# LTM8074
# 1.2A Step-Down Silent Switcher µModule Regulator

## DESCRIPTION

Demonstration circuit 2753A features the LTM®8074EY µModule regulator, a tiny high performance high efficiency step-down regulator with Silent Switcher® architecture. DC2753A has an operating input voltage range of 3.4V to 40V and is able to provide an output current of up to 1.2A. The output voltage can be programmed from 0.78V up to 15V. The LTM8074EY is a complete DC/DC point of load regulator in a thermally enhanced 4mm × 4mm × 1.82mm BGA package requiring only a few input and output capacitors.

The radiated EMI performances of the board (with EMI filter) are shown in Figure 6 and Figure 7. The demo board also has a conducted EMI filter installed. To use the conducted EMI filter, the input should be tied to $V_{EMI}$, not $V_{IN}$. An inductor L2, which is a 0Ω jumper on the board by default now, can be added in the EMI filter to further reduce the conducted emission.

The LTM8074 data sheet must be read in conjunction with this demo manual for working on or modifying DC2753A.

**Design files for this circuit board are available.**

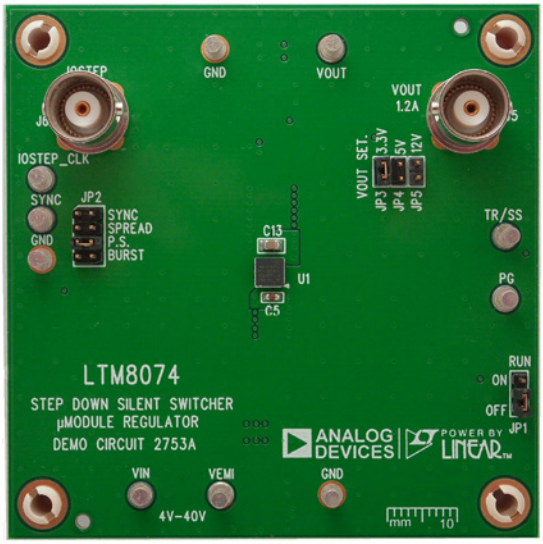


## PERFORMANCE SUMMARY

**Specifications are at $T_A$ = 25°C**

| PARAMETER | CONDITIONS/NOTES | VALUE |
|---|---|---|
| Input Voltage Range | | 3.4V – 40V |
| Output Voltage $V_{OUT}$ | Jumper Selectable | $3.3V_{DC}$, $5V_{DC}$, $12V_{DC}$ |
| Maximum Continuous Output Current | De-Rating is Necessary for Certain Operating Conditions. See Data Sheet for Details | $1.2A_{DC}$ |
| Default Operating Frequency | | 2MHz |
| Efficiency | $V_{IN}$ = 12V, $V_{OUT}$ = 5V, $I_{OUT}$ = 1.2A | 89% See Figure 2 |

## BOARD PHOTO



## QUICK START PROCEDURE

Demonstration circuit 2753A is an easy way to evaluate the performance of the LTM8074EY. Please refer to Figure 1 for test setup connections and follow the procedure below.

1. With power off, place the jumpers in the following positions for a typical 3.3$V_{OUT}$ application:

| JP1 | JP2 | JP3 |
|---|---|---|
| RUN | MODE | $V_{OUT}$ Select |
| ON | PS | 3.3V |

2. Before connecting input supply, load and meters, preset the input voltage supply to be between 3.4V to 40V. Pre-set the load current to 0A.

   Note: $V_{EMI}$ is the input pin with EMI filter. To bypass input EMI filer, connect supply to $V_{IN}$ pin.

3. With power off, connect the load, input voltage supply and meters as shown in Figure 1.

4. Turn on input power supply. The output voltage meter should display the selected output voltage ± 2%.

5. Once the proper output voltage is established, adjust the load current within the 0A – 1.2A range and observe the load regulation, efficiency, and other parameters. Output voltage ripple should be measured across C12 with a BNC cable terminated into 50Ω and an oscilloscope.

6. To observe BURST light load efficiency, place the Mode pin jumper (JP2) in the BURST position.

7. An external clock can be added to the SYNC terminal when the SYNC function is used (JP2 on the SYNC position). Please ensure the chosen $R_T$ sets the LTM8074 switching frequency to equal or below the lowest sync frequency.

