Advanced Monolithic Systems

AMS4123

2A BUCK CONVERTER + 1A LDO IN SO-8

RoHS compliant

FEATURES

- One Asynchronous Buck Converter + LDO in SO-8
- Internally compensated
- Built in soft start
- Enable with Zero current shut down
- 300KHz switching frequency
- Hiccup current limit and thermally protected
- Ultra-low dropout LDO (500mV Max.)
- Up to 2A output on the Switch and 1A on LDO
- 0.6V reference for low output voltage settings

APPLICATIONS

- Audio Power Amplifiers
- Portable (Notebook) Computers
- Point of regulation for high performance electronics
- Consumer Electronics
- DVD, Blue-ray DVD writers
- LCD TVs and LCD monitors
- Distributed Power Systems
- Battery Chargers
- Pre-Regulator for Linear Regulators

GENERAL DESCRIPTION

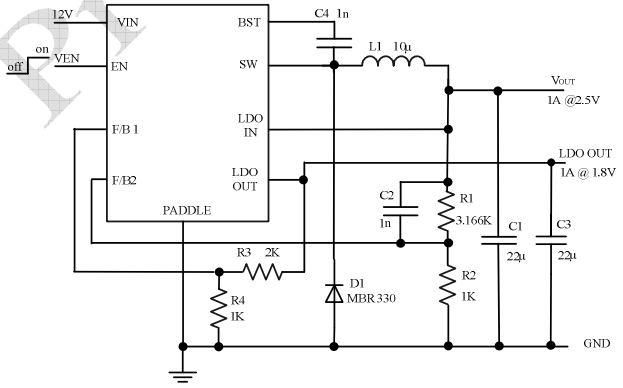
AMS4123 is a switching regulator capable to deliver up to 2A and one LDO rated for 1A output in a single SO-8 EDP package. The switching regulator is Internally Compensated internal Soft Start to reduce to minimum external components. The regulator has hiccup current limit and thermal protection. The Enable pin has built-in power-up sequencing externally programmable. If 2.0V or higher it is applied to EN pin it turns on the Switching Regulator. By increasing the voltage to 2.5V or more it turns on the LDO section. Since both circuits share one single package the thermal protection turns off both circuits when the die temperature exceeds approximately 135°C. Both regulators are adjustable using a 0.600V reference for low output voltage settings. The LDO has options for fixed output voltages from 0.6V to 5V in 100mV steps. The LDO input can be supplied from the Switching Regulator output increasing the efficiency but can supplied as well from another source that is equal or lower than the device supply voltage. With a Dropout of 400mV @1A makes AMS4123 the perfect solution for low noise 1.8V from a 2.5V source. The AMS4123 combined with AMS4122 (2A Dual Switching Regulator in SO-8) makes complete solution for LCD TV power requirements.

ORDERING INFORMATION

Package Type SOIC EDP	TEMP. RANGE
AMS4123S	-25°C to 125°C

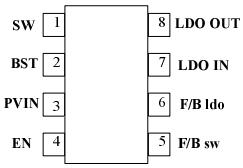
TYPICAL APPLICATION

$V_{OUT1} = V_{REF}(1 + R1/R2)$
$V_{OUT2} = V_{REF}(1 + R3/R4)$



PINCONNECTIONS

8L SOIC
SO Package (S)



Top View

PIN DESCRIPTION

Pin Number	NAME	DESCRIPTION
1	SW	This connects the inductor the Internal Switch.
2	BST	Bootstrap. This capacitor is needed to drive the power switch above the supply voltage.
3	PVIN	Input Power Pin from unregulated power supply.
4	EN	Enable. A voltage greater than 2V at this pin enables the switching regulator. By increasing the voltage on this pin above 2.5V will enable the LDO section.
5	F/B SW	Feedback Switch. A resistor network of two resistors is used to set-up the output voltage connected between Output2 to GND. The node between the two resistors is connected to Feedback Switch pin.
6	F/B LDO	Feedback LDO. A resistor network of two resistors is used to set-up the output voltage connected between Output1 to GND. The node between the two resistors is connected to Feedback LDO pin.
7	LDO IN	LDO Input pin can be connected from Switch Output pin. LDO IN can be powered up from another supply that is 2V lower then PVIN.
8	LDO OUT	LDO Output pin.
9	GND (PADDLE)	Ground paddle to be connected to PCB ground plane. This is also the ground for internal voltage reference.

