UNITRODE

Magnetic Amplifier Controller

UC1838A
UC2838A
UC3838A

FEATURES

- Independent 1% Reference
- Two Uncommitted, Identical Operational Amplifiers
- 100mA Reset Current Source with –120V Capability
- 5V to 40V Analog Operation
- 5W DIL Package

DESCRIPTION

The UC1838A family of magnetic amplifier controllers contains the circuitry to generate and amplify a low-level analog error signal along with a high voltage-compliant current source. This source will provide the reset current necessary to enable a magnetic amplifier to regulate and control a power supply output in the range of 2A to 20A.

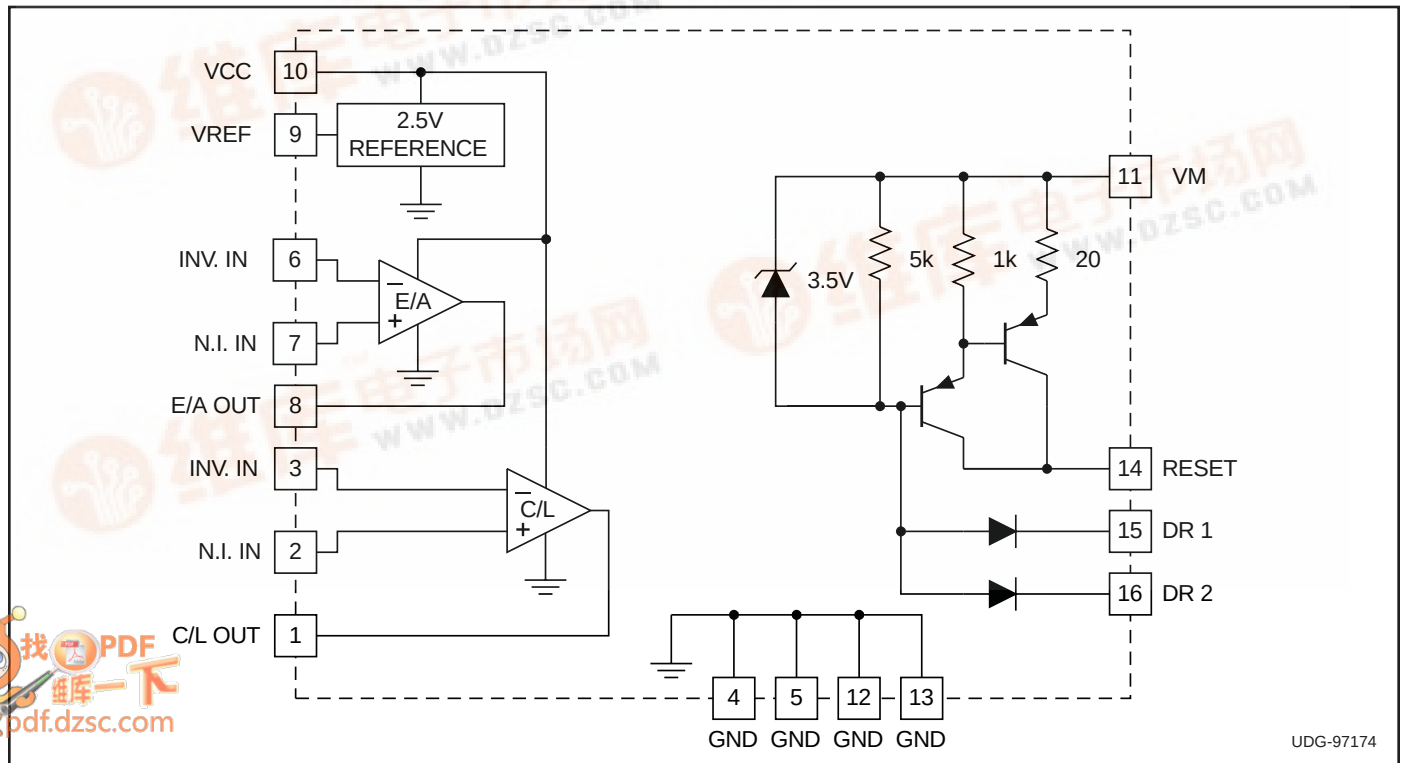
By controlling the reset current to a magnetic amplifier, this device will define the amount of volt-seconds the magnetic amplifier will block before switching to the conducting state. Magnetic amplifiers are ideal for post-regulators for multiple-output power supplies where each output can be independently controlled with efficiencies up to 99%. With a square or pulse-width-modulated input voltage, a magnetic amplifier will block a portion of this input waveform, allowing just enough to pass to provide a regulated output. With the UC1838A, only the magnetic amplifier coil, three diodes, and an output L-C filter are necessary to implement a complete closed-loop regulator.