8. A spread spectrum mode is available by moving the Mode pin jumper (JP2) in the SPREAD position. The spread spectrum modulation frequency is set to be 3kHz.

## QUICK START PROCEDURE

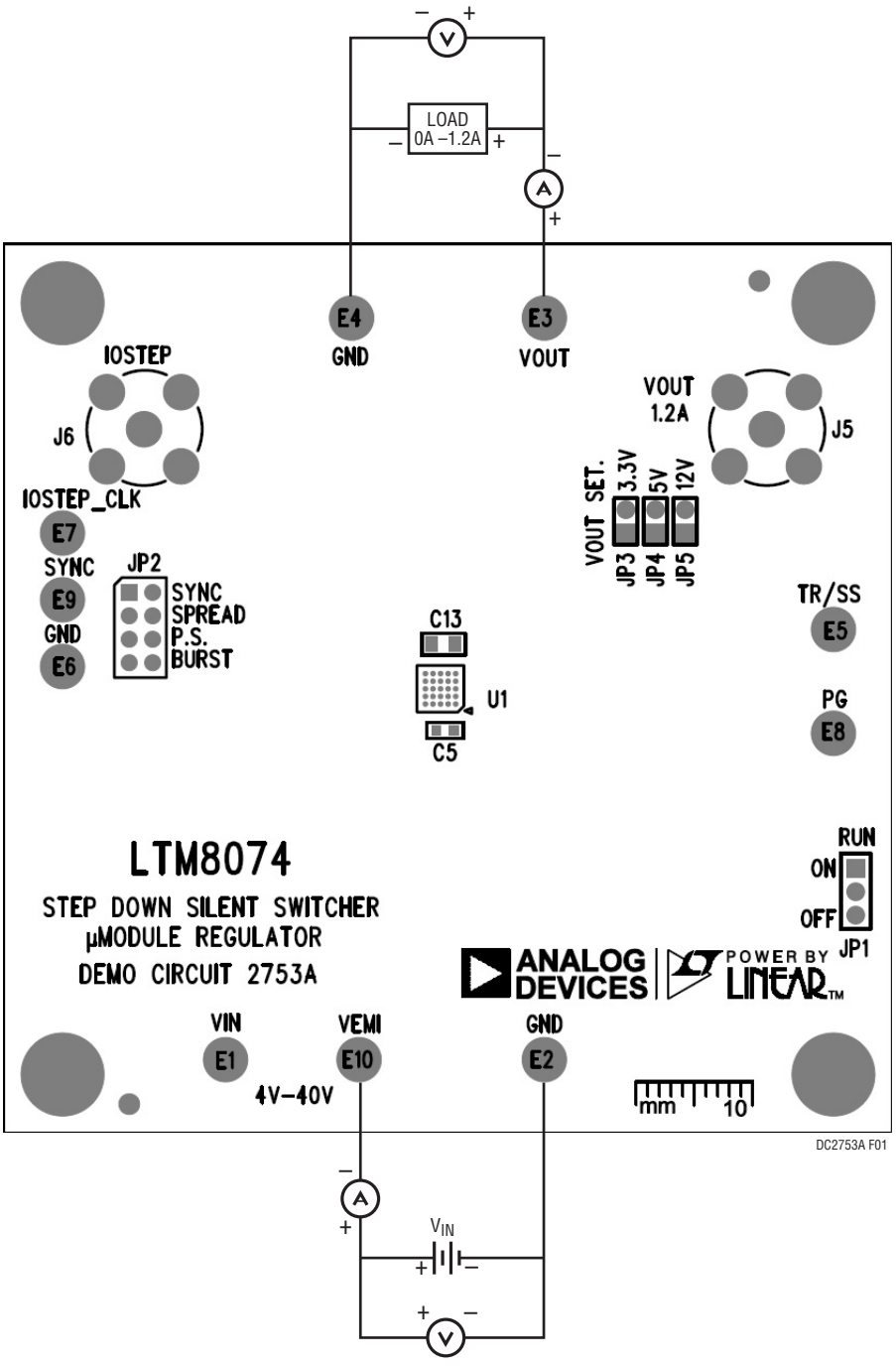



**Figure 1. Test Setup**

## QUICK START PROCEDURE

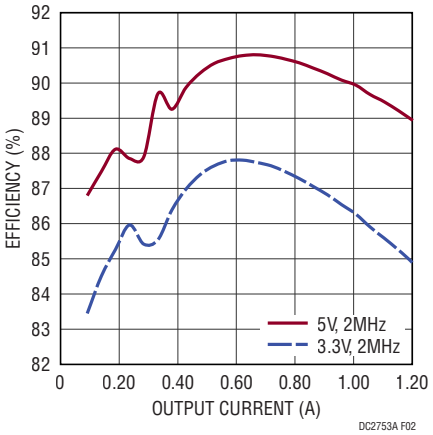
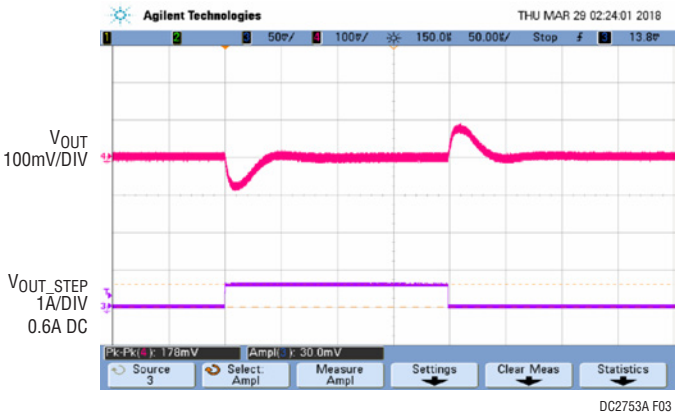
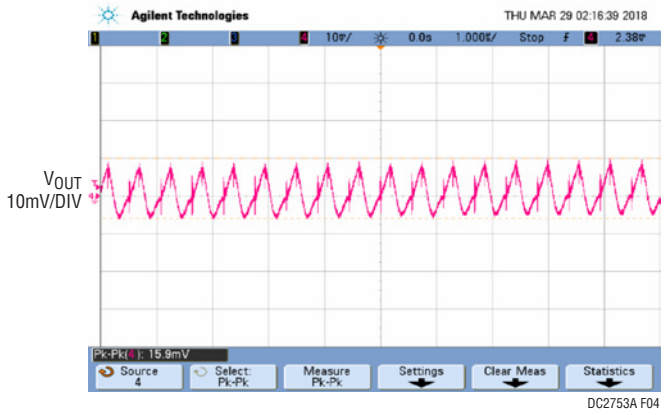



**Figure 2. Measured Supply Efficiency at $12V_{IN}$**




| $V_{IN}$ (V) | $V_{OUT}$ (V) | $C_{OUT}$ |
|---|---|---|
| 12 | 3.3 | 1µF × 47µF/16V + 1µF × 4.7µF/16V |

**Figure 3. Measured Load Transient Response (0.6A – 1.2A Load Step)**




| $V_{IN}$ (V) | $V_{OUT}$ (V) | $I_{OUT}$ (A) | $C_{OUT}$ |
|---|---|---|---|
| 12 | 3.3 | 1.2 | 1µF × 47µF/16V + 1µF × 4.7µF/16V |

**Figure 4. Measured $V_{OUT}$ Ripple**


| $V_{IN}$ (V) | $V_{OUT}$ (V) | $I_{LOAD}$ (A) | $f_{SW}$ (MHz) | $T_{AMBIENT}$ (°C) | Forced Airflow (LFM) |
|---|---|---|---|---|---|
| 12 | 5 | 1.2 | 2 | 25 | 0 |