ABSOLUTE MAXIMUM RATINGS

V_{IN}	4.2V to 23V	Junction Temperature	+150ºC
F/B	-0.3 to +12.0V	Storage Temperature	-65ºC to +150ºC
EN	-0.3V to +20V	Lead temperature	260ºC

ELECTRICAL CHARACTERISTICS

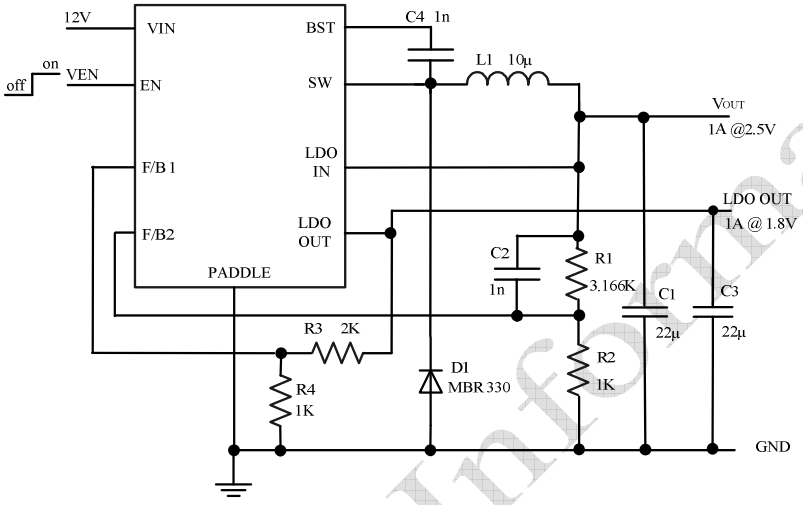
Electrical Characteristics at T_A= 25 °C and VIN=12V (unless otherwise noted).

PARAMETER	TEST CONDITIONS	AMS4123 Min.	AMS4123 Typ.	AMS4123 Max.	Units
Feedback Voltage1	F/B1 (Switching Regulator Feedback Pin)	0.590	0.6	0.610	V
Feedback Voltage2	F/B2 (LDO Feedback Pin)	0.585	0.6	0.615	V
Output Voltage tolerance (LDO)	Vo=0.6V to 5V in 100mV increments	-1.5	1	1.5	%
Supply Current Switching Section	$V_{EN} \geq 2.0V$; V_{FB} = 1.5V (LDO Off)		1.4	1.9	mA
Supply Current LDO section	$V_{EN} \geq 2.5V$; V_{FB} = 1.5V		400		µA
Supply Current (Shutdown)	$V_{EN} \leq 0.4V$		90		nA
Thermal Shutdown			145		°C
Current Limit (Switching regulator)	Vout=5V		4.2		A
Current Limit (LDO)	LDO Input=5V; LDO Co=2.2µF		1.5		A
Dropout Voltage	(LDO)		350		mV
Load Regulation	(LDO)		0.5		%
Line Regulation	(LDO)		0.1		%
Oscillator Frequency		260	300	340	KHz
Efficiency	(Switching regulator)		88		%
Maximum Duty Cycle				99	%
Enable Threshold	Switching section		2.0	2.1	V
Enable Hysteresis	Switching section		70		mV
Enable Threshold	LDO section		2.5	2.55	V
Enable Pull-up Current			0.7		µA
Under Voltage Lockout	Voltage Rising		4.2		V
Under Voltage Lockout Hysteresis			400		mV
Total Power dissipation	Note (1)		2.5		W

Notes: 1) The total power dissipation for SO-8 EDP package is recommended to 2.5W, rated at 25°C ambient temperatures. The thermal resistance Junction to Case is 45°C/W. Total power dissipation for both switching regulators should be taken in consideration when calculating the output current for each regulator.

