

Dual, High-PSRR, Low-Noise, Low-Dropout, 300mA CMOS Linear Regulator

General Description

The EMP5523 series is a family of dual-channel CMOS linear regulators featuring ultra-high power supply rejection ratio (PSRR), low output voltage noise, low dropout voltage, low quiescent current and fast transient response. It guarantees delivery of 300mA output current per regulator, and supports preset output voltages ranging from 1.2V to 3.3V with 0.1V increment (except for 1.85V and 2.85V).

The EMP5523 is well suited for portable battery-powered application which requires high efficiency, low noise and small board space. With 170mV low dropout voltage at 300mA output current, EMP5523 sustains high PSRR at very low input voltage which is common in battery-powered application. The EMP5523 also features 120 μ V_{RMS} low output voltage noise without the presence of a noise bypass capacitor, which fits the application where noise and board space are both concerned. Other features include thermal protection and over-current protection. The EMP5523 is available in SOP-8 package.

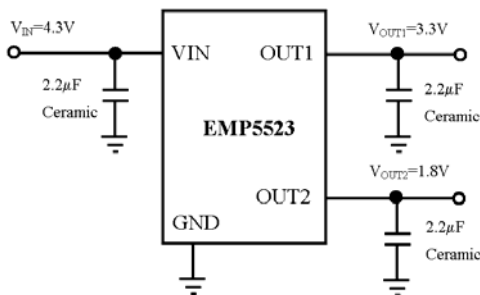
Features

- 300mA guaranteed output current
- 72dB typical PSRR at 1kHz (60dB typical at 10kHz)
- 120 μ V_{RMS} output voltage noise (10Hz to 100kHz)
- 170mV typical dropout at 300mA
- 150 μ A typical quiescent current
- Fast line and load transient response
- 2.5V to 5.5V input range
- Stable with small ceramic output capacitors
- Over temperature and over current protection
- $\pm 2\%$ output voltage tolerance
- SOP-8 package available
- RoHS compliant and Pb-free

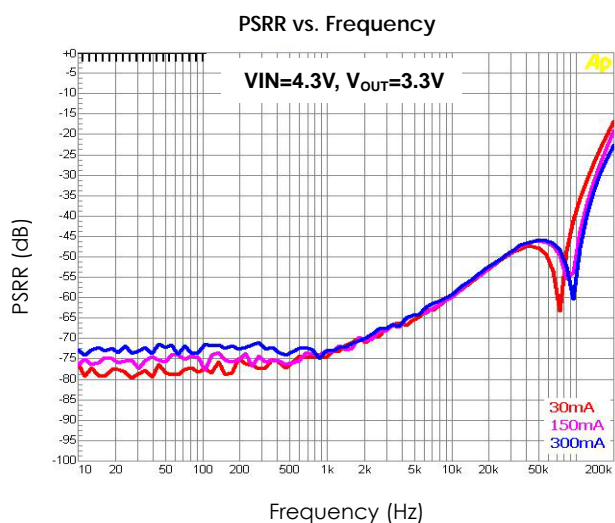
Applications

- Wireless handsets
- PCMCIA cards
- DSP core power
- Hand-held instruments
- Battery-powered systems
- Portable information appliances

Typical Application Diagram

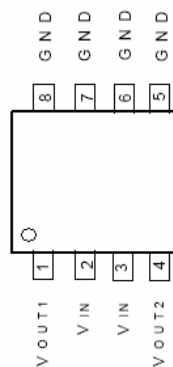


Typical Performance Characteristics



Connection Diagrams

SOP-8 (Top View)



Order information

EMP5523-XXSA08GRR/NRR

XX Output Operation

SA08 SOP-8 Package

GRR RoHS (Pb Free)

Rating: -40 to 85°C

Package in Tape & Reel

NRR RoHS & Halogen free (By Request)