**Figure 5. Measured Case Temperature**

## QUICK START PROCEDURE

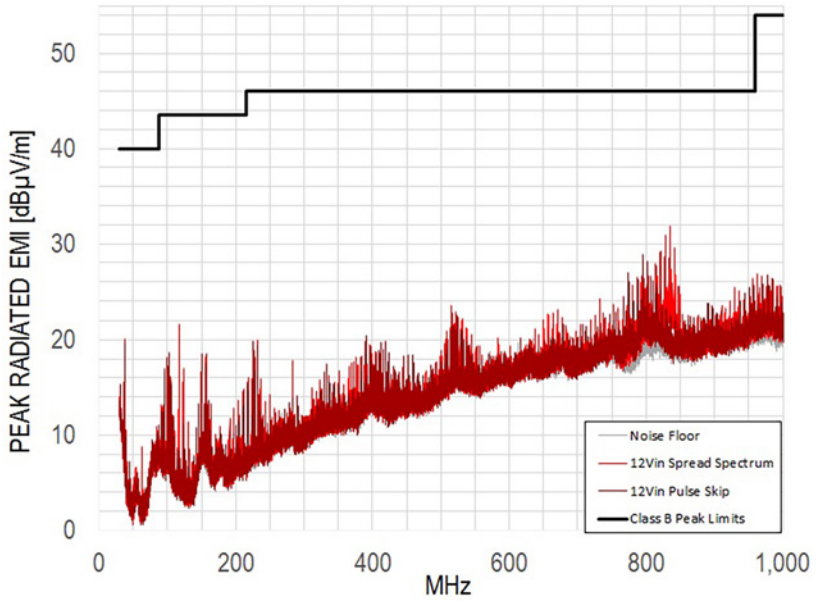



**Figure 6. LTM8074 Demo Circuit EMI Performance, without EMI Filter, in CISPR22 Radiated Emission Test, Antenna Polarization: Vertical, 3 Meters ($V_{IN}$ = 12V, $V_{OUT}$ = 3.3V, $I_{OUT}$ = 1.2A, 2MHz Switching Frequency)**

