

# LT4320

## 3-Phase Ideal Diode Bridge

### DESCRIPTION

Demonstration circuit 2465A is a 3-phase ideal diode bridge using three LT<sup>®</sup>4320 controllers and six N-channel FETs. This demo board provides highly efficient 3-phase rectification with an input voltage range from 5VAC to 28VAC RMS (line to neutral) and maximum load current of 25A.

High efficiency 3-phase rectification is achieved by using six low  $R_{DS(ON)}$  (3.3m $\Omega$  typical) N-channel FETs instead of the six diodes used in a conventional 3-phase diode bridge. This solution reduces heat dramatically and eases

thermal design requirements. Furthermore, power lost to the diodes is available to the application.

The 3-phase ideal diode bridge eliminates a costly heat sink and active cooling solutions required with a conventional 3-phase diode bridge. Overall solution cost and size can be dramatically reduced.

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2465A>**

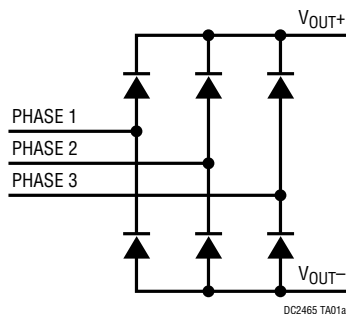
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### PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$

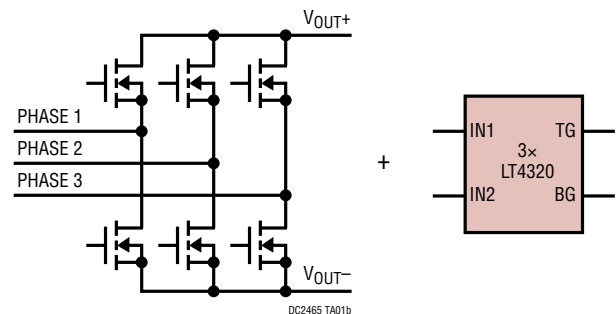
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	Line to Neutral AC RMS Voltage	5		28	V
	Line to Line AC RMS Voltage	9		48	V
Output Voltage	DC Voltage			70	V
Output Current	Without Forced Airflow			25	A
Input Line Frequency				400	Hz

### TYPICAL APPLICATION

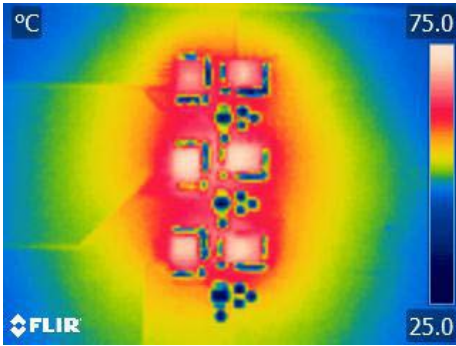
**3-Phase Diode Bridge**  
84% Efficiency at 5VAC RMS L-N, 25A



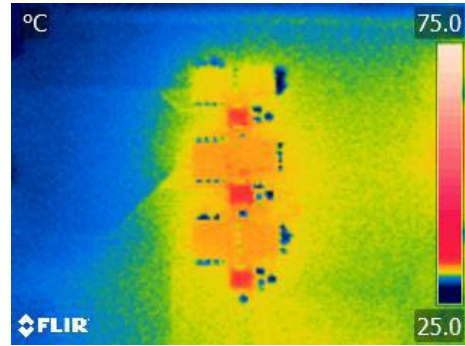
**3-Phase Ideal Diode Bridge**  
97% Efficiency at 5VAC RMS L-N, 25A



## THERMAL PERFORMANCE COMPARISON



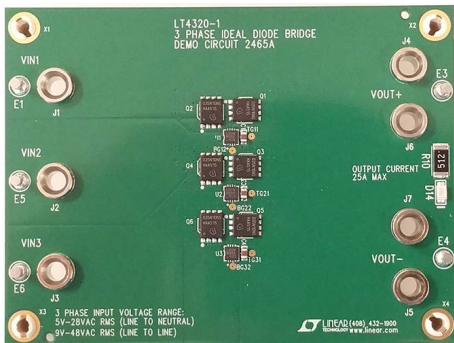
Conventional 3-Phase Diode Bridge, 48°C Temperature Rise  
PDS5100H



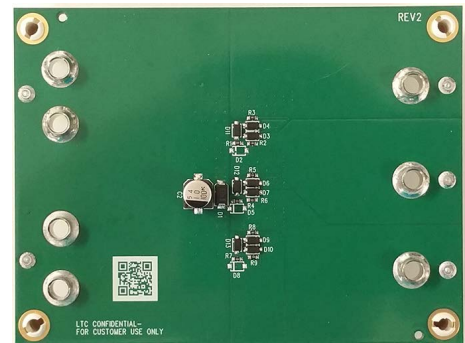
3-Phase Ideal Diode Bridge, 10°C Temperature Rise  
Infineon BSC035N10NS5ATMA1