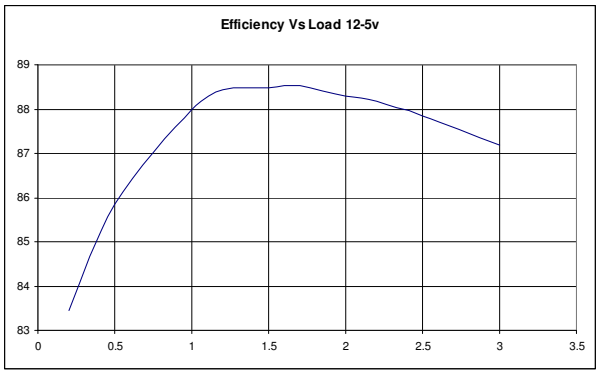
TYPICAL APPLICATION

$V_{OUT1} = V_{REF} (1 + R1/R2)$
$V_{OUT2} = V_{REF} (1 + R3/R4)$

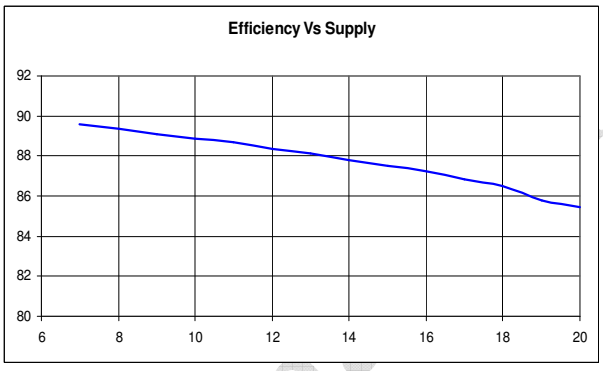


High efficiency 12V to 2.5V and 1.8V converter

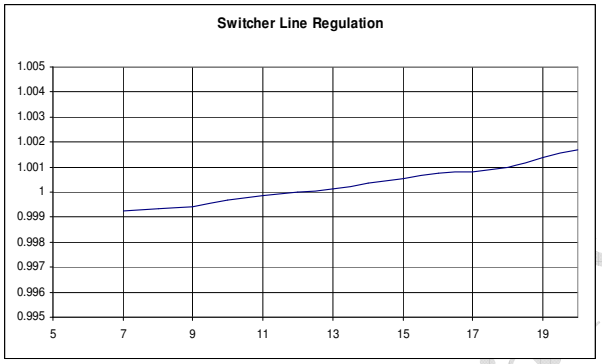
TYPICAL PERFORMANCE CHARACTERISTICS



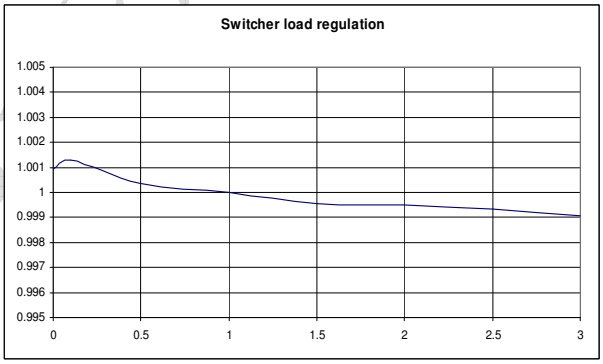
Efficiency VS Load 12-5V



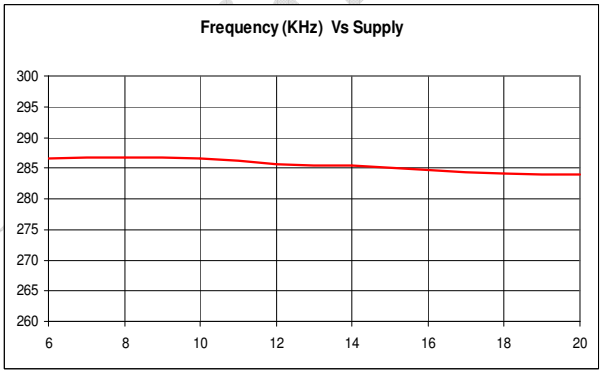
5V 2A Load



