300mA, Low-Noise CMOS Dual LDO Regulators

REV: 00

General Description

The LD6918 is a dual micro power linear regulator, featuring low quiescent current, low-noise, low-dropout and high ripple rejection ration. The precision of feedback reference voltage is within ±1% and output current is up to 300mA. As well, the LD6918 can be stable with a 1μF low ESR ceramic output capacitor which reduces the board space and cost.

The LD6918 is available in SOT23-6; DFN-8L 3 x 3; DFN-8L 2 x 2 and DFN-6L 1.6 x 1.6 packages.

+patented

Features

- Wide Operating range: 2.5V to 5.5V
- Low Noise for RF application
- No Noise Bypass capacitor required
- Low Quiescent Current: 40μA (typ.)/LDO
- High Output Voltage Accuracy: ±1%
- High RSRR:70dB @ 1KHz
- V_{OUT} Discharge Function
- Very Small Inrush Current
- Thermal Shutdown and Current Limiting Protection
- Output Voltage : 1.5V to 3.3V
  (0.1V increments, 1.85V, 2.85V, 3.15V extra)

Applications

- Battery-Powered Equipment
- Hand-Held Instruments

Typical Application Circuit

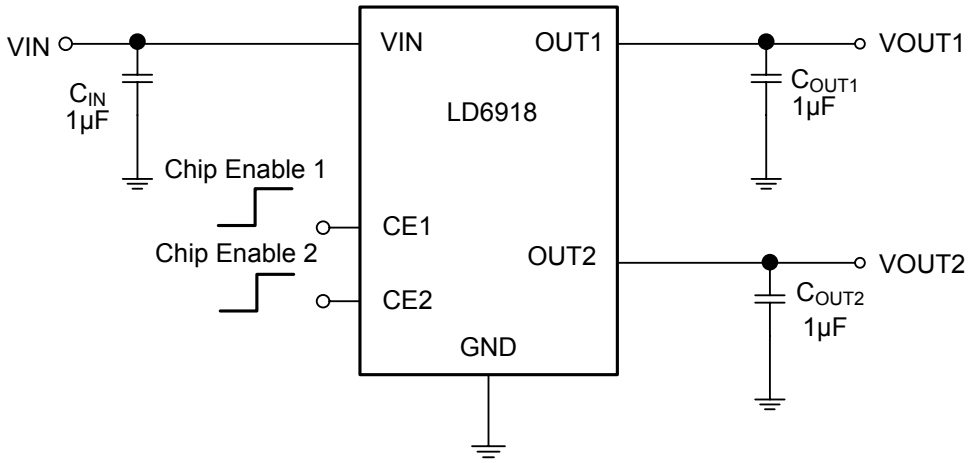
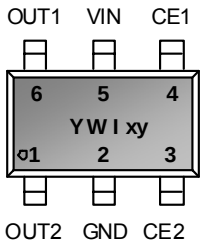


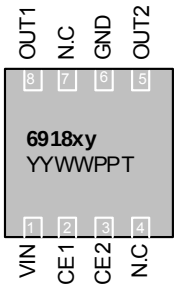
Fig. 1 Typical Application Circuit

Pin Configuration

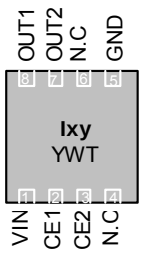
SOT-26 (TOP VIEW)



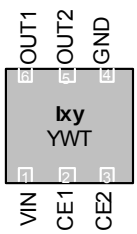
DFN-8L (3x3)



DFN-8L (2x2)



DFN-6L (1.6x1.6)



Y, YY: Year code (D: 2004, E: 2005…..)
W, WW: Week code
PP: Production code
I : LD6918
xy: Voltage code

T: Thickness
V: 0.85~0.9mm
W: 0.75mm (normal)
U: 0.55mm
X: 0.4mm

Ordering Information

Part number	Package		TOP MARK	Shipping
LD6918 GL-xy	SOT-26	Green Package	YWIxy	3000 /tape & reel
LD6918 GDGW-xy	DFN-8L 3×3	Green Package	6918xy (W)	2500 /tape & reel
LD6918 GDDW-xy	DFN-8L 2×2	Green Package	Ixy (W)	3000 /tape & reel
LD6918 GDAW-xy	DFN-6L 1.6×1.6	Green Package	Ixy (W)	3000 /tape & reel

Note 1: The LD6918 is Green Packaged.

Note 1: Part number xy: Output voltage, the description as below

VOUT1	VOUT2
x	y

Voltage Code for X or Y respectively																				
Standard Voltage																		Extra Voltage		
H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	1	2	3
1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	1.85	2.85	3.15

