300mA、微功率、双通道超低压差(VLDO)线性稳压器

UM4750S-xx *SOT23-6*
UM4750DA-xx *DFN6 2.0×2.0*
UM4750DB-xx *DFN8 3.0×3.0*

描述

UM4750系列是双通道 VLDO（极低压差）线性稳压器，专为低功耗便携式应用而设计。输出电压范围为 1.2V 至 5.0V，输入电压范围为 2.5V 至 5.5V。典型输出噪声仅为 200μV_{RMS}，负载电流为 100mA 时最大压降仅为 200mV。

UM4750系列具有高输出电压精度、出色的瞬态响应、使用低至1μF的超低ESR陶瓷电容器的稳定性、过温保护和输出电流限制。

UM4750S-xx系列采用扁平SOT23-6封装，UM4750DA-xx系列采用扁平DFN6 2.0×2.0封装，UM4750DB-xx系列采用扁平DFN8 3.0×3.0封装。

应用

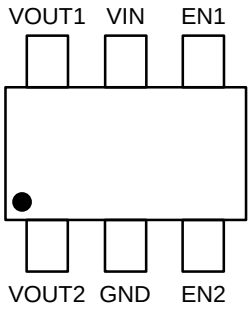
- 蓝牙/802.11 板卡
- PDA 和笔记本电脑
- 便携式仪器和电池供电系统
- 蜂窝电话

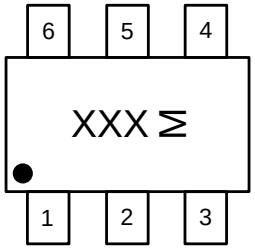
特性

- 超低压差：100mA 负载电流下最大 200mV
- 最大输入电压：5.5V
- 低噪声：200μV_{RMS}（10Hz 至 100kHz）
- 快速瞬态响应
- 双通道 LDO 输出（300mA/300mA）
- 输出电流限制
- 使用 1μF 输出电容，具有良好的稳定性
- 过热保护
- 采用扁平 SOT23-6、6 引脚 DFN 2.0×2.0 和 8 引脚 DFN 3.0×3.0 封装

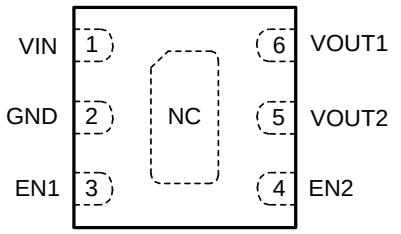
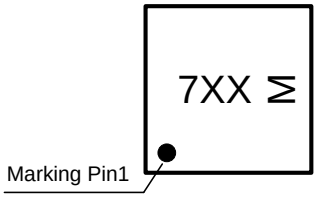
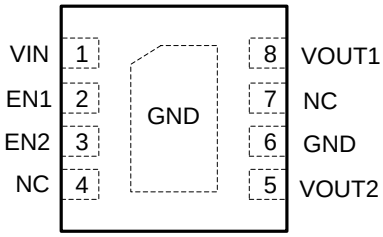
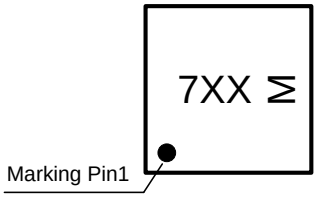
引脚配置

顶部视图





M: Month Code
UM4750S-xx
SOT23-6

(Top View)  	 **M: Month Code** **UM4750DA-xx** **DFN6 2.0×2.0**
(Top View)  	 **M: Month Code** **UM4750DB-xx** **DFN8 3.0×3.0**

Pin Description

Pin Number			Symbol	Function
UM4750S-xx	**UM4750DA-xx**	**UM4750DB-xx**		
1	5	5	VOUT2	Channel2 Output Voltage
2	2	6	GND	Ground
3	4	3	EN2	Enable2 Input, Active High
4	3	2	EN1	Enable1 Input, Active High
5	1	1	VIN	Power Supply
6	6	8	VOUT1	Channel1 Output Voltage
-	-	4,7	NC	No Connection

Naming Information

UM4750 □ □-□ □

- □ (last): Channel 2 Output Voltage
- □ (middle): Channel 1 Output Voltage
- □ □ (first): Package Type
  - S: SOT23-6
  - DA: DFN6 2.0×2.0
  - DB: DFN8 3.0×3.0

