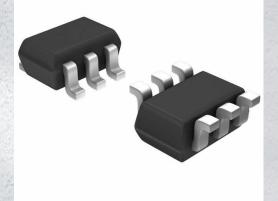


NC7SZ374P6X Datasheet

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NC7SZ374P6X-DG
onsemi
NC7SZ374P6X
IC FF D-TYPE SNGL 1BIT SC88
Flip Flop 1 Element D-Type 1 Bit Positive Edge 6-TS SOP, SC-88, SOT-363

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
NC7SZ374P6X	onsemi
Series:	Product Status:
7SZ	Active
Function:	Туре:
Standard	D-Type
Output Type:	Number of Elements:
Tri-State, Non-Inverted	1
Number of Bits per Element:	Clock Frequency:
1	175 MHz
Max Propagation Delay @ V, Max CL:	Trigger Type:
4ns @ 5V, 50pF	Positive Edge
Current - Output High, Low:	Voltage - Supply:
32mA, 32mA	1.65V ~ 5.5V
Current - Quiescent (lq):	Input Capacitance:
1 μΑ	3 pF
Operating Temperature:	Mounting Type:
-40°C ~ 85°C (TA)	Surface Mount
Supplier Device Package:	Package / Case:
SC-88 (SC-70-6)	6-TSSOP, SC-88, SOT-363
Base Product Number:	
75Z374	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	

onsemi

TinyLogic UHS D-Type Flip-Flop with 3-STATE Output

NC7SZ374

Description

The NC7SZ374 is a single positive edge-triggered D-type CMOS Flip-Flop with 3-STATE output from **onsemi**'s Ultra High Speed Series of TinyLogic in the space saving SC-88 6-lead package. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} range. The inputs and output are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 5.5 V independent of V_{CC} operating voltage. This single flip-flop will store the state of the D input that meets the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. The output tolerates voltages above V_{CC} in the 3-STATE condition.

Features

- Space Saving SC-88 6-Lead Package
- Ultra Small MicroPakTM Leadless Package
- Ultra High Speed: t_{PD} = 2.6 ns Typ into 50 pF at 5 V V_{CC}
- High Output Drive: ±24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Matches the Performance of LCX when Operated at 3.3 V V_{CC}
- Power Down High Impedance Inputs / Output
- Overvoltage Tolerant Inputs Facilitate 5 V 3 V Translation
- Patented Noise / EMI Reduction Circuitry Implemented
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

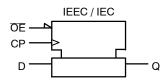
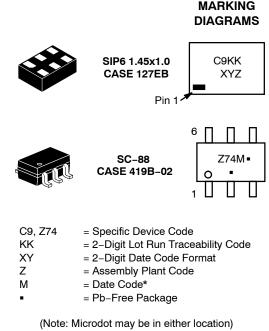


Figure 1. Logic Symbol



*Date Code orientation and/or position may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet. NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 7.

Connection Diagrams

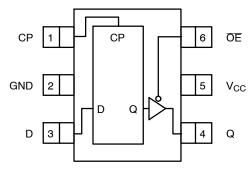
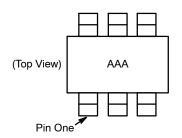


Figure 2. SC-88 (Top View)



AAA represents Product Code Top Mark - see ordering code.

NOTE: Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Figure 3. Pin 1 Orientation

PIN DESCRIPTIONS

Pin Name	Description
D	Data Input
СР	Clock Pulse Input
ŌĒ	Output Enable Input
Q	Flip–Flop Output

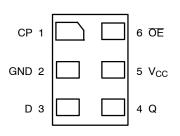


Figure 4. MicroPak (Top Through View)

FUN	CTION	TABL	E

	Output		
СР	D	ŌE	Q
	L	L	L
	Н	L	Н
~_	Х	L	Q _n
Х	х	Н	Z

H = HIGH Logic Level L = LOW Logic Level

X = Immaterial

Z = High Impedance $Q_n = No$ Change in Data





ABSOLUTE MAXIMUM RATINGS

Symbol	Parame	Parameter			Unit
V _{CC}	Supply Voltage		-0.5	+6.5	V
V _{IN}	DC Input Voltage		-0.5	+6.5	V
V _{OUT}	DC Output Voltage		-0.5	+6.5	V
I _{IK}	DC Input Diode Current	V _{IN} < 0 V	-	-50	mA
Ι _{ΟΚ}	DC Output Diode Current	V _{OUT} < 0 V	-	-50	mA
I _{OUT}	DC Output Source / Sink Current	-	±50	mA	
I _{CC} / I _{GND}	DC V _{CC} / GND Current		-	±50	mA
T _{STG}	Storage Temperature Range	Storage Temperature Range			°C
TJ	Junction Temperature under Bias	Junction Temperature under Bias			°C
ΤL	Junction Lead Temperature (Soldering, 10 Seconds)		-	260	°C
PD	Power Dissipation in Still Air SC-88		-	332	mW
		MicroPak	-	812	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Min	Мах	Unit
V _{CC}	Supply Voltage Operating		1.65	5.5	V
	Supply Voltage Data Retention		1.5	5.5	
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