

# Silicon – Diode Quad

## **FA4333E**

(Diode Quad FD3389)

125V/225mA

# DATASHEET

OEM – Fairchild

Source: Fairchild Databook 1978

# FA SERIES

## PAIR, QUAD AND BRIDGE DIODE ASSEMBLIES

SILICON PLANAR EPITAXIAL

- $\Delta V_F$  ... Down to 3 mV (MAX)
- $\Delta I_R$  ... Down to 10 nA (MAX)

**GENERAL DESCRIPTION**

The FA series of diode assemblies are pairs, quads and bridges composed of individual glass diodes encapsulated in epoxy packages. The pairs and quads are also available in unencapsulated form, the diodes being securely taped together for shipment.

These assemblies feature very tight matching characteristics over broad temperature and current ranges.

**ABSOLUTE MAXIMUM RATINGS (Note 1)**

**Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+175°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Power Dissipation at 25°C Ambient	
Each Diode	250 mW
Encapsulated Package	500 mW
Linear Power Derating factor (from 25°C)	
Each Diode	1.67 mW/°C
Encapsulated Package	3.33 mW/°C

**Maximum Voltage and Currents**

Basic Diode (See Specification below)	FD1389	FD2389	FD3389	FD6389
$V_{iV}$ Working Inverse Voltage	75 V	150 V	125 V	50 V
$I_{O}$ Average Rectified Current	100 mA	100 mA	150 mA	200 mA
$I_F$ Continuous Forward Current	150 mA	150 mA	225 mA	300 mA
$i_f$ Recurrent Peak Forward Current	300 mA	300 mA	450 mA	600 mA
$i_{f(surge)}$ Peak Forward Surge Current				
Pulse width = 1.0 s	1.0 A	1.0 A	1.0 A	1.0 A
Pulse width = 1.0 $\mu$ s	4.0 A	4.0 A	4.0 A	4.0 A



**MATCHING CHARACTERISTICS (Apply over temperature range of -55°C to +100°C)**

Basic Diode (See Specification below)	Forward Current Matching Range (Notes 4 & 6)	Reverse Current Match ( $\Delta I_R$ Maximum) (Note 3)	Forward Voltage Match ( $\Delta V_F$ Maximum)	Assembly Type Number				
				Encap- sulated Pair	Unencap- sulated Pair	Encap- sulated Quad	Unencap- sulated Quad	Bridge (Note 6)
FD1389	10 $\mu$ A to 1.0 mA		3.0 mV	FA2310E	FA2310U	FA4310E	FA4310U	FA3310
FD1389	10 $\mu$ A to 1.0 mA		10 mV	FA2311E	FA2311U	FA4311E	FA4311U	FA3311
FD1389	1.0 mA to 10 mA		5.0 mV	FA2312E	FA2312U	FA4312E	FA4312U	FA3312
FD1389	1.0 mA to 10 mA		15 mV	FA2313E	FA2313U	FA4313E	FA4313U	FA3313
FD2389	10 $\mu$ A to 1.0 mA		3.0 mV	FA2320E	FA2320U	FA4320E	FA4320U	FA3320
FD2389	10 $\mu$ A to 1.0 mA		10 mV	FA2321E	FA4321U	FA4321E	FA4321U	FA3321
FD2389	1.0 mA to 10 mA		5.0 mV	FA2322E	FA2322U	FA4322E	FA4322U	FA3322
FD2389	1.0 mA to 10 mA		15 mV	FA2323E	FA2323U	FA4323E	FA4323U	FA3323
FD2389	1.0 mA to 10 mA		10 mV	FA2324E	FA2324U	FA4324E	FA4324U	FA3324
FD2389	10 mA to 100 mA		20 mV	FA2325E	FA2325U	FA4325E	FA4325U	FA3325
FD3389	10 $\mu$ A to 1.0 mA	(2.0 + 0.064 $V_R$ ) nA	10 mV	FA2330E	FA2330U	FA4330E	FA4330U	FA3330
FD3389	1.0 mA to 10 mA	(2.0 + 0.064 $V_R$ ) nA	15 mV	FA2331E	FA2331U	FA4331E	FA4331U	FA3331
FD3389	10 mA to 100 mA	(2.0 + 0.064 $V_R$ ) nA	20 mV	FA2332E	FA2332U	FA4332E	FA4332U	FA3332
FD3389	10 $\mu$ A to 1.0 mA	(4.0 + 0.128 $V_R$ ) nA	10 mV	FA2333E	FA2333U	FA4333E	FA4333U	FA3333
FD3389	1.0 mA to 10 mA	(4.0 + 0.128 $V_R$ ) nA	15 mV	FA2334E	FA2334U	FA4334E	FA4334U	FA3334
FD3389	10 mA to 100 mA	(4.0 + 0.128 $V_R$ ) nA	20 mV	FA2335E	FA2335U	FA4335E	FA4335U	FA3335
FD6389	10 mA to 100 mA		10 mV	FA2360E	FA2360U	FA4360E	FA4360U	FA3360
FD6389	10 mA to 100 mA		20 mV	FA2361E	FA2361U	FA4361E	FA4361U	FA3361

