MAX667

+5V Programmable, Low-Dropout Voltage Regulator

Description

The MAX667 low-dropout, positive, linear voltage regulator supplies up to 250mA of output current. With no load, it has a typical quiescent current of 20µA. At 200mA of output current, the input/output voltage differential is typically 150mV. Other features include a low-voltage detector to indicate power failure, as well as early-warning and low-dropout detectors to indicate an imminent loss of output voltage regulation. A shutdown control disables the output and puts the circuit into a low quiescent-current mode.

The MAX667 employs Dual Mode™ operation. One mode uses internally trimmed feedback resistors to produce +5V. In the other mode, the output may be varied from +1.3V to +16V by connecting two external resistors.

The MAX667 is a pin-compatible upgrade to the MAX666 in most applications where the input voltages are above +3.5V. Choose the MAX667 when high output currents and/or low dropout voltages are desired, as well as for improved performance at higher temperatures.

Key Features

- 350mV Max Dropout at 200mA
- 250mA Output Current
- Normal Mode: 20µA Typ Quiescent Current
- Shutdown Mode: 0.2µA Typ Quiescent Current
- Low-Battery Detector
- Fixed +5V (Min Component Count) or Adjustable Output
- +3.5V to +16.5V Input
- Dropout Detector Output
- 10µF Output Capacitor

Applications / Uses

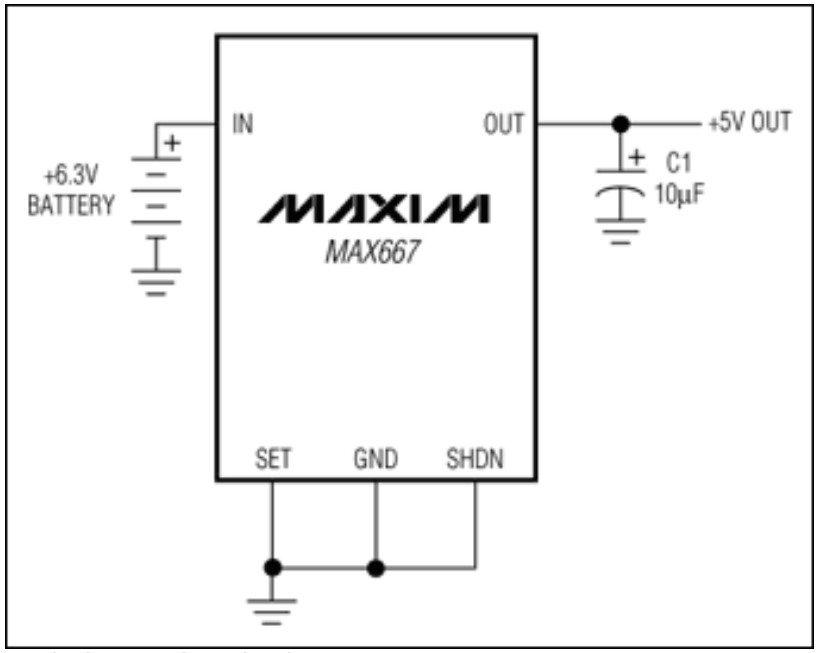
Automotive Electronics
Pagers and Radio Control Receivers
Portable Instrumentation
Solar-Powered Instruments

Key Specifications: Linear Regulators

Part Number	Regulators per Pkg.	Min. V_{IN} (V)	Max. V_{IN} (V)	Preset V_{OUT} (V)	Min. Adjustable V_{OUT} (V)	Max. Adjustable V_{OUT} (V)	Typ. $V_{DROPOUT}$@ Rated I_{LOAD} (V)	Rated I_{LOAD} (mA)	Max. I_{CC} (µA)	Low Battery/ Power Fail Output	Watchdog	Reverse Battery Protection	Package	Operating Temp. Range (°C)	
MAX667	1	3.5	16.5	5.0	1.3	15	0.19	250	25	No	No	No	Ceramic DIP/8 PDIP/8 SOIC/8	-40 to +85 0 to +70	
See All Linear Regulators (145)															

Notes:
**This pricing is BUDGETARY, for comparing similar parts. Prices are in U.S. dollars and subject to change. Quantity pricing may vary substantially and international prices may differ due to local duties, taxes, fees, and exchange rates. For volume-specific prices and delivery, please see the price and availability page or contact an authorized distributor.

