

HIGH SPEED LOW DROPOUT
MIDDLE CURRENT VOLTAGE REGULATORS
 Dual 300mA High Speed Low Dropout CMOS Voltage Regulators

L6401 Series

DESCRIPTION

The L6401 series are highly accurate, Dual, low noise, CMOS LDO voltage regulators. Performance features of the series includes low output noise, high ripple rejection ratio, low dropout and very fast turn-on times.

The L6401 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators internally. The L6401's current limiter's foldback circuit also operates as a short protect for the output current limiter. The output voltage for each regulator is set independently by laser trimming. Voltages are selectable in 50mV steps within a range of 1.3V to 5.0V.

The EN function allows the output of each regulator to be turned off independently, resulting in greatly reduced power consumption. The L6401 series is available in the SOT-26 and USP-6B.

FEATURES

- Output Voltage Range 1.3V to 6.0V (selectable in 50mV steps)
- Highly Accurate $\pm 2\%$
- Dropout Voltage 200mV @ 100mA (3.0V type)
- High Ripple Rejection 70dB (1 kHz)
- Low Power Consumption 25 μ A (TYP.)
- Maximum Output Current 300mA
- Standby Current less than 0.1 μ A
- Internal protector current limiter and short protector
- Small packages SOT-26 and other required

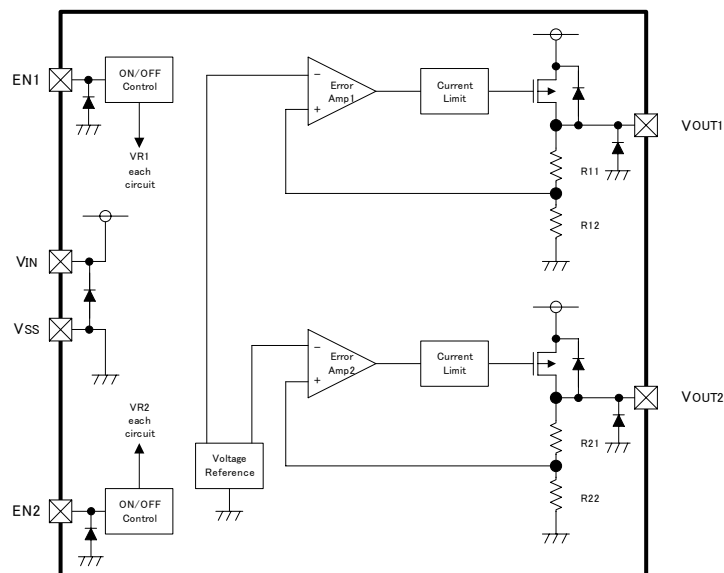
APPLICATIONS

- Mobile phones
- Cordless phones and radio communication equipment
- Cameras, Video cameras
- Portable games
- Portable AV equipment
- PDAs

PACKAGE

- SOT-26
- USP-6B

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MAXIMUM RATING		UNIT
Input Voltage	V_{IN}	$V_{SS}-0.3 \sim V_{SS}+10$		V
	V_{EN}	$V_{SS}-0.3 \sim V_{IN}+0.3$		
Output Voltage	V_{OUT}	$V_{SS}-0.3 \sim V_{IN}+0.3$		
Output Current	$I_{OUT1}+I_{OUT2}$	700		mA
Power Dissipation	P_D	SOT-26	250	mW
		USP-6B	100	
Operating Ambient Temperature	T_{opr}	-40~+85		°C
Storage Temperature	T_{stg}	-40~+125		

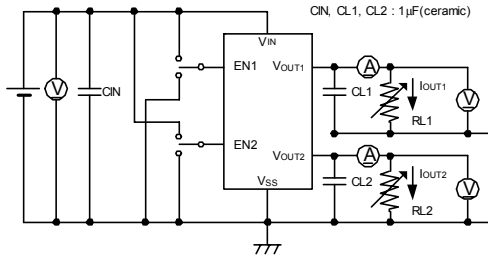
Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Electrical Characteristics

