LTC4419
18V Dual Input Micropower PowerPath™ Prioritizer

DESCRIPTION

Demonstration circuit 2160A uses the LTC®4419 to provide backup switchover, keeping the output load powered during brown out or power loss conditions. Priority is assigned by supply connection to the V1 and V2 inputs. The power source connected to V1 has a higher priority and is monitored by undervoltage switchover threshold comparator CADJ (pin ADJ). If V1 exceeds 1.55V and ADJ is above 1.097V for 64ms, V1 is considered valid, and the LTC4419 connects V1 to the load. If V1 drops below 1.52V, or ADJ drops below 1.047V, V1 is considered invalid, and the LTC4419 powers the load from V2. The DC2160A is populated to provide switchover when V1 drops below 10.19V ±0.33V. The upper limit for V1 is the maximum operating voltage, 18V; however, the recommended V1 voltage is 12V. The resistive divider (R1-R2) of the first auxiliary comparator CMP1 is adjusted to trigger the comparator when VCMP1_TOP's voltage is in the 9.92V to 10.74V range. Practically, any voltage from the operating range can be selected for V2, however, 5V is recommended to have a standard voltage level.

The second auxiliary comparator CMP2 divider (R8-R7) is adjusted to trigger the comparator when VCMP2_TOP's voltage is in the 3.26V to 3.53V range. Overcurrent (0.5A to 1.6A) and thermal protection inherent to the LTC4419 allows safe prioritization. Overtemperature protection is activated when the junction temperature exceeds 125°C.

Another inherent feature – reverse supply protection – protects the prioritizer and load when a negative voltage (up to –15V) is applied to any input – V1 or V2.

The LTC4419's "break-before-make" switching method prevents cross conduction between input channels. The LTC4419 does not connect any input source to the load until the input voltage exceeds the output by 50mV. This eliminates reverse current from the output into the selected input supply.

Design files for this circuit board are available at http://www.linear.com/demo/DC2160A

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PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V1, V2, V_{OUT}	V1, V2, V_{OUT} Operating Supply Range		1.8		18	V
R_{ON}	Switch Resistance	V1 = V2 = 5V, I_{OUT} = –100µA	1	2	5	Ω
$t_{VALID(V1)}$	Input Qualification Time	V1 Rising, ADJ Rising	34	64	94	ms
V_{THA}	ADJ Threshold	ADJ Falling	1.032	1.047	1.062	V
V_{HYSTA}	ADJ Comparator Hysteresis	ADJ Rising	30	50	70	mV
V_{THC}	CMP1, CMP2 Threshold	CMP1, CMP2 Falling	0.378	0.387	0.396	V
V_{HYSTC}	CMP1, CMP2 Hysteresis	CMP1, CMP2 Rising	7.5	10	12.5	mV
I_{LIM}	Current Limit	V1 = V2 = 8.4V	0.5	1.1	1.6	A
V_{REV}	Reverse Comparator Threshold	(V1, V2) – V_{OUT} for Power Path Turn-On	25	50	75	mV
t_{SWITCH}	Switch Break-Before-Make Time	V1 = V2 = 5V, I_{OUT} < –10mA	1	2.5	5	µs
$V_{1_SWITCHOVER}$	Demo Board Switchover Voltage		9.6	9.92	10.24	V
V_{1_ALARM}	Demo Board V1 Alarmed Voltage		9.92	10.32	10.74	V
V_{2_ALARM}	Demo Board V2 Alarmed Voltage		3.26	3.38	3.53	V

OVERVIEW

The DC2160A includes the LTC4419 2-input prioritizer (U1), LDO regulator with 2.5V output voltage (U2-LT1763) for powering LEDs and logic, four LEDs (D4-D7) for visual information, two jumpers (JP1, JP2) for selecting the power source for the LDO, push button (SW1) for engaging freshness seal mode, and a few turrets for connecting the board to power sources, load and measuring instrument. Auxiliary components—LDO and logic—are placed on the bottom side of board.

The DC2160A design permits operation of each channel over its full operating voltage range.

Provision is made for increasing the hysteresis of auxiliary comparator 1 and auxiliary comparator 2 by placing optional resistors R17/R19.

TURRETS

V1 (E1): 12V supply input; should not exceed +18V, and should be larger than –15V.

V2 (E8): 5V supply input; should not exceed +18V, and should be larger than –15V.

ADJ (E3): Adjustable comparator non-inverting input for setting switchover threshold level.

VCMP1_TOP (E2): Input for voltage monitored by first auxiliary comparator CMP1.

VCMP2_TOP (E7): Input for voltage monitored by second auxiliary comparator CMP2.

CMP1 (E4): First auxiliary comparator CMP1 non-inverting input.