The UC1838A contains a precision 2.5V reference, two uncommitted high-gain op amps and a high-gain PNP-equivalent current source which can deliver up to 100mA of magnetic amplifier reset current and with –120 volt capability.

These devices are available in a plastic “bat-wing” DIP for operation over a –20°C to +85°C temperature range and, with reduced power, in a hermetically sealed cerdip for –55°C to +125°C operation. Surface mount versions are also available.

This improved “A” version replaced the non “A” version formerly introduced.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} 40V
Magnetic Amp. Source Voltage, V_M 40V
Reset Output Voltage, V_R . . . . . –120V
Total Current Source Voltage, $V_M - V_R$ . . . . . –140V
Amplifier Input Range . . . . . –0.3V to V_{CC}
Reset Input Current, I_{DR} . . . . . –10mA
Power Dissipation at T_A = 25°C
  Q, N, DP Package 2W
  J, L Package 1W
Power Dissipation at T (leads/case) = 25°C
  Q, N, DP Package 5W
  J, L Package 2W
Operating Temperature Range . . . . . –55°C to +125°C
Storage Temperature Range . . . . . –65°C to +150°C
Lead Temperature (Soldering, 10 sec) . . . . . 300°C

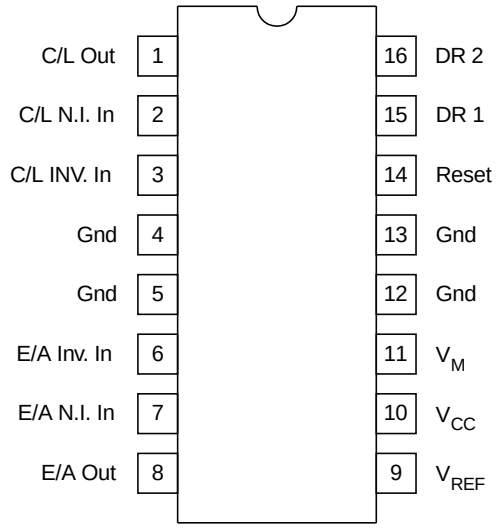
Note: All voltages are with respect to ground pins. All currents are positive into the specified terminal. Consult Packaging section of Databook for thermal limitations and considerations of package.

ORDERING INFORMATION

	TEMPERATURE RANGE	PACKAGE
UC1838AJ	–55°C to +125°C	Ceramic Dip
UC1838AL		CLCC
UC2838ADP	–20°C to +85°C	Power SOIC
UC2838AN		Plastic Dip
UC2838AQ		PLCC
UC3838ADP	0°C to +70°C	Power SOIC
UC3838AN		Plastic Dip
UC3838AQ		PLCC

