

Precision voltage regulator

μ A723/723C

DESCRIPTION

The μ A723/ μ A723C is a monolithic precision voltage regulator capable of operation in positive or negative supplies as a series, shunt, switching, or floating regulator. The 723 contains a temperature-compensated reference amplifier, error amplifier, series pass transistor, and current limiter, with access to remote shutdown.

FEATURES

- Positive or negative supply operation
- Series, shunt, switching, or floating operation
- 0.01% line and load regulation
- Output voltage adjustable from 2V to 37V
- Output current to 150mA without external pass transistor
- μ A723 MIL-STD-883A, B, C available

PIN CONFIGURATION

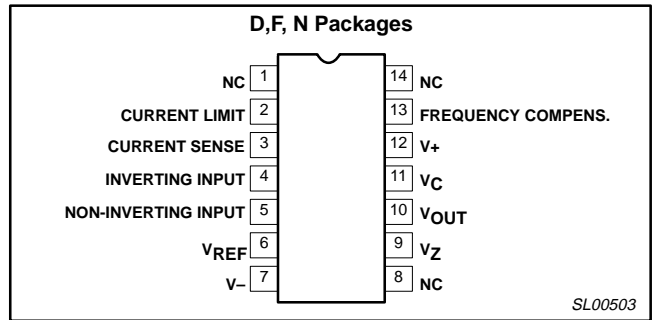


Figure 1. Pin Configuration

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Ceramic Dual In-Line Package (CERDIP)	-55°C to 125°C	μ A723F	0581B
14-Pin Plastic Dual In-Line Package (DIP)	0 to 70°C	μ A723CN	SOT27-1
14-Pin Plastic Small Outline (SO) Package	0 to 70°C	μ A723CD	SOT108-1

EQUIVALENT CIRCUIT

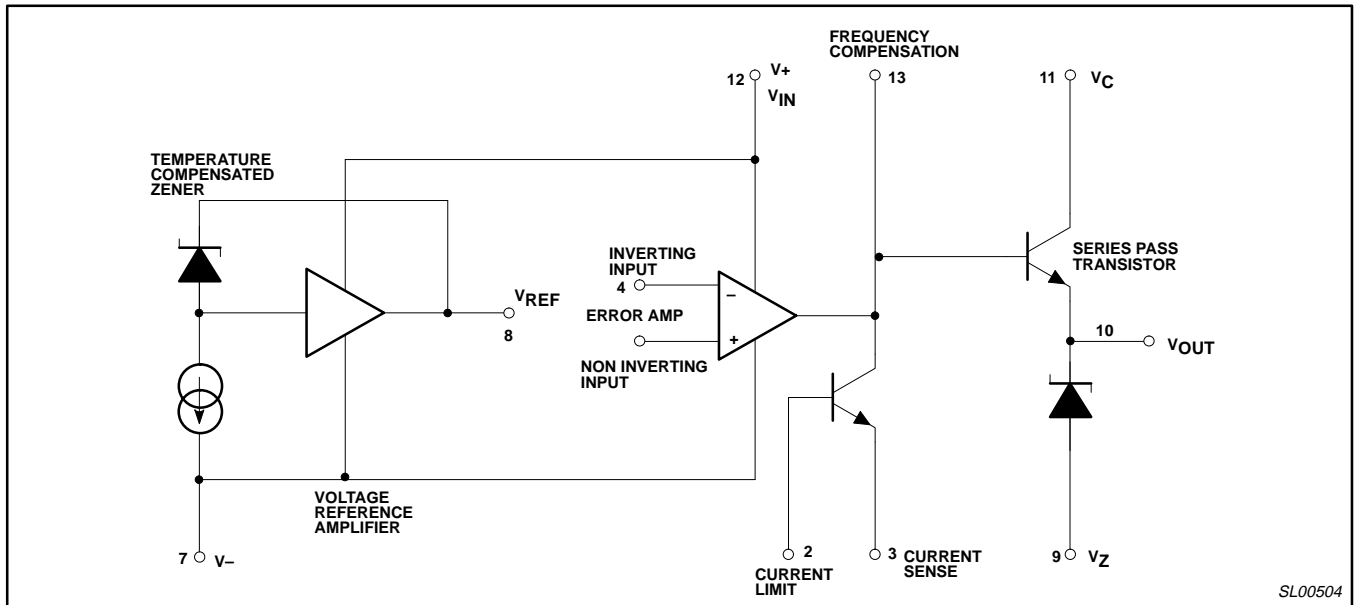


Figure 2. Equivalent Circuit

Precision voltage regulator

 μ A723/723C**ABSOLUTE MAXIMUM RATINGS**

SYMBOL	PARAMETER	RATING	UNIT
	Pulse voltage from V+ to V- (50ms)	50	V
	Continuous voltage from V+ to V-	40	V
	Input-output voltage differential	40	V
V _{DIFF}	Error amplifier maximum input differential voltage	±5	V
V _{CM}	Error amplifier non-inverting input (Pin 5) to -V (Pin 7)	8	V
I _{OUT}	Maximum output current	150	mA
	Current from V _{REF}	15	mA
	Current from V _Z	25	mA
P _{MAX}	Maximum power dissipation T _A =25°C (still-air) ¹		
	F package	1190	mW
	N package	1420	mW
	D package	1040	mW
T _A	Operating ambient temperature range		
	μ A723	-55 to +125	°C
	μ A723C	0 to 70	°C
T _{STG}	Storage temperature range	-65 to +150	°C
T _{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTES:

1. The following derating factors should be applied above 25°C

F package at 9.5mW/°C

N package at 11.4mW/°C

D package at 8.3mW/°C

Precision voltage regulator

 μ A723/723C**DC ELECTRICAL CHARACTERISTICS** $T_A=25^\circ\text{C}$, unless otherwise specified.¹

SYMBOL	PARAMETER	TEST CONDITIONS	μ A723			μ A723C			UNITS
			Min	Typ	Max	Min	Typ	Max	
$V_{R\text{ LINE}}$	Line regulation ²	$V_{\text{IN}}=12\text{V}$ to $V_{\text{IN}}=15\text{V}$ $V_{\text{IN}}=12\text{V}$ to $V_{\text{IN}}=40\text{V}$		0.01 0.02	0.1 0.2		0.01 0.1	0.1 0.5	$\%V_{\text{OUT}}$
$V_{R\text{ LOAD}}$	Load regulation ²	$I_L=1\text{mA}$ to $I_L=50\text{mA}$		0.03	0.15		0.03	0.2	$\%V_{\text{OUT}}$
$\Delta V_{\text{IN}}/\Delta V_{\text{O}}$	Ripple Rejection	$f=50\text{Hz}$ to 10kHz , $C_{\text{REF}}=0$		74			74		dB
		$f=50\text{Hz}$ to 10kHz , $C_{\text{REF}}=5\mu\text{F}$		86			86		
I_{OS}	Short-circuit current	$R_{\text{SC}}=10\Omega$, $V_{\text{OUT}}=0$		65			65		mA
V_{REF}	Reference voltage	$I_{\text{REF}}=0.1\text{mA}$	6.95	7.15	7.35	6.80	7.15	7.50	V
$V_{\text{REF (LOAD)}}$	Reference voltage change with load	$I_{\text{REF}}=0.1\text{mA}$ to 5mA			20			20	mV
V_{NOISE}	Output noise voltage	$\text{BW}=100\text{Hz}$ to 10kHz , $C_{\text{REF}}=0$		20			20		μV_{RMS}
		$\text{BW}=100\text{Hz}$ to 10kHz , $C_{\text{REF}}=5\mu\text{F}$		2.5			2.5		
S	Long-term stability	$T_j=T_{j\text{max}}$, $T_A=25^\circ\text{C}$ for end point measurement		0.1			0.1		$\%1000\text{ hrs.}$
I_{SCD}	Standby current drain	$I_L=0$, $V_{\text{IN}}=30\text{V}$		2.3	3.5		2.3	4.0	mA
V_{IN}	Input voltage range		9.5		40	9.5		40	V
V_{OUT}	Output voltage range		2.0		37	2.0		37	V
V_{DIFF}	Input-output voltage differential		3.0		38	3.0		38	V
The following specifications apply over the operating temperature ranges.									
$V_{R\text{ LINE}}$	Line regulation	$V_{\text{IN}}=12\text{V}$ to $V_{\text{IN}}=15\text{V}$			0.3			0.3	$\%V_{\text{OUT}}$
$V_{R\text{ LOAD}}$	Load regulation	$I_L=1\text{mA}$ to $I_L=50\text{mA}$			0.6			0.6	$\%V_{\text{OUT}}$
TC	Average temperature coefficient of output voltage			0.002	0.015		0.003	0.015	$\%/^\circ\text{C}$

NOTES:

- $V_{\text{IN}}=V_+=V_C=12\text{V}$, $V_-=0\text{V}$, $V_{\text{OUT}}=5\text{V}$, $I_L=1\text{mA}$, $R_{\text{SC}}=0$, $C_1=100\text{pF}$, $C_{\text{REF}}=0$ and divider impedance as seen by error amplifier $\leq 10\text{k}\Omega$.
- The load and line regulation specifications are for constant junction temperature. Temperature drift effects must be taken into account separately when the unit is operating under conditions of high dissipation.

Precision voltage regulator

μ A723/723C

TYPICAL PERFORMANCE CHARACTERISTICS

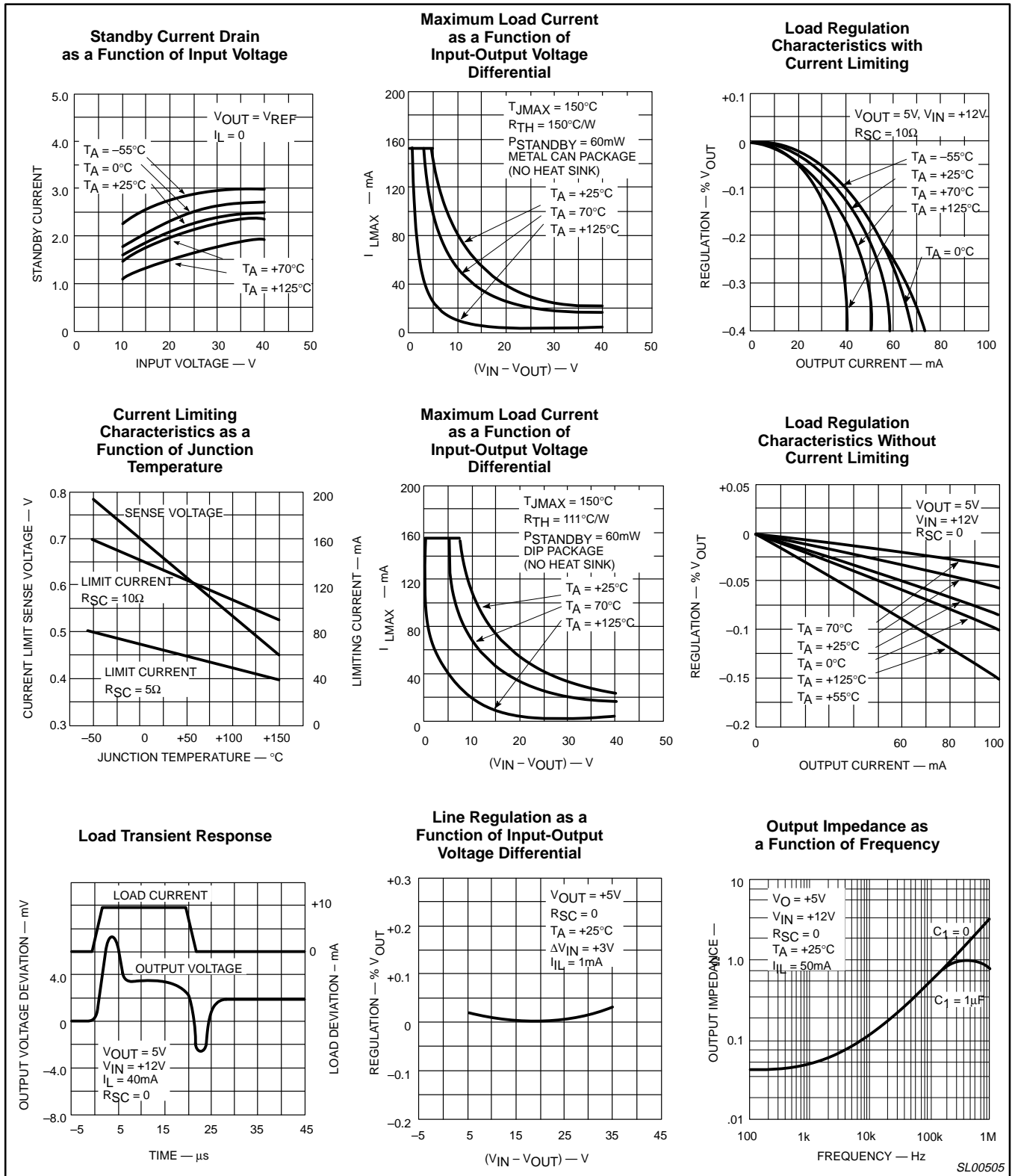


Figure 3. Typical Performance Characteristics

Precision voltage regulator

μA723/723C

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

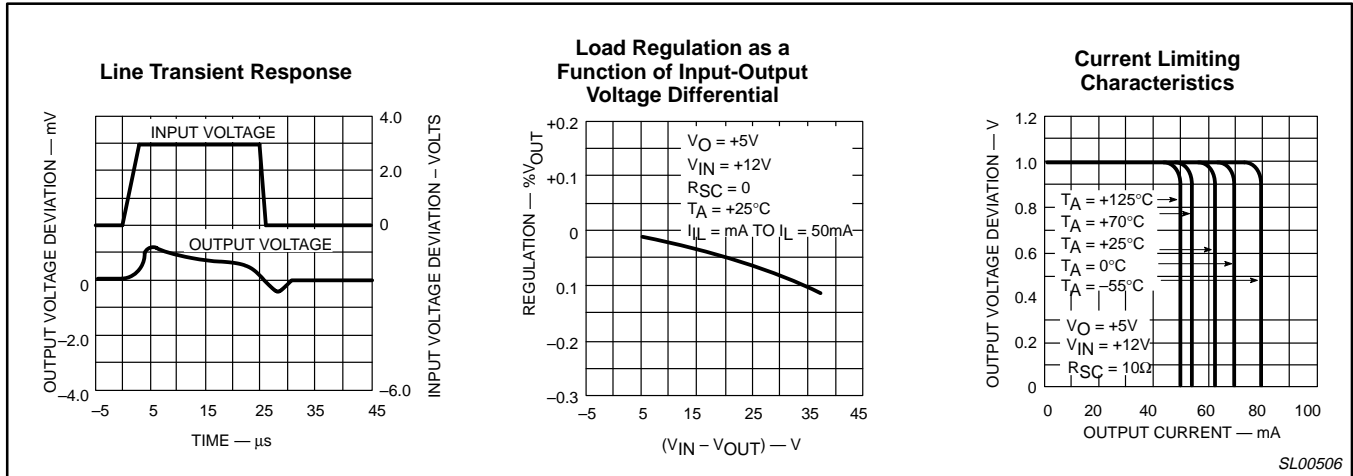


Figure 4. Typical Performance Characteristics (cont.)

TYPICAL APPLICATIONS

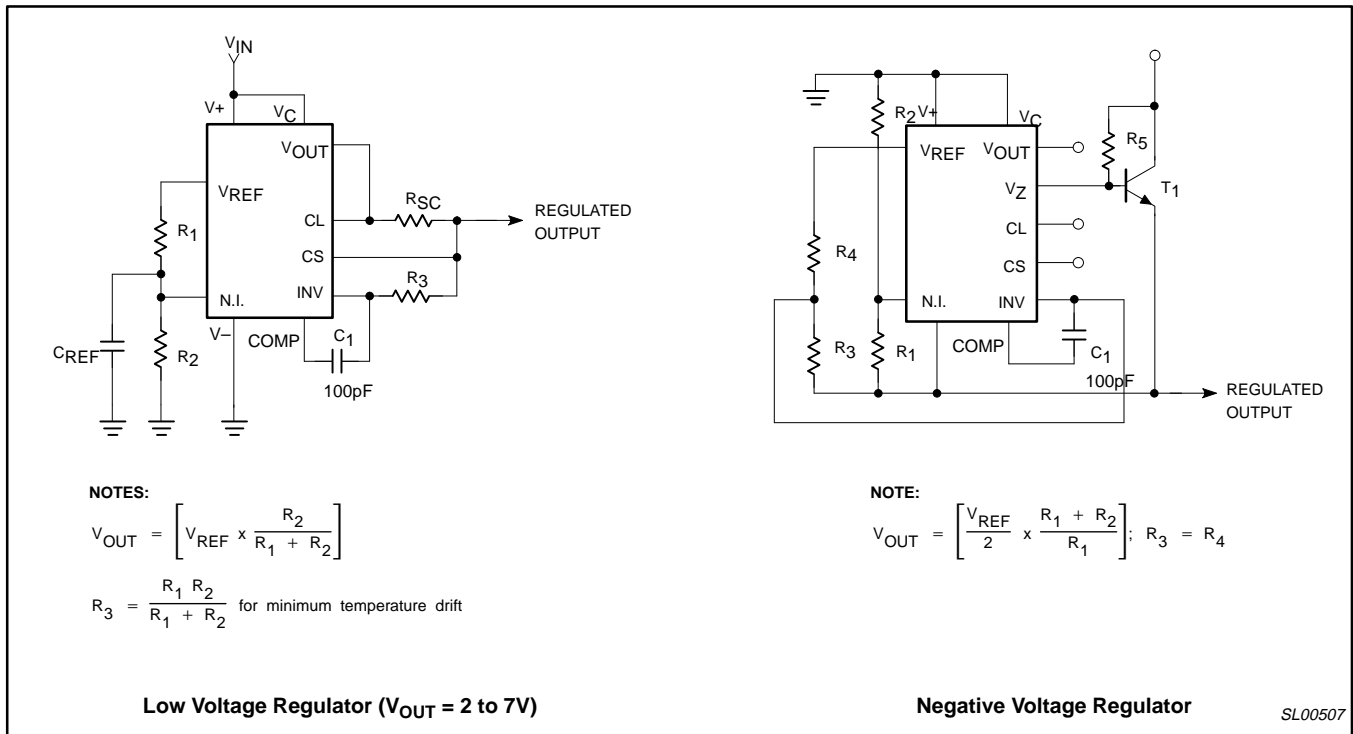
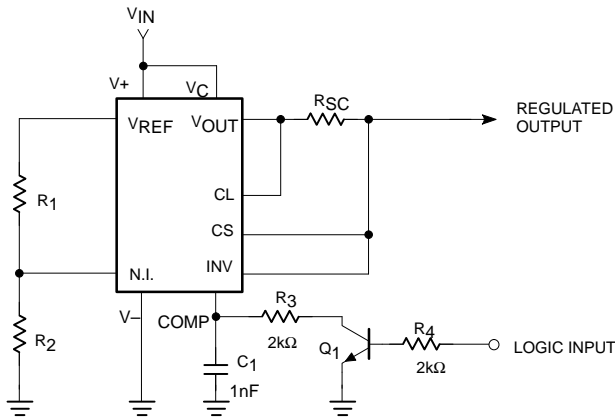


Figure 5. Typical Applications

Precision voltage regulator

μA723/723C

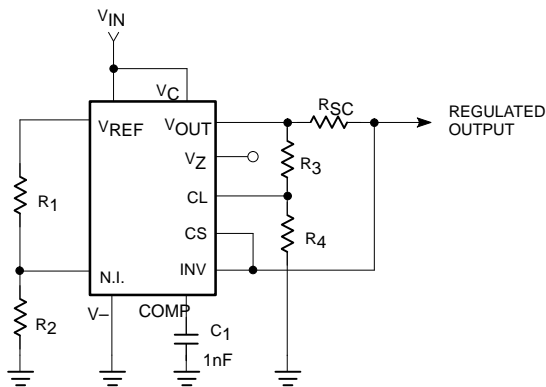
TYPICAL APPLICATIONS (Continued)



NOTE:

$$V_{OUT} = \left[V_{REF} \times \frac{R_2}{R_1 + R_2} \right]$$

Remote Shutdown Regulator With Current Limiting ($V_{OUT} = 2$ to $7V$)



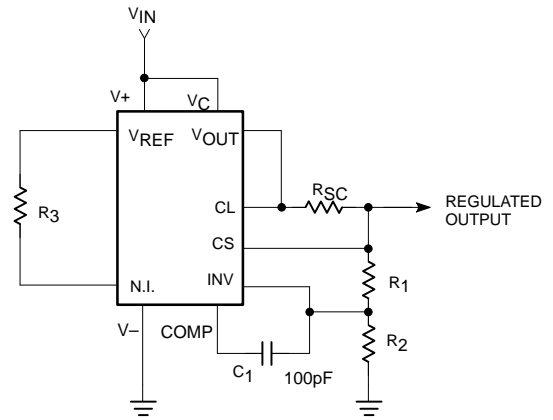
NOTES:

$$I_{KNEE} = \left[\frac{V_{OUT} R_3}{R_{SC} R_4} + \frac{V_{SENSE} (R_3 + R_4)}{R_{SC} R_4} \right]$$

$$V_{OUT} = \left[V_{REF} \times \frac{R_1 + R_2}{R_4} \right]$$

$$I_{SHORT\ CKT} = \left[\frac{V_{SENSE}}{R_{SC}} \times \frac{R_3 + R_4}{R_4} \right]$$

Foldback Current Limiting Regulator ($V_{OUT} = 2$ to $7V$)



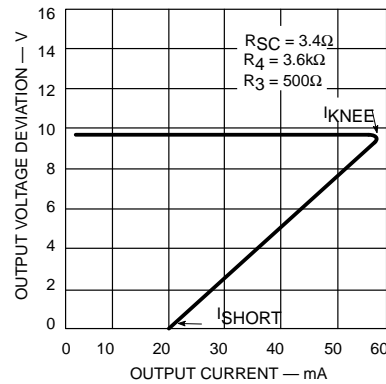
NOTE:

$$V_{OUT} = \left[V_{REF} \times \frac{R_2}{R_1 + R_2} \right]; R_3 = R_4$$

$$R_3 = \frac{R_1 R_2}{R_1 + R_2} \text{ for minimum temperature drift}$$

R3 may be eliminated for minimum component count

High Voltage Regulator ($V_{OUT} = 7$ to $37V$)



NOTES:

$$\frac{R_4}{R_3} = \frac{V_{OUT} I_{SC}}{V_{SENSE} (I_{KNEE} - I_{SHORT\ CKT})} - 1$$

$$R_{SC} = \frac{V_{SENSE}}{I_{SC}} \left[1 + \frac{R_3}{R_4} \right]$$

SL00508

Figure 6. Typical Applications (cont.)