CMP2 (E6): Second auxiliary comparator CMP2 non-inverting input.

GND (E5, E11, and E12): Common ground terminal.

OUT (E9): Output for up to 2A load.

LDO_EXT (E13): Positive terminal for external auxiliary 3.5V to 20V power supply.

V2P5V (E10): LDO output voltage terminal (2.5V).

JUMPERS

JP1, LDO: ON/OFF switch for LDO.

JP2, LDO_POWER: Power supply selection for LDO.

LEDS

D4: Indicates LDO output voltage.

D5: Indicates first auxiliary comparator output stage (CMPOUT1 pin).

D6: Indicates second auxiliary comparator output stage (CMPOUT2 pin).

D7: Indicates powering load from V2 source.

QUICK START PROCEDURE

Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place JP1 in position ON and JP2 in position EXTER_ POWER. Turn off all external switches SW1-SW4. Connect turrets ADJ and GND with external wire.
2. Adjust V1 supply output to 12.0V, V2 to 5V, and auxiliary power supply to 10V. Use 30Ω resistive load.
3. Turn all external switches SW1-SW4 on.
4. Place scope probes at the ADJ and OUT turrets. Disconnect the turrets ADJ and GND and measure the time between events when the ADJ pin voltage reaches 1.097V and when the output voltage starts to rise. The qualification time should be in the range 34ms to 94ms.
5. Turning SW1 off or decreasing V1 to 9V initiates switchover from V1 to V2. Turning SW1 back to on or increasing V1 above 10.5V initiates switchover from V2 to V1 with a qualification time delay.
6. Turn all external switches SW1-SW4 off again and connect turrets ADJ and GND with external wire. Use 5Ω resistive load. Place current probe to measure load current.
7. Turn all external switches SW1-SW4 on. Disconnect the turrets ADJ and GND and observe overcurrent transients with cooling period and thermal protection.

