

500mA, Linear Regulator with Precision Current Limit and Diagnostics

DESCRIPTION

Demonstration circuit 1865A is an adjustable 500mA linear regulator featuring [LT®3055](#). LT3055 is a micropower, low noise and low dropout voltage linear regulator. The device supplies 500mA of output current with a dropout voltage of 350mV. A 10nF bypass capacitor reduces output noise to $25\mu\text{V}_{\text{RMS}}$ in a 10Hz to 100kHz bandwidth and soft-starts the reference. The LT3055's $\pm 45\text{V}$ input voltage rating combined with its precision current limit and diagnostic functions make the IC an ideal choice for robust, high reliability applications.

LT3055 current limit can be programmed by a single resistor, accurate to $\pm 10\%$ over a wide input voltage and temperature range. Another resistor programs the LT3055's minimum output current monitor, useful for detecting open-circuit conditions. The internal current limit should be considered when the input-to-output differential is high. The current monitor function sources a current equal to 1/500th of output current. See the Operation sec-

tion in the data sheet for a detailed calculation. Logic fault pins assert low if the LT3055 is in current limit (FAULT2), operating below its minimum output current (FAULT1) or is in thermal limit (both FAULT1 and FAULT2). The die temperature is indicated by the TEMP pin.

LT3055 optimizes stability and transient response with a low ESR ceramic capacitor, requiring a minimum of $3.3\mu\text{F}$.

The LT3055 is available in the thermally-enhanced 16-lead 4mm \times 3mm DFN and MSOP packages.

The LT3055 data sheet gives a complete description of the device, operation and application information. The data sheet must be read in conjunction with this quick start guide for DC1865.

Design files for this circuit board are available at
<http://www.linear.com/demo/DC1865A>

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PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	VALUE
Minimum Input Voltage (Max)	$V_{\text{OUT}} = 5\text{V}$, $I_{\text{OUT}} = 500\text{mA}$	5.6V
Maximum Input Voltage	$V_{\text{OUT}} = 5\text{V}$	45V
Output Voltage V_{OUT}	Header in JP1 Header in JP2 Header in JP3 Header in JP4 Header in JP5 Header in JP6	$1.20\text{V} \pm 3\%$ $1.50\text{V} \pm 3\%$ $1.80\text{V} \pm 3\%$ $2.50\text{V} \pm 3\%$ $3.32\text{V} \pm 3\%$ $4.99\text{V} \pm 3\%$
Maximum Output Current (Typ)	$V_{\text{IN}} = 12\text{V}$, $V_{\text{OUT}} = 5\text{V}$, $R_{10} = 604\Omega$	500mA
Minimum Output Current (Typ)	$V_{\text{IN}} = 12\text{V}$, $V_{\text{OUT}} = 5\text{V}$, $R_9 = 121\text{k}\Omega$	10mA
I_{MON} Voltage (to $\mu\text{P ADC}$) (Typ)	$V_{\text{IN}} = 12\text{V}$, $V_{\text{OUT}} = 5\text{V}$, $R_8 = 1\text{k}$, $I_{\text{OUT}} = 500\text{mA}$	1V
Temp voltage (Typ)	$V_{\text{IN}} = 12\text{V}$, $V_{\text{OUT}} = 5\text{V}$	0.25V

DEMO MANUAL DC1865A

QUICK START PROCEDURE

DC1865A is easy to set up to evaluate the performance of the LT3055. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE: Make sure that the input voltage does not exceed 45V.

NOTE: The shutdown jumper JP8 shunt is required to be placed in the OFF or ON position for proper operation.

NOTE: Place the output voltage selection jumper JP1-JP7 at the desired position.

NOTE: Do not hot-plug the input voltage terminal V_{IN} . The absolute maximum voltage on V_{IN} is 50V and hot-plugging a power supply through wire leads to the demonstration circuit can cause the voltage on the extremely low-ESR ceramic input capacitor to ring to twice its DC value. In order to protect the IC, a higher ESR Aluminum Electrolytic capacitor is placed at the input terminals. This may protect against some, but not all, input transients due to hot-plugging with a power supply. See Application Note 88 for more details.

NOTE: Connect the power supply (with power off), load, and meters as shown in Figure 1.

1. After all connections are made, turn on input power and verify that the output voltage according to the output voltage selection jumper (JP1-JP7). If the output voltage is different from the above values, use the USER option and install R7. Select R7 according to the following equation:

$$R7 = (V_{OUT}/0.6 - 1) \cdot 60.4k$$

NOTE: If the output voltage is too low, temporarily disconnect the load to make sure that the load is not set too high.

2. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, $\overline{FAULT1}$, $\overline{FAULT2}$, $PWRGD$ and other parameters.