Available Voltage Version

Code	Voltage	Code	Voltage	Code	Voltage	Code	Voltage
A	5	F	4.2	L	3.3	R	1.8
B	4.8	G	4	M	3	S	1.5
C	4.7	H	3.8	N	2.8	T	1.3
D	4.5	J	3.6	P	2.7	U	1.2
E	4.3	K	3.5	Q	2.5		

Ordering Information

Part Number	Packaging Type	Marking Code	Shipping Qty
UM4750S-RN	SOT23-6	UDS	3000pcs/7Inch Tape & Reel
UM4750S-RL		UDT	
UM4750S-NR		UGS	
UM4750S-xx		7XX	
UM4750DA-xx	DFN6 2.0×2.0	7XX	
UM4750DB-xx	DFN8 3.0×3.0	7XX	

Absolute Maximum Ratings (Note 1)

Symbol	Parameter		Value	Unit
V_{IN}	Supply Voltage on VIN Pin		-0.3 to +6.5	V
V_{OUT}	Voltage on VOUT Pin		-0.3 to +7.5	V
T_J	Operating Junction Temperature (Note 2, 3)		-40 to +125	℃
T_{STG}	Storage Temperature Range		-65 to +150	℃
T_L	Lead Temperature for Soldering 10 Seconds		+300	℃
	ESD Susceptibility HBM		2000	V
P_D	Continuous Power Dissipation at T_A=25 ℃	SOT23-6	1.13	W
		DFN6 2.0×2.0	1.48	
		DFN8 3.0×3.0	3.04	

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: The device is guaranteed to meet performance specifications from 0 ℃ to 70 ℃. Specifications over the -40 ℃ to 125 ℃ operating junction temperature range are guaranteed by design, characterization and correlation with statistical process controls.

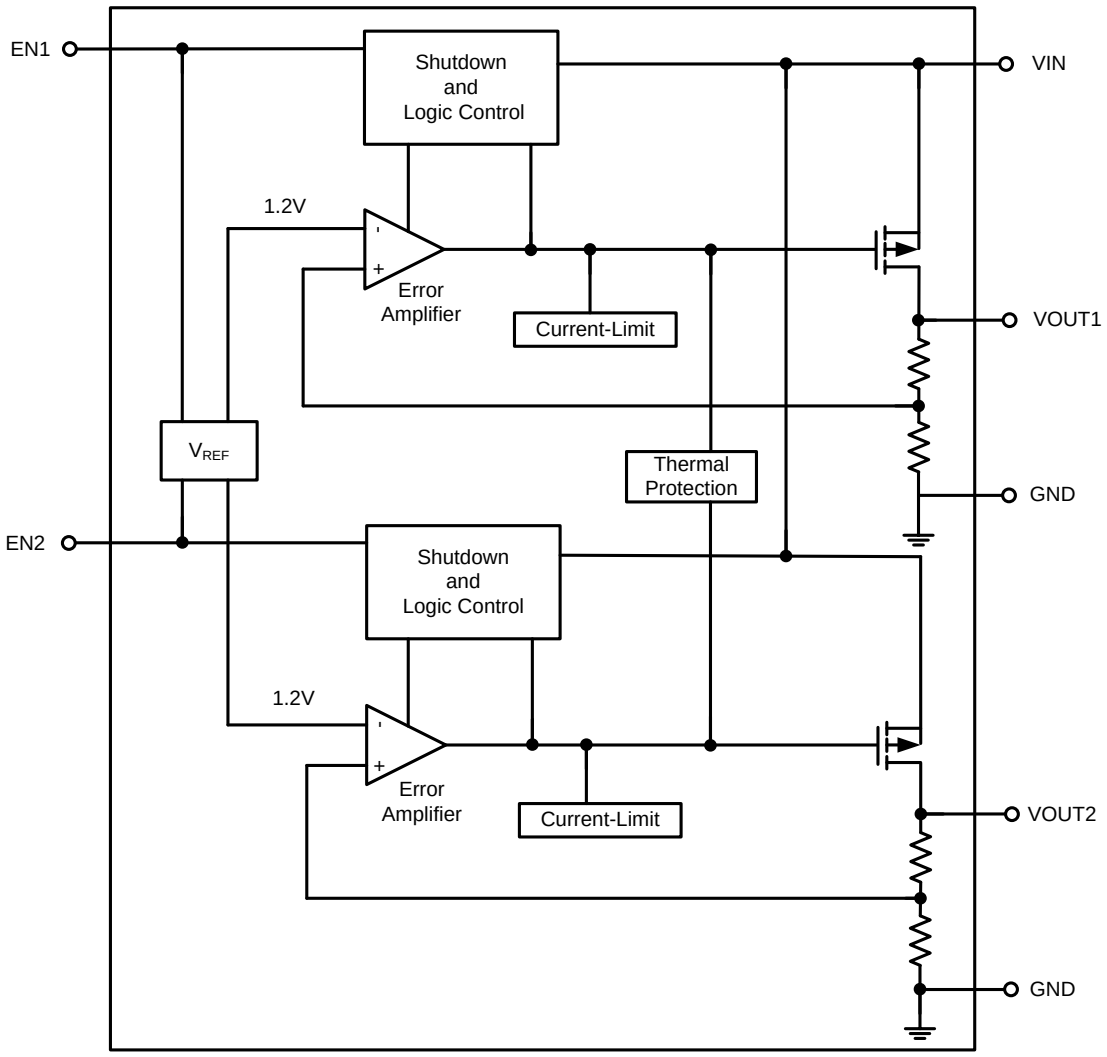
Note 3: This IC includes over temperature protection circuit inside that is intended to protect the device during momentary overload conditions. Over temperature protection trip point is around 160 ℃. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

