MC1468
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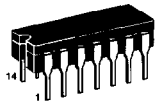
Dual ±15 Volt Tracking Regulator

DUAL ±15 VOLT TRACKING REGULATOR

SILICON MONOLITHIC INTEGRATED CIRCUIT

The MC1468/1568 is a dual polarity tracking regulator designed to provide balanced positive and negative output voltages at currents to 100 mA. Internally, the device is set for ±15 V outputs but an external adjustment can be used to change both outputs simultaneously from 8.0 V to 20 V. Input voltages up to ±30 V can be used and there is provision for adjustable current limiting.

- Internally Set to ±15 V Tracking Outputs
- Output Currents to 100 mA
- Outputs Balanced to within 1.0% (MC1568)
- Line and Load Regulation of 0.06%
- 1.0% Max Output Variation Due to Temperature Changes
- Standby Current Drain of 3.0 mA
- Externally Adjustable Current Limit
- Remote Sensing Provisions

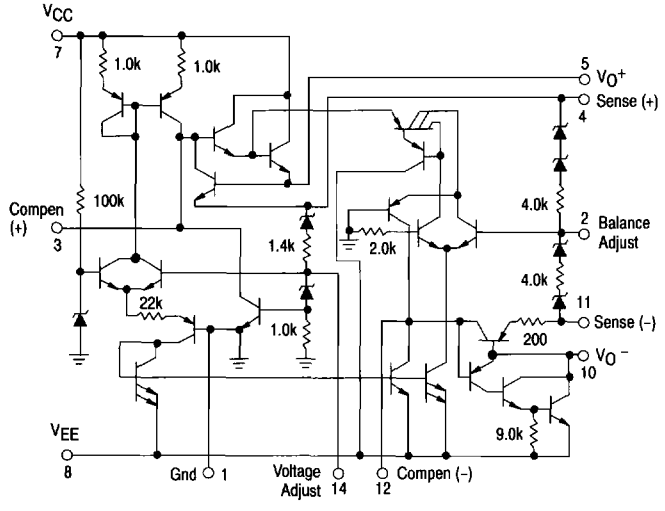


L SUFFIX
CERAMIC PACKAGE
CASE 632

ORDERING INFORMATION

Device	Temperature Range	Package
MC1468L	0° to + 70°C	Ceramic DIP
MC1568L	–55° to + 125°C	Ceramic DIP

Circuit Schematic



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MAXIMUM RATINGS (T_C = +25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage	V_{CC},$\|V_{EE}\|$	30	Vdc
Peak Load Current	I_{pk}	100	mA
Power Dissipation and Thermal Characteristics			
T_A = + 25°C	P_D	1.25	W
Derate above T_A = + 25°C	$1/\theta_{JA}$	10	mW/°C
Thermal Resistance, Junction to Air	θ_{JA}	100	°C/W
T_C = + 25°C	P_D	2.5	W
Derate above T_C = + 25°C	$1/\theta_{JC}$	20	mW/°C
Thermal Resistance, Junction to Case	θ_{JC}	50	°C/W
Storage Junction to Temperature Range	T_J, T_{stg}	−65 to +150	°C
Minimum Short Circuit Resistance	R_{SC}(min)	4.0	Ω
Ambient Temperature	T_A		°C
MC1468		0 to +70	
MC1568		−55 to +125	

ELECTRICAL CHARACTERICISTICS (V_{CC} = +20 V, V_{EE} = −20 V, C1 = C2 = 1500 pF, C3 = C4 = 1.0 µF, $R_{SC}+ = R_{SC}-$ = 4.0 Ω, $I_L+ = I_L-$ = 0, T_C = +25°C, unless otherwise noted, see Figure 1.)

Characteristics	Symbol	MC1568			MC1468			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_O	±14.5	±15	±15.5	±14.5	±15	±15.5	Vdc
Input Voltage	V_I	—	—	±30	—	—	±30	Vdc
Input-Output Voltage Differential	$\|V_I-V_O\|$	2.0	—	—	2.0	—	—	Vdc
Output Voltage Balance (L package only)	V_{Bal}	—	±50	±150	—	±50	±300	mV
Line Regulation Voltage	Reg_{line}							mV
(V_{in} = 18 V to 30 V)		—	—	10	—	—	10	
T_{low} to T_{high} (Note 1)		—	—	20	—	—	20	
Load Regulation Voltage	Reg_{load}							mV
(I_L = 0 mA to 50 mA, T_J = constant)		—	—	10	—	—	10	
(T_A = T_{low} to T_{high})		—	—	30	—	—	30	
Output Voltage Range	V_{OR}							Vdc
L Package (See Figure 4)		±8.0	—	±20	±8.0	—	±20	
Ripple Rejection (f = 120 Hz)	RR	—	75	—	—	75	—	dB
Output Voltage Temperature Stability (T_{low} to T_{high})	$\|TS_{VO}\|$	—	0.3	1.0	—	0.3	1.0	%
Short Circuit Current Limit (R_{SC} = 10 Ω)	I_{SC}	—	60	—	—	60	—	mA
Output Noise Voltage (BW = 100 Hz–10 kHz)	V_n	—	100	—	—	100	—	µV(RMS)
Positive Standby Current (V_{in} = +30 V)	I_{B+}	—	2.4	4.0	—	2.4	4.0	mA
Negative Standby Current (V_{in} = −30 V)	I_{B-}	—	1.0	3.0	—	1.0	3.0	mA
Long-Term Stability	$\Delta V_O/\Delta t$	—	0.2	—	—	0.2	—	%/k Hr.