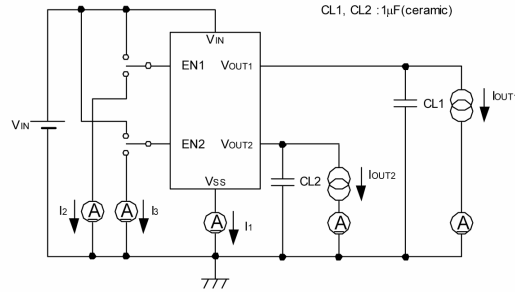
Parameter	Symbol	CONDITION	MIN	TYP	MAX	UNIT	CIRCUIT	
Output Voltage	$V_{OUT(E)}$	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$, $I_{OUT}=30\text{ mA}$	$V_{OUT(S)} \times 0.98$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.02$	V	1	
Output Current	I_{OUT}	$V_{IN} \geq V_{OUT(S)}+1.0\text{ V}$	300	—	—	mA	1	
Dropout Voltage	V_{drop}	$I_{OUT}=50\text{ mA}$	—	0.06	0.10	V	1	
		$I_{OUT}=100\text{ mA}$	—	0.20	0.30			
Line Regulations	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \cdot V_{OUT}}$	$V_{OUT(S)}+0.5\text{ V} \leq V_{IN} \leq 8\text{ V}$ $I_{OUT}=30\text{ mA}$	—	0.01	0.2	%/V		
Load Regulation	ΔV_{OUT2}	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$ $1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	15	50	mV		
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T_a \cdot V_{OUT}}$	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$, $I_{OUT}=10\text{ mA}$ $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	—	± 100	—	ppm/°C		
Supply Current	I_{SS1}	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$	—	25	40	μA		2
Standby Current	I_{STB}	$V_{IN}=V_{EN}=V_{OUT(T)}+1\text{ V}$, $V_{EN}=V_{SS}$	—	0.01	0.1	μA		3
Input Voltage	V_{IN}	—	2.0	—	10	V		—
Ripple-Rejection	PSRR	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$, $f=1\text{ kHz}$ $V_{rip}=0.5\text{ V}_{rms}$, $I_{OUT}=30\text{ mA}$	—	70	—	dB		5
Short-circuit Current	I_{short}	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$, $V_{IN}=V_{EN}$	—	30	—	mA	1	
Current limiter	I_{lim}	$V_{IN}=V_{EN}=V_{OUT(T)}+1\text{ V}$	—	450	—	mA	1	
CE “High” Voltage	V_{CEH}		1.3		V_{IN}	V	2	
CE “Low” Voltage	V_{CEL}				0.25	V	2	
CE “High” Current	I_{CEH}	$V_{IN}=V_{EN}=V_{OUT(T)}+1\text{ V}$	-0.1		0.1	uA	2	
CE “Low” Current	I_{CEL}	$V_{IN}=V_{EN}=V_{OUT(T)}+1\text{ V}$, $V_{EN}=V_{SS}$	-0.1		0.1	uA	2	

TEST CIRCUITS

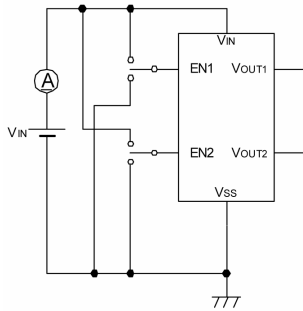
Circuit ①



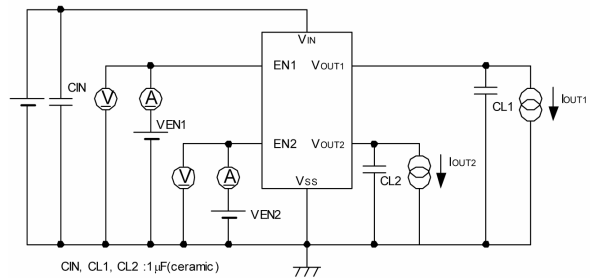
Circuit ②



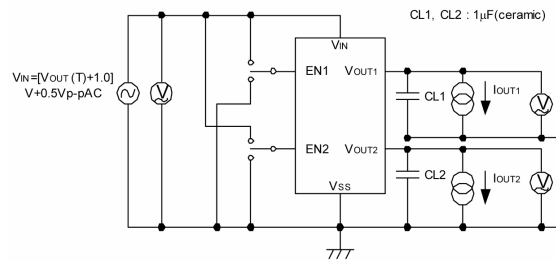
Circuit ③



Circuit ④



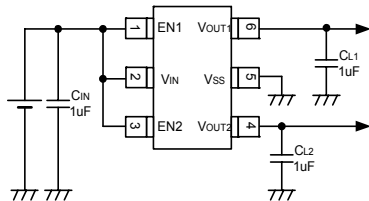
Circuit ⑤



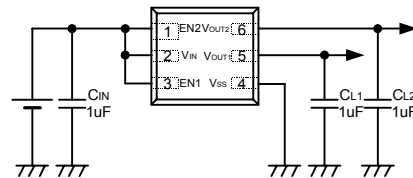
TYPICAL APPLICATION CIRCUIT

Basic circuit

●SOT-26W



●USP-6



Caution: The above connection diagram and constant will not guarantee successful operation. Perform thorough evaluation using the actual application to set the constant.