Recommended Operating Conditions (Note 4)

Parameter	Value	Unit
Supply Input Voltage	2.5 to 5.5	V
Enable Input Voltage	0 to 5.5	V
Junction Temperature Range	-40 to 125	℃
Ambient Temperature Range	-40 to 85	℃

Note 4: The device is not guaranteed to function outside its operating conditions.

Internal Block Diagram



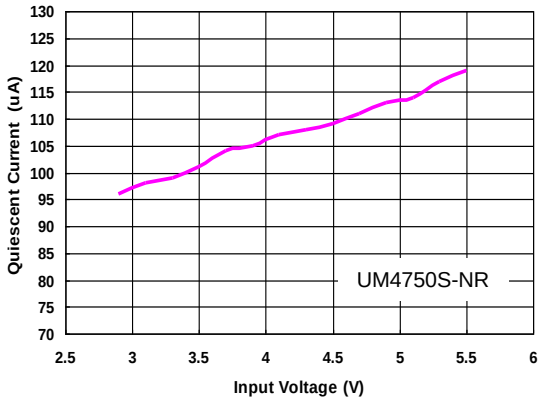
Electrical Characteristics

V_{CC}=+5V ±10%, C_{IN}=1μF, C_{OUT1}=C_{OUT2}=1μF, T_A=-40℃ to +85℃. Typical conditions are at V_{CC}=5V, T_A=25℃.

