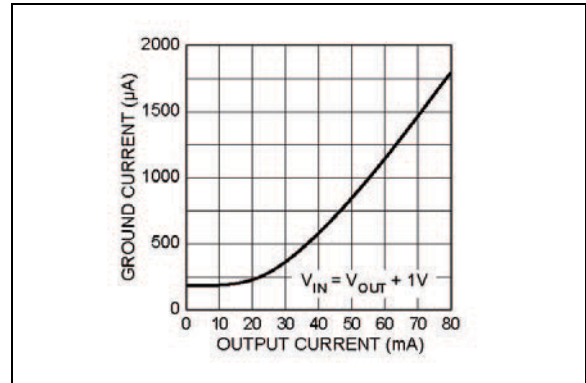


FIGURE 2-4: Ground Current vs. Output Current.

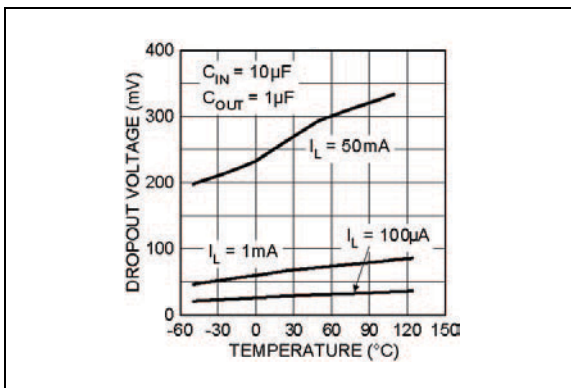


FIGURE 2-2: Dropout Voltage vs. Temperature.

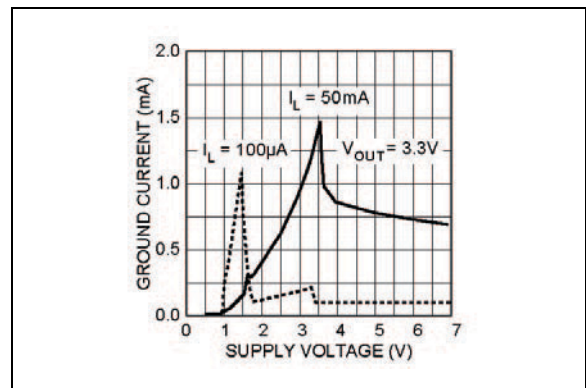


FIGURE 2-5: Ground Current vs. Supply Voltage.

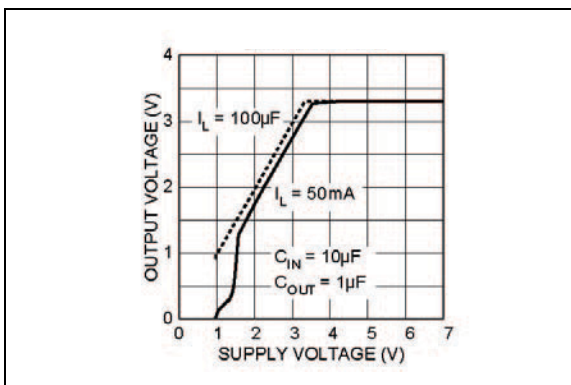


FIGURE 2-3: Dropout Characteristics (MIC5211-3.3).

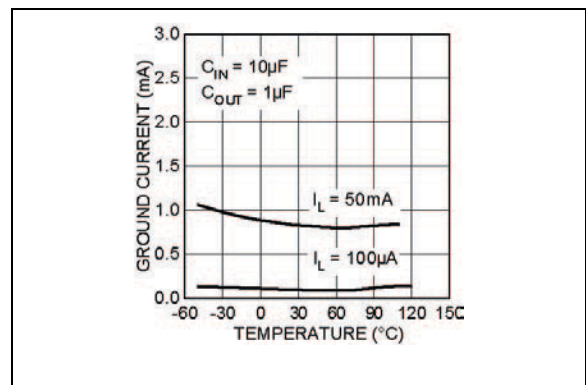


FIGURE 2-6: Ground Current vs. Temperature.

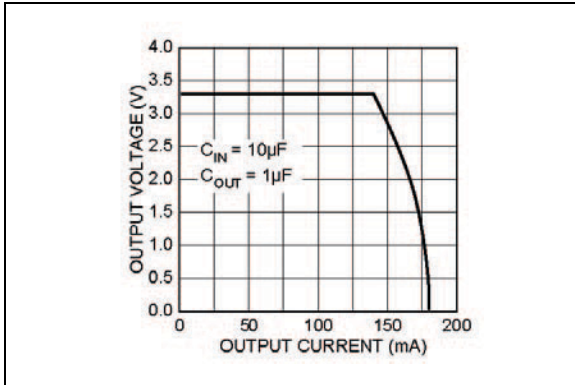


FIGURE 2-7: Output Voltage vs. Output Current.