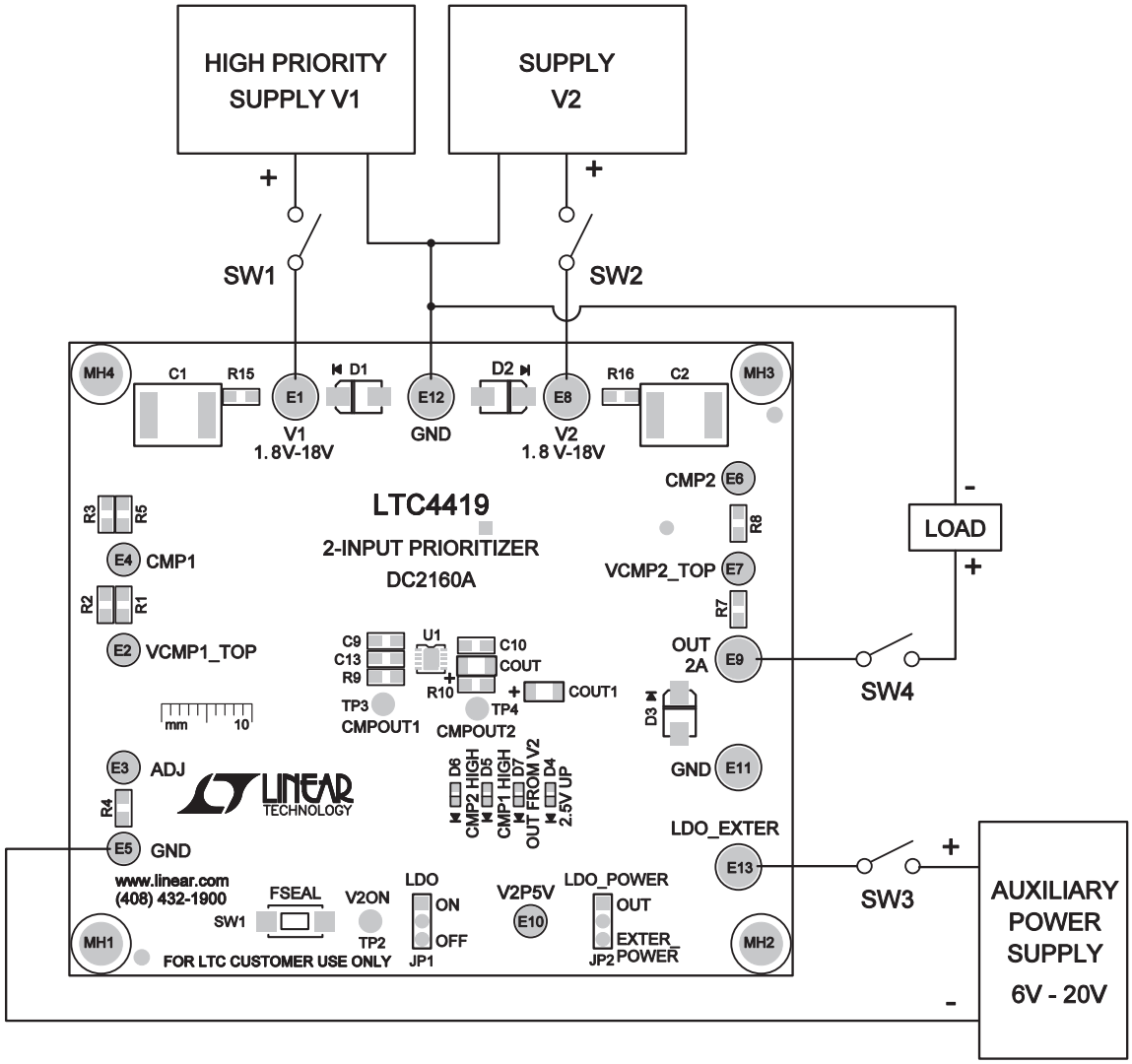
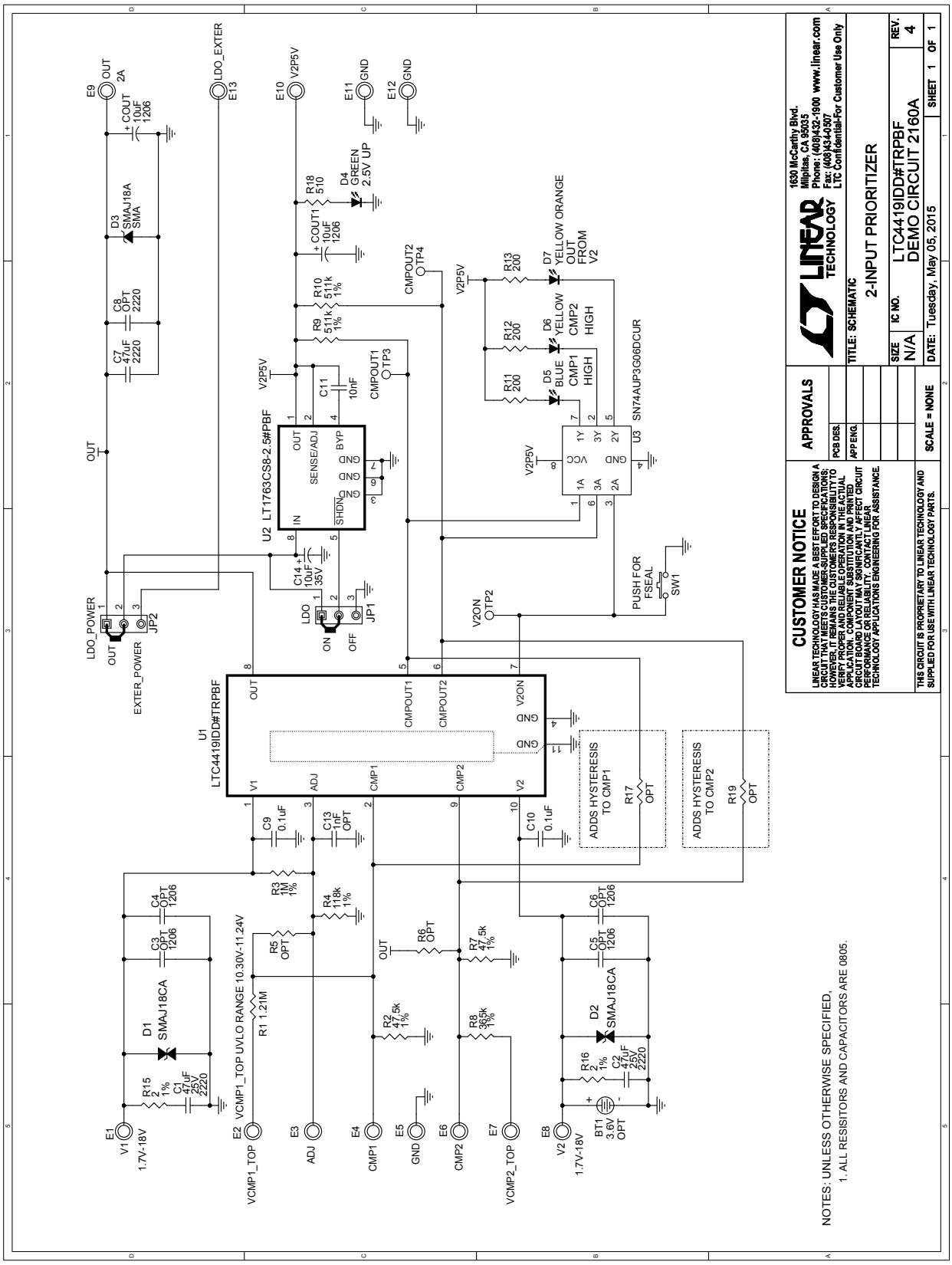