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QUICK START PROCEDURE

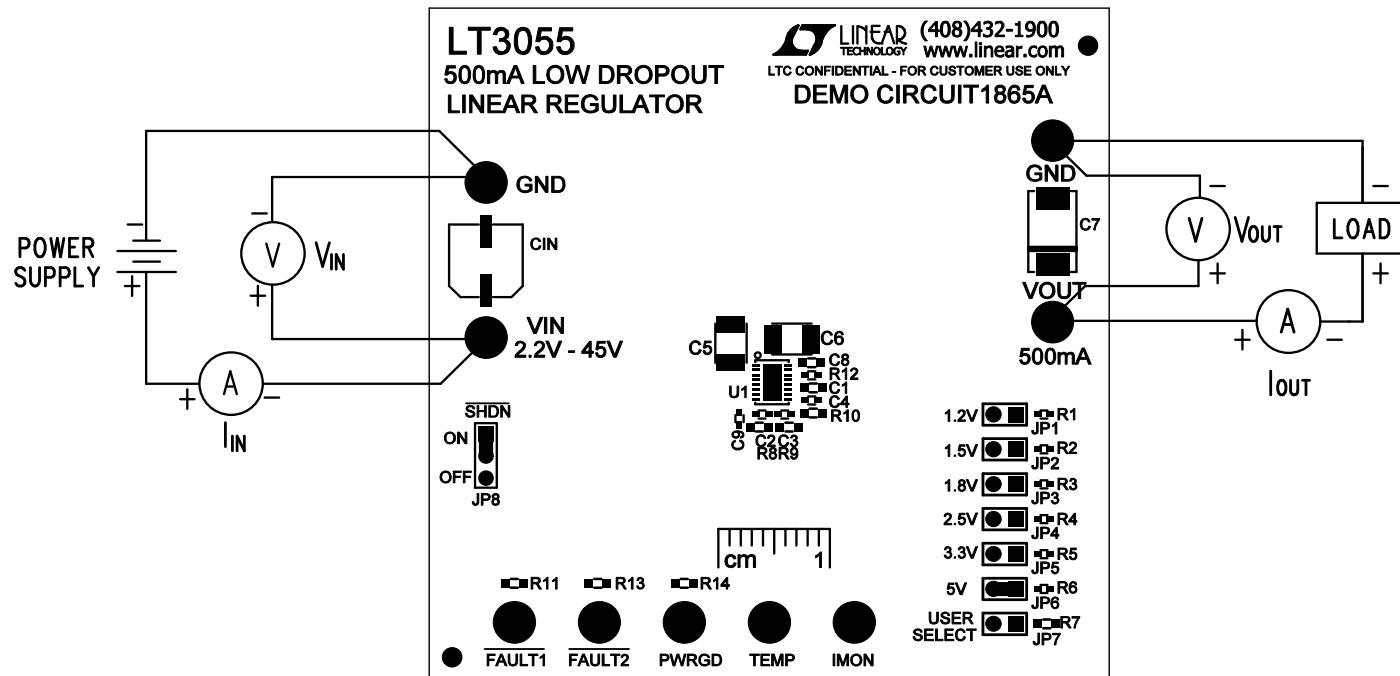


Figure 1. Proper Measurement Equipment Setup

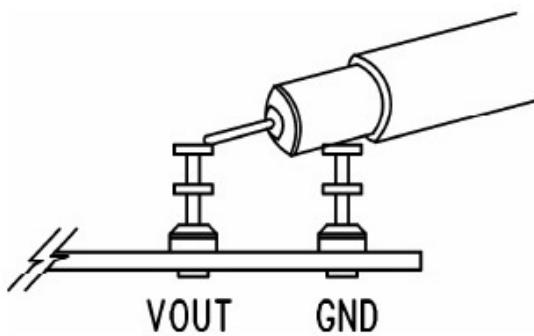


Figure 2. Measuring Input or Output Ripple

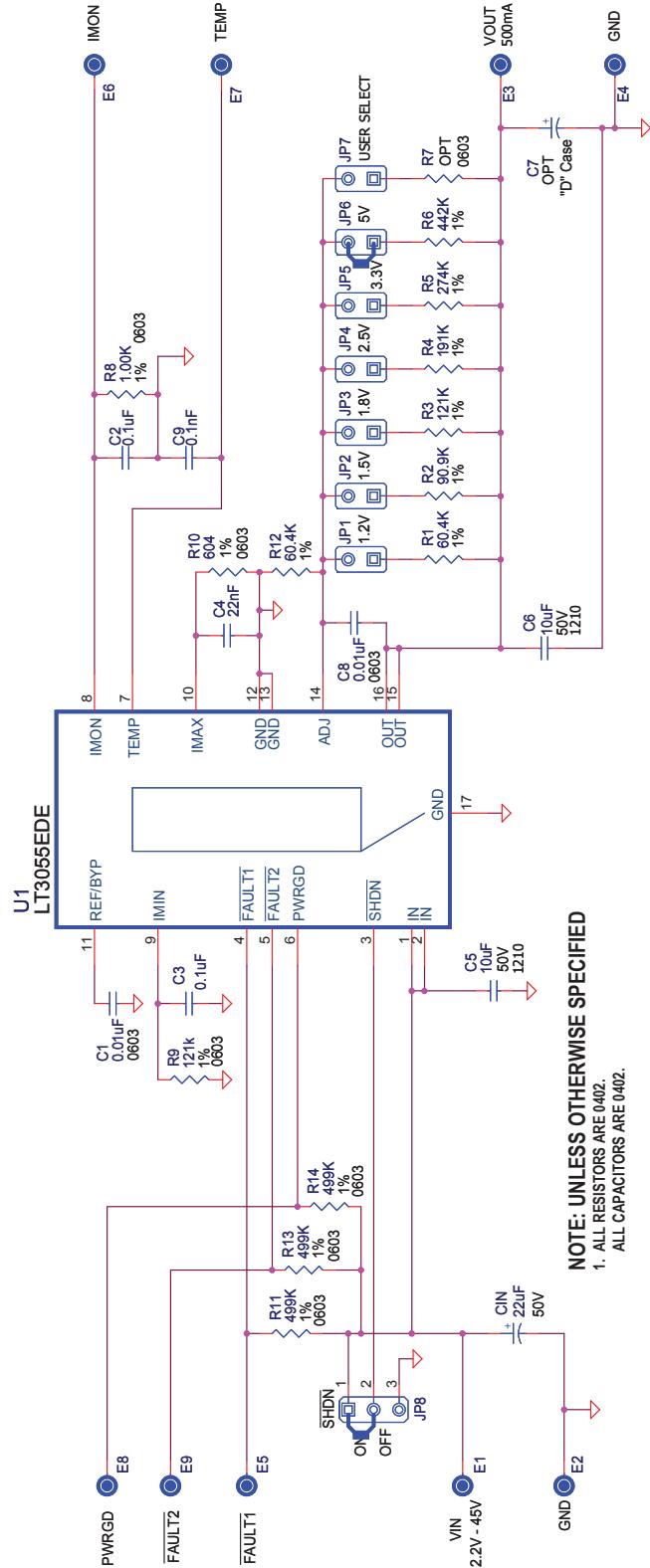
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PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C8	Cap., X7R, 0.01µF, 16V, 10% 0603	AVX, 0603YC103KAT2A
2	2	C2, C3	Cap., X5R, 0.1µF, 16V, 20% 0402	AVX, 0402YD104MAT2A
3	1	C4	Cap., X7R, 22nF, 16V, 10% 0402	AVX, 0402YC223KAT2A
4	2	C5, C6	Cap., X7R, 10µF, 50V, 10% 1210	TAIYO YUDEN, UMK325AB7106KM-T
5	1	C9	Cap., X7R, 100pF, 16V, 10% 0402	AVX, 0402YC101KAT2A
6	2	R1, R12	Res., Chip, 60.4k, 0.06W, 1% 0402	VISHAY, CRCW040260K4FKED
7	1	R2	Res., Chip, 90.9k, 0.06W, 1% 0402	VISHAY, CRCW040290K9FKED
8	1	R3	Res., Chip, 121k, 0.06W, 1% 0402	VISHAY, CRCW0402121KFKED
9	1	R4	Res., Chip, 191k, 0.06W, 1% 0402	VISHAY, CRCW0402191KFKED
10	1	R5	Res., Chip, 274k, 0.06W, 1% 0402	VISHAY, CRCW0402274KFKED
11	1	R6	Res., Chip, 442k, 0.06W, 1% 0402	VISHAY, CRCW0402442KFKED