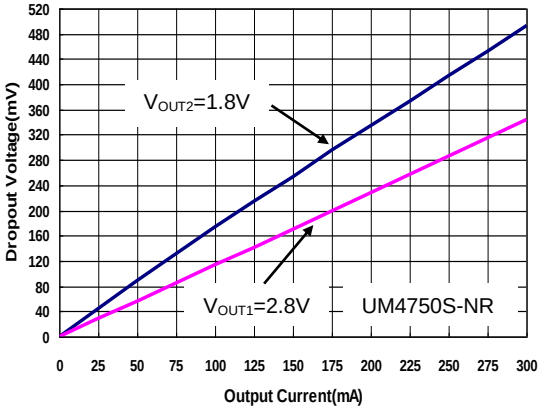
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		2.5		5.5	V
Output Voltage Range	V_{OUT}		1.2		5.0	V
Operating Quiescent Current	I_Q	I_{OUT}=0mA		110	190	μA
Shut Down Current	I_{Q_SD}	EN1=EN2=GND			2	μA
EN Input Current	I_{EN}	EN=V_{IN} or GND			1	μA
Output Current	I_{OUT}		300			mA
Output Voltage Accuracy		I_{OUT}=10mA	-2		2	%
Dropout Voltage	ΔV_{DO}	I_{OUT}=100mA, V_{OUT}>2.8V		100	200	mV
Output Current Limit	I_{LIMT}		330	450	700	mA
Startup Time Response	t	R_L=68Ω, C_{OUT}=1μF		20		μs
EN Input Low Voltage	V_{IL}	V_{IN}=2.5V to5.5V			0.3×V_{IN}	V
EN Input High Voltage	V_{IH}		0.7×V_{IN}			V
Output Voltage TC				100		ppm/℃
Thermal-Shutdown Temperature	T_{SHDN}			150		℃
Thermal-Shutdown Hysteresis	ΔT_{SHDN}			30		℃
Line Regulation	LNR	1.5<V_{OUT}≤4V V_{OUT}+1V≤V_{IN}≤5.5V, I_{OUT}=10mA			0.3	%/V
		4V<V_{OUT}≤5V or 1.2V≤V_{OUT}≤1.5V V_{OUT}+1V≤V_{IN}≤5.5V and V_{IN}>2.5V, I_{OUT}=10mA			0.6	
Load Regulation	LDR	V_{OUT}≤4V 1mA≤I_{OUT}≤300mA			0.6	%
		4V<V_{OUT}≤5V 1mA≤I_{OUT}≤300mA			0.8	
Output Voltage Noise		10Hz to 100KHz C_{IN}=1μF, I_{OUT}=10mA		200		μV_{RMS}
Power Supply Ripple Rejection	PSRR	V_{IN}=V_{OUT}+1V I_{OUT}=100mA, f=100Hz	60			dB
		V_{IN}=V_{OUT}+1V I_{OUT}=100mA, f=1kHz	45			
ESD Rating		Human Body Mode	2			kV