Diagram



Typical Operating Circuit

Application Notes

Application Note 44: Regulated Step-Up Converter Provides High Efficiency Without Inductors - MAX667
Application Note 59: Flyback Winding Adds 12V Output To 5V Buck Regulator - MAX667
Application Note 175: LAN Power Supply Generates Isolated 9V - MAX667
Application Note 966: Low Battery Monitor Delays System Shutdown - MAX667
Application Note 1923: Draw 150mW Of Isolated Power From Off-Hook Phone Line - MAX667

Evaluation Kits

none

Design Guides

Reference (PDF)

Reliability Reports

Show FIT data for:
Reliability Report: MAX667xxA.pdf

Software / Models

none

Ordering Information

Notes:

1. Other options and links for purchasing parts are listed at:
2. Didn't Find What You Need? Ask our applications engineers. Expert assistance in finding parts, usually within one business day.
3. Part number suffixes: T or T&R = tape and reel; + = RoHS/lead-free; # = RoHS/lead-exempt. More: SeeFull Data Sheet or Part Naming Conventions.
4. * Some packages have variations, listed on the drawing. "PkgCode/Variation" tells which variation the product uses. Note that "+", "#", "-" in the part number suffix describes RoHS status. Package drawings may show a different suffix character.

Devices: 1-15 of 15

MAX667	Free Sample	Buy	Package: TYPE PINS FOOTPRINT DRAWING CODE/VAR *	Temp	RoHS/Lead-Free? Materials Analysis
MAX667MJA			Ceramic DIP;8 pin; Dwg: 21-0045 (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: No Materials Analysis
MAX667MJA/883B			Ceramic DIP;8 pin; Dwg: 21-0045 (PDF) Use pkgcode/variation: J8-2*	-55°C to +125°C	RoHS/Lead-Free: No Materials Analysis
MAX667C/D					See data sheet

MAX667CPA+			PDIP;8 pin; Dwg: 21-0043 (PDF) Use pkgcode/variation: P8+2*	0°C to +70°C	RoHS/Lead-Free: Lead Free Materials Analysis
MAX667CPA			PDIP;8 pin; Dwg: 21-0043 (PDF) Use pkgcode/variation: P8-2*	0°C to +70°C	RoHS/Lead-Free: No Materials Analysis
MAX667EPA+			PDIP;8 pin; Dwg: 21-0043 (PDF) Use pkgcode/variation: P8+2*	-40°C to +85°C	RoHS/Lead-Free: Lead Free Materials Analysis
MAX667EPA			PDIP;8 pin; Dwg: 21-0043 (PDF) Use pkgcode/variation: P8-2*	-40°C to +85°C	RoHS/Lead-Free: No Materials Analysis
MAX667CSA			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8-4*	0°C to +70°C	RoHS/Lead-Free: No Materials Analysis
MAX667CSA+			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8+4*	0°C to +70°C	RoHS/Lead-Free: Lead Free Materials Analysis
MAX667CSA+T			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8+4*	0°C to +70°C	RoHS/Lead-Free: Lead Free Materials Analysis
MAX667CSA-T			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8-4*	0°C to +70°C	RoHS/Lead-Free: No Materials Analysis
MAX667ESA-T			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8-4*	-40°C to +85°C	RoHS/Lead-Free: No Materials Analysis
MAX667ESA			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8-4*	-40°C to +85°C	RoHS/Lead-Free: No Materials Analysis
MAX667ESA+			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8+4*	-40°C to +85°C	RoHS/Lead-Free: Lead Free Materials Analysis
MAX667ESA+T			SOIC;8 pin; Dwg: 21-0041 (PDF) Use pkgcode/variation: S8+4*	-40°C to +85°C	RoHS/Lead-Free: Lead Free Materials Analysis

More Information

New Product Press Release 2008-11-25

+5V/Programmable Low-Dropout Voltage Regulator

General Description

The MAX667 low-dropout, positive, linear voltage regulator supplies up to 250mA of output current. With no load, it has a typical quiescent current of 20µA. At 200mA of output current, the input/output voltage differential is typically 150mV. Other features include a low-voltage detector to indicate power failure, as well as early-warning and low-dropout detectors to indicate an imminent loss of output voltage regulation. A shutdown control disables the output and puts the circuit into a low quiescent-current mode.