12	1	R8	Res., Chip, 1.00k, 0.1W, 1% 0603	VISHAY, CRCW06031K00FKEA
13	1	R9	Res., Chip, 121k, 0.1W, 1% 0603	VISHAY, CRCW0603121K00FKEA
14	1	R10	Res., Chip, 604Ω, 0.1W, 1% 0603	VISHAY, CRCW0603604RFKEA
15	3	R11, R13, R14	Res., Chip, 499k, 0.1W, 1% 0603	VISHAY, CRCW0603499K00FKEA
16	1	U1	I.C., Volt. Reg., DFN-16 (4x3)	LINEAR TECH., LT3055EDE#PBF
Additional Demo Board Circuit Components				
1	1	C _{IN}	Cap., Alum., 22µF, 50V, 6.3mm × 5.4mm	SUN SELECT, 50CE22BSS
2	0	C7 (OPT)	Cap., D Case	
3	0	R7 (OPT)	Res., 0603	
Hardware-For Demo Board Only				
1	9	E1-E9	Turret, Testpoint 0.094"	MILL-MAX 2501-2-00-80-00-00-07-0
2	7	JP1-JP7	Headers, 2 Pins 2mm Ctrs.	SAMTEC, TMM-102-02-L-S
3	1	JP8	Headers, Single Row 3 Pins 2mm Ctrs.	SAMTEC, TMM-103-02-L-S
4	2	XJP6, XJP8	Shunt, 2mm Ctrs.	SAMTEC, 2SN-BK-G

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SCHEMATIC DIAGRAM



OTE: UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE 0402.
ALL CAPACITORS ARE 0402.

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

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