Application Conditions

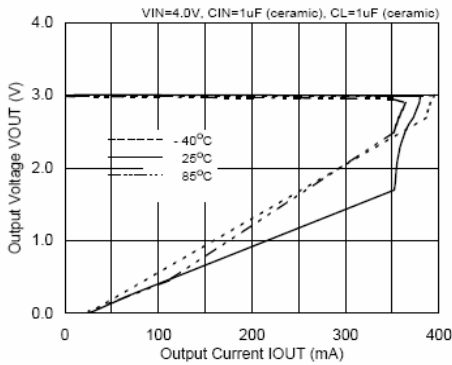
Input capacitor (CIN): 1.0µF or more

Output capacitor (CL): 1.0 µF or more (tantalum capacitor)

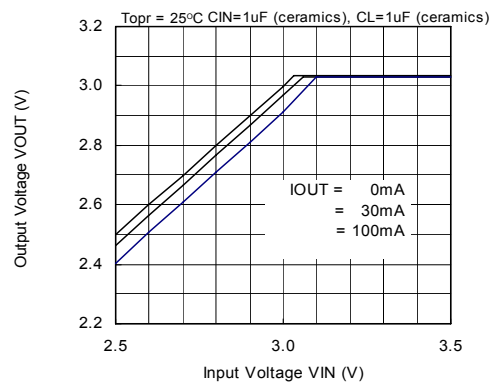
Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

TYPICAL PERFORMANCE CHARACTERISTICS (3.0V output)