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Applications

Battery-Powered Devices

Pagers and Radio Control Receivers

Portable Instruments

Solar-Powered Instruments

Features

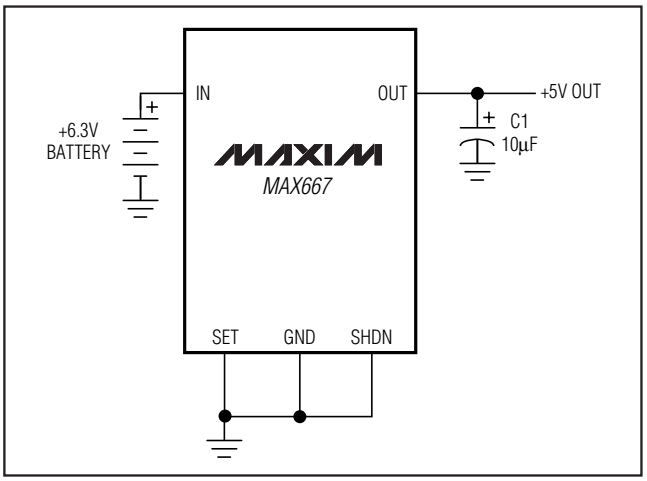
- **350mV Max Dropout at 200mA**
- **250mA Output Current**
- **Normal Mode: 20µA Typ Quiescent Current**
  Shutdown Mode: 0.2µA Typ Quiescent Current
- **Low-Battery Detector**
- **Fixed +5V (Min Component Count) or Adjustable Output**
- **+3.5V to +16.5V Input**
- **Dropout Detector Output**
- **10µF Output Capacitor**

Ordering Information

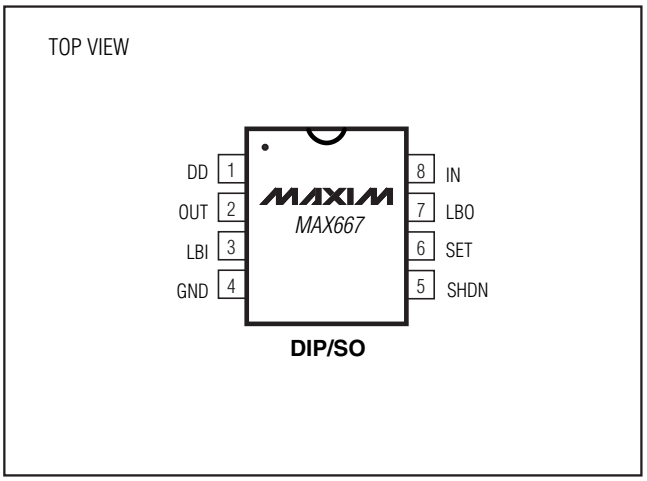
PART	TEMP RANGE	PIN-PACKAGE
MAX667CPA	0°C to +70°C	8 Plastic DIP
MAX667CSA	0°C to +70°C	8 SO
MAX667C/D	0°C to +70°C	Dice*
MAX667EPA	-40°C to +85°C	8 Plastic DIP
MAX667ESA	-40°C to +85°C	8 SO
MAX667MJA	-55°C to +125°C	8 CERDIP**
MAX667MSA/PR	-55°C to +125°C	8 SO†
MAX667MSA/PR-T	-55°C to +125°C	8 SO†

**Contact factory for dice specifications.*
***Contact factory for availability and processing to MIL-STD-883.*
†Contact factory for availability.

Typical Operating Circuit



Pin Configuration



™ Dual Mode is a trademark of Maxim Integrated Products.