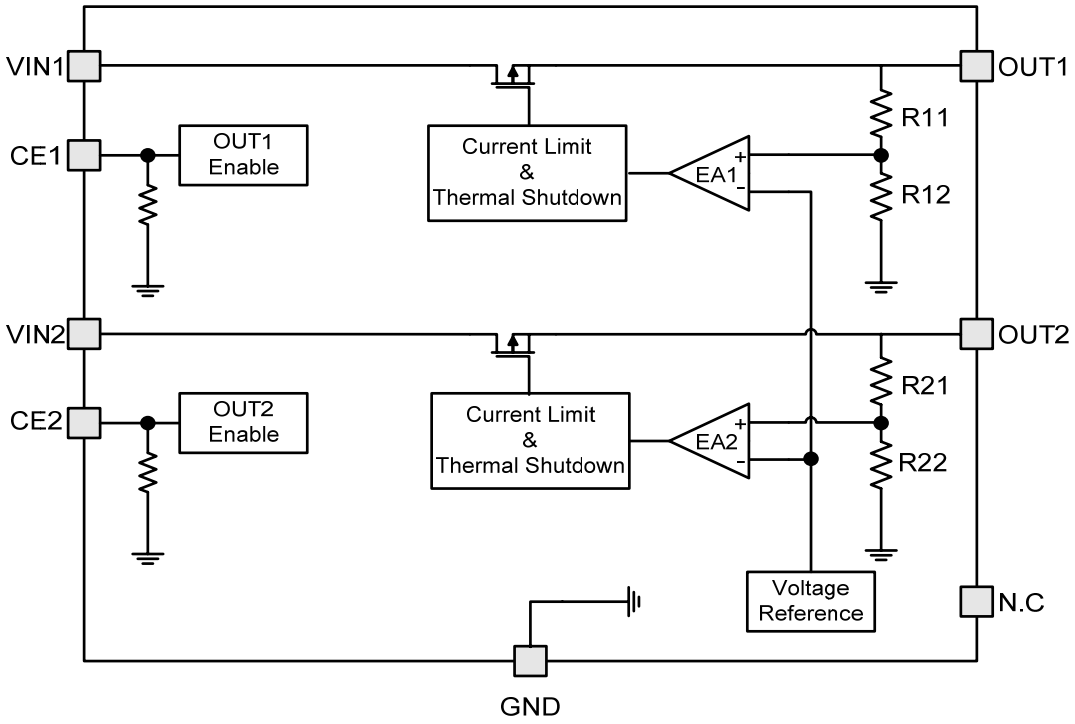
Ex1:KZ: V_{OUT1}=1.8V, V_{OUT2}=3.3V;

Ex2:1U: V_{OUT1}=1.85V, V_{OUT2}=2.8V;

Pin Descriptions

PIN Number				PIN NAME	FUNCTION
SOT26	DFN-8 (3x3)	DFN (2x2)	DFN-6 (1.6x1.6)		
5	1	1	1	VIN	Regulator Input
4	2	2	2	CE1	OUT1 Enable, High=Enable, Low=Disable
3	3	3	3	CE2	OUT2 Enable, High=Enable, Low=Disable
2	6, Exposed Pad	5, Exposed Pad	4, Exposed Pad	GND	IC GND, Exposed Pad should be connected to GND plane, to provide efficient heat path soldered directly to the PCB.
1	5	7	5	OUT2	Regulator 2 Output
6	8	8	6	OUT1	Regulator 1 Output
--	4,7	4,6	--	N.C.	No Connected

Block Diagram



Absolute Maximum Ratings

VIN1, VIN2, OUT1, OUT2, BP Pin	-0.3V~6V
CE1, CE2 Pin	-0.3V~ (VIN+0.3) V
Power dissipation SOT26@T_A=25°C	400mW
Power dissipation DFN-8L 3×3 @T_A=25°C	926mW
Power dissipation DFN-8L 2×2 @T_A=25°C	606mW
Power dissipation DFN-6L 1.6×1.6 @TA=25°C	571mW
Package Thermal Resistance SOT26	250°C/W
Package Thermal Resistance DFN-8L 3×3	108°C/W
Package Thermal Resistance DFN-8L 2×2	165°C/W
Package Thermal Resistance DFN-6L 1.6×1.6	175°C/W
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-55°C to 125°C
Lead temperature (Soldering, 10sec)	260°C
ESD Level (Human Body Model)	2KV
ESD Level (Machine Model)	200V

Caution:

Stresses beyond the ratings specified in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics

(CE1=CE2=V_{IN}, C_{IN}=C_{OUT1}=C_{OUT2}=1μF, V_{IN}=4.3V, V_{OUT1}=1.5V, V_{OUT2}=3.3V,T_A=-40°C to +85°C unless otherwise stated, Typical value are at T_A=25°C) (NOTE 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT POWER					
Input Voltage		2.5	-	5.5	V
Quiescent Current	CE1=CE2=V_{IN}, I_{OUT1}= I_{OUT2}=0mA		90	130	μA
Shutdown Supply Current	CE1=CE2=GND	-	0.1	1	μA
Dropt Voltage					
Dropt Voltage (Note2)	I_{OUT}=200mA, V_{OUT}≥3.0V		170	220	mV
	I_{OUT}=300mA, V_{OUT} ≥3.0V		240		mV
	I_{OUT}=200mA, 2.5V≤ V_{OUT} <3.0V		190	250	mV
	I_{OUT}=300mA, 2.5V≤V_{OUT}<3.0V		270		mV
	I_{OUT}=200mA, 2.0V≤ V_{OUT} <2.5V		255	330	mV
	I_{OUT}=300mA, 2.0V≤V_{OUT}<2.5V		350		mV
OUTPUT					
Output Current Limit		330	420		mA
Output Voltage Accuracy	I_{OUT}=1mA, T_A =+25°C;	-1		+1	%
	I_{OUT}=1mA, T_A=-40°C to +85°C	-2		+2	%
	I_{OUT}=1mA to 300mA, T_A= -40°C to +85°C	-3		+3	%
Line Regulation	V_{IN}=V_{OUT}+1V to 5.5V, I_{OUT}=1mA,			0.02	%/V
Load Regulation	1mA≤ I_{OUT}≤ 300mA	-	0.001	0.003	%/mA
Output Noise Voltage	BW=100Hz to 100KHz,I_{OUT}=1mA		60		μVrms
Ripple Rejection	F=1KHz, E_{IN}=1Vrms, I_{OUT}=10mA, C_{OUT}=2.2μF	-	70	-	dB
	F=10KHz, E_{IN}=1Vrms, I_{OUT}=10mA, C_{OUT}=2.2μF		60		
	F=100KHz, E_{IN}=1Vrms, I_{OUT}=10mA, C_{OUT}=2.2μF	-	50	-	dB
	F=1MHz, E_{IN}=1Vrms, I_{OUT}=10mA, C_{OUT}=2.2μF	-	35	-	dB
Discharge Resistance In shutdown	CE1=High to Low	-	120	250	Ω
	CE2=High to Low	-	120	250	