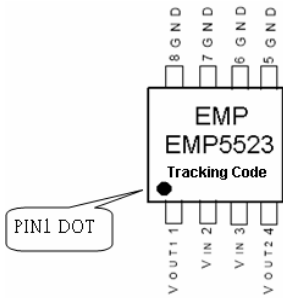
Rating: -40 to 85°C

Package in Tape & Reel

Pin Functions

Name	SOP-8	Function
OUT1	1	Output Voltage Feedback of Regulator 1
VIN	2, 3	Supply Voltage Input. Require a minimum input capacitor of close to 1μF to ensure stability and sufficient decoupling from the ground pin. Pins 2 and 3 must be shorted together.
OUT2	4	Output Voltage Feedback of Regulator 2
GRND	5~8	Ground Pin.

Order, Mark & Packing Information

No. of PIN	Package	Vout1	Vout2	Marking	Product ID
8	SOP-8	3.3	1.8		EMP5523-05SA08GRR

Absolute Maximum Ratings (Notes 1, 2)

V_{IN} , V_{OUT1} , V_{OUT2}	-0.3V to 6.0V	Thermal Resistance (θ_{JA})	
Power Dissipation	(Note 3)	SOP-8	150°C/W
Storage Temperature Range	-65°C to 160°C		
Junction Temperature (T_J)	150°C	Operating Ratings (Note 1, 2)	
Lead Temperature (10 sec.)	260°C	Temperature Range	-40°C to 85°C
ESD Rating		Supply Voltage	2.5V to 5.5V
HBM (Note 5)	2kV		
MM	200V		

Electrical Characteristics

Unless otherwise specified, all limits guaranteed for $V_{IN} = V_{OUT} + 1V$ (Note 6), $C_{IN} = C_{OUT} = 2.2\mu F$, $T_J = 25^\circ C$. **Boldface** limits apply for the operating temperature extremes: -40°C and 85°C.

Symbol	Parameter	Conditions	Min	Typ (Note 7)	Max	Units
V_{IN}	Input Voltage		2.5		5.5	V
ΔV_{OTL}	Output Voltage Tolerance	$I_{OUT} = 30mA$ $V_{IN} = V_{OUT(NOM)} + 1V$, (Note 6)	-2 -3		+2 +3	% of $V_{OUT(NOM)}$
I_{OUT}	Maximum Output Current	Average DC Current Rating	300			mA
I_{LIMIT}	Output Current Limit			600		mA
I_Q	Supply Current	$I_{OUT1} = I_{OUT2} = 0mA$ $I_{OUT1} = I_{OUT2} = 300mA$	50 50	150 250	250 400	μA
V_{DO}	Dropout Voltage (Note 4), (Note 6)	$I_{OUT} = 30mA$ $I_{OUT} = 100mA$ $I_{OUT} = 300mA$	5 50	16 55 170	32 320	mV
PSRR	Power-supply rejection ratio $V_{IN}=4.3V$, $V_{OUT}=3.3V$	$f = 1kHz$ $f = 10kHz$ $f = 100kHz$		72 60 45		dB
ΔV_{OUT}	Line Regulation Load Regulation	$I_{OUT} = 30mA$, $(V_{OUT} + 1V) \leq V_{IN} \leq 5.5V$, (Note 6) $1mA \leq I_{OUT} \leq 100mA$ $1mA \leq I_{OUT} \leq 300mA$	-0.1 40	0.01 13 40	0.1 100	%/V mV
e_n	Output Voltage Noise	$V_{OUT}=2.8V$, $I_{OUT} = 30mA$, $10Hz \leq f \leq 100kHz$ (Note 8)		120		μV_{RMS}
V_{EN}	Enable Input Threshold	V_{IH} , $(V_{OUT} + 0.5V) \leq V_{IN} \leq 5.5V$ (Note 6) V_{IL} , $(V_{OUT} + 0.5V) \leq V_{IN} \leq 5.5V$ (Note 6)	1.2		0.4	V
T_{SD}	Thermal Shutdown Temperature Thermal Shutdown Hysteresis			170 30		$^\circ C$

Note 1: Absolute Maximum ratings indicate limits beyond which damage may occur. Electrical specifications are not applicable when the device is operated outside of its rated operating conditions.

