



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

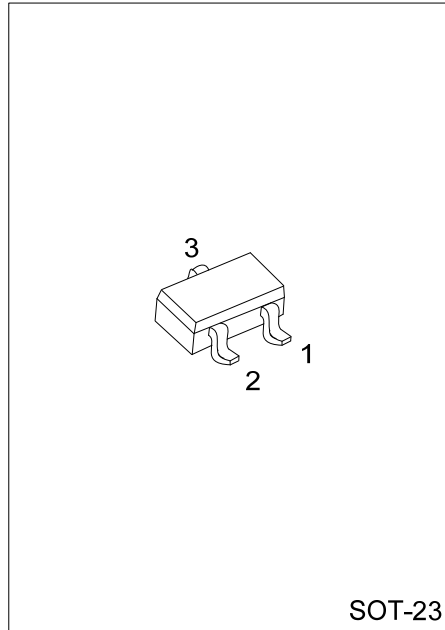
- * Output Tolerances and Temperature Coefficient: Max 1.0%, 150 ppm/°C
- * Low Output Noise : 20µV_{RMS} (Typ.)
- * Operating Current range : 45µA ~ 12mA
- * Halogen Free

ORDERING INFORMATION

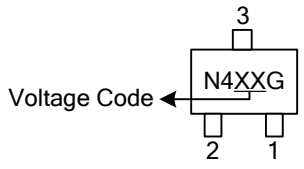
Order Number	Package	Packing
LM4041G-xx-AE3-R	SOT-23	Tape Reel

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

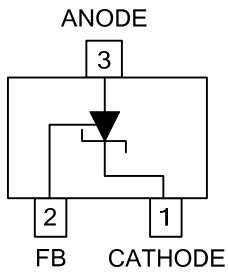
<p>LM4041G-xx-AE3-R</p>	<p>(1) R: Tape Reel</p> <p>(2) AE3: SOT-23</p> <p>(3) xx: Refer to Marking Information</p> <p>(4) G: Halogen Free</p>
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MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23	AD: ADJ	

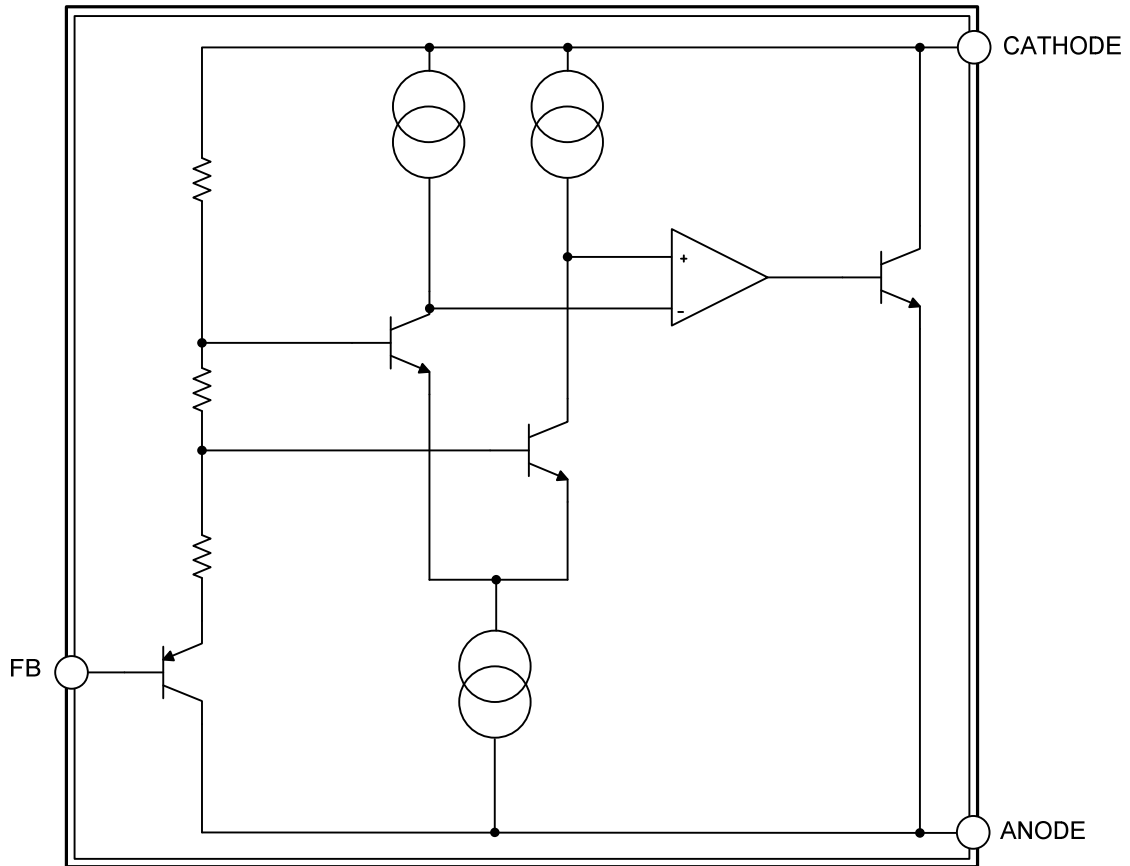
PIN CONFIGURATION



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

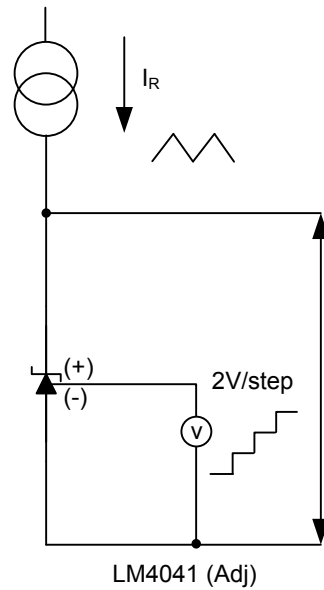
PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Current (max)	I _Z	12	mA
Reverse Breakdown Voltage	V _Z	10	V
Operating Temperature	Ta	-40~+85	°C

■ 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

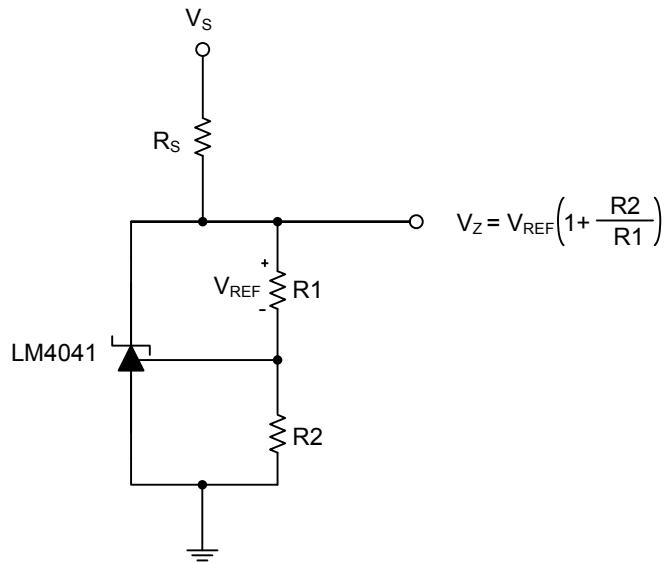
Across CATHODE and ANODE, there's no need to use output capacitor for the UTC **LM4041** stability operation.

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.

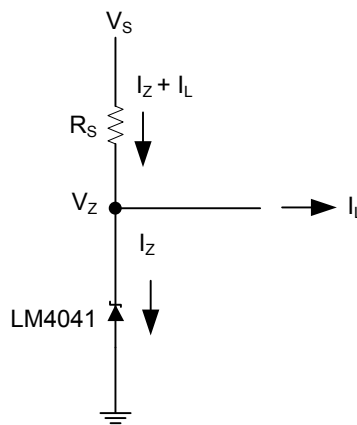


Adjustable Shunt Regulator

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

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