CE1/CE2					
Impedance to GND			750		KΩ
CE Input Level	Enable	1.4	-	VIN	V
	Disable	-	-	0.4	V
THERMAL PROTECTION					
Thermal Shutdown	V_{OUT} short to GND		145		°C
Hysteresis			30		°C

Note1: Limits are 100% tested at T_A =+25°C. Limits over operating range are guaranteed by design.

Note2: the drop voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} is V_{OUT} (normal)-100mV.

Typical Performance Characteristics

(C_{IN}=1μF, C_{OUT1}=C $_{OUT2}$=1μF, V_{IN}=4.3V, OUT1=1.5V and OUT2=3.3V, unless otherwise noted.)

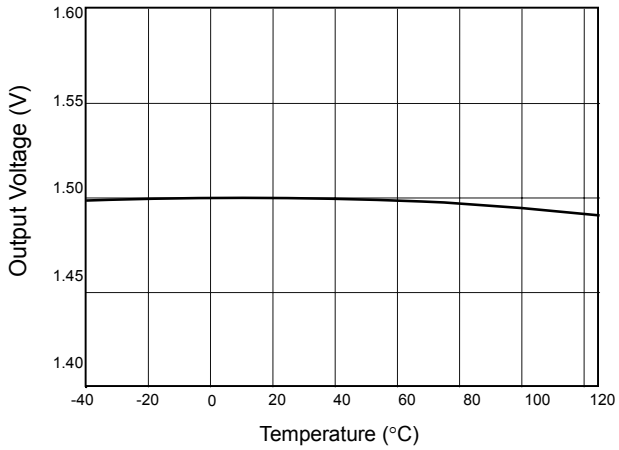


Fig. 2 Output Voltage vs. Temperature

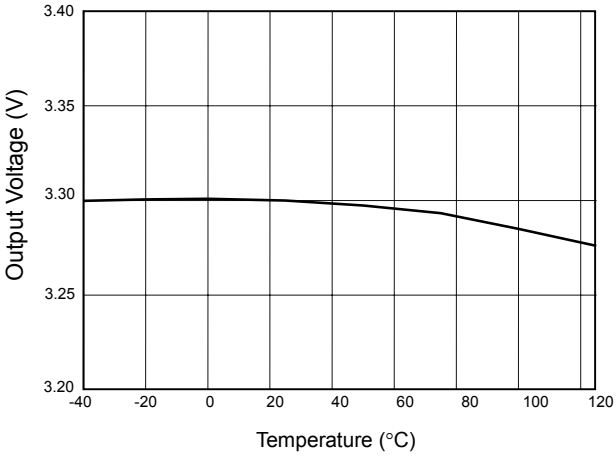


Fig. 3 Output Voltage vs. Temperature