NOTES: 1. T_{Low} to T_{High} = 0° to +70°C for MC1468
= −55° to +125°C for MC1568

APPLICATIONS INFORMATION

Compensation capacitors C1 and C2 must be located as close to the device as possible to prevent instablity due to noise pickup. Input bypass capacitors C_{in} are required if the device is located more than four inches from the power source filter capacitor. Output capacitor C4 is required for stability of the negative regulator. Capacitor C3 is used to improve the positive regulator load transient response. Low impedance quality capacitors are required when operating the MC1568 at its temperature extremes. Extended range ceramic, tantalum, and electrolytic capacitors are readily available from several manufacturers.

Capacitor values should be determined on a system by system basis. Input lead length, output load, temperature range, and printed circuit board layout are factors that will influence circuit performance. Typical values for capacitors C_{in}, C3, and C4 are 0.1 µF to 10 µF while C1 and C2 are 1500 pF.

The presence of Bal_{Adj}, pin 2, on devices housed in the dual in-line package (L suffix) allows the user to adjust the output voltages down to ±8.0 V. The required value of resistor R2 can be calculated from

$$R2 = \frac{R1\ R_{int}\ (\phi + V_Z)}{R_{int}\ (V_O - \phi - V_Z) - \phi\ R1}$$

where: R_{int} = An Internal Resistor = R1 = 1.0 kΩ
ϕ = 0.68 V
V_Z = 6.6 V

Some common design values are listed below:

$\pm V_O$(V)	R2	$T_C\ V_O$ (%/°C)	I_B + (mA)
14	1.2 k	0.003	10
12	1.8 k	0.022	7.2
10	3.5 k	0.025	5.0
8.0	∞	0.028	2.6

Figure 1. Basic 50 mA Regulator

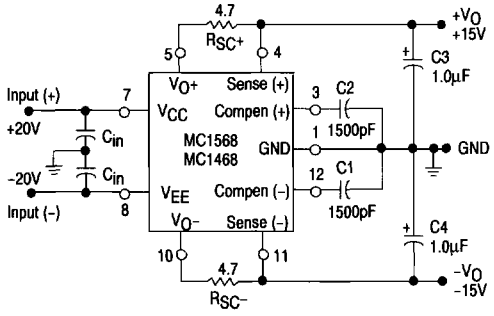
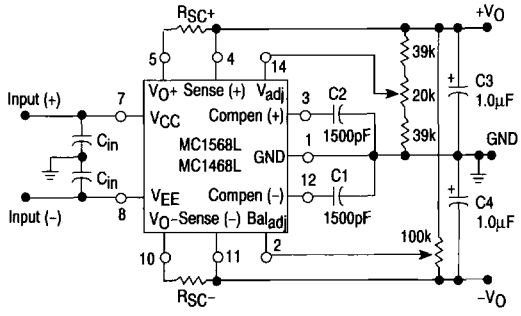


Figure 2. Voltage Adjust and Balance Adjust Circuit
(14.5 V ≤ V_{out} ≤ 20 V)



Balance adjust available in MC1568L, MC1468L ceramic dual-in-line package only.