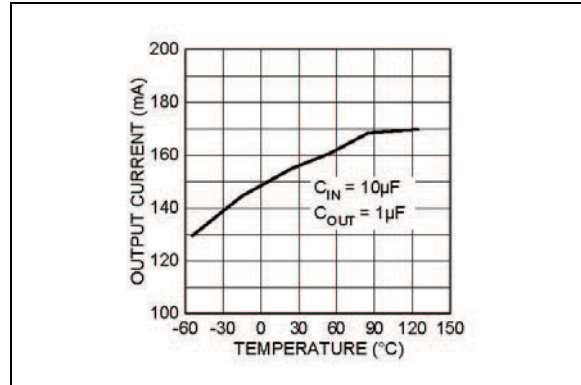


FIGURE 2-10: Short Circuit Current vs. Temperature.

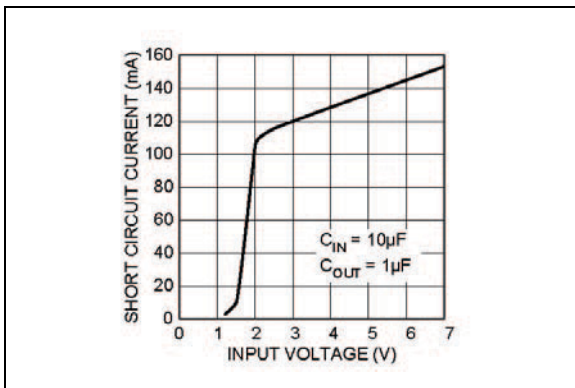


FIGURE 2-8: Short Circuit Current vs. Input Voltage.

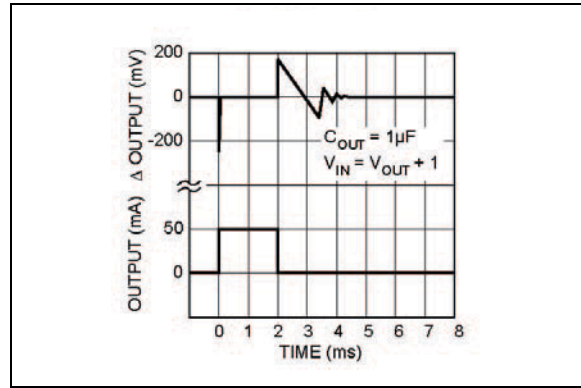


FIGURE 2-11: Load Transient.

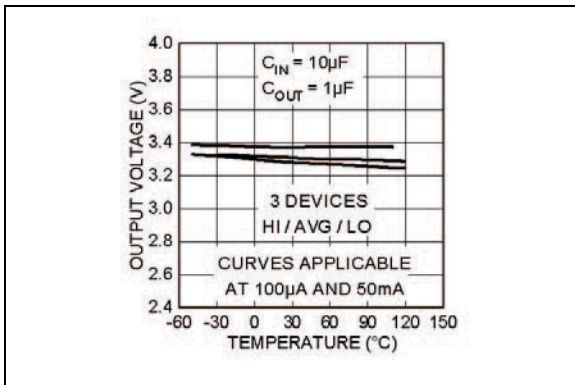


FIGURE 2-9: Output Voltage vs. Temperature.

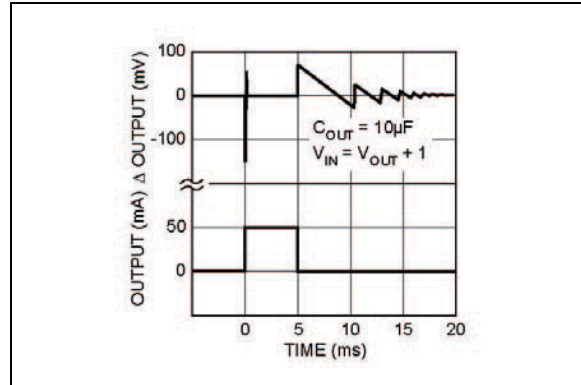


FIGURE 2-12: Load Transient.

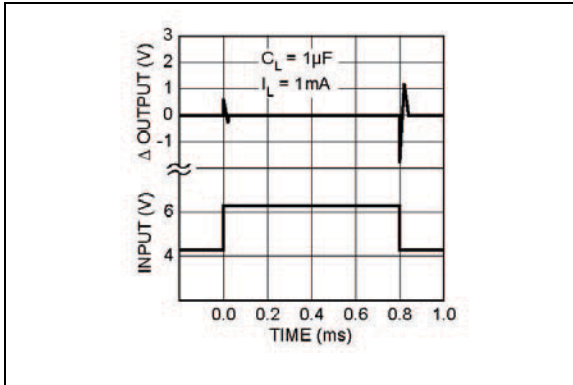


FIGURE 2-13: Line Transient (MIC5211-3.3).