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BASIC DIODE ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	FD1389		FD2389		FD3389		FD6389		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
BV	Breakdown Voltage	100		200		150		75		V	$I_R = 5.0 \mu A$ $I_R = 100 \mu A$
$I_R$	Reverse Current		100 100		100 100		1.0 3.0		100 100	nA $\mu A$	$V_R = WIV$ $V_R = WIV, T_A = 150^\circ C$
$V_F$	Forward Voltage				1.000 0.925 0.860 0.790 0.740 0.800 0.725 0.670		1.000 0.930 0.880 0.840 0.810 0.770 0.730 0.710		1.000 0.920 0.860 0.790 0.750 0.710 0.670 0.630	V	$I_F = 200 \text{ mA}$ $I_F = 100 \text{ mA}$ $I_F = 50 \text{ mA}$ $I_F = 20 \text{ mA}$ $I_F = 10 \text{ mA}$ $I_F = 5.0 \text{ mA}$ $I_F = 2.0 \text{ mA}$ $I_F = 1.0 \text{ mA}$
C	Capacitance (Note 5)		2.0		5.0		6.0		3.0	pF	$V_R = 0, f = 1 \text{ MHz}$
$t_{rr}$	Reverse Recovery Time		4.0		50				4.0	ns	$I_F = I_R = 10 \text{ mA}$ Recover to 1.0 mA $I_F = I_R = 30 \text{ mA}$ Recover to 1.0 mA $I_F = I_R = 200 \text{ mA}$ Recover to 20 mA

- NOTES:
- These are limiting values above which life or satisfactory performance may be impaired.
  - These are steady state limits. The factory should be consulted on applications involving pulsed or low duty-cycle operation.
  - The Reverse Current Match ( $\Delta I_R$ ) is the difference in reverse current between the diode having the highest  $I_R$  and that having the lowest  $I_R$  in a given assembly. The reverse voltage ( $V_R$ ) in the  $\Delta I_R$  calculation can be any value up to 125 V. For example, the maximum  $\Delta I_R$  for an FA2330E at  $V_R$  of 10 V is  $(2.0 \pm 0.054 \times 10) \text{ nA}$  or 2.84 nA.
  - The Forward Current Matching Ranges between 10  $\mu A$  and 10 mA may be applied either as a dc current or a pulse current. Above 10 mA, however, the matching characteristics are guaranteed only for low duty cycle ( $\leq 1\%$ ) pulse current. Conditions of test are shown in the characteristic curve and test circuit section of this book (see Note 7).
  - Capacitance cannot be monitored independently on each diode in a bridge configuration. In measuring capacitance in a bridge, the limit is 4/3 that shown in the basic diode electrical characteristics.
  - For matched bridges, the forward current range specified is per leg. Therefore, twice the current specified is applied to the assembly.
  - For product family characteristics curves for the basic diodes used in the assemblies, refer to the following parts of Section 4.  
FD1389 D4  
FD2389 D1  
FD3389 D2  
FD6389 D4  
For test circuits, refer to Chapter 4, D18.

**CURVE SET NUMBER D2**  
**LOW LEAKAGE SMALL SIGNAL DIODE**

**TYPICAL ELECTRICAL CHARACTERISTIC CURVES**  
 AT 25°C AMBIENT TEMPERATURE UNLESS OTHERWISE NOTED

