



LM4041

Preliminary

LINEAR INTEGRATED CIRCUIT

PRECISION MICROPOWER SHUNT VOLTAGE REFERENCE

DESCRIPTION

As a shunt voltage reference integrated circuit, UTC **LM4041** can be used for widespread applications with enhancement of the competitive advantage by saving use of external capacitors..

In order to ensure a stable output voltage, the reference not only offers low dynamic impedance, low noise and a low temperature coefficient, but also provides tight output tolerance (Max 1.0 %) and low temperature coefficient (150ppm/°C).

However, for those applications which the output voltage needs to be adjusted between 1.225V and 10V, an external resistor divider is necessary.

FEATURES

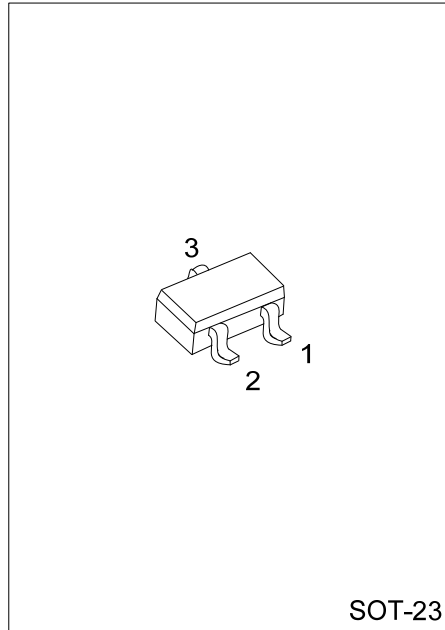
- * Output Tolerances and Temperature Coefficient: Max 1.0%, 150 ppm/°C
- * Low Output Noise : 20µV_{RMS} (Typ.)
- * Operating Current range : 45µA ~ 12mA
- * Halogen Free

ORDERING INFORMATION

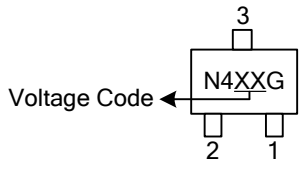
Order Number	Package	Packing
LM4041G-xx-AE3-R	SOT-23	Tape Reel

Note: xx: Output Voltage, refer to Marking Information.

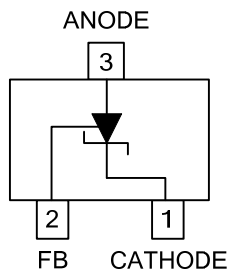
<p>LM4041G-xx-AE3-R</p>	<p>(1) R: Tape Reel</p> <p>(2) AE3: SOT-23</p> <p>(3) xx: Refer to Marking Information</p> <p>(4) G: Halogen Free</p>
-------------------------	---



■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23	AD: ADJ	

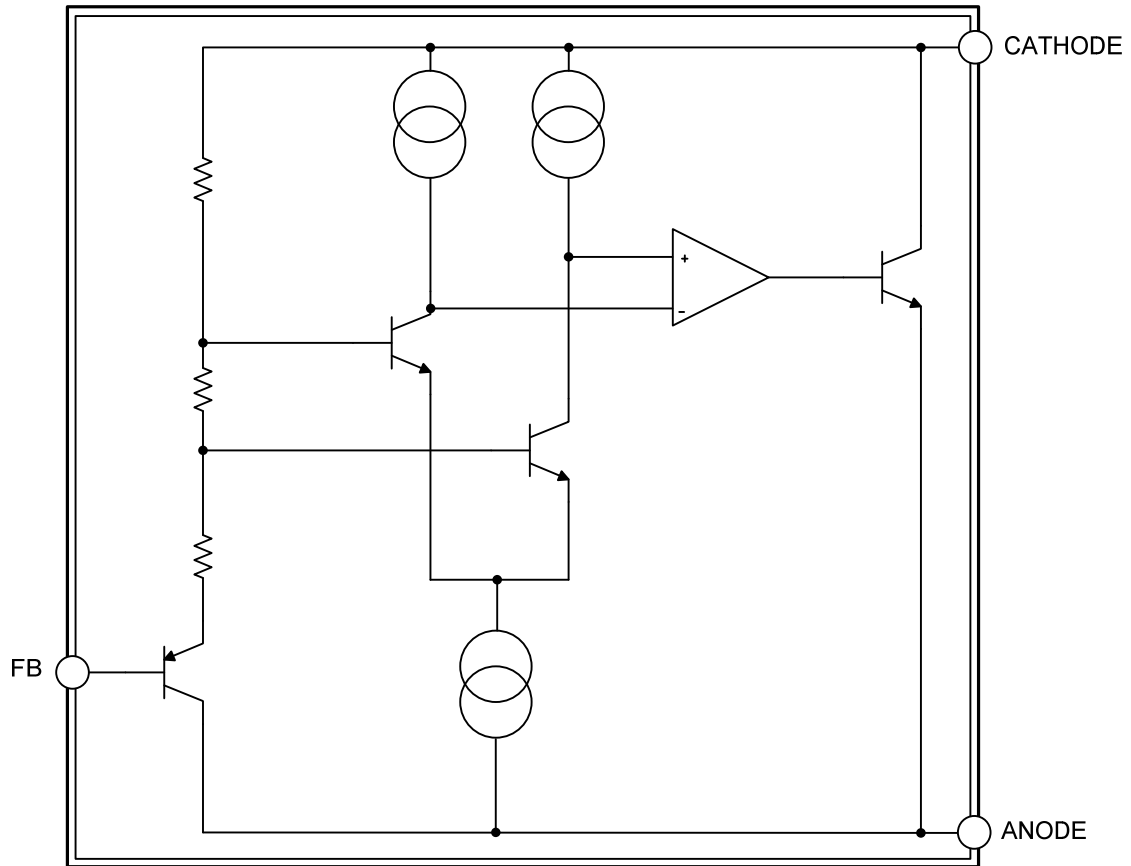
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	Cathode	Output reference voltage, cathode terminal
2	FB	Feedback terminal
3	Anode	Output reference voltage, anode terminal

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (Ta = 25°C, unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Continuous Cathode Voltage	V _Z	15	V
Continuous Cathode Current	I _Z	-10~+25	mA
Junction Temperature	T _J	150	°C
Storage Temperature	T _{STG}	-65~+150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ _{JA}	206	°C/W

Note: Maximum power dissipation is a function of T_{J(max)}, θ_{JA}, and Ta. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_{J(max)} - T_A) / θ_{JA}. Operating at the absolute maximum T_J of 150°C can affect reliability.

■ RECOMMENDED OPERATING CONDITIONS

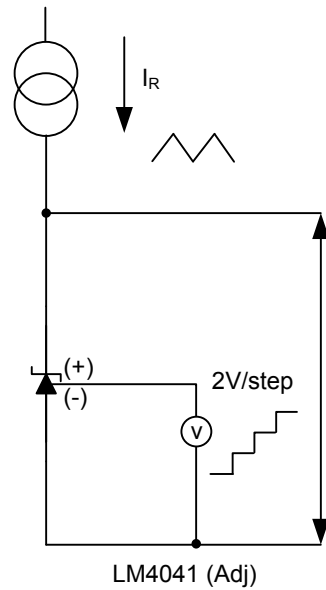
PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Current (max)	I _Z	12	mA
Reverse Breakdown Voltage	V _Z	10	V
Operating Temperature	Ta	-40~+85	°C

■ ELECTRICAL CHARACTERISTICS (Ta = -40°C~ +85°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Voltage	V _{REF}	V _Z =5V, I _Z = 100μA, Ta=25°C		1.233		V
Reference Voltage Tolerance (Note)		V _Z =5V, I _Z = 100μA	Ta=25°C -12		12	mV
			Ta=-40°C~+85°C -24		24	mV
Reference Voltage Change With Cathode Current Change	$\frac{\Delta V_{REF}}{\Delta I_Z}$	I _{Z(MIN)} < I _Z < 1mA	Ta=25°C	0.7	2	mV
			Ta=-40°C~+85°C		2.5	mV
		1mA < I _Z < 12mA	Ta=25°C	2	6	mV
			Ta=-40°C~+85°C		8	mV
Reference Voltage Change With Output Voltage Change	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I _Z =1mA	Ta=25°C	-1.55	-2	mV/V
			Ta=-40°C~+85°C		-3	mV/V
Minimum Cathode Current	I _{Z(MIN)}	Ta=25°C		45	75	μA
		Ta=-40°C~+85°C			80	μA
Feedback Current	I _{FB}	Ta=25°C		60	150	nA
		Ta=-40°C~+85°C			200	nA
Temperature Coefficient of Output Voltage (Note)	T _C V _O	V _Z =5V, I _Z = 10mA, Ta=25°C		±20		ppm/°C
		V _Z =5V, I _Z =1mA	Ta=25°C	±15		ppm/°C
			Ta=-40°C~+85°C		±150	ppm/°C
		V _Z =5V, I _Z =100μA, Ta=25°C		±15		ppm/°C
Reverse Dynamic Impedance	Z _Z	V _Z =V _{REF} , I _Z =1mA, I _{AC} =0.1I _Z f=120Hz, Ta=25°C		0.3		Ω
		V _Z =10V, I _Z =1mA, I _{AC} =0.1I _Z f=120Hz, Ta=25°C		2		Ω
Output Voltage Noise	e _N	V _Z =V _{REF} , I _Z = 100μA 10Hz ≤ f ≤ 10 kHz, Ta=25°C		20		μVrms
Long-term Stability of Reverse Breakdown Voltage		t=1000h, I _Z =100μA, Ta = 25°C±0.1°C,		120		ppm

Note: Reference voltage tolerance and average temperature coefficient change with output voltage (V_Z).

■ TYPICAL APPLICATION CIRCUIT



Reverse Characteristics Test Circuit

Output Capacitor

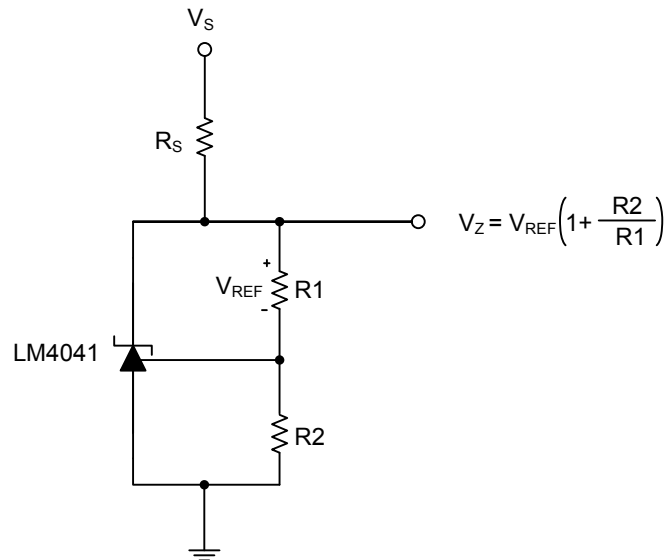
Across CATHODE and ANODE, there's no need to use output capacitor for the UTC **LM4041** stability operation.

Pin Connections

There is a parasitic Schottky diode connected between Cathode (pin 1) and Anode (pin 3). Thus, pin 3 must be left floating or connected to pin 1.

■ APPLICATION INFORMATION

V_Z is set according to the equation shown as below which can be set by a user-defined resistor divider.

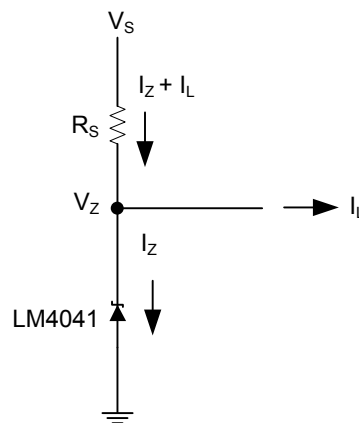


Adjustable Shunt Regulator

Cathode and Load Currents

The total current available to supply the load (I_L) and bias the UTC **LM4041** (I_Z) is set by R_S , so its value must be set properly. In all cases, I_Z must stay in a specified range for proper operation of the reference; R_S must be small enough to supply the minimum I_Z . At maximum V_S and minimum I_L , to limit I_Z to not exceed rating of 12 mA, R_S must be large enough.

$$R_S = \frac{(V_S - V_Z)}{(I_L + I_Z)}$$



Shunt Regulator

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.