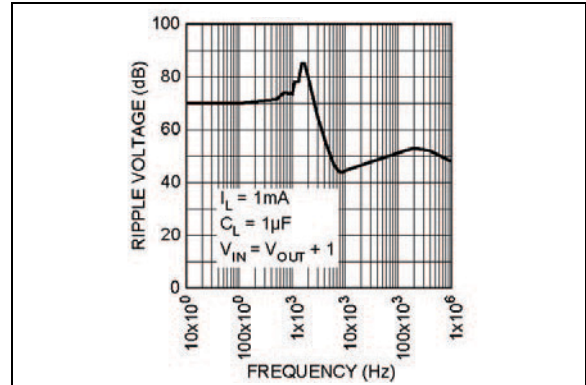


FIGURE 2-16: Ripple Voltage vs. Frequency.

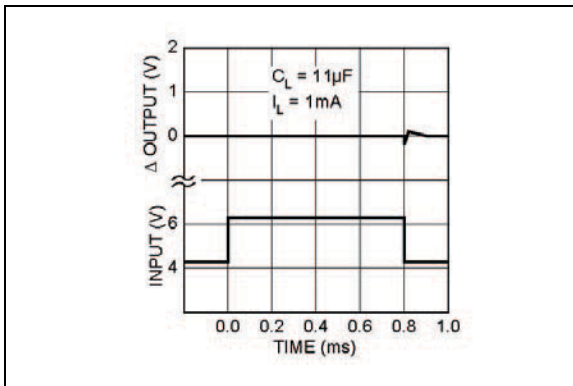


FIGURE 2-14: Line Transient (MIC5211-3.3).

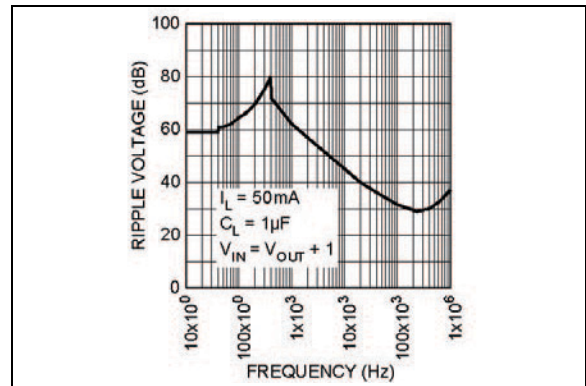


FIGURE 2-17: Ripple Voltage vs. Frequency.

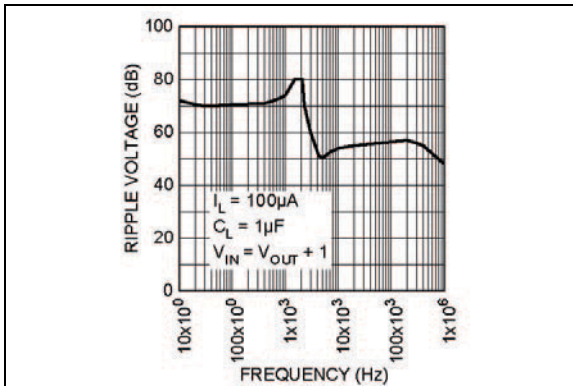


FIGURE 2-15: Ripple Voltage vs. Frequency.

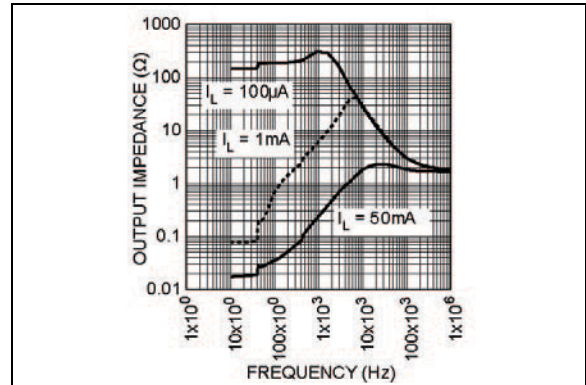


FIGURE 2-18: Output Impedance.

MIC5211

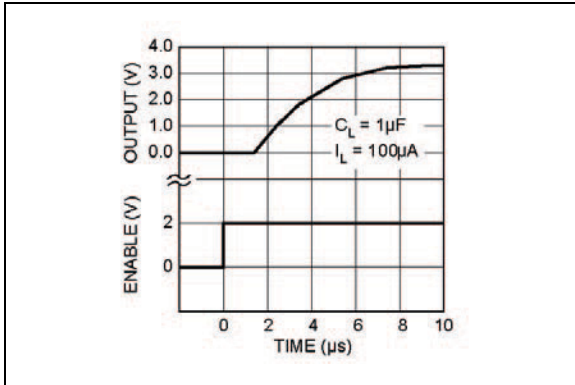


FIGURE 2-19: Enable Characteristics (MIC5211-3.3).