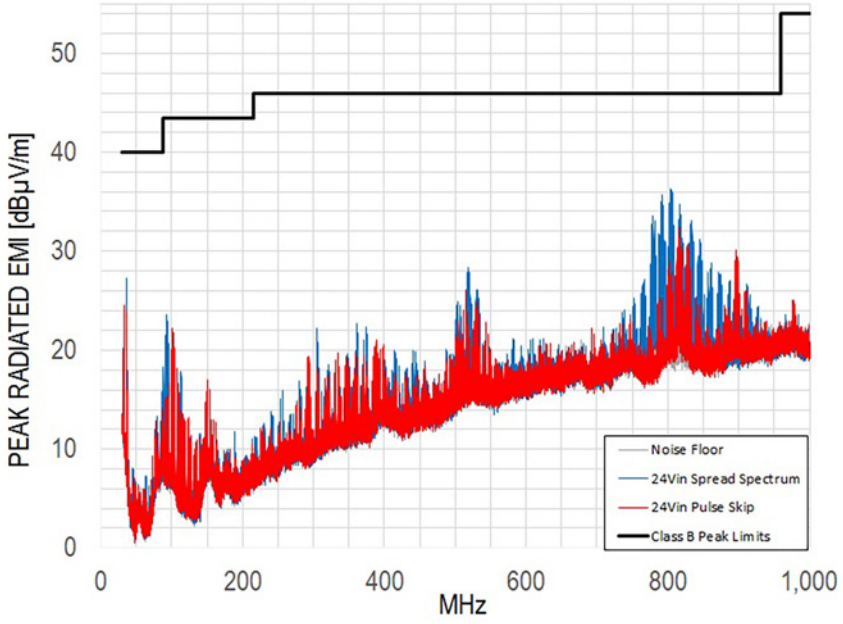
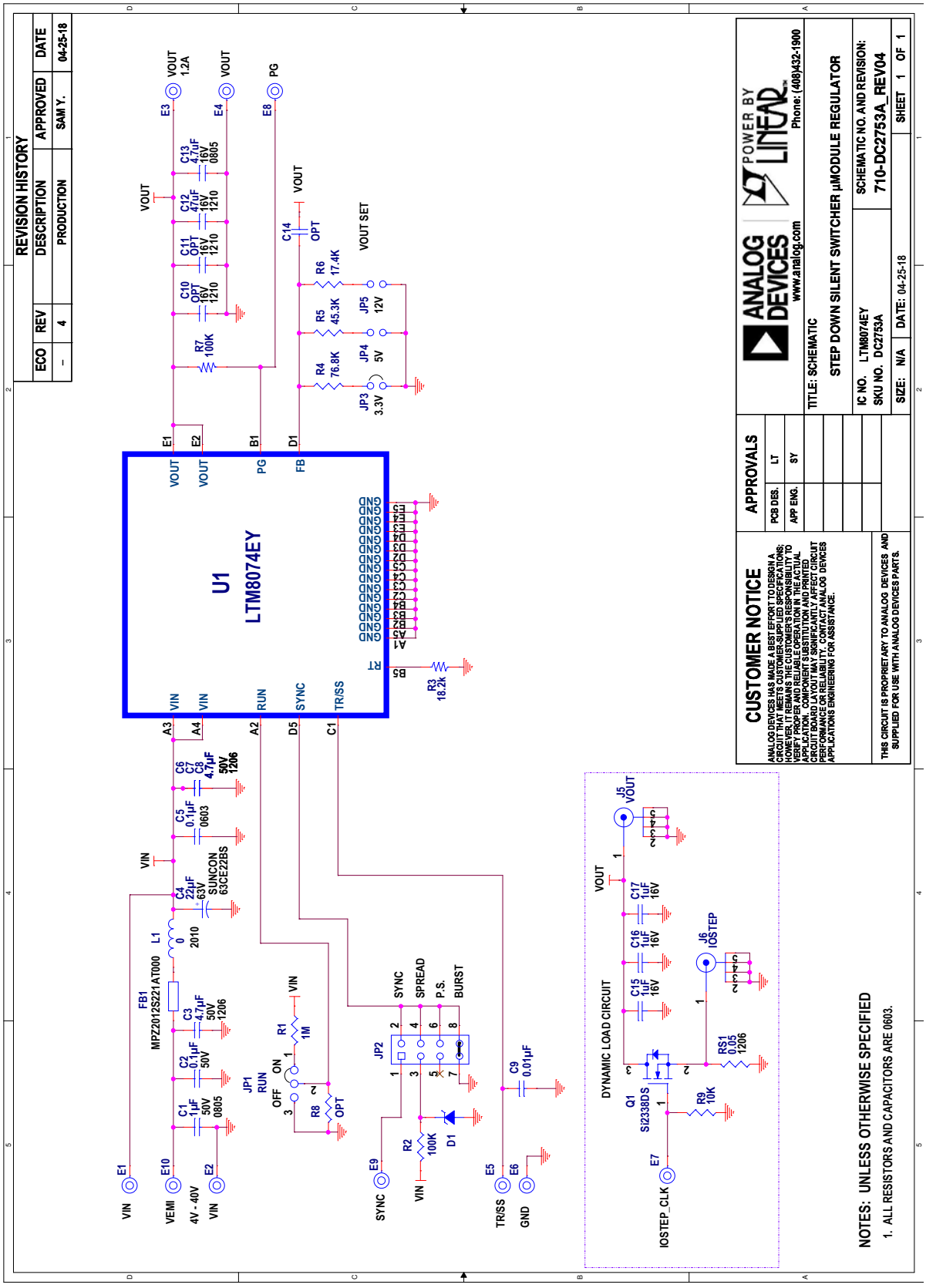



**Figure 7. LTM8074 Demo Circuit EMI Performance, without EMI Filter, in CISPR22 Radiated Emission Test, Antenna Polarization: Vertical, 3 Meters ($V_{IN}$ = 24V, $V_{OUT}$ = 3.3V, $I_{OUT}$ = 1.2A, 2MHz Switching Frequency)**

## PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|---|---|---|---|
| **Required Circuit Components** | | | | |
| 1 | 2 | C3, C6 | CAP., X7R, 4.7µF, 50V, 10% 1206 | MURATA, GRM31CR71H475KA12L |
| 2 | 1 | C9 | CAP., X5R, 0.01µF, 50V, 10%, 0603 | AVX, 06035C103KAT2A |
| 3 | 1 | C12 | CAP., X7R, 47µF, 10V, 10%, 1210 | MURATA, GRM32ER71A476KE20L |
| 4 | 1 | R4 | RES., 76.8k, 1%, 0603 | VISHAY, CRCW060376K8FKEA |
| 5 | 1 | U1 | IC, LTM8074EY, BGA-25-4×4-1566 | ANALOG DEVICES, LTM8074EY#PBF |
| **Additional Demo Board Circuit Components** | | | | |
| 1 | 1 | C1 | CAP., X7R, 1µF, 50V, 10%, 0805 | TDK, C2012X7R1H105K |
| 2 | 1 | C2, C5 | CAP., X7R, 0.1µF, 50V, 10%, 0603 | MURATA, GRM188R71H104KA93D |
| 3 | 1 | L1 | RES., CHIP., 0Ω, 3/4W, 2010 | VISHAY, CRCW20100000Z0EF |
| 4 | 1 | FB1 | FERRITE BEAD, 220Ω, 0805 | TDK, MPZ2012S221AT000 |
| 5 | 1 | C5 | CAP., X7R, 0.1µF, 50V, 10%, 0603 | MURATA, GRM188R71H104KA93D |
| 6 | 2 | C7, C8 | CAP., X7R, 4.7µF, 50V, 10% 1206 | MURATA, GRM31CR71H475KA12L |
| 7 | 1 | C4 | CAP., ALUM, 22µF, 63V | SUN ELECT, 63CE22BS |
| 8 | 0 | C10, C11 | CAP., OPT, 1210 | OPT |
| 9 | 1 | C13 | CAP., X7R, 4.7µF, 16V, 10%, 0805 | MURATA, GRM21BR71C475K73L |
| 10 | 0 | C14 | CAP., OPT, 0603 | OPT |
| 11 | 3 | C15, C16, C17 | CAP., X7R, 1.0µF, 25V, 10%, 0603 | MURATA, GRM188R71E105KA12D |
| 12 | 1 | D1 | DIODE, ZENER, 3.6V, SOD323 | CENTRAL SEMI, CMDZ3L6 TR |
| 13 | 1 | Q1 | XSTR., MOSFET, N-CH, 30V, SOT23 | VISHAY, Si2338DS-T1-GE3 |
| 14 | 1 | RS1 | SENSE RES, 0.05Ω, 1W, 1%, 1206 | VISHAY, WSLP1206R0500FEA |
| 15 | 1 | R1 | RES., 1MEG, 1%, 0603 | VISHAY, CRCW06031M00FKEA |
| 16 | 2 | R2, R7 | RES., 100k, 1%, 0603 | VISHAY,CRCW0603100KFKEA |
| 17 | 1 | R3 | RES., 18.2k, 1%, 0603 | VISHAY, CRCW060318K2FKEA |
| 18 | 1 | R5 | RES., 45.3k, 1%, 0603 | VISHAY, CRCW060345K3FKEA |
| 19 | 1 | R6 | RES., 17.4k, 1%, 0603 | VISHAY, CRCW060317K4FKEA |
| 20 | 0 | R8 | RES., OPT, 0603 | OPT |
| 21 | 1 | R9 | RES., 10k, 1%, 0603 | VISHAY, CRCW060310KFKEA |
| **Hardware** | | | | |
| 1 | 10 | E1-E10 | TESTPOINT, TURRET, 0.094" PBF | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 2 | 3 | JP3, JP4, JP5 | CONN., HEADER, 1mm × 2mm, 2mm | WURTH ELEKTRONIK, 62000211121 |
| 3 | 1 | JP2 | CONN., HEADER, 2mm × 4mm, 2mm | WURTH ELEKTRONIK, 62000821121 |
| 4 | 1 | JP1 | CONN., HEADER, 1mm × 3mm, 2mm | WURTH ELEKTRONIK, 62000311121 |
| 5 | 3 | JP1, JP2, JP3 | SHUNT, 2mm | WURTH ELEKTRONIK, 608 002 134 21 |
| 6 | 2 | J5, J6 | CONN, BNC, 5 PINS | CONNEX, 112404 |
| 7 | 4 | (STAND-OFF) | STAND-OFF, SNAP ON NYLON 0.50" TALL | KEYSTONE, 8833(SNAP ON) |

# SCHEMATIC DIAGRAM




UG-1365 Rev. 0

**ESD Caution**

**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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