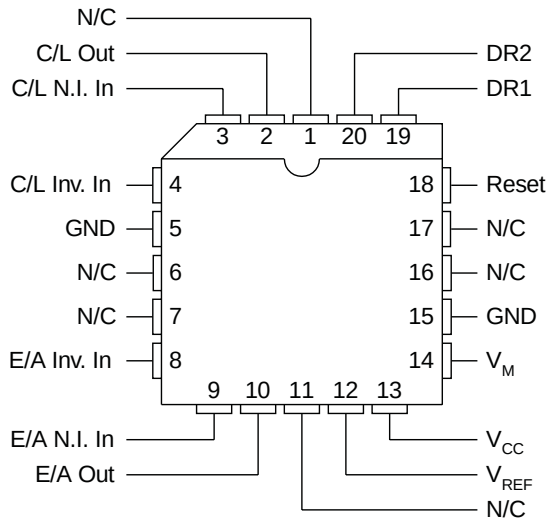
CONNECTION DIAGRAMS

DIL-16, SOIC-16 (TOP VIEW)
J or N Package, DP Package



Note: All four ground pins must be connected to a common ground

PLCC-20, LCC-20 (TOP VIEW)
Q, L Packages

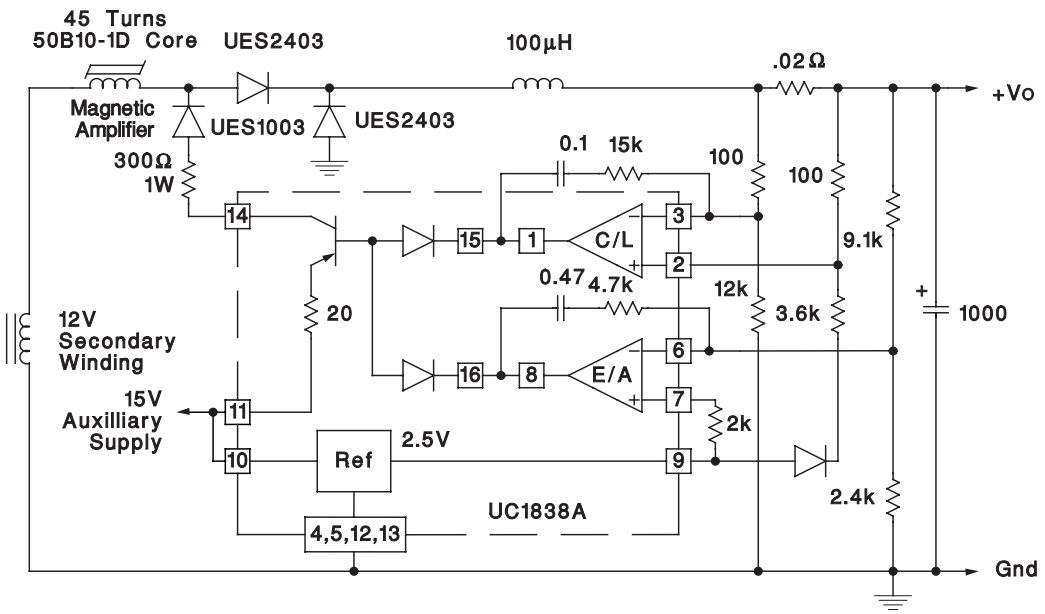


ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for T_A = –55°C to +125°C for the UC1838A, –20°C to +85°C for the UC2838A, and 0°C to +70°C for the UC3838A, V_{CC} = 20V, V_M = 5V, T_A = T_J.

PARAMETER	TEST CONDITIONS	UC1838A / UC2838A			UC3838A			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Reference Section								
Supply Current	V_{CC} = V_M = 40V		4	8		4	8	mA
Reference Output	T_A = 25°C	2.47	2.5	2.53	2.45	2.5	2.55	V
Line Regulation	V_{CC} = 5 to 30V		1	5		1	10	mV
Load Regulation	I_O = 0 to –2mA		5	20		5	20	mV
Short Circuit Current	V_{REF} = 0V		–30	–60		–30	–60	mA
Temperature Stability*	Over Operating Temp. Range		15	25		10	25	mV
Amplifier Section (Each Amplifier)								
Offset Voltage	V_{CM} = 2.5V			5			10	mV
Input Bias Current	V_{IN} = 0V			–1			–1	µA
Input Offset Current				100			100	nA
Minimum Output Swing		0.4		18	0.4		18	V
Output Sink Current	V_O = 5V	1	10	30	1	10	30	mA
Output Source Current	V_O = 0V	–1	–10	–20	–1	–10	–20	mA
A_{VOL}	V_O = 1 to 11V	100	120		100	120		dB
C_{MRR}	V_{IN} = 1 to 11V	70	80		70	80		dB
P_{SRR}	V_{CC} = 10 to 20V	70	100		70	100		dB
Gain Bandwidth*		0.6	0.8		0.6	0.8		MHz
Reset Drive Section								
Input Leakage	V_{DR} = 40V			10			10	µA
Output Leakage	V_R = –120V			–100			–100	µA
Input Current	I_R = –50mA		–1	–2		–1	–2	mA
Maximum Reset Current	I_{DR} = –3mA	–100	–120	–200	–100	–120	–200	mA
Transconductance	I_R = –10 to –50mA	.03	.042	.055	.03	.042	.055	A/V