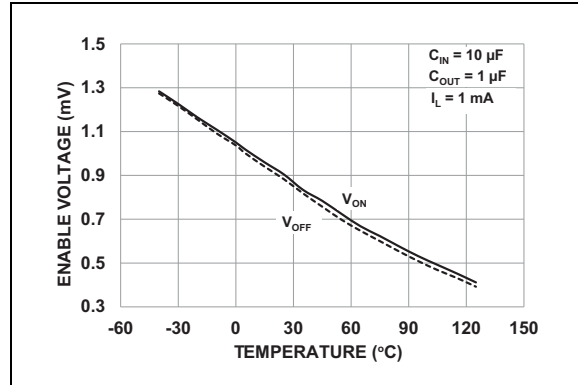


FIGURE 2-22: Enable Voltage vs. Temperature.

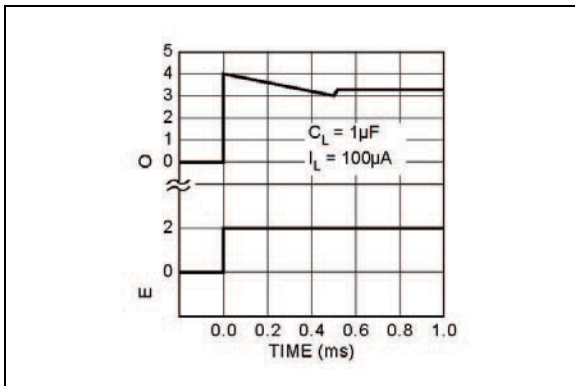


FIGURE 2-20: Enable Characteristics (MIC5211-3.3).

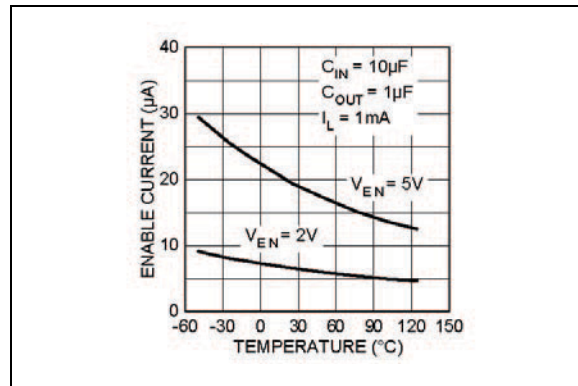


FIGURE 2-23: Enable Current vs. Temperature.

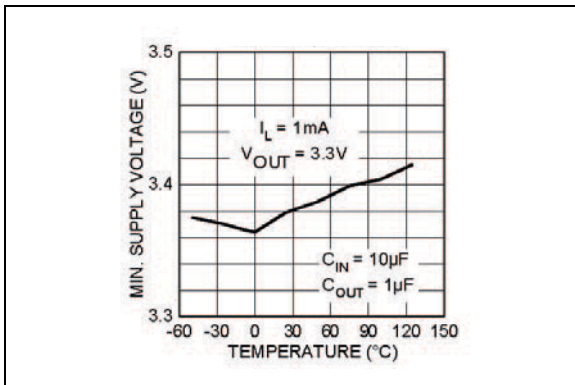


FIGURE 2-21: Minimum Supply Voltage vs. Temperature.

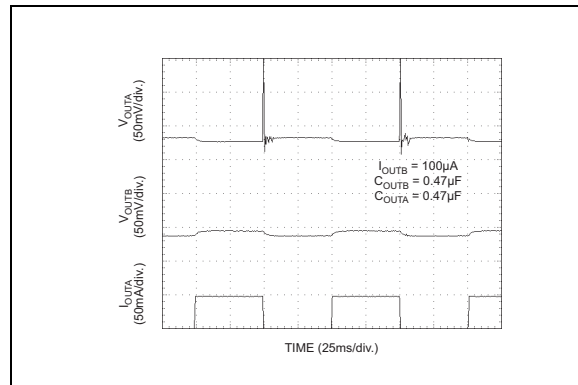


FIGURE 2-24: Crosstalk Characteristics

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 3-1](#).

TABLE 3-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	ENA	Enable/Shutdown A (Input): CMOS compatible input. Logic high = enable, logic low or open = shutdown.
2	GND	Ground.
3	ENB	Enable/Shutdown B (Input): CMOS compatible input. Logic high = enable, logic low or open = shutdown.
4	OUTB	Regulator Output B.
5	IN	Supply Input.
6	OUTA	Regulator Output A.

4.0 APPLICATIONS INFORMATION

4.1 Enable/Shutdown

ENA and ENB (enable/shutdown) may be controlled separately. Forcing ENA/B high (>2V) enables the regulator. The enable inputs typically draw only 15 μ A.