Figure 1. Proper Measurement Equipment Setup

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	0	BT1	HOLDER, BATTERY 20mm OPTION	KEYSTONE 1066 OPTION
2	2	COUT1,COUT	CAP, 1206 10µF 20% 25V TANT	AVX F951E106MAAAQ2
3	3	C1, C2, C7	CAP, 2220 47uF 20% 25V X5R	TDK CKG57NX5R1E476M500JH
4	0	C3, C4, C5, C6	CAP, 1206 OPTION	OPTION
5	0	C8	CAP, 2220 OPTION	OPTION
6	2	C9, C10	CAP, 0805 0.1µF 10% 25V X5R	AVX 08053C104KAT2A
7	1	C11	CAP, 0805 10nF 10% 16V X7R	AVX 0805YC103KAT2A
8	0	C13	CAP, 0805 1nF 10% 50V X7R OPTION	AVX 08055C102KAT OPTION
9	1	C14	CAP, 7343 10µF 10% 35V TANT	AVX TPSD106K035R0300
10	2	D1, D2	DIODE, 400 WATT TRANSIENT VOLTAGE SUPPRESSOR	LITTELFUSE INC. SMAJ18CA
11	1	D3	DIODE, 400 WATT TRANSIENT VOLTAGE SUPPRESSOR	LITTELFUSE INC. SMAJ18A
12	1	D4	LED, 0603 GREEN	WURTH ELEKTRONIK 150060GS75000
13	1	D5	LED, 0603 BLUE	WURTH ELEKTRONIK 150060BS75000
14	1	D6	LED, 0603 YELLOW	WURTH ELEKTRONIK 150060YS75000
15	1	D7	LED, 0603 YELLOW ORANGE	LITEON LTST-C190KFKT
16	6	E1, E8, E9, E11, E12, E13	TURRET	MILL-MAX 2501-2-00-80-00-00-07-0
17	7	E2, E3, E4, E5, E6, E7, E10	TURRET	MILL MAX 2308-2-00-80-00-00-07-0
18	2	JP1, JP2	HEADER, 2mm, 3-PIN	WURTH 62000311121
19	4	MH1, MH2, MH3, MH4	STANDOFF, SNAP ON	KEYSTONE_8831
20	1	R1	RES, 0805 1.21M PHMS 1% 1/18W	VISHAY CRCW08051M21FKEA
21	2	R2, R7	RES, 0805 47.5k 5% 1/8W	VISHAY CRCW080547K5FKEA
22	1	R3	RES, 0805 1M 1% 1/8W	VISHAY CRCW08051M00FKEA
23	1	R4	RES, 0805 118k 1% 1/8W	VISHAY CRCW0805118KFKEA
24	0	R5	RES, 0805 69.8k 1% 1/8W OPTION	VISHAY CRCW080569K8FKEA OPTION
25	0	R6	RES, 0805 OPTION	OPTION
26	1	R8	RES, 0805 365k 1% 1/8W	VISHAY CRCW0805365KFKEA
27	2	R9, R10	RES, 0805 511k 1% 1/8W	VISHAY CRCW0805511KFKEA
28	3	R11, R12, R13	RES, 0805 200Ω 1% 1/8W	VISHAY CRCW0805200RFKEA
29	2	R15, R16	RES, 0805 2Ω 1% 1/8W	VISHAY CRCW08052R00FKEA
30	0	R17, R19	RES, 0805 1M 1% 1/8W OPTION	VISHAY CRCW08051M00FKEA OPTION
31	1	R18	RES, 0805 510Ω 5% 1/8W	VISHAY CRCW0805510RJNEA
32	1	SW1	SWITCH, MOMENTARY, PUSH BUTTON	WURTH 434 123 050 816
33	1	U1	IC, LTC4419IDD#TRPBF	LINEAR TECH LTC4419IDD#TRPBF
34	1	U2	IC, 500mA LOW NOISE LDO MICROPOWER REGULATOR	LINEAR TECH LT1763CS8-2.5#PBF
35	1	U3	IC, LOW-POWER TRIPLE INVERTER BUFFER/DRIVER	TEXAS INSTRUMENTS SN74AUP3G06DCUR
36	2	XJP1, XJP2	SHUNT, 2mm	WURTH 60800213421

SCHEMATIC DIAGRAM



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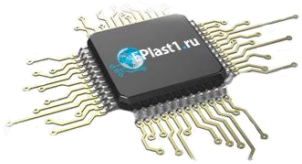

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