

GENERAL DESCRIPTION

The MIC5213 is a μ Cap 80mA linear voltage regulator in the SC-70 package. Featuring half the footprint of the standard SOT-23 package, this regulator has very low dropout voltage (typically 20mV at light loads and 300mV at 80mA) and very low ground current (225 μ A at 20mA output). It also offers better than 3% initial accuracy and includes a logic-compatible enable input.

The μ Cap regulator design is optimized to work with low-value, low-cost ceramic capacitors. The outputs typically require only 0.47 μ F of output capacitance for stability.

Designed especially for hand-held, battery-powered devices, the MIC5213 can be controlled by a CMOS or TTL compatible logic signal. When disabled, power consumption drops nearly to zero. If on-off control is not required, the enable pin may be tied to the input for 3-terminal operation. The ground current of the MIC5213 increases only slightly in dropout, further prolonging battery life. Key MIC5213 features include current limiting, overtemperature shutdown, and protection against reversed battery.

The MIC5213 is available in 2.5V, 2.6V, 2.7V, 2.8V, 3.0V, 3.3V, 3.6, 4.0 and 5.0V fixed voltages. Other voltages are available; contact Mikron for details.

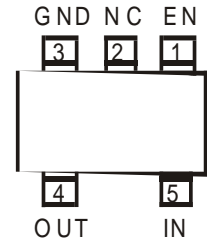
FEATURES

- SC-70 package
- Wide Selection of output voltages
- Guaranteed 80mA output
- Low quiescent current
- Low dropout voltage
- Tight load and line regulation
- Low temperature coefficient
- Current and thermal limiting
- Reversed input polarity protection
- Zero off-mode current
- Logic-controlled shutdown
- Stability with low-ESR ceramic capacitors

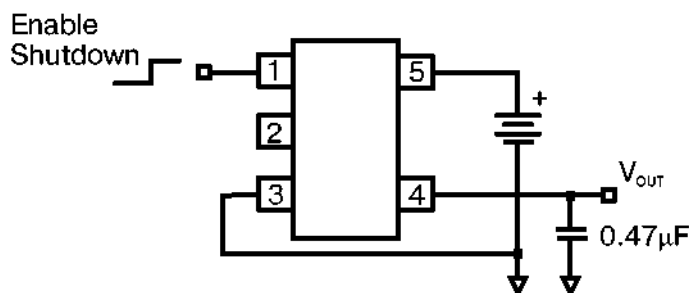
APPLICATIONS

- Cellular telephones
- Laptop, notebook, and palmtop computers
- Battery-powered equipment
- Bar code scanners
- SMPS post-regulator/DC-to-DC modules
- High-efficiency linear power supplies

PIN CONFIGURATION
(SC-70-5 Package)



TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Ratings
Input Supply Voltage	V_{IN}	-20V to +20V
Enable input Voltage	V_{EN}	-20V to +20V
Power Dissipation	P_D	Internally Limited
Storage Temperature Range	T_S	-60°C to +150°C
Lead Temperature (Soldering, 5 sec.)		260°C
ESD (Note 3)		

OPERATING RATINGS (Note 2)

Parameter	Symbol	Ratings
Input Voltage	V_{IN}	2.5V to 16V
Enable Input Voltage	V_{EN}	0V to V_{IN}
Junction Temperature Range	T_J	-40°C to +125°C
Thermal Resistance (Note 4)	θ_{JA}	

PIN DESCRIPTION

Pin Number	Pin Name	Pin Function
1	EN	Enable (Input): TTL/CMOS compatible control input. Logic high=enabled; Logic low or open=shutdown.
2	NC	Not internally connected
3	GND	Ground
4	OUT	Regulator Output
5	IN	Supply Input

ELECTRICAL CHARACTERISTICS

$V_{IN} = V_{OUT} + 1V$; $I_L = 1mA$; $C_L = 0.47\mu F$; $V_{EN} \geq 2.0V$; $T_J = 25^\circ C$, **bold** values indicate $-40^\circ C \leq T_J \leq +125^\circ C$; unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	V_O		-3 -4		3 4	% %
Output Voltage Temp. Coefficient	$\Delta V_O / \Delta T$	(Note 5)		50	200	ppm/°C
Line Regulation	$\Delta V_O / V_O$	$V_{IN} = V_{OUT} + 1V$ to 16V		0.008	0.3 0.5	% %
Load Regulation	$\Delta V_O / V_O$	$I_L = 0.1mA$ to 80 mA (Note 6)		0.08	0.3 0.5	% %
Dropout Voltage (Note 7)	$V_{IN} - V_O$	$I_L = 100\mu A$		20		mV
		$I_L = 20mA$		200	350	mV
		$I_L = 50mA$		250		mV
		$I_L = 80mA$		300	600	mV
Quiescent Current	I_Q	$V_{EN} \leq 0.4V$ (shutdown)		0.01	10	μA
Ground Pin Current (Note 8)	I_{GND}	$I_L = 100\mu A$, $V_{EN} \geq 2.0V$ (active)		180		μA
		$I_L = 20mA$, $V_{EN} \geq 2.0V$ (active)		225	750	μA
		$I_L = 50mA$, $V_{EN} \geq 2.0V$ (active)		850		μA
		$I_L = 80mA$, $V_{EN} \geq 2.0V$ (active)		1800	3000	μA
Ground Pin Current at Dropout	I_{GNDDO}	$V_{IN} = V_{OUT}(\text{nominal}) - 0.5V$ (Note 8)		200	300	μA
Current Limit	I_{LIMIT}	$V_{OUT} = 0V$		180	250	mA
Thermal Regulation	$\Delta V_O / \Delta P_D$	(Note 9)		0.05		%W