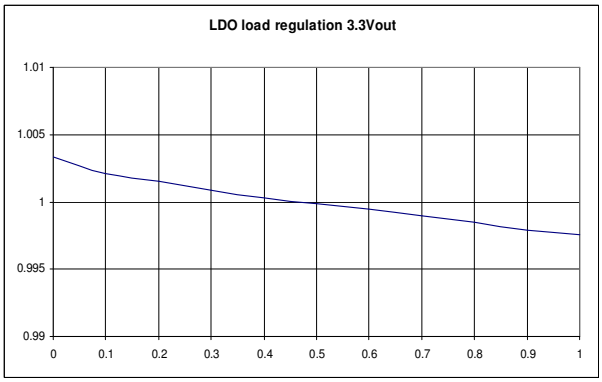
5V Output



5V Output at 12V Supply

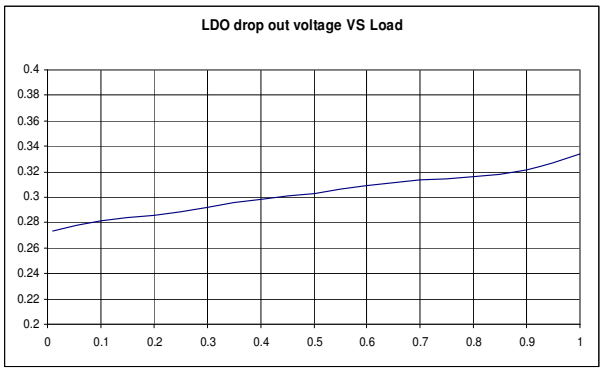


5V Output

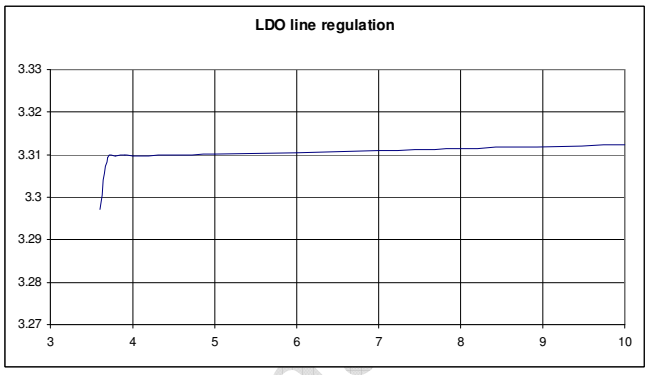


5V Input Supply

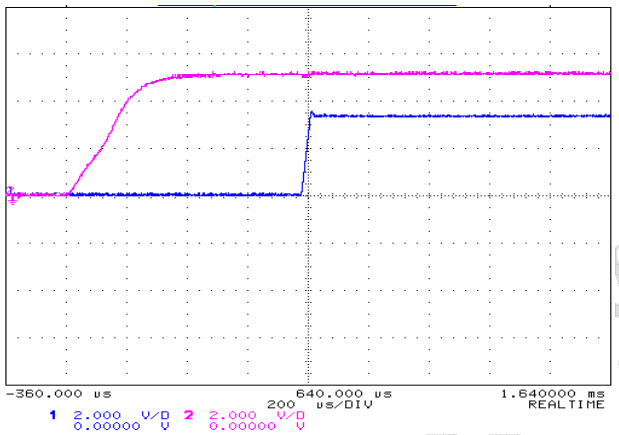
TYPICAL PERFORMANCE CHARACTERISTICS



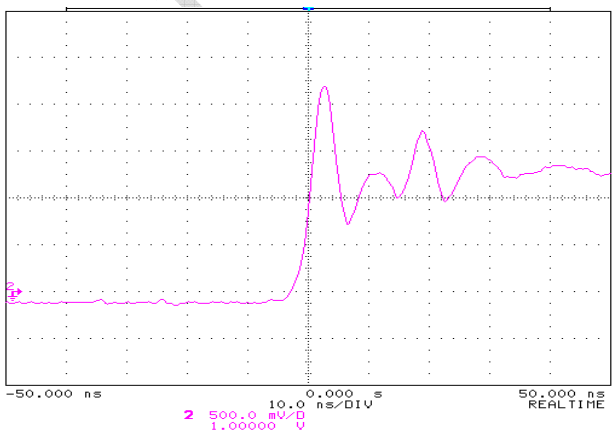
LDO Input 3.0V, set-point 3.3V



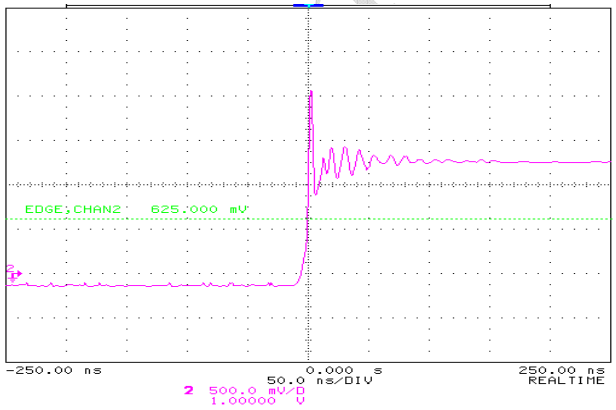
100mA Load



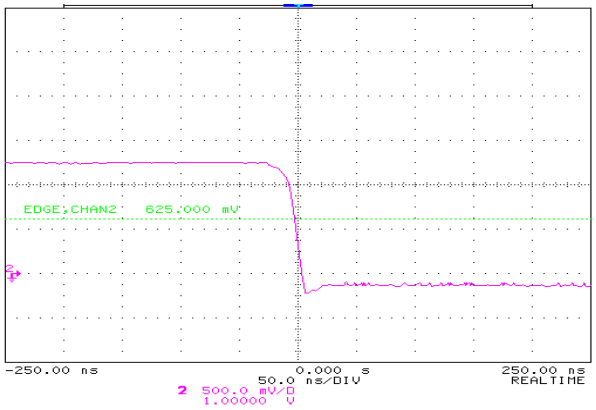
Switcher and LDO Start up