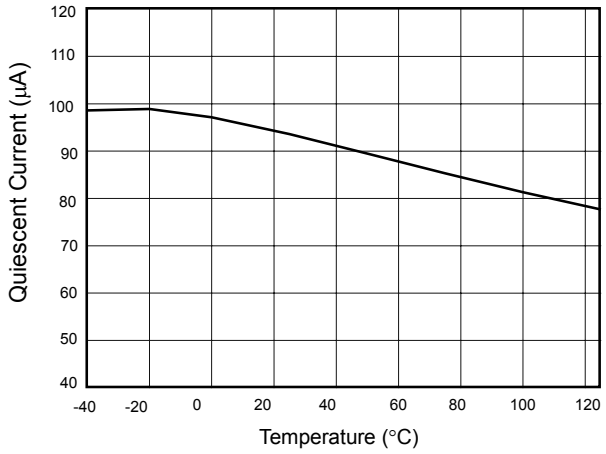


Fig. 4 Quiescent Current vs. Temperature

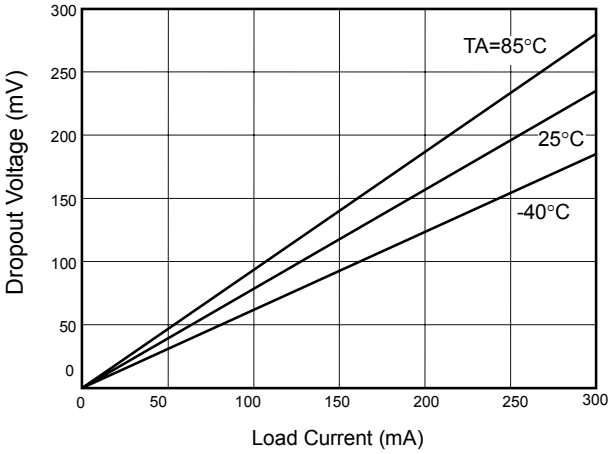


Fig. 5 Dropout Voltage vs. Load Current

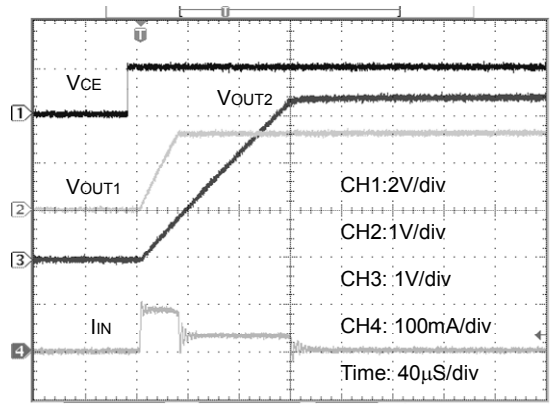


Fig. 6 Start Up Waveform

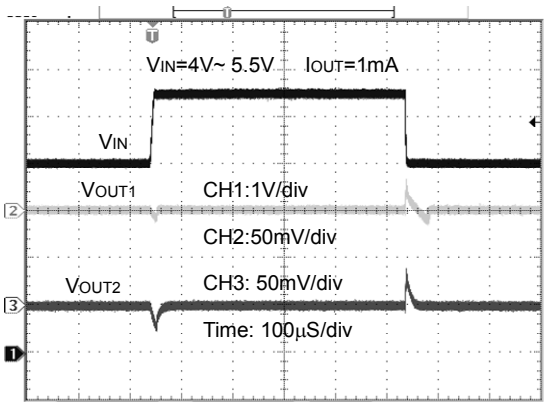


Fig. 7 Line Transient

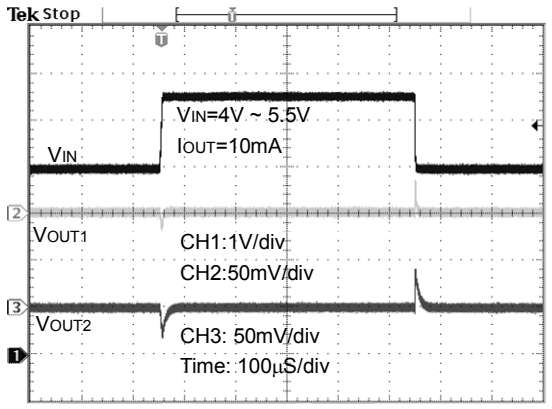


Fig. 8 Line Transient

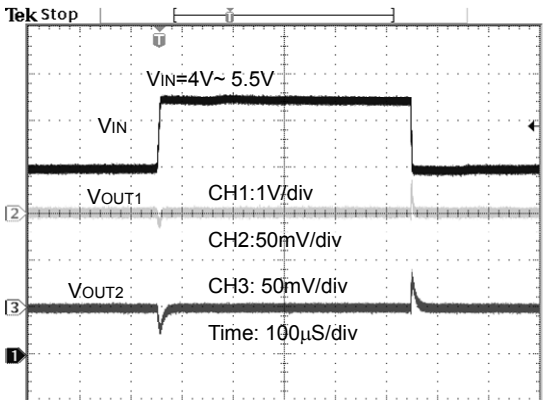


Fig. 9 Line Transient

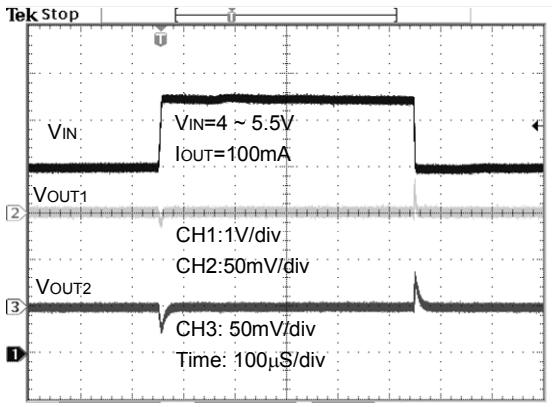


Fig. 10 Line Transient

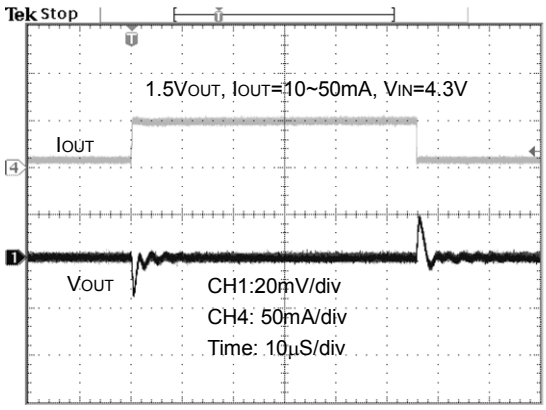


Fig. 11 $1.5V_{OUT}$ Load Transient

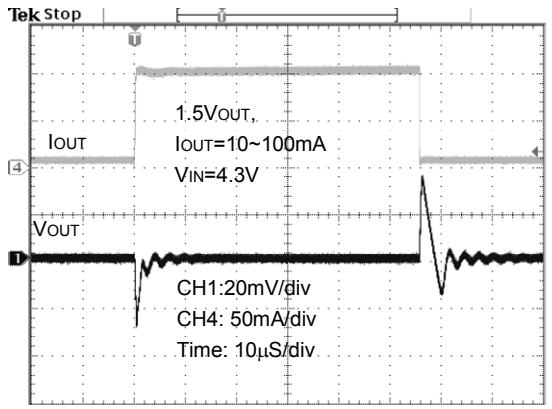


Fig. 12 $1.5V_{OUT}$Load Transient

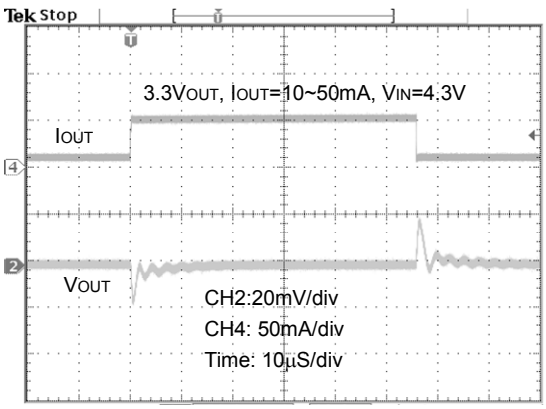


Fig. 12 $3.3V_{OUT}$ Load Transient