** These parameters are guaranteed by design but not 100% tested in production.*

TYPICAL APPLICATION



+12V, 4A output with switching frequency = 50 kHz.

APPLICATION INFORMATION

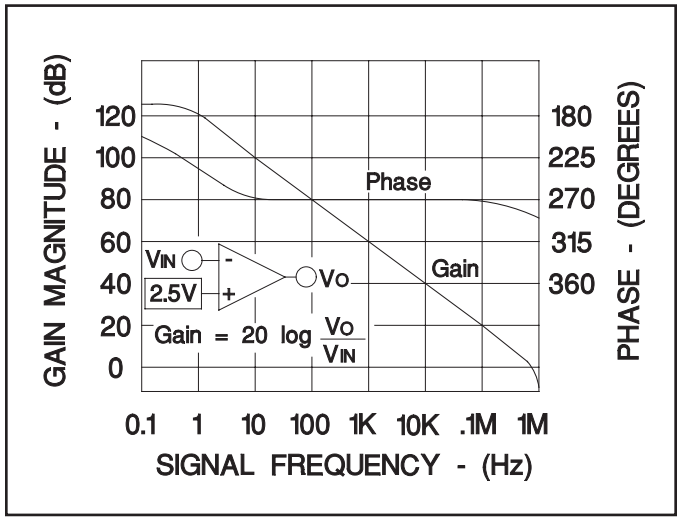


Figure 1. Amplifier open loop response.

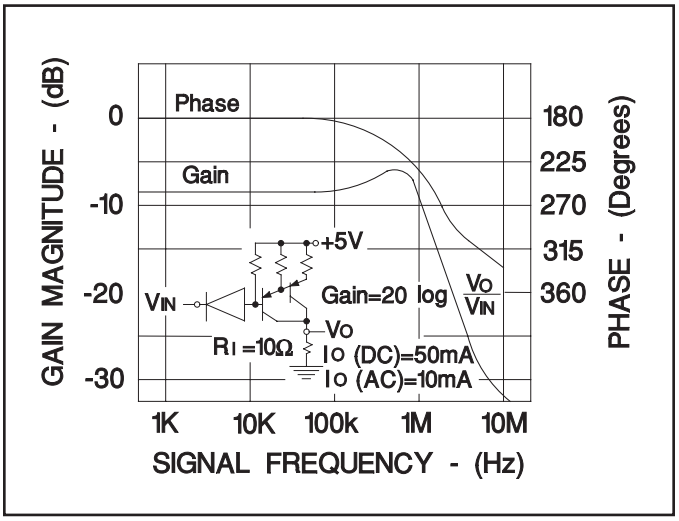


Figure 4. Reset driver response.

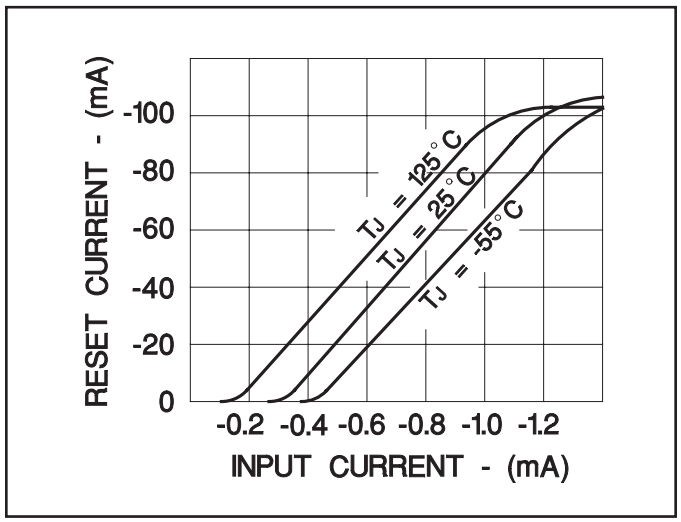


Figure 2. Reset driver-input current.