While the logic threshold is TTL/CMOS compatible, ENA/B may be forced as high as 20V, independent of V_{IN} . ENA/B may be connected to the supply if the function is not required.

4.2 Input Capacitor

A 0.1 μ F capacitor should be placed from IN to GND if there is more than 10 inches of wire between the input and the AC filter capacitor or when a battery is used as the input.

4.3 Output Capacitor

Typical PNP-based regulators require an output capacitor to prevent oscillation. The MIC5211 is ultra-stable, requiring only 0.1 μ F of output capacitance per regulator for stability. The regulator is stable with all types of capacitors, including the tiny, low ESR ceramic chip capacitors. The output capacitor value can be increased without limit to improve transient response.

The capacitor should have a resonant frequency above 500 kHz. Ceramic capacitors work, but some dielectrics have poor temperature coefficients, which will affect the value of the output capacitor over temperature. Tantalum capacitors are much more stable over temperature, but typically are larger and more expensive. Aluminum electrolytic capacitors will also work, but they have electrolytes that freeze at about -30°C . Tantalum or ceramic capacitors are recommended for operation below -25°C .

4.4 No-Load Stability

The MIC5211 will remain stable and in regulation with no load (other than the internal voltage divider) unlike many other voltage regulators. This is especially important in CMOS RAM keep-alive applications.

4.5 Thermal Shutdown

Thermal shutdown is independent on both halves of the dual MIC5211, however, an overtemperature condition in one half may affect the other half because of proximity.

4.6 Thermal Considerations

When designing with a dual low-dropout regulator, both sections must be considered for proper operation. The part is designed with thermal shutdown, therefore, the maximum junction temperature must not be exceeded. Since the dual regulators share the same substrate, the total power dissipation must be considered to avoid thermal shutdown. Simple thermal calculations based on the power dissipation of both regulators will allow the user to determine the conditions for proper operation.

The maximum power dissipation for the total regulator system can be determined using the operating temperatures and the thermal resistance of the package. In a minimum footprint configuration, the SOT23-6 junction-to-ambient thermal resistance (θ_{JA}) is $220^{\circ}\text{C}/\text{W}$. Because the maximum junction temperature for this device is 125°C , at an operating temperature of 25°C the maximum power dissipation is:

EQUATION 4-1:

$$P_{D(MAX)} = \frac{T_{(J(MAX))} - T_A}{\theta_{JA}}$$
$$P_{D(MAX)} = \frac{125^{\circ}\text{C} - 25^{\circ}\text{C}}{220^{\circ}\text{C}/\text{W}}$$
$$P_{D(MAX)} = 455\text{mW}$$

The MIC5211-3.0 can supply 3V to two different loads independently from the same supply voltage. If one of the regulators is supplying 50 mA at 3V from an input voltage of 4V, the total power dissipation in this portion of the regulator is:

EQUATION 4-2:

$$P_{D1} = (V_{IN} - V_{OUT})I_{OUT} + V_{IN} \times I_{GND}$$
$$P_{D1} = (4V - 3V)50\text{mA} + 4V \times 0.85\text{mA}$$
$$P_{D1} = 53.4\text{mW}$$

Up to approximately 400 mW can be dissipated by the remaining regulator (455 mW – 53.4 mW) before reaching the thermal shutdown temperature, allowing up to 50 mA of current.

EQUATION 4-3:

$$P_{D2} = (V_{IN} - V_{OUT})I_{OUT} + V_{IN} \times I_{GND}$$

$$P_{D2} = (4V - 3V)50mA + 4V \times 0.85mA$$

$$P_{D1} = 53.4mW$$

The total power dissipation is:

EQUATION 4-4:

$$P_{D1} + P_{D2} = 53.4mW + 53.4mW$$

$$P_{D1} + P_{D2} = 106.8mW$$

Therefore, with a supply voltage of 4V, both outputs can operate safely at room temperature and full load (50 mA).

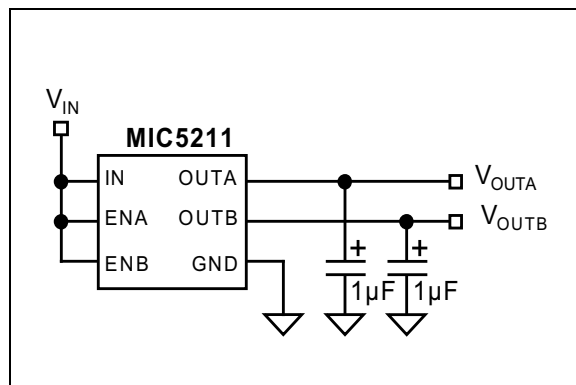


FIGURE 4-1: Thermal Conditions Circuit.

In many applications, the ambient temperature is much higher. By recalculating the maximum power dissipation at +70°C ambient, it can be determined if both outputs can supply full load when powered by a 4V supply.