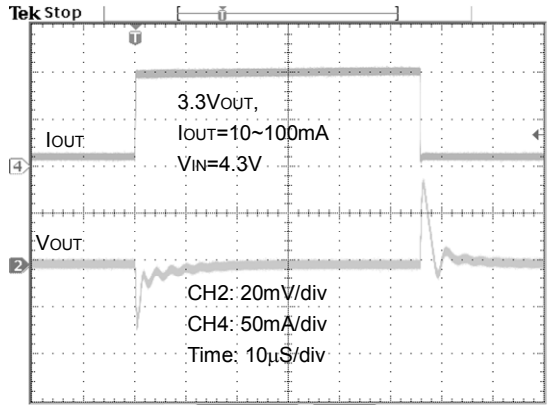


Fig. 14 $3.3V_{OUT}$ Load Transient

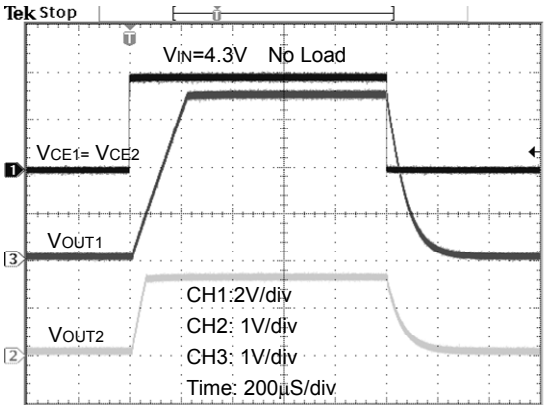


Fig. 15 $3.3V_{OUT}$ EN Shut Down Response

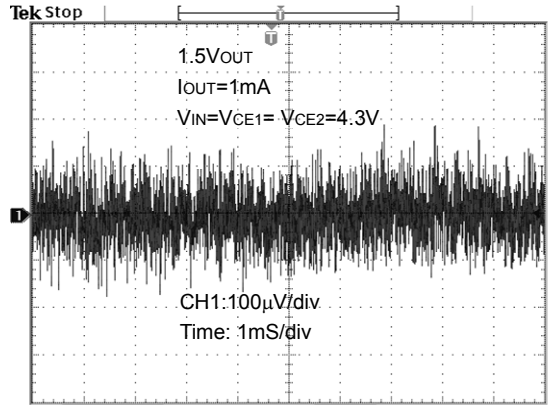


Fig. 16 $1.5V_{OUT}$ Output Noise

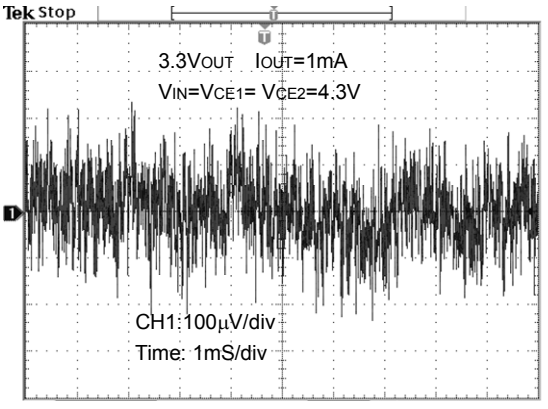


Fig. 17 $3.3V_{OUT}$ Output Noise

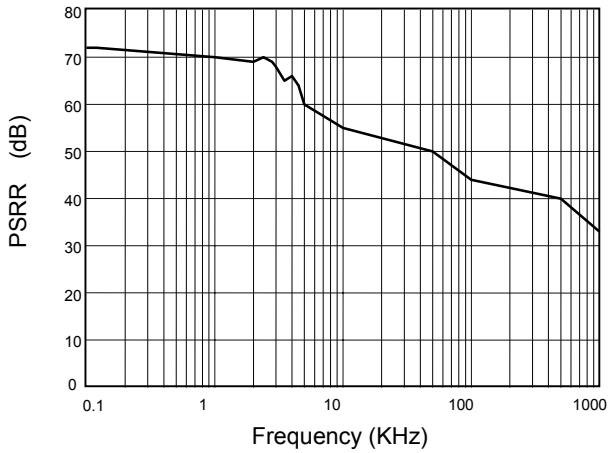


Fig. 18 PSRR vs. Frequency

Application Information

Operation Overview

An input capacitor is necessary to place between the input and GND to stabilize V_{IN}. The input capacitor should be large than 1μF to obtain beneficial effect. Besides, the input capacitor must be located in the distance within 5mm from the VIN pin.