Figure 1. Conditions: 24VAC RMS (L-N), 5A Load Current, Without Forced Airflow

## BOARD PHOTOS



Top Side



Bottom Side

## QUICK START PROCEDURE

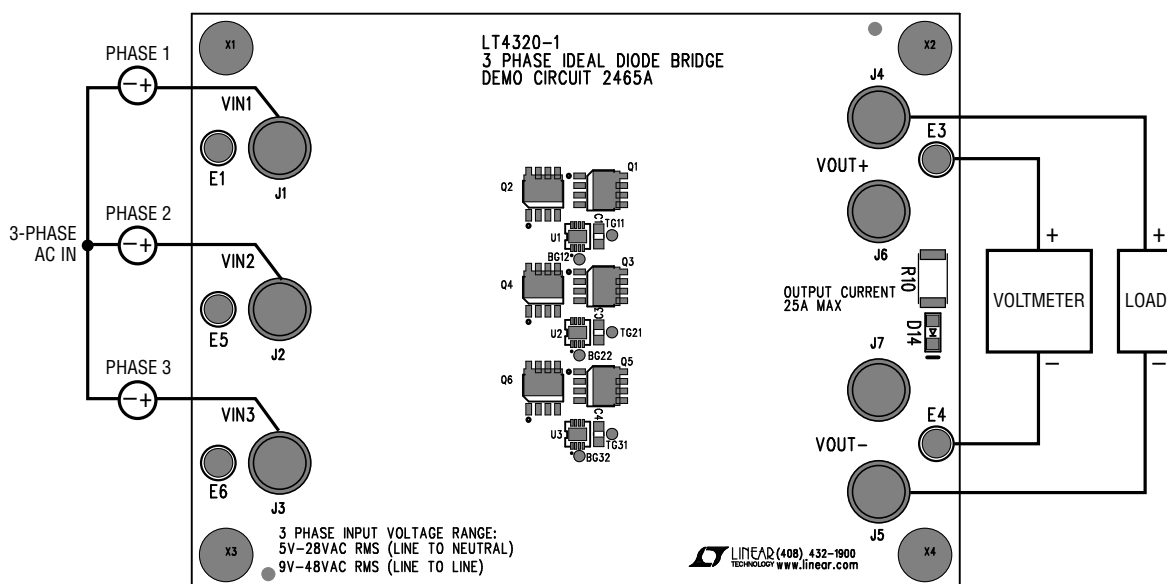
Refer to Figure 2 for proper equipment setup and follow the procedure below:

1. Verify that the output voltage of the 3-phase AC source is within the input voltage range of the DC2465A as shown in Table 1. Turn off the 3-phase AC source. Connect the 3-phase AC source to VIN1, VIN2, and VIN3 as shown in Figure 2.

2. Connect a load and a voltmeter across VOUT+ to VOUT- as shown in Figure 2. Turn down the load current to zero. Put the voltmeter in DC volt measurement mode.
3. Raise the output voltage of the 3-phase AC source to the desired level. Check the output voltage with the voltmeter.
4. Raise the load current to desired level. Make sure the load current is within the maximum load current as shown in Table 1.

**Table 1. Input Voltage and Output Current Specification**

Input Voltage	Maximum Load Current
5VAC to 28VAC RMS (Line to Neutral) 9VAC to 48VAC RMS (Line to Line)	25A (Without Forced Airflow or Heat sink)