Switch Node Rise time

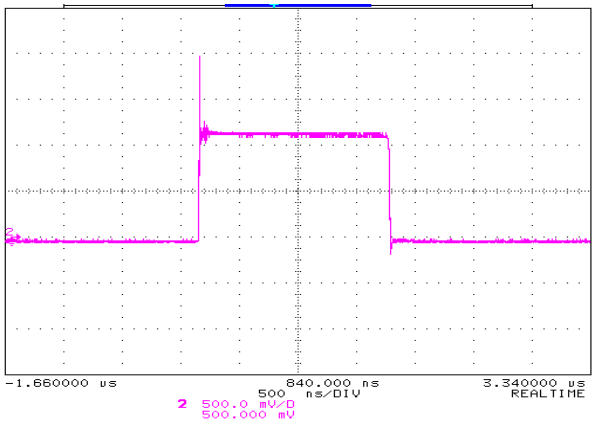


Switch Node Rise time

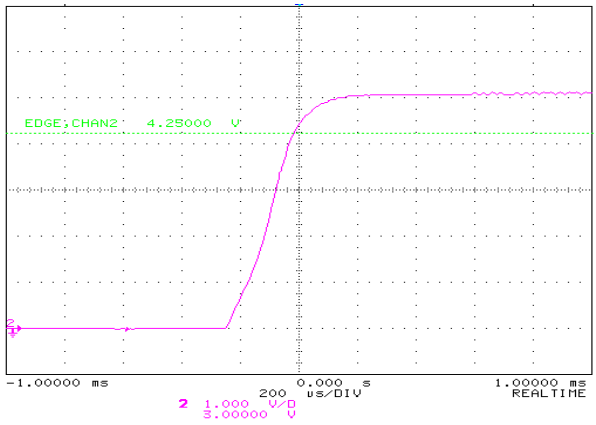


Switch Node Fall Time 1A Load

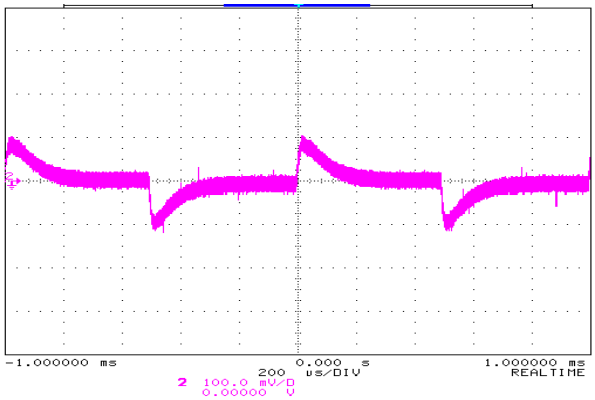
TYPICAL PERFORMANCE CHARACTERISTICS



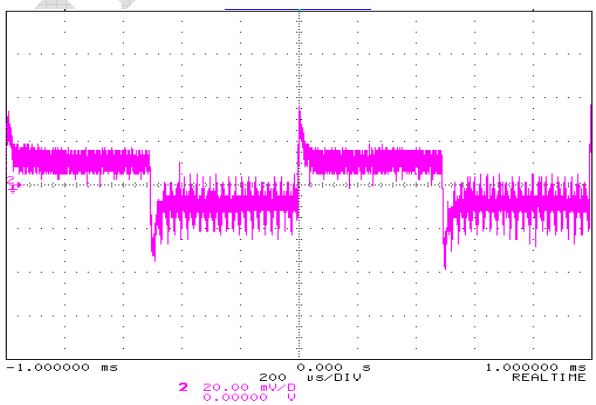
Full Switching Signal at 3A



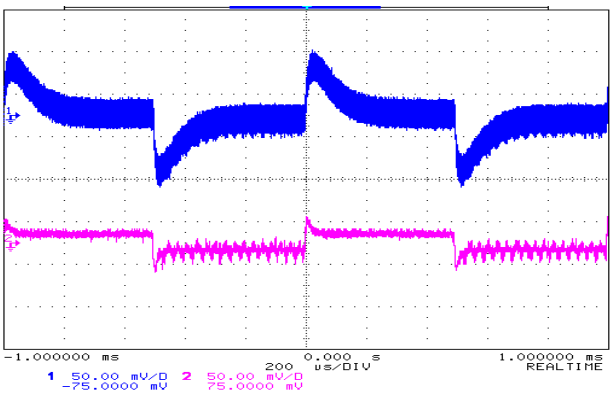
Hard Switch Start –Up



Switcher 0.5 – 2A load Transient, 5V Output