For stable operation, the output capacitor should be at least 1μF with ESR >25 mΩ. The Fig. 19 shows the curves of the allowable ESR range as a function of load current for C_{OUT}=1μF.

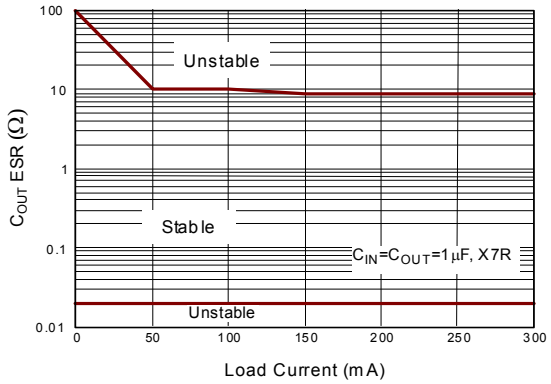


Fig. 19 Region of Stable C_{OUT} ESR vs. Load Current

Output capacitor of larger capacitance can reduce noise and improve load transient response, stability and PSRR. The output capacitor should be located in the distance within 5mm from the OUT pin.

X5R or X7R types of capacitors are recommended for the input and output capacitors.

Current Limit/ Short Circuit Protection

Output current is limited to 420mA (typical). When current limit engages, the output voltage scales back linearly until the over current condition ends. Take care not to exceed the power dispassion ratings of the package.

Thermal Consideration

When the junction temperature exceeds Tj=145°C, the thermal sensor will turn off the pass transistor and allowing the IC to cool. The thermal sensor turns the pass transistor on after the IC's junction temperature cools by 30°C (typical) For continuous operation, do not exceed absolute maximum operation junction temperature at 125°C. The maximum power dissipation can be decided according to following equation.

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

θ_{JA}: Package Thermal Resistance

(SOT26: θ_{JA}=250℃/W;

DFN-8L 3×3: θ_{JA}=108°C/W;

DFN-8L 2×2: θ_{JA}=165°C /W;

DFN-6L 1.6×1.6: θ_{JA}=175°C /W)

The maximum power dispassion at Ta=25°C can be obtained by above formula.

P_{DMAX}= (125°C-25°C)/250=400mW (SOT26 package)

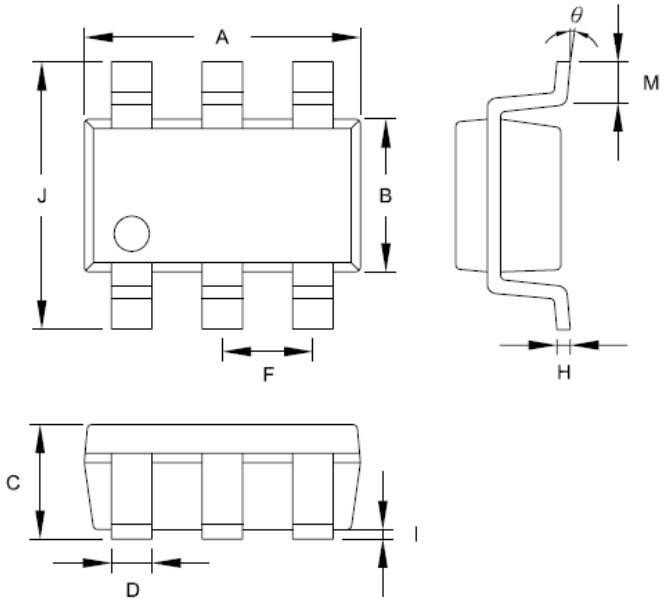
P_{DMAX}= (125°C-25°C)/108=926mW (DFN-8L 3×3 package)

P_{DMAX}= (125°C-25°C)/165=606 mW (DFN-8L 2×2 package)

P_{DMAX}= (125°C-25°C)/175=571mW (DFN-6L 1.6×1.6 package)