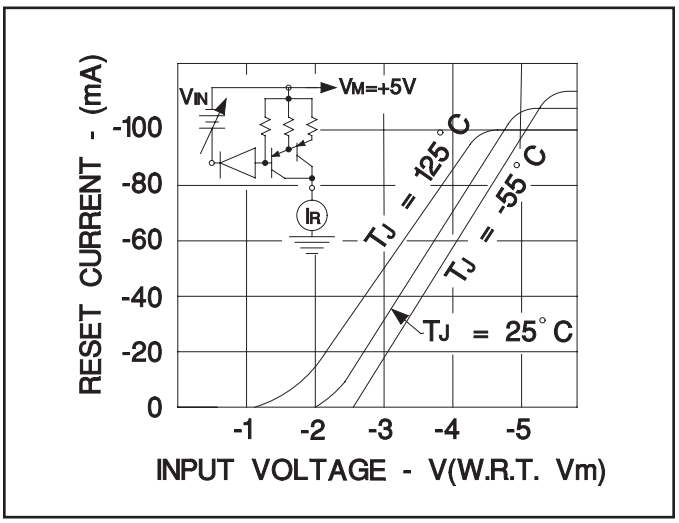


Figure 5. Reset driver-input voltage.

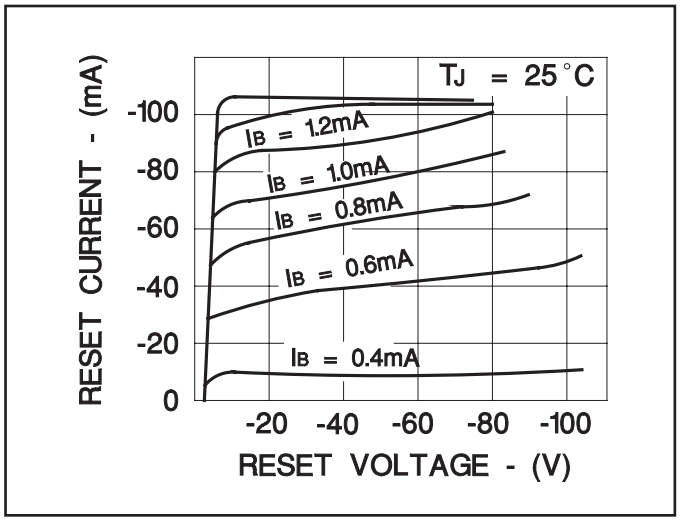


Figure 3. Reset driver-output impedance.

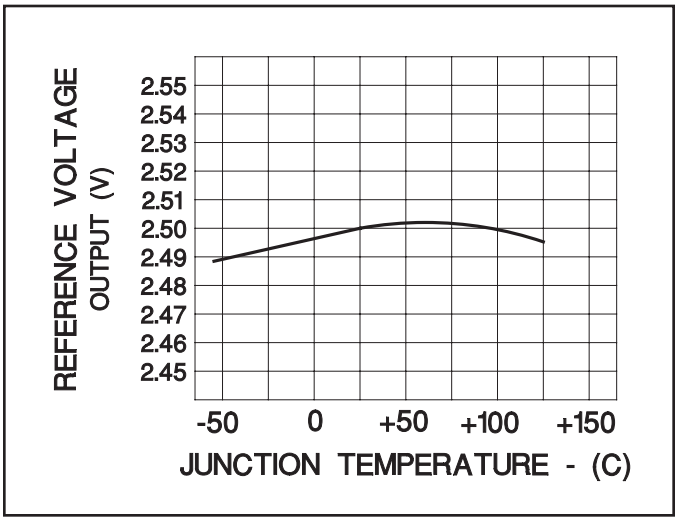


Figure 6. Reference temperature coefficient.

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