+5V/Programmable Low-Dropout Voltage Regulator

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage .....+18V
Output Short Circuited to Ground.....1sec
LBO Output Sink Current 50mA
LBO Output Voltage .....GND to V_{OUT}
SHDN Input Voltage .....-0.3V to (V_{IN} + 0.3V)
Input Voltages LBI, SET.....-0.3V to (V_{IN} - 1.0V)
Continuous Power Dissipation
Plastic DIP (derate 9.09mW/°C above +70°C) 727mW
SO (derate 5.88mW/°C above +70°C).....471mW
CERDIP (derate 8.00mW/°C above +70°C).....640mW
Operating Temperature Ranges
MAX667C_A.....0°C to +70°C
MAX667E_A.....-40°C to +85°C
MAX667MJA .....-55°C to +125°C
Storage Temperature Range .....-65°C to +160°C
Lead Temperature (soldering, 10sec) .....+300°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(GND = 0V, V_{IN} = +9V, V_{OUT} = +5V, C1 = 10µF, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		T_A = +25°C MIN	TYP	MAX	T_A = T_{MIN} to T_{MAX} MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}						3.5		16.5	V
Output Voltage	V_{OUT}	V_{SET} = 0V, V_{IN} = 6V, I_{OUT} = 10mA, T_A = -40°C to +85°C			5		4.8		5.2	V
		V_{SET} = 0V, V_{IN} = 6V, I_{OUT} = 10mA, T_A = -55°C to +125°C			5		4.75		5.25	
Maximum Output Current	I_{OUT}	V_{IN} = 6V, 4.5V < V_{OUT} < 5.5V		250			250			mA
Quiescent Current	I_Q	V_{SHDN} = 2V			0.2	1			2	µA
		V_{SHDN} = 0V, V_{SET} = 0V	I_{OUT} = 0µA		20	25			35	
			I_{OUT} = 100µA		20	30			50	
			I_{OUT} = 200mA		5	15			20	mA
Dropout Voltage (Note1)		I_{OUT} = 100µA			5	60			75	mV
		I_{OUT} = 200mA			150	250			350	
Load Regulation		I_{OUT} = 10mA to 200mA			50	100			250	mV
Line Regulation		V_{IN} = 6V to 10V, I_{OUT} = 10mA			5	10			15	mV
SET Reference Voltage	V_{SET}				1.225		1.20		1.25	V
SET Input Leakage Current	I_{SET}	V_{SET} = 1.5V			0.01	±10			±1000	nA
Output Leakage Current	I_{OUT}	V_{SHDN} = 2V			0.1				1	µA
Short-Circuit Current	I_{OUT}	(Note 2)				400			450	mA
Low-Battery Detector Reference Voltage	V_{LBI}				1.225		1.195		1.255	V
Low-Battery Detector Input Leakage Current	I_{LBI}	V_{LBI} = 1.5V			0.01	±10			±1000	nA
Low-Battery Detector Output Voltage	V_{LBO}	V_{IN} = 9V, V_{LBI} = 2V, I_{LBO} = 10mA				0.25			0.4	V
SHDN Threshold	V_{SHDN}	V_{IH}		1.5			1.5			V
		V_{IL}				0.3			0.3	
SHDN Leakage Current	I_{SHDN}	V_{SHDN} = 0V to V_{IN}			0.01	±10			±1000	nA
Dropout Detector Output Voltage	V_{DD}	V_{SET} = 0V, V_{SHDN} = 0V, R_{DD} = 100kΩ, I_{OUT} = 10mA	V_{IN} = 7V						0.25	V
			V_{IN} = 4.5V				3.5			

Note 1: Dropout Voltage is V_{IN}-V_{OUT} when V_{OUT} falls to 0.1V below its value at V_{IN} = V_{OUT} + 2V.
Note 2: Short-Circuit Current is pulse tested to maintain junction temperature. Short-circuit duration is limited by package dissipation.

+5V/Programmable Low-Dropout Voltage Regulator

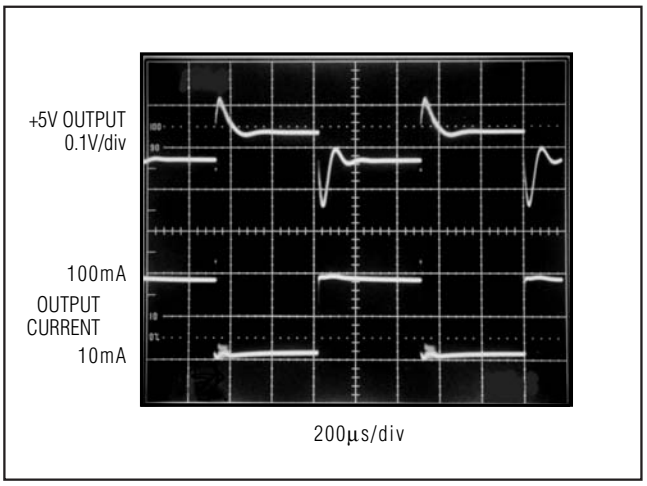


Figure 12. Output Response to 10mA/100mA Load Step with 10µF Output Capacitor (1.5Ω ESR)