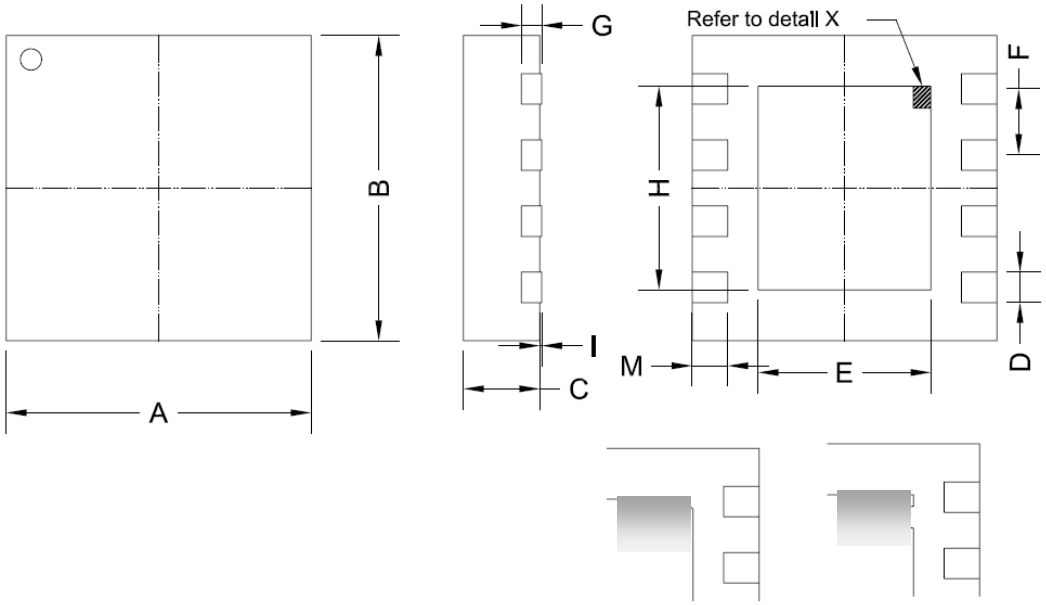
Package Information

SOT-26



Symbol	Dimension in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	-------	1.450	-------	0.058
D	0.300	0.550	0.012	0.022
F	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
θ	0°	10°	0°	10°

DFN-8L(3X3X0.75)

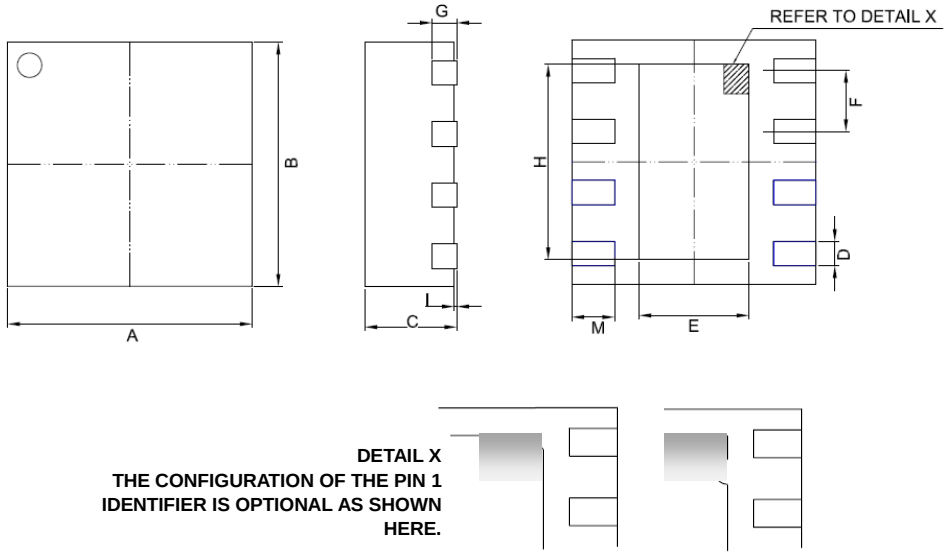


DETAIL X

THE CONFIGURATION OF THE PIN 1 IDENTIFIER IS OPTIONAL AS ABOVE.

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	2.900	3.100	0.114	0.122
B	2.900	3.100	0.114	0.122
C	0.650	0.850	0.026	0.033
D	0.200	0.350	0.008	0.014
E	1.600	1.800	0.063	0.071
F	0.65 TYP.		0.026 TYP.	
G	0.20 REF.		0.008 REF.	
H	1.900	2.100	0.075	0.083
I	0.000	0.050	0.000	0.002
M	0.300	0.400	0.012	0.016

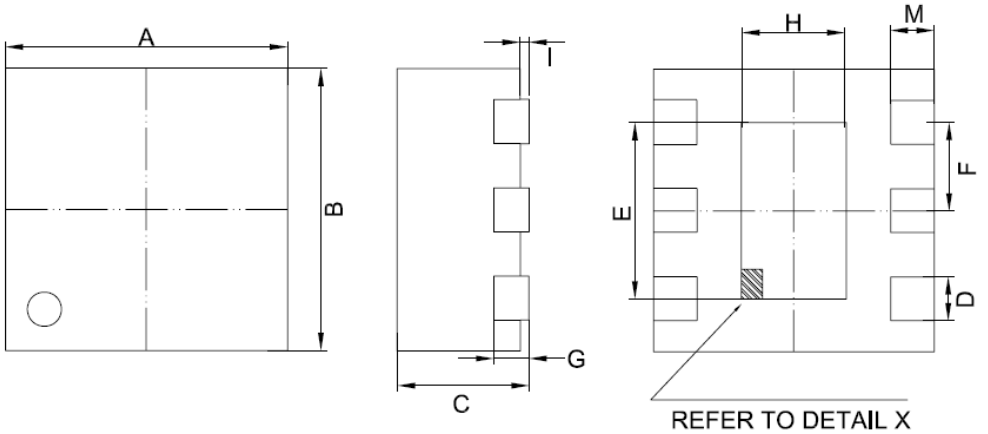
DFN-8 (2mm*2mm)



DETAIL X
THE CONFIGURATION OF THE PIN 1 IDENTIFIER IS OPTIONAL AS SHOWN HERE.