Typical Performance Characteristics

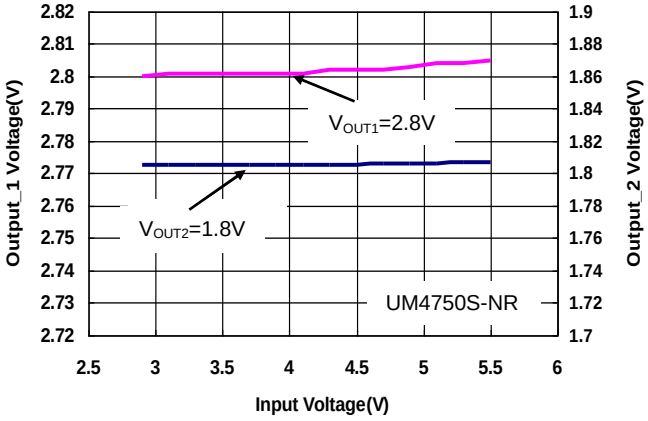
Quiescent Current vs. Input Voltage



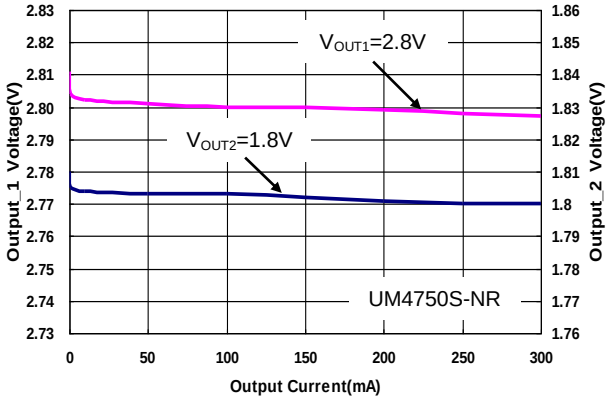
Dropout Voltage vs. Output Current



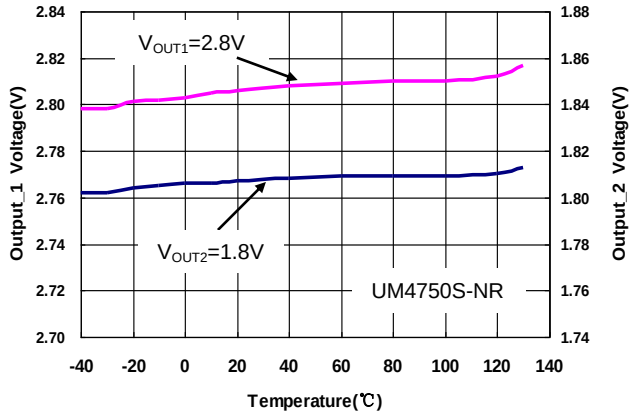
Output Voltage vs. Input Voltage



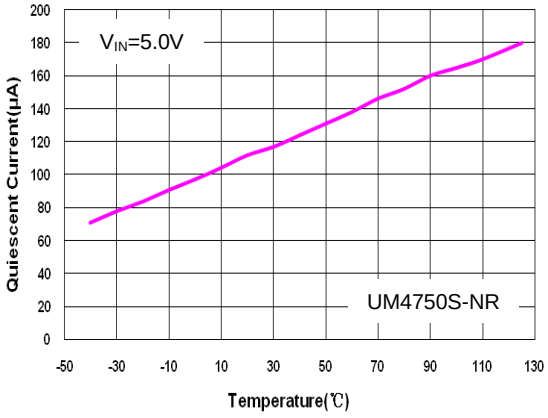
Output Voltage vs. Output Current



Output Voltage vs. Temperature

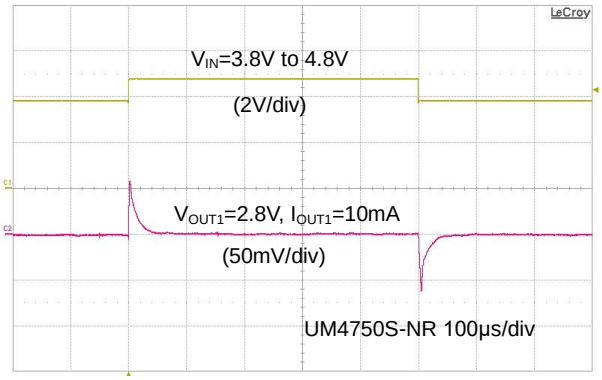


Quiescent Current vs. Temperature

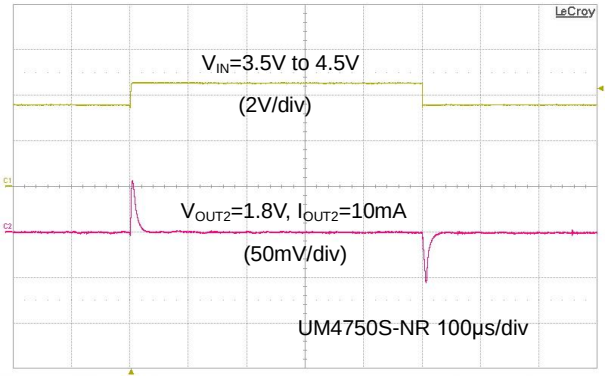


Typical Performance Characteristics (Continued)

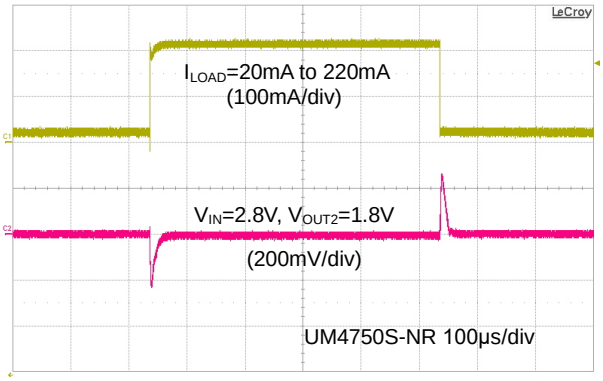
Line Transient Response



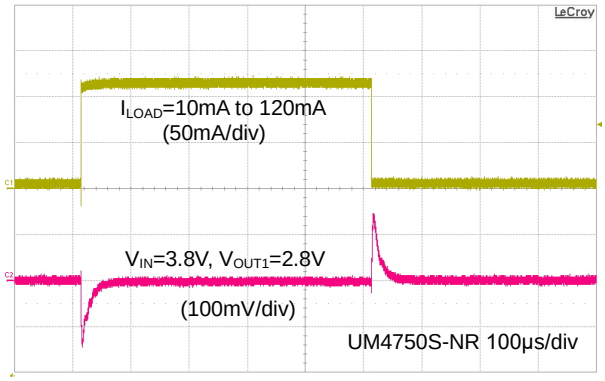
Line Transient Response



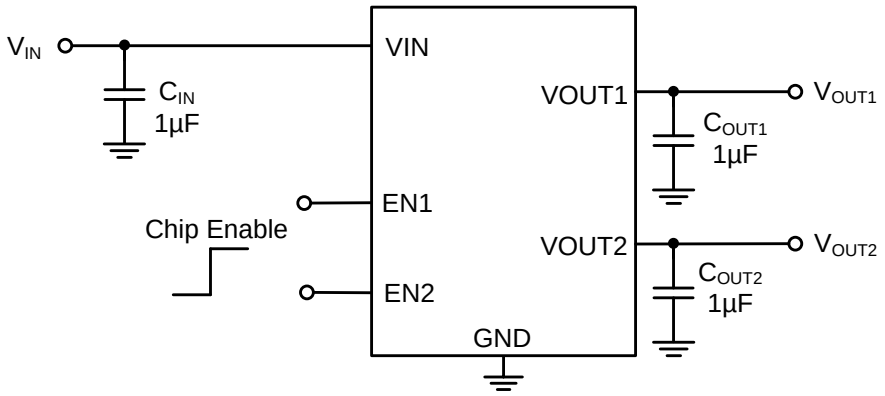
Load Transient Response



Load Transient Response



Typical Application Circuit



Pin Function

VIN : Unregulated input supply. A small 1.0µF capacitor should be connected from VIN to GND.
GND : Ground and Heat Sink. Solder to a ground plane or large pad to maximize heat dissipation.
EN: Enable, Active High. This pin is used to put the UM4750 into shutdown. The EN pin cannot be left floating and must be tied to the input pin if not used.
VOUT : Regulated Voltage Output.

Applications Information

The UM4750 series are 300mA very low dropout regulators with micropower quiescent current and shutdown. The maximum dropout is only 200mV at the load current of 100mA. Output voltage noise is as low as 200µV_{RMS} over a 10Hz to 100kHz bandwidth.
In addition to the low quiescent current, the UM4750 regulators incorporate several protection features which make them ideal for use in battery-powered systems. Devices include current limit and thermal overload protection.

Output Capacitance and Transient Response

The UM4750 regulators are designed to be stable with a wide range of output capacitors. The ESR of the output capacitor affects stability, most notably with small capacitors. A minimum output capacitor of 1µF with an ESR of 0.3Ω or less is recommended to ensure stability. The UM4750 series are micropower devices and output transient response will be a function of output capacitance. Larger values of output capacitance decrease the peak deviations and provide improved transient response for larger load current changes. Extra consideration must be given to the use of ceramic capacitors. The X5R and X7R dielectrics result in more stable characteristics and are more suitable for use as the output capacitor. The X7R type has better stability across temperature, while the X5R is less expensive and is available in higher values.

Board Layout Recommendations to Improve PSRR and Noise Performance

To improve AC performance such as PSRR, output noise, and transient response, it is recommended that the board be designed with separate ground planes for VIN and VOUT, with each ground plane connected only at the GND pin of the device. In addition, the ground connection for the output capacitor should connect directly to the GND pin of the device. High ESR capacitors may degrade PSRR.

Internal Current Limit

The UM4750 internal current limits help protect the regulator during fault conditions. During current limit, the output sources a fixed amount of current that is largely independent of output voltage. For reliable operation, the device should not be operated in a limit state for extended periods of time.
The PMOS pass element in the UM4750 has a built-in body diode that conducts current when the voltage at OUT exceeds the voltage at IN. This current is not limited, so if extended reverse voltage operation is anticipated, external limiting to 5% of rated output current may be appropriate.

Dropout Voltage

The UM4750 use a PMOS pass transistor to achieve low dropout. When (V_{IN}-V_{OUT}) is less than the dropout voltage, the PMOS pass device is in its linear region of operation and the input-to-output resistance is the R_{DS} of the PMOS pass element. V_{DROP} approximately scales with output current because the PMOS device behaves like a resistor in dropout.

Thermal Protection

Thermal protection disables the output when the junction temperature rises to approximately +150℃ allowing the device to cool. When the junction temperature cools to approximately +120℃ the output circuit is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may circle on and off. This cycling limits the dissipation of the regulator, protecting it from damage due to overheating.

Thermal Considerations

Thermal protection limits power dissipation in UM4750. When the operation junction temperature exceeds 150℃, the OTP circuit starts the thermal shutdown function and turns the pass element off. The pass element turns on again after the junction temperature cools by 25℃. For continuous operation, do not exceed absolute maximum operation junction temperature 125℃. The power dissipation definition in device is:

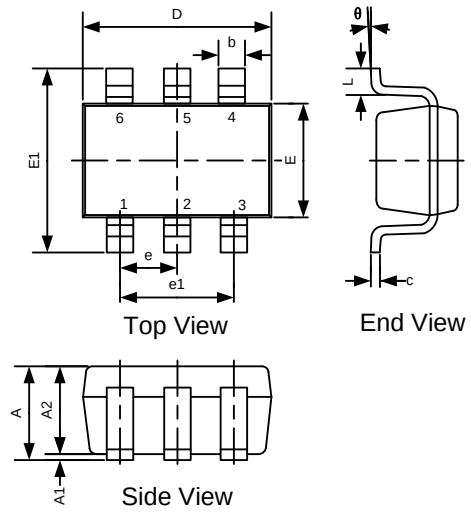
$$P_D = (V_{IN} - V_{OUT1}) \times I_{OUT1} + (V_{IN} - V_{OUT2}) \times I_{OUT2} + V_{IN} \times I_Q$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junctions to ambient. The recommended maximum power dissipation of SOT23-6, DFN6 2.0×2.0 and DFN8 3.0×3.0 packages for 25℃ ambient temperature are 1.13W, 1.48W and 3.04W.

Package Information

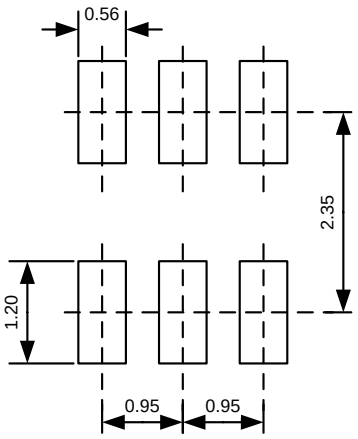
UM4750S-xx SOT23-6

Outline Drawing



Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.013	1.15	1.40	0.040	0.045	0.055
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	1.00	1.10	1.30	0.039	0.043	0.051
b	0.30	-	0.50	0.012	-	0.020
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.82	-	3.10	0.111	-	0.122
E	1.50	1.60	1.70	0.059	0.063	0.067
E1	2.60	2.80	3.00	0.102	0.110	0.118
e	0.95REF			0.037REF		
e1	1.90REF			0.075REF		
L	0.30	-	0.60	0.012	-	0.024
θ	0°	-	8°	0°	-	8°

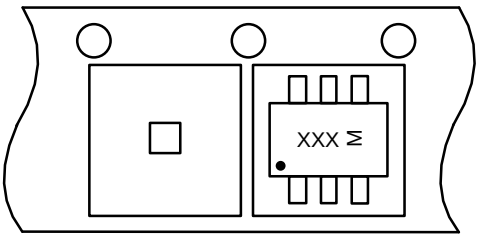
Land Pattern



NOTES:

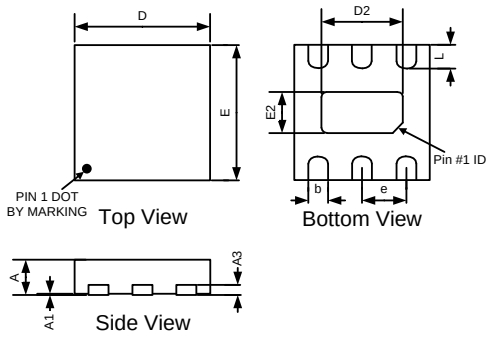
1. Compound dimension: 2.92×1.60；
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