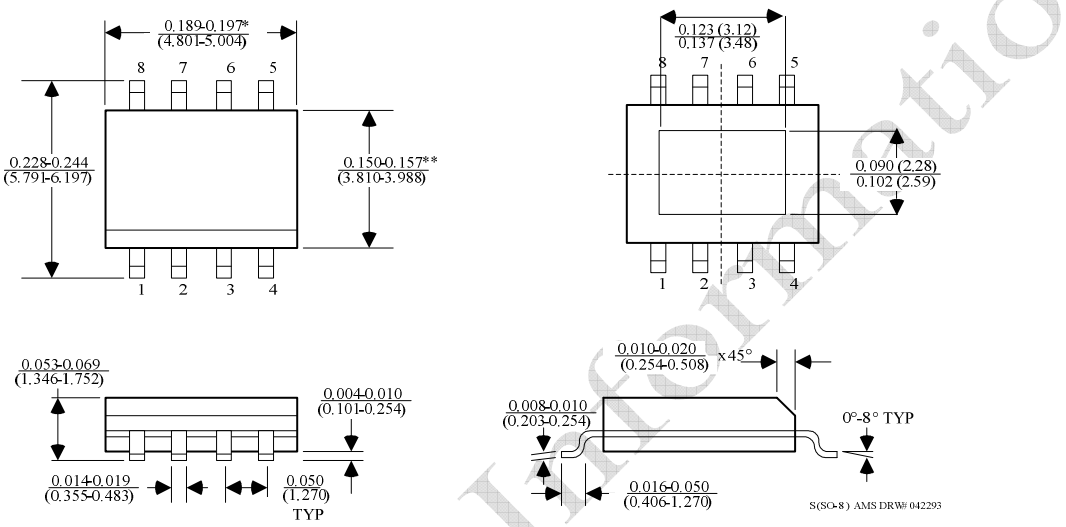
LDO 0.1- 1A load Transient, 3.3V Output

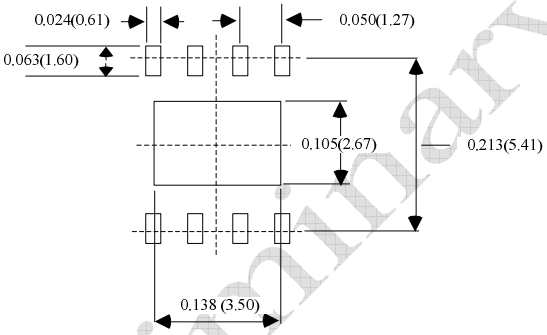


Effect of LDO Transient on Switcher.
Switcher has 0.5A Standing Current

PACKAGE DIMENSIONS inches (millimeters) unless otherwise noted.

8 LEAD SOIC PLASTIC PACKAGE (S)





RECOMMENDED LAYOUT PATTERN

*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE

**DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE