



## Application Hint 54

### Low Output Voltage Conversion

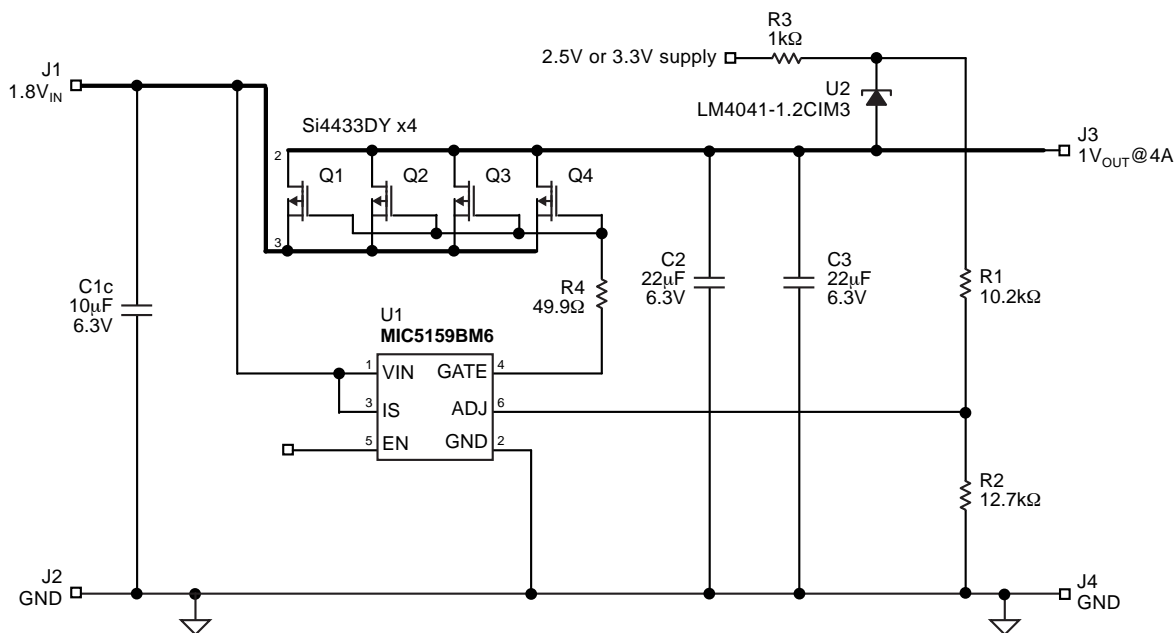
By Martin Galinski

#### Description

In this circuit, an external reference (U2, LM4041-1.2) and an additional supply provide the ability to regulate an output less than the internal reference voltage of the regulator. It adds the 1.225V above the output voltage to allow the feedback resistor divider to divide the voltage to the regulator's internal reference and can be calculated as follows:

$$V_{OUT} = V_{REF} \times \left( \frac{R1}{R2} + 1 \right) - 1.225$$

A light minimum load is required to keep the reference from back-biasing up the LM4041. The load should be much greater than that of the current supplied through the LM4041.



Low Output Voltage Conversion Circuit

**Bill of Materials**

Item	Part Number	Manufacturer	Description	Qty.
C1c	GRM40 X7R 106K 6.3	Murata <sup>(1)</sup>	10 $\mu$ F/ 6.3V	1
C2, C3	GRM42-2 X5R 226K6.3	Murata <sup>(1)</sup>	22 $\mu$ F/ 6.3V	2
Q1, Q2, Q3, Q4	Si4433DY	Vishay Siliconix <sup>(2)</sup>	P-Channel MOSFET	4
R7	CRCW080549R9FRT1	Vishay Dale <sup>(3)</sup>	49.9 $\Omega$ , 1%, 1/10W, size 0805	1
R1	CRCW08051022FRT1	Vishay Dale <sup>(3)</sup>	10.2k $\Omega$ , 1%, 1/10W, size 0805	1
R2	CRCW08051272FRT1	Vishay Dale <sup>(3)</sup>	12.7k $\Omega$ , 1%, 1/10W, size 0805	1
U1	MIC5159BM6	Micrel, Inc. <sup>(4)</sup>	Programmable Current Limit $\mu$ Cap LDO Controller	1
U2	LM4041	Micrel, Inc. <sup>(4)</sup>	1.2V Reference	1

1. Murata: [www.murata.com](http://www.murata.com)2. Vishay Siliconix: [www.vishay.com](http://www.vishay.com)3. Vishay Dale: [www.vishay.com](http://www.vishay.com)4. **Micrel, Inc.:** [www.micrel.com](http://www.micrel.com)**MICREL, INC. 1849 FORTUNE DRIVE SAN JOSE, CA 95131 USA**TEL + 1 (408) 944-0800 FAX + 1 (408) 944-0970 WEB <http://www.micrel.com>

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