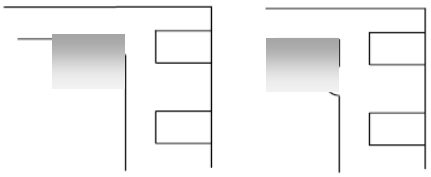
Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	1.900	2.100	0.075	0.083
B	1.900	2.100	0.075	0.083
C	0.650	0.850	0.026	0.033
D	0.150	0.300	0.006	0.012
E	0.550	0.950	0.022	0.037
F	0.500 TYP.		0.026 TYP.	
G	0.203 REF.		0.008 REF.	
H	1.150	1.650	0.045	0.065
I	0.000	0.050	0.000	0.002
M	0.300	0.400	0.012	0.016

DFN-6L (1.6x1.6)



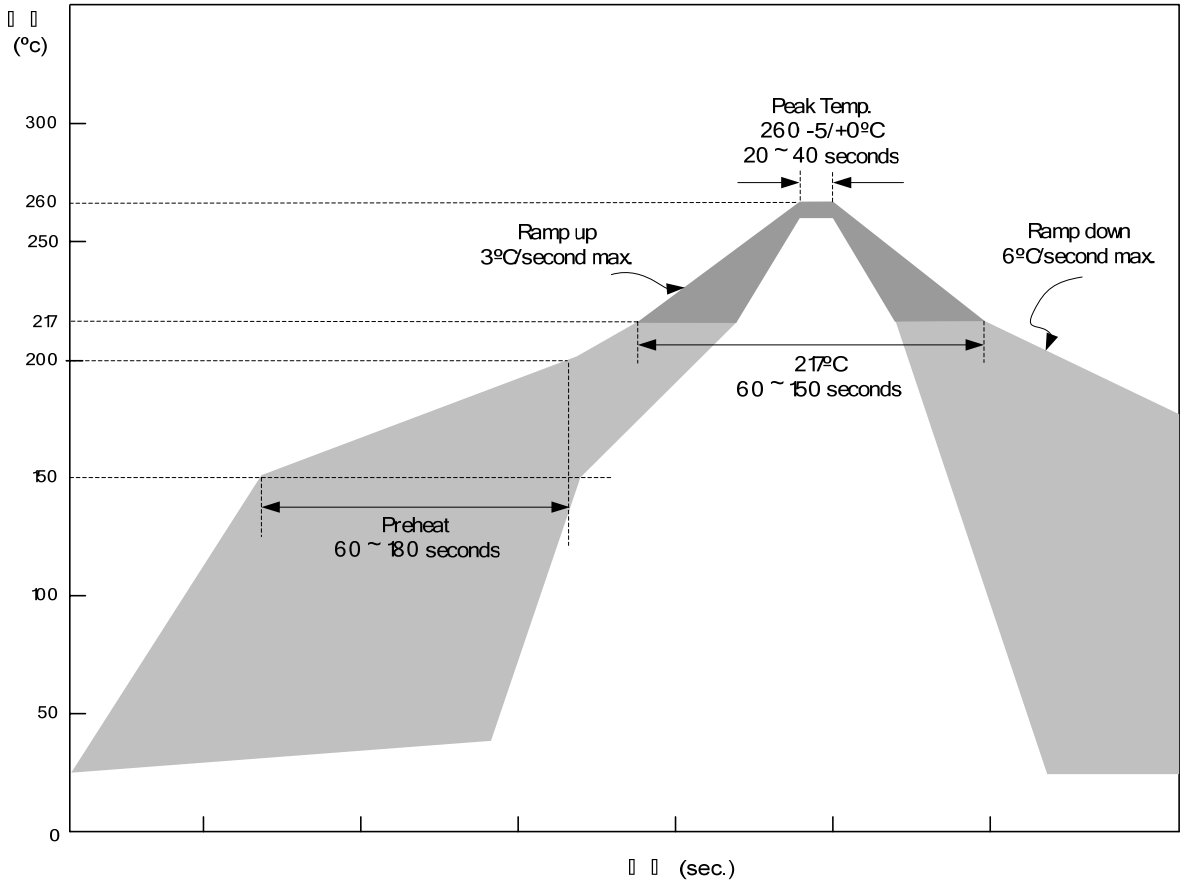
DETAIL X

THE CONFIGURATION OF THE PIN 1 IDENTIFIER IS OPTIONAL AS SHOWN HERE.



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	1.500	1.700	0.059	0.066
B	1.500	1.700	0.059	0.066
C	0.700	0.800	0.027	0.031
D	0.200	0.300	0.007	0.011
E	0.500	0.700	0.020	0.028
F	0.500 TYP.		0.019 TYP.	
G	0.203 REF.		0.008 REF.	
H	0.900	1.100	0.035	0.043
I	0.000	0.050	0.000	0.002
M	0.200	0.300	0.008	0.012

IR Profile for SMD Device



Item	Average Ramp-up Rate	Pre-heat (150 ~ 200°C)	Time Maintained Above 217°C	Peak Temp.	Ramp-down Rate
Required	3°C second max.	60~180 seconds	60~150 seconds	260 +0/-5°C 20~40 seconds	6°C second max.

Important Notice

Leadtrend Technology Corp. reserves the right to make changes or corrections to its products at any time without notice. Customers should verify the datasheets are current and complete before placing order.

Revision History

Rev.	Date	Change Notice
00	2008/6/16	Original specification.