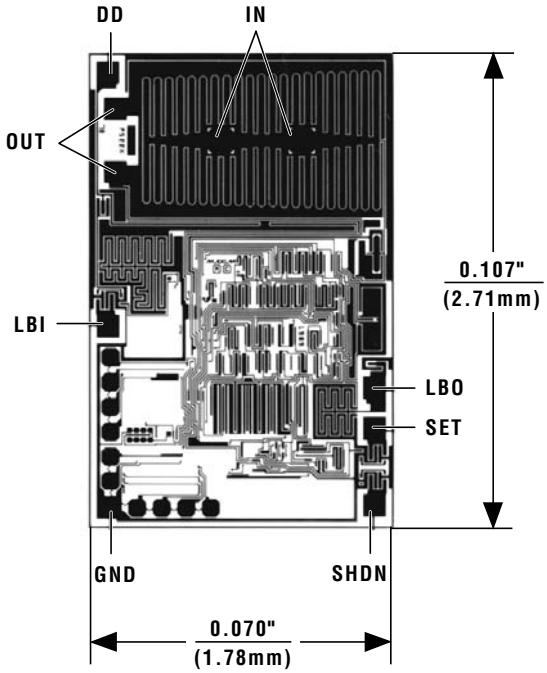
(PSRR) is therefore not specified. Since the output must be connected to a 10µF or larger filter capacitor, the capacitor characteristics dominate the PSRR. Large values of input and output capacitors reduce the ripple.

In addition, both DD and LBI/LBO can trigger on the lowest DC component of the ripple, particularly at high load currents. In the case of the low-battery detector, the ripple can be effectively filtered out by placing a capacitor to ground in parallel with the LBI input pin. The high resistance values that can be used for the voltage divider allow relatively small capacitance values to form an effective lowpass filter at 120Hz. When power is first applied, however, this filter tends to hold LBO low longer than normal.

Transient Considerations

The low operating current and gain-bandwidth product of the internal reference and amplifier result in limited rejection of fast-step input changes. Negative-going steps, which occur in under 100µs, may turn off the output for several milliseconds. An input filter (nominally 10µF) is recommended if input changes greater than 1V and faster than 100µs (other than turn-on or turn-off) are anticipated. Figure 12 shows the output response to a 10mA/100mA instantaneous load step. The relationship between output-capacitor ESR and load-transient response is explained in the *Output Capacitor* section.

Chip Topography



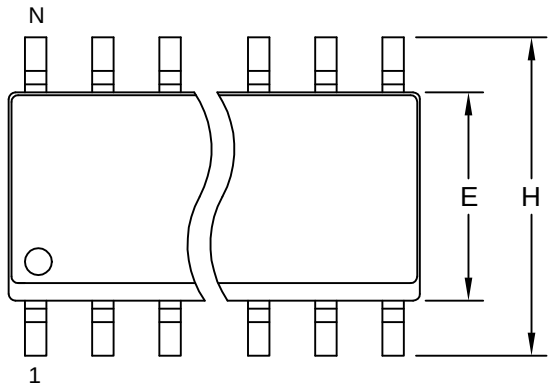
TRANSISTOR COUNT: 65
SUBSTRATE MUST BE LEFT UNCONNECTED

Package Information

For the latest package outline information and land patterns,

PACKAGE TYPE	PACKAGE CODE	DOCUMENT NO.
8 PDIP	P8-T	21-0043
8 SO	S8-4	21-0041
8 CERDIP	J8-2	21-0045

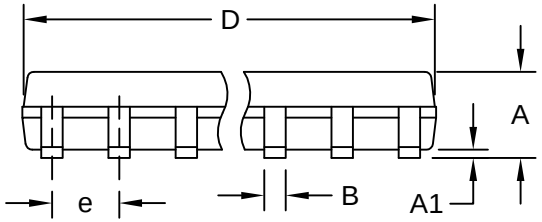
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
e	0.050 BSC		1.27 BSC	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27



TOP VIEW

VARIATIONS:

	INCHES		MILLIMETERS			
DIM	MIN	MAX	MIN	MAX	N	MS012
D	0.189	0.197	4.80	5.00	8	AA
D	0.337	0.344	8.55	8.75	14	AB
D	0.386	0.394	9.80	10.00	16	AC



FRONT VIEW

SIDE VIEW

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS012.
6. N = NUMBER OF PINS.

DALLAS SEMICONDUCTOR MAXIM

PROPRIETARY INFORMATION

TITLE:

PACKAGE OUTLINE, .150" SOIC

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0041	B	1/1