DC2447 F03

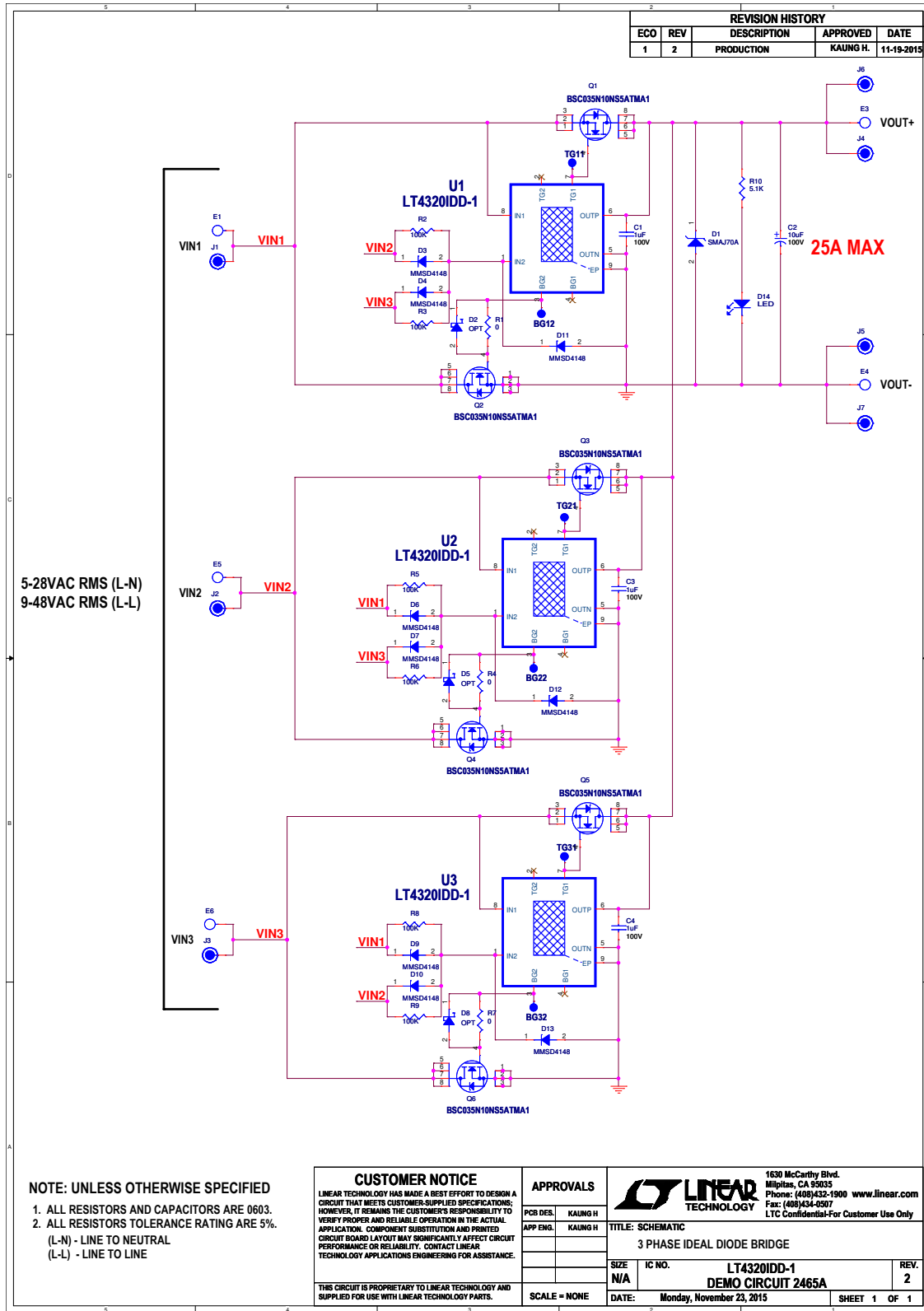
**Figure 2. Setup Diagram**

# DEMO MANUAL DC2465A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	3	C1, C3, C4	CAP, CER, X7S 1 $\mu$ F 100V 20% 0805	TDK C2012X7S2A105M125AB
2	1	C2	CAP, ELE, 10 $\mu$ F 100V 20% 6.3X6.0	SUNCON 100CE-10KX
3	9	D3, D4, D6, D7, D9, D10, D11, D12, D13	DIODE, SCHOTTKY, MMSD4148 100V SOD123	FAIRCHILD MMSD4148
4	6	Q1, Q2, Q3, Q4, Q5, Q6	MOSFET, N-CH, BSC035N10NS5ATMA1 100V PG-TDSON-8	INFINEON BSC035N10NS5ATMA1
5	6	R2, R3, R5, R6, R8, R9	RES, CHIP, 100k 5% 0603	VISHAY CRCW0603100KJNEA
6	3	U1, U2, U3	IC, LT4320IDD-1	LINEAR TECH LT4320IDD-1#PBF
<b>Additional Demo Board Circuit Components</b>				
1	1	D1	DIODE, TVS, SMAJ70A 70V SMA	LITTELFUSE SMAJ70A
2	3	D2, D5, D8	DIODE, OPT SOD123	OPT
3	1	D14	DIODE, LED	ROHM SML-010FTT86L
4	5	E1, E3, E4, E5, E6	CONN, TURRET, MILL-MAX-2501	MILL-MAX 2501
5	7	J1, J2, J3, J4, J5, J6, J7	CONN, BANANA JACK	KEYSTONE 575-4
6	3	R1, R4, R7	RES, CHIP, 0 $\Omega$ SHUNT 0603	VISHAY CRCW06030000Z0EA
7	1	R10	RES, CHIP, 5.1k 5% 2512	VISHAY CRCW25125K10JNEG
8	4	MH1-MH4	STAND-OFF, NYLON 0.50" TALL (SNAP ON)	KEYSTONE 8833

## SCHEMATIC DIAGRAM



# DEMO MANUAL DC2465A

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