Figure 3. ±1.5 A Regulator
(Short Circuit Protected, with Proper Heatsinking)

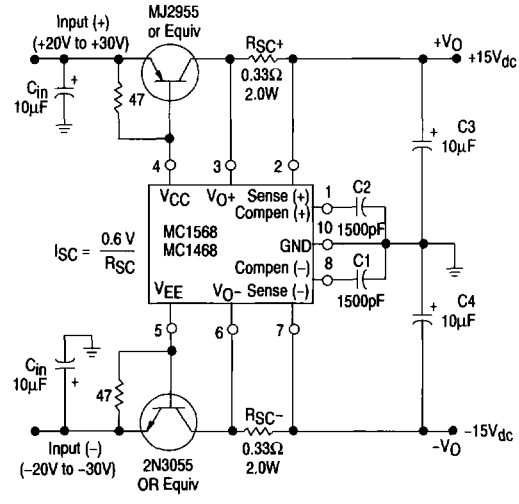


Figure 4. Output Voltage Adjustment for 8.0 V ≤ |±V_O| ≤ 14.5 V
(Ceramic-Packaged Devices Only)

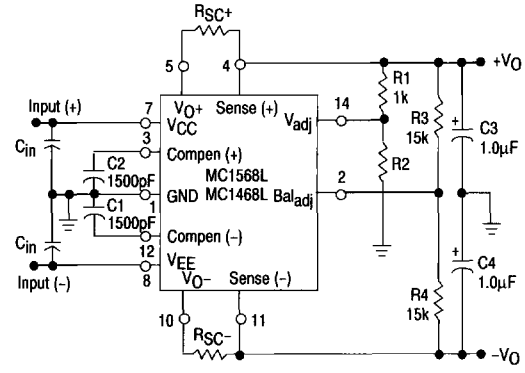


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Figure 5. Load Regulation

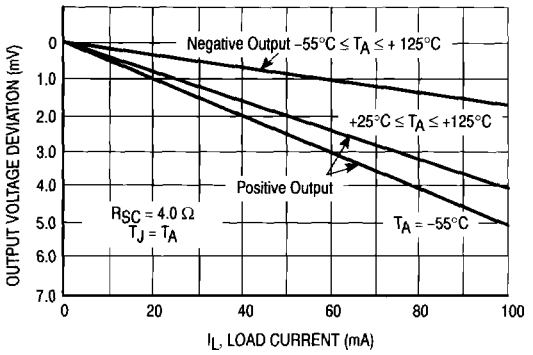

Figure 6. Regulator Dropout Voltage

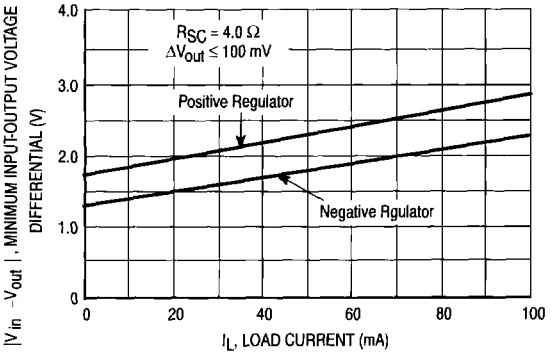

Figure 7. Maximum Current Capability

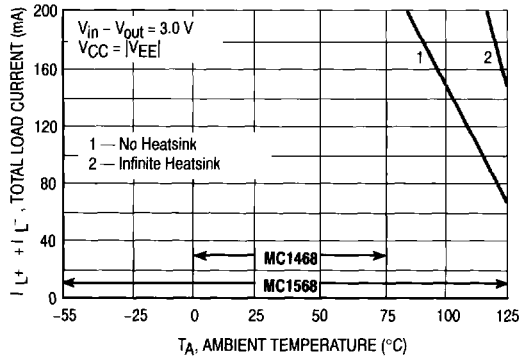

Figure 8. Maximum Current Capability

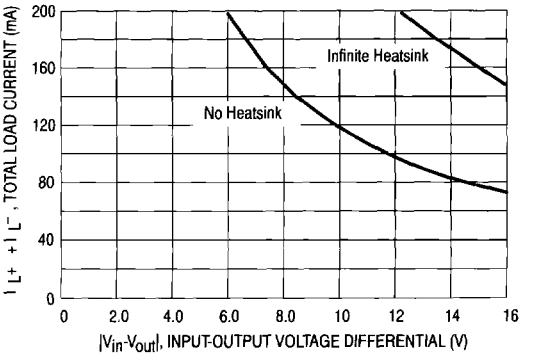

Figure 9. I_{SC} versus R_{SC}

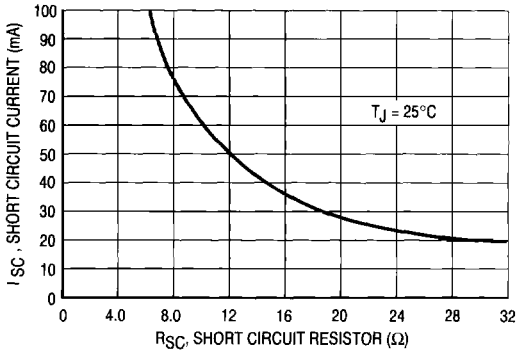

Figure 10. Current-Limiting Characteristics

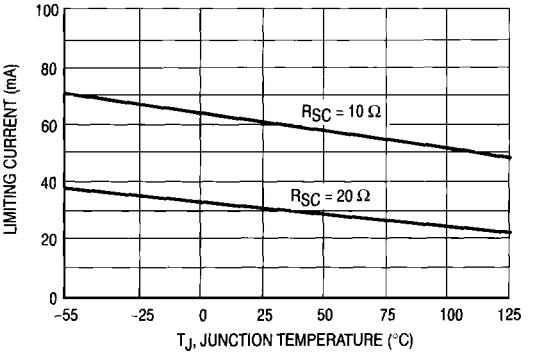

Figure 11. Standby Current Drain

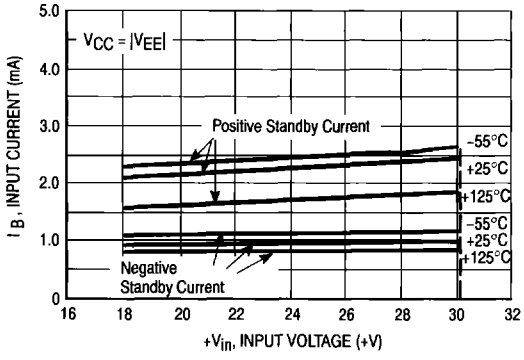

Figure 12. Standby Current Drain

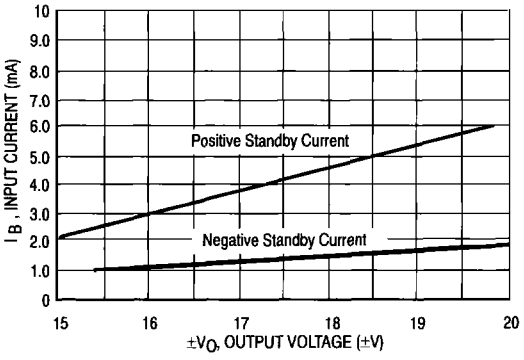

Figure 13. Temperature Coefficient of Output Voltage

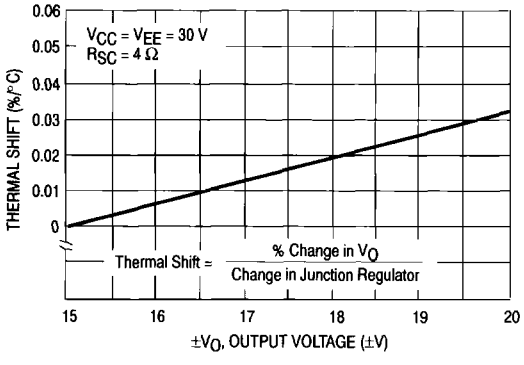

Figure 14. Load Transient Response

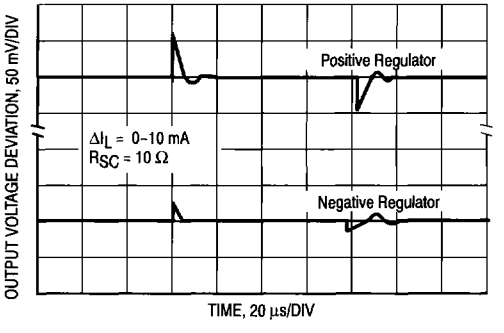

Figure 15. Line Transient Response

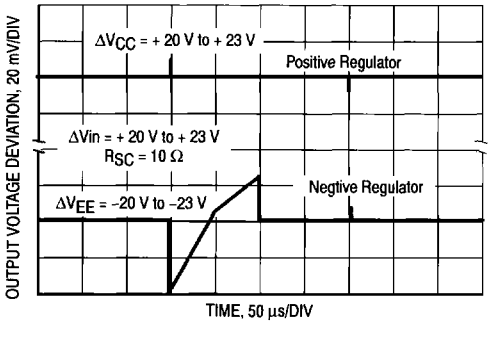

Figure 16. Ripple Rejection

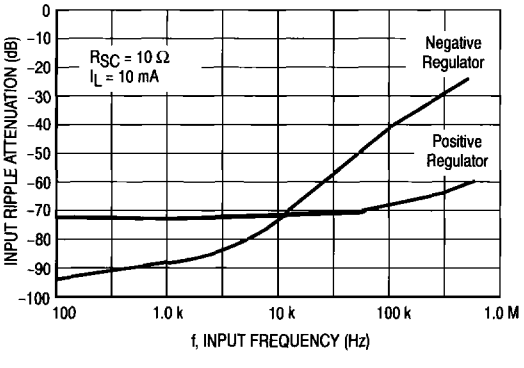

Figure 17. Output Impedance