EQUATION 4-5:

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

$$P_{D(MAX)} = \frac{125^{\circ}C - 70^{\circ}C}{220^{\circ}C/W}$$

$$P_{D(MAX)} = 250mW$$

At +70°C, the device can provide 250 mW of power dissipation, suitable for the application above.

When using supply voltages higher than 4V, do not exceed the maximum power dissipation for the device. If the device is operating from a 7.2V nominal two-cell lithium-ion battery and both regulators are dropping the voltage to 3.0V, then output current will be limited at higher ambient temperatures.

For example, at +70°C ambient the first regulator can supply 3.0V at 50 mA output from a 7.2V supply; however, the second regulator will have limitations on output current to avoid thermal shutdown. The dissipation of the first regulator is:

EQUATION 4-6:

$$P_{D1} = (7.2V - 3V)50mA + 7.2V \times 0.85mA$$

$$P_{D1} = 216mW$$

Because maximum power dissipation for the dual regulator is 250 mW at 70°C, the second regulator can only dissipate up to 34 mW without going into thermal shutdown. The amount of current the second regulator can supply is:

EQUATION 4-7:

$$P_{D2(MAX)} = (7.2V - 3V)I_{OUT2(MAX)} = 34mW$$

$$4.2V \times I_{OUT2(MAX)} = 34mW$$

$$I_{OUT2(MAX)} = 8mA$$

The second regulator can provide up to 8 mA output current, suitable for the keep-alive circuitry often required in handheld applications.

MIC5211

Refer to [Application Hint 17](#) for heat sink requirements when higher power dissipation capability is needed. Refer to [Designing with Low-Dropout Voltage Regulators handbook](#) for a more thorough discussion of regulator thermal characteristics.

4.7 Dual-Voltage Considerations

For configurations where two different voltages are needed in the system, the MIC5211 has the option of having two independent output voltages from the same input. For example, a 3.3V rail and a 5.0V rail can be supplied from the MIC5211 for systems that require both voltages. Important considerations must be taken to ensure proper functionality of the part. The input voltage must be high enough for the 5V section to operate correctly, this will ensure the 3.3V section proper operation as well.

Both regulators live off of the same input voltage, therefore the amount of output current each regulator supplies may be limited thermally. The maximum power the MIC5211 can dissipate at room temperature is 455 mW, as shown in the [Thermal Considerations](#) section. If we assume 6V input voltage and 50 mA of output current for the 3.3V section of the regulator, then the amount of output current the 5V section can provide can be calculated based on the power dissipation.

EQUATION 4-8:

$$P_D = (V_{GND} - V_{OUT})I_{OUT} + V_{GND} \times I_{GND}$$
$$P_{D(3.3V)} = (6V - 3.3V)50mA + 6V \times 0.85mA$$
$$P_{D(3.3V)} = 140.1mW$$
$$P_{D(MAX)} = 455mW$$
$$P_{D(MAX)} - P_{D(3.3V)} = P_{D(5V)}$$

Based on the power dissipation allowed for the 5V section, the amount of output current it can source is easily calculated.

EQUATION 4-9:

$$P_{D(5V)} = 455mW - 140.1mW$$
$$P_{D(5V)} = 314.9mW$$

EQUATION 4-10:

$$P_{D(5V)} = 314.9mW$$
$$314.9mW = (6V - 5V)I_{MAX} - 6V \times I_{GND}$$

I_{GND} typically adds less than 5% to the total power dissipation and in this case can be ignored.

EQUATION 4-11:

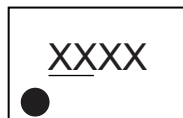
$$314.9mW = (6V - 5V)I_{MAX}$$
$$I_{MAX} = 314.9mA$$

I_{MAX} exceeds the maximum current rating of the device. Therefore, for this condition, the MIC5211 can supply 50 mA of output current from each section of the regulator.

5.0 PACKAGING INFORMATION

5.1 Package Marking Information

6-Lead SOT23*



Example



TABLE 5-1: MARKING CODES

Part Number	Marking Code	Voltage Side A/Side B	Temperature Range
MIC5211-1.8YM6	<u>LFBB</u>	1.8V	0°C to +125°C
MIC5211-2.5YM6	<u>LFCC</u>	2.5V	-40°C to +125°C
MIC5211-2.7YM6	<u>LFDD</u>	2.7V	-40°C to +125°C
MIC5211-2.8YM6	<u>LFEE</u>	2.8V	-40°C to +125°C
MIC5211-3.0YM6	<u>LFGG</u>	3.0V	-40°C to +125°C
MIC5211-3.0YM6	<u>LFLL</u>	3.3V	-40°C to +125°C
MIC5211-3.6YM6	<u>LFQQ</u>	3.6V	-40°C to +125°C
MIC5211-5.0YM6	<u>LFXX</u>	5.0V	-40°C to +125°C
Dual-Voltage Regulators			
MIC5211-BCYM6	<u>LFBC</u>	1.8V/2.5V	0°C to +125°C
MIC5211-BLYM6	<u>LFBL</u>	1.8V/3.3V	0°C to +125°C
MIC5211-CLYM6	<u>LFCL</u>	2.5V/3.3V	-40°C to +125°C
MIC5211-LXYM6	<u>LF LX</u>	3.3V/5.0V	-40°C to +125°C