Note 2: All voltages are defined and measured with respect to the potential at the ground pin.

Note 3: Maximum Power dissipation for the device is calculated using the following equations:

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

where $T_{J(MAX)}$ is the maximum junction temperature, T_A is the ambient temperature, and θ_{JA} is the junction-to-ambient thermal resistance.

Note 4: Dropout voltage is measured by reducing V_{IN} until V_{OUT} drops 100mV from its nominal value at $V_{IN} - V_{OUT} = 1V$.

Dropout voltage does not apply to the regulator versions with V_{OUT} less than 2.5V.

Note 5: Human body model: 1.5k Ω in series with 100pF.

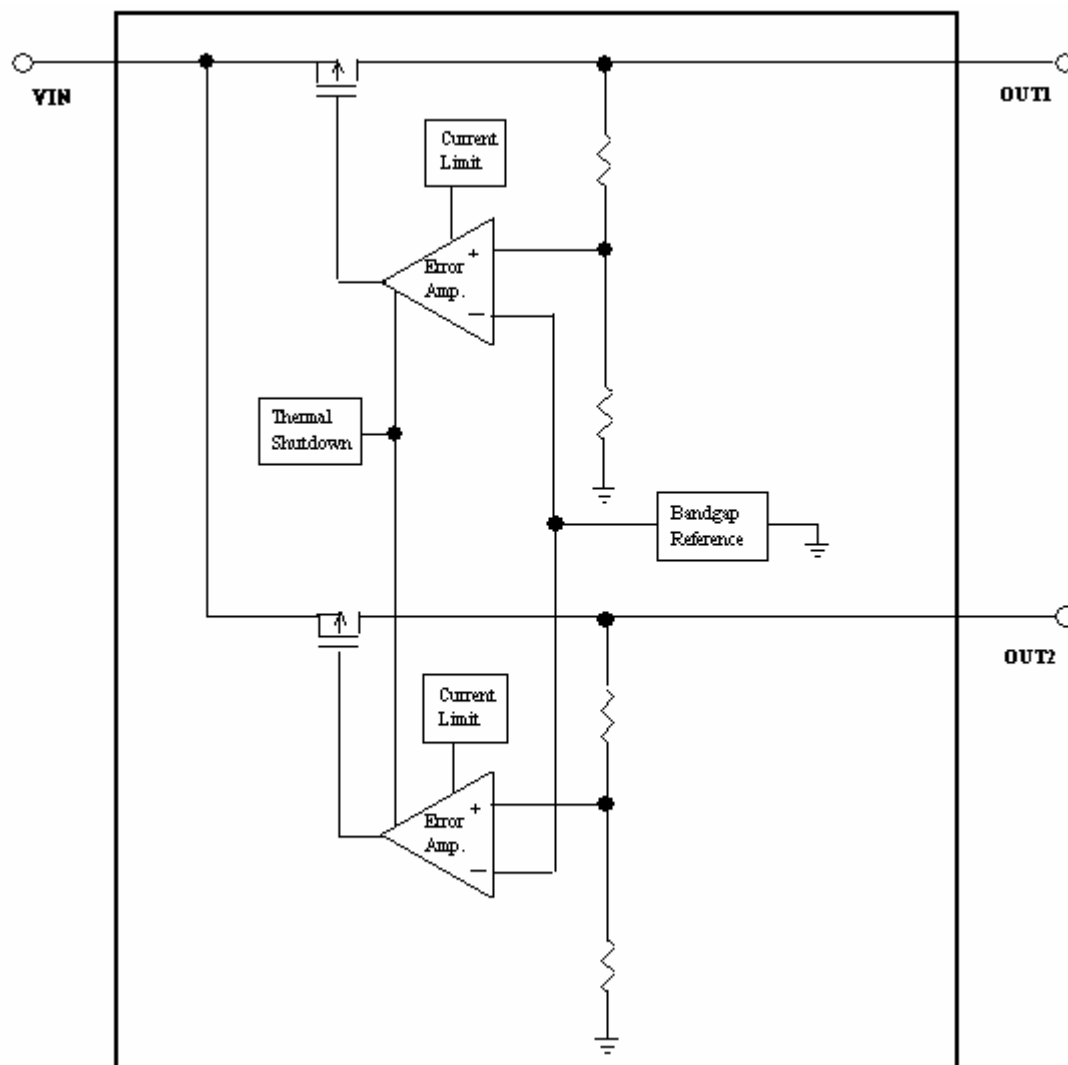
Note 6: Condition does not apply to input voltages below 2.5V since this is the minimum input operating voltage.