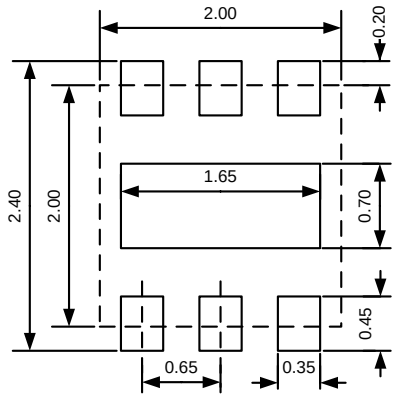
UM4750DA-xx DFN6 2.0×2.0

Outline Drawing



DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.55	-	0.80	0.022	-	0.031
A1	0.00	-	0.05	0.000	-	0.002
A3	0.20REF			0.008REF		
b	0.25	0.30	0.35	0.010	0.012	0.014
D	1.924	2.00	2.076	0.076	0.079	0.082
D2	1.35	-	1.75	0.053	-	0.069
E	1.924	2.00	2.076	0.076	0.079	0.082
E2	0.65	-	1.06	0.026	-	0.042
e	0.65BSC			0.026BSC		
L	0.224	-	0.45	0.009	-	0.018

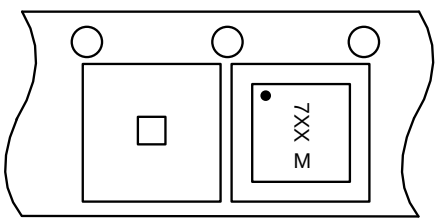
Land Pattern



NOTES:

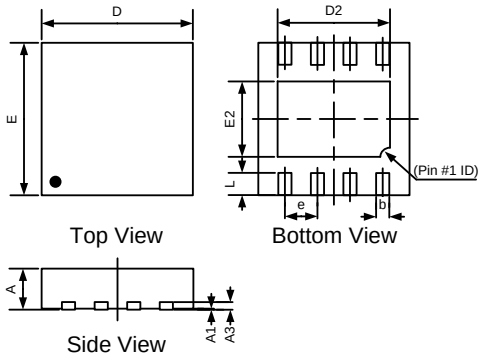
1. Compound dimension: 2.00×2.00；
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



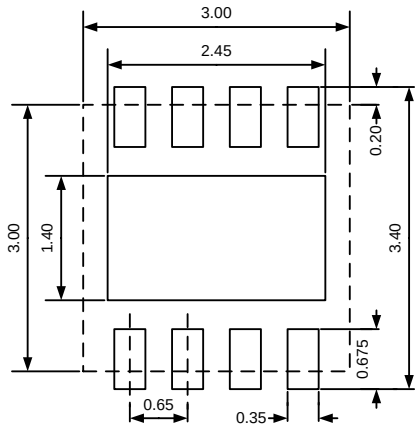
UM4750DB-xx DFN8 3.0×3.0

Outline Drawing



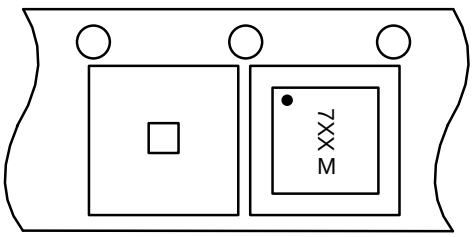
Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.57	-	0.80	0.022	-	0.031
A1	0.00	-	0.05	0.000	-	0.002
A3	0.20REF			0.008REF		
b	0.20	-	0.35	0.008	-	0.014
D	2.924	3.00	3.076	0.115	0.118	0.121
D2	2.15	-	2.55	0.085	-	0.100
E	2.924	3.00	3.076	0.115	0.118	0.121
E2	1.40	-	1.75	0.055	-	0.069
e	0.65BSC			0.026BSC		
L	0.30	-	0.60	0.012	-	0.024

Land Pattern



NOTES:
1. Compound dimension: 3.00×3.00;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Tape and Reel Orientation



GREEN COMPLIANCE

Union Semiconductor is committed to environmental excellence in all aspects of its operations including meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions.
All Union components are compliant with the RoHS directive, which helps to support customers in their compliance with environmental directives. For more green compliance information, please visit:
http://www.union-ic.com/index.aspx?cat_code=RoHSDeclaration

IMPORTANT NOTICE

The information in this document has been carefully reviewed and is believed to be accurate. Nonetheless, this document is subject to change without notice. Union assumes no responsibility for any inaccuracies that may be contained in this document, and makes no commitment to update or to keep current the contained information, or to notify a person or organization of any update. Union reserves the right to make changes, at any time, in order to improve reliability, function or design and to attempt to supply the best product possible.