<p>Legend:</p> <p>XX...X Product code or customer-specific information</p> <p>Y Year code (last digit of calendar year)</p> <p>YY Year code (last 2 digits of calendar year)</p> <p>WW Week code (week of January 1 is week '01')</p> <p>NNN Alphanumeric traceability code</p> <p>(e3) Pb-free JEDEC® designator for Matte Tin (Sn)</p> <p>* This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.</p> <p>•, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).</p>	<p>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.</p> <p>Underbar (<u> </u>) and/or Overbar () symbol may not be to scale.</p>
---	---

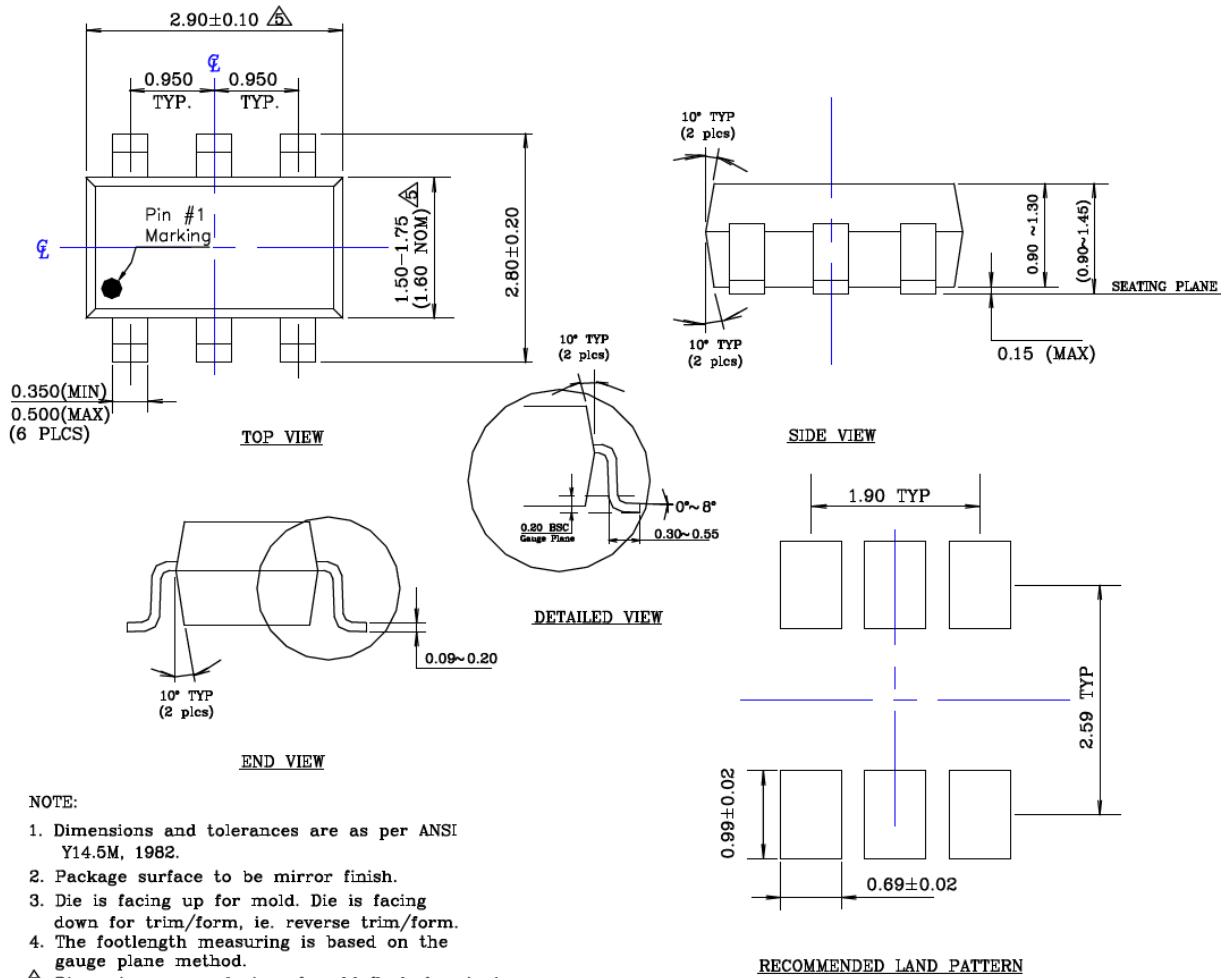
MIC5211

6-Lead SOT23 Package Outline & Recommended Land Pattern

TITLE

6 LEAD SOT23 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOT23-6LD-PL-1	UNIT	MM
------------------	----------------	-------------	----



NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1982.
 2. Package surface to be mirror finish.
 3. Die is facing up for mold. Die is facing down for trim/form, ie. reverse trim/form.
 4. The footlength measuring is based on the gauge plane method.
- △ Dimension are exclusive of mold flash & gate burr.

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

APPENDIX A: REVISION HISTORY

Revision A (May 2022)

- Converted Micrel document MIC5211 to Microchip data sheet template DS20006684A.
- Minor grammatical text changes throughout.

MIC5211

NOTES:

PRODUCT IDENTIFICATION SYSTEM

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

Device	-X.X	X	XX	-XX	Examples:
Part No.	Dual Output Voltage	Junction Temp. Range	Package	Media Type	a) MIC5211-1.8YM6-TR MIC5211, 1.8V Dual Output Voltage, 0°C to +125°C (Note 2), Temperature Range, 6-Lead SOT23, 3,000/Reel
Device	-XX	X	XX	-XX	
Part No.	Mixed Output Voltage	Junction Temp. Range	Package	Media Type	b) MIC5211-3.0YM6-TR MIC5211, 3.0V Dual Output Voltage, -40°C to +125°C, Temperature Range, 6-Lead SOT23, 3,000/Reel
					c) MIC5211-3.0YM6- TX MIC5211, 3.0V Dual Output Voltage, -40°C to +125°C, Temperature Range, 6-Lead SOT23, 3,000 Reverse Tape & Reel
					d) MIC5211-3.3YM6-TR MIC5211, 3.3V Dual Output Voltage, -40°C to +125°C, Temperature Range, 6-Lead SOT23, 3,000/Reel
					e) MIC5211-BCYM6-TR MIC5211, 1.8V/2.5V Mixed Output Voltage, 0°C to +125°C (Note 2), Temperature Range, 6-Lead SOT23, 3,000/Reel
					f) MIC5211-BLYM6-TR MIC5211, 1.8V/3.3V Mixed Output Voltage, 0°C to +125°C (Note 2), Temperature Range, 6-Lead SOT23, 3,000/Reel
					g) MIC5211-CLYM6-TR MIC5211, 2.5V/3.3V Mixed Output Voltage, -40°C to +125°C, Temperature Range, 6-Lead SOT23, 3,000/Reel
					h) MIC5211-LXYM6-TR MIC5211, 3.3V/5.0V Mixed Output Voltage, -40°C to +125°C, Temperature Range, 6-Lead SOT23, 3,000/Reel
Device: MIC5211: Dual μ Cap 80 mA LDO Regulator					
Dual Output Voltage:					
	1.8 =	1.8V			
	2.5 =	2.5V			
	2.7 =	2.7V			
	2.8 =	2.8V			
	3.0 =	3.0V			
	3.3 =	3.3V			
	3.6 =	3.6V			
	5.0 =	5.0V			
Mixed Output Voltage:					
	BC =	1.8V/2.5V			
	BL =	1.8V/3.3V			
	CL =	2.5V/3.3V			
	LX =	3.3V/5.0V			
Junction Temperature Range:					
	Y =	-40°C to +125°C, RoHS-Compliant			
Package: M6 = 6-Lead SOT23					
Media Type:					
	TX =	3,000/Reverse Tape & Reel (RVT/R)			
	TR =	3,000/Reel			
Voltage Code Table					
	Voltage	Code			
	1.8V	B			
	2.5V	C			
	2.7V	D			
	2.8V	E			
	3V	G			
	3.15V	H			
	3.3V	L			
	3.6V	Q			
	5V	X			
Note: Other voltage options available. Contact your Microchip sales office.					
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.					
Note 2: For $V_R = 1.8V$, temperature range is 0°C to +125°C.					

MIC5211

NOTES:

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright Act.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is “unbreakable”. Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. Contact your local Microchip sales office for additional support or, obtain additional support at <https://www.microchip.com/en-us/support/design-help/client-support-services>.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, Flashtec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, QuietWire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, TrueTime, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, GridTime, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, NVM Express, NVMe, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SmartHLS, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, Symmcom, and Trusted Time are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2022, Microchip Technology Incorporated and its subsidiaries.

All Rights Reserved.

ISBN: 978-1-6683-0493-8



MICROCHIP

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta

Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX

Tel: 512-257-3370

Boston

Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago

Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas

Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit

Novi, MI
Tel: 248-848-4000

Houston, TX

Tel: 281-894-5983

Indianapolis

Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles

Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC

Tel: 919-844-7510

New York, NY

Tel: 631-435-6000

San Jose, CA

Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto

Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880-3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820