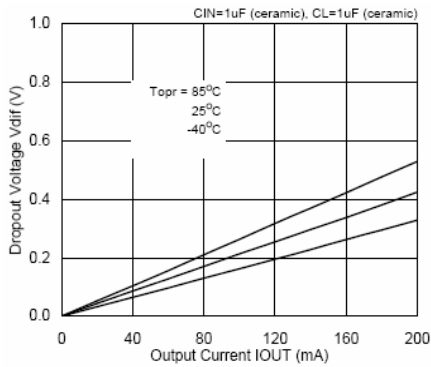
1. Output Voltage vs. Output Current



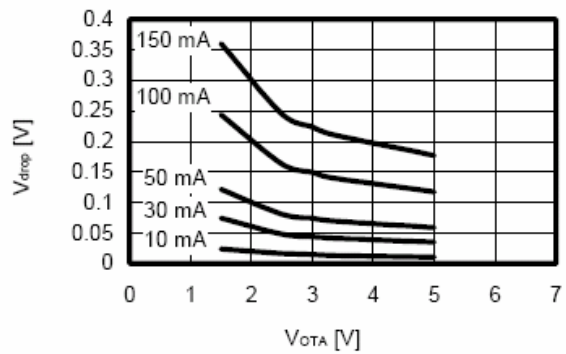
2. Output Voltage vs. Input Voltage



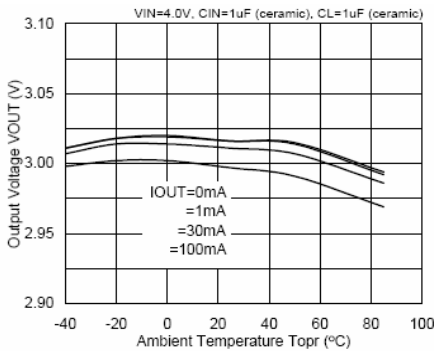
3. Dropout Voltage vs. Output Current



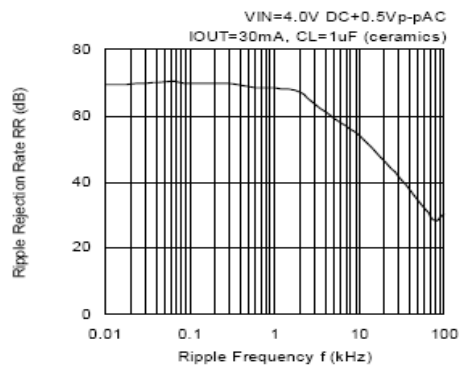
4. Dropout Voltage vs. Output Voltage



5. Output Voltage vs. Ambient Temperature

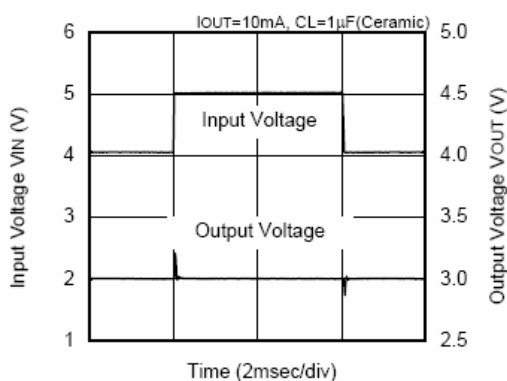


6. Ripple Rejection Rate

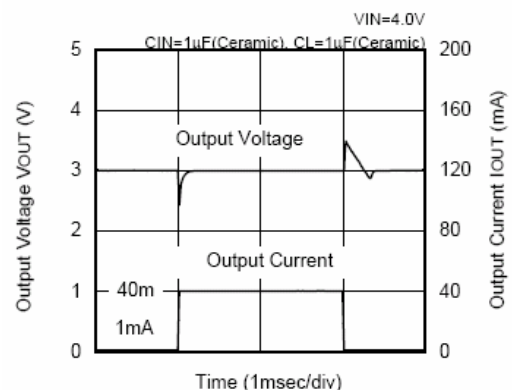


7. Transient Response

Input Transient Response



Load Transient Response

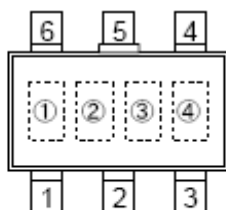


Ordering Information

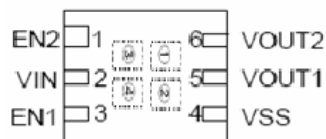
L6401①②③④⑤⑥⑦⑧

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Regulator1 EN type	E	Active 'High' (pull-down resistor built in)
		F	Active 'High' (no pull-down resistor built in)
		G	Active 'Low' (pull-up resistor built in)
		H	Active 'Low' (no pull-up resistor built in)
②	Regulator2 EN type	E	Active 'High' (pull-down resistor built in)
		F	Active 'High' (no pull-down resistor built in)
		G	Active 'Low' (pull-up resistor built in)
		H	Active 'Low' (no pull-up resistor built in)
③④	Regulator1 Output Voltage	13~50	eg. 30 represents 3.0V
⑤⑥	Regulator2 Output Voltage	13~50	eg. 30 represents 3.0V
⑦	Packaging Types	M	SOT26
⑧	Device Orientation	R	Embossed tape: Standard feed
		L	Embossed tape: Reverse feed

MARKING



SOT-26W
(TOP VIEW)



USP-6B (TOP VIEW)

①Represents the product name

SYMBOL	PRODUCT NAME
1	L6401 ◆◆◆◆◆◆◆◆◆◆

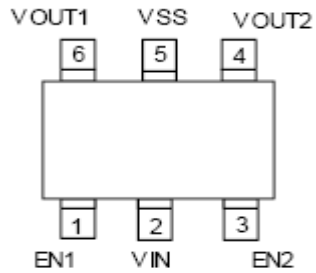
②③Represents internally set sequential number

Include the output voltage and enable pin type information.

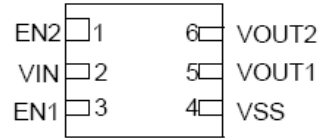
④Represents the assembly lot no.

0 to 9, A to Z, reversed character of 0 to 9 and A to Z repeated (G, I, J, O, Q W excepted)

PIN CONFIGURATION



SOT-26W
(TOP VIEW)

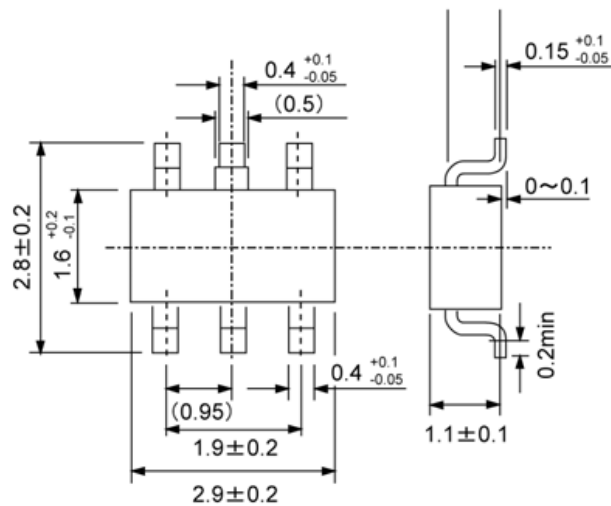


USP-6B (TOP VIEW)

PIN ASSIGNMENT

Pin Number		Pin Name	Function
SOT-26	USP-6B		
1	3	EN1	ON/OFF Control1
2	2	VIN	Power Input
3	1	EN2	ON/OFF Control2
4	6	VOUT2	Output2
5	4	VSS	Ground
6	5	VOUT1	Output 1

SOT-26



USP-6B