Enable Input						
Enable Input Voltage Level	V_{IN}	logic Low (off)			0.6	V
	V_{IH}	logic high (on)	2.0			V
Enable Input Current	I_{IL}	$V_{IN} \leq 0.6 \text{ V}$		0.01	1	μA
	I_{IH}	$V_{IH} \geq 2.0 \text{ V}$		15	50	μA

Notes:

Note 1: Exceeding the absolute maximum rating may damage the device.

Note 2: The device is not guaranteed to function outside its operating rating

Note 3: Devices are ESD sensitive. Handling precautions recommended.

Note 4: 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: $P_{D(max)} = (T_{J(max)} - T_A) \div \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown. θ_{JA} of the SC-70-5 is 450°C/W, mounted on a PC board.

Note 5: Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.

Note 6: Regulation is measured at constant junction temperature using low duty cycle pulse testing.

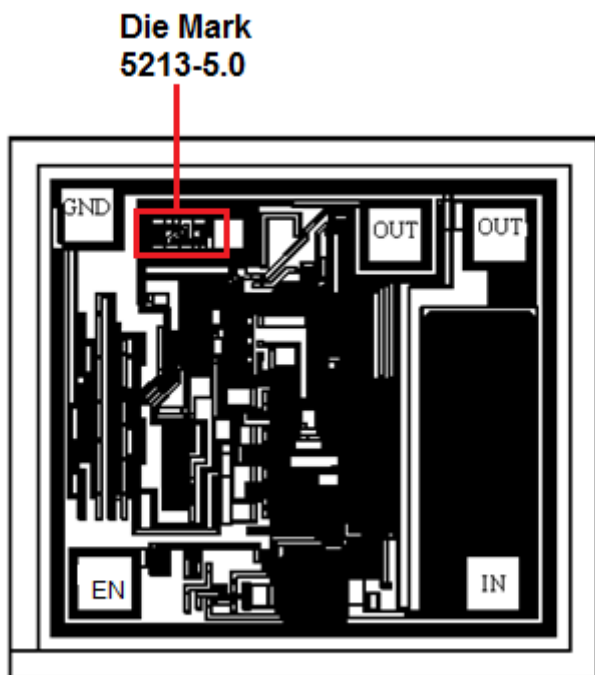
Changes in output voltage due to heating effects are covered by the thermal regulation specification

Note 7: 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.

Note 8: 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.

Note 9: 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 an 80mA load pulse at $V_{IN} = 16\text{V}$ for $t = 10\text{ms}$

PAD LOCATION AND COORDINATES



Die size (including scribe line): 0.84×0.78 mm²

MIC5213 – for 4" wafers

MIC5213K – for 6" wafers

Name (Package)	Pad centers coordinates (μm)		Pad Size (μm×μm)
	X	Y	
EN	135	137	80×80
GND	110	669.5	80×80
OUT	550	641	80×80
OUT	700	641	80×80
IN	689.5	137	80×80

BONDING DIAGRAM MIC5213(K)
Package SC-70-5 (bottom view)



ASSEMBLY CHARACTERISTICS

No.	Assembly Characteristics	Value
1	Wafer Size	6 Inch
2	Wafer Thickness before Grinding	675 +/-25 μm
3	Scribe Street Width	80 μm
4	Chip Size (including Scribe Line)	0.84x0.78 mm ²
5	Die Attach Material	Substrate is connected to GND
6	Quantity of Bond Pad Metal Layers	1
7	Pad Thickness	1.2 μm
8	Composition of Metal Layers	Al+Si(1.0%)+Ti(0.5%)
9	Min. Bond Pad Opening Size	80x80 μm
10	Min. Bond Pad Pitch	147 μm
11	Min. Wire Diameters	1 mil (25 μm)
12	Circuit Under Pad Design (CUP)	Yes

ADDITIONAL INFORMATION

Pb-free products:

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.

Green products:

- Lead-free (RoHS compliant)
- Halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

The appearance complies with the requirements of the company standards.