Note 7: Typical Values represent the most likely parametric norm.

Note 8: For different output voltage, the noise can be approximately calculated using the following formula:

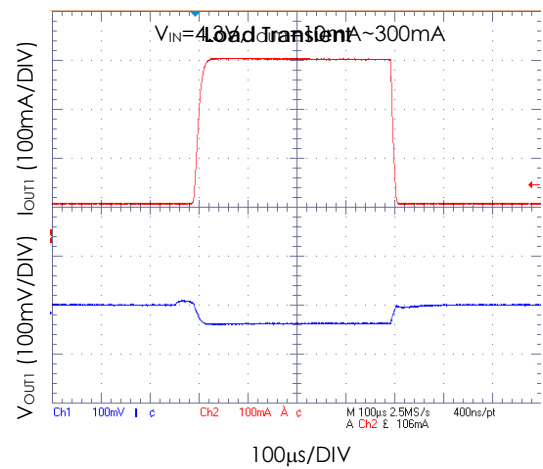
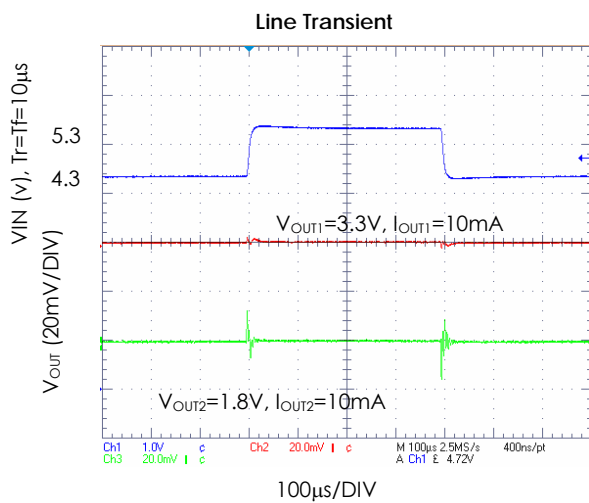
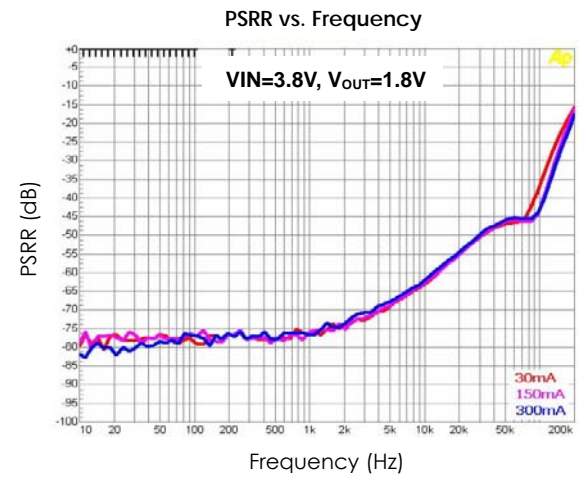
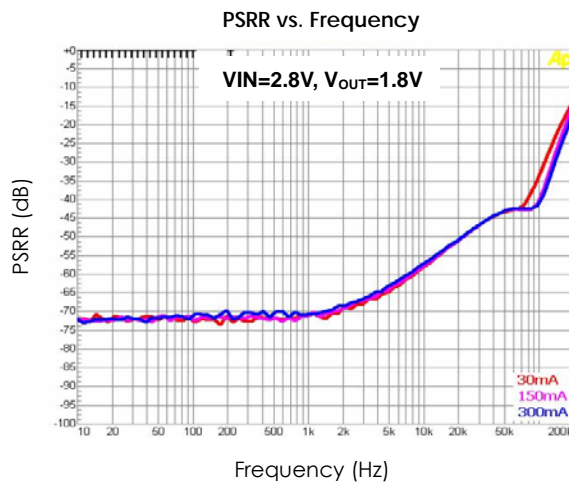
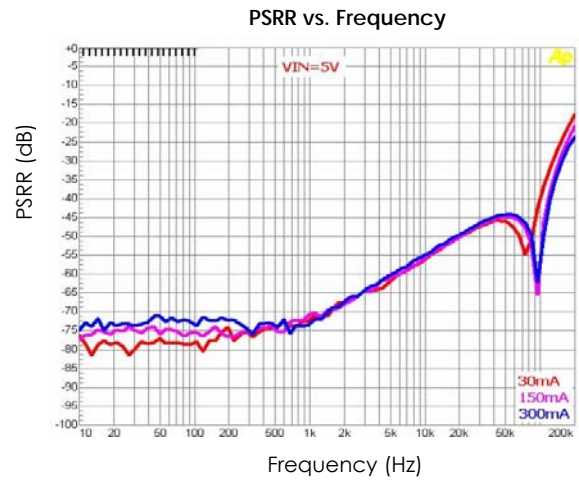
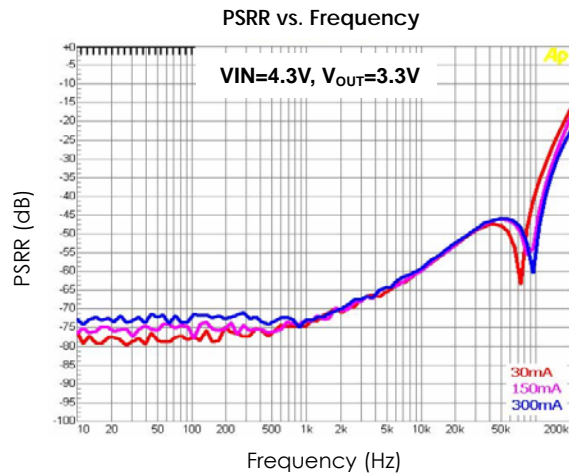
$$Noise = V_{OUT} \times 42 (\mu V_{RMS})$$

Functional Block Diagram



Typical Performance Characteristics

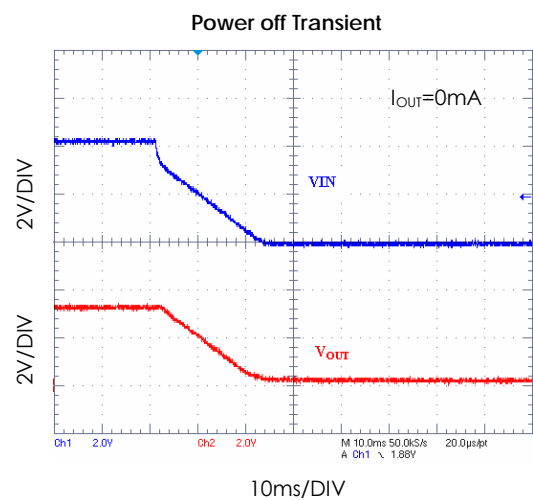
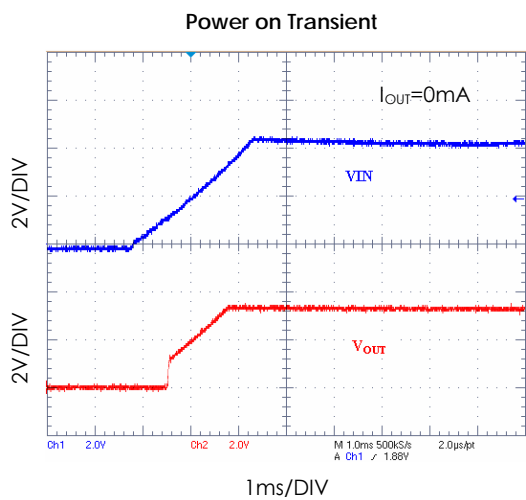
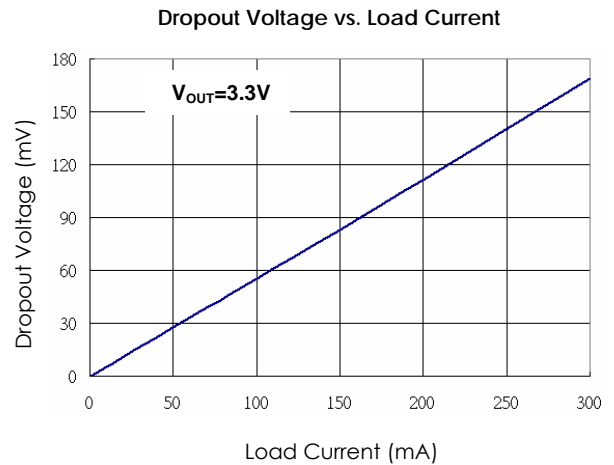
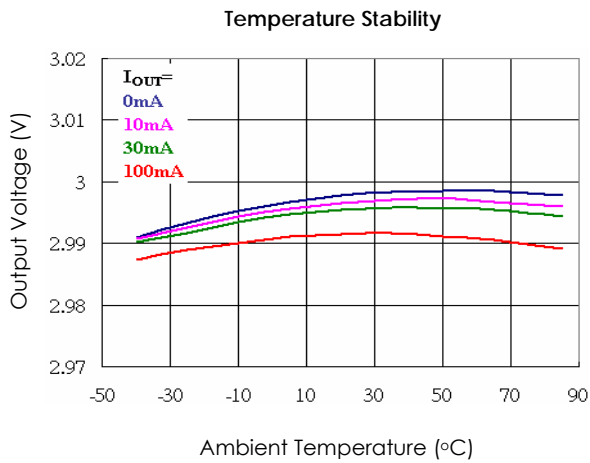
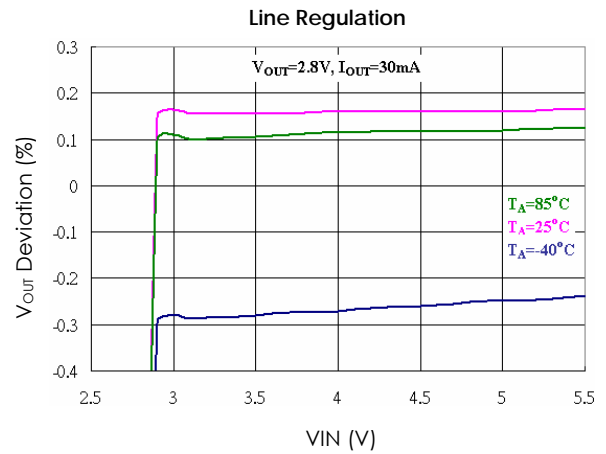
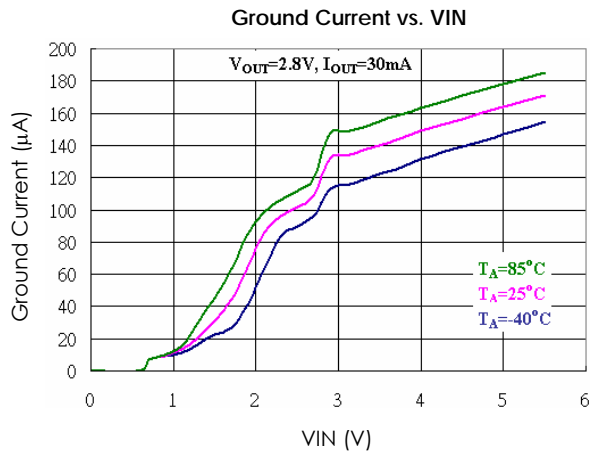
Unless otherwise specified, $V_{IN} = V_{OUT(NOM)} + 1V$, $C_{IN} = C_{OUT} = 2.2\mu F$, $T_A = 25^\circ C$.



$V_{IN}=5V$, $V_{OUT}=3.3V$

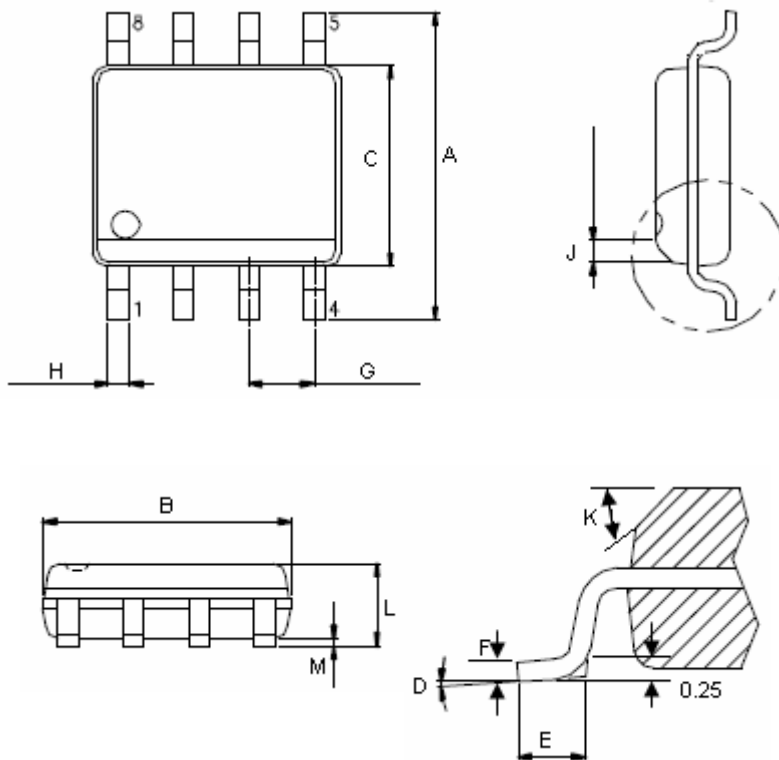
Typical Performance Characteristics

Unless otherwise specified, $V_{IN} = V_{OUT(NOM)} + 1V$, $C_{IN} = C_{OUT} = 2.2\mu F$, $T_A = 25^\circ C$. (Continued)



Physical Dimensions

SOP-8



SYMBOLS	MIN.	MAX.
A	5.80	6.20
B	4.80	5.00
C	3.80	4.00
D	0°	8°
E	0.40	0.90
F	0.19	0.25
G	1.27 TYP.	
M	0.10	0.25
H	0.35	0.49
L	1.35	1.75
J	0.375 REF.	
K	45°	

UNIT: Millimeters

Revision History

Revision	Date	Description
2.0	2009.06.08	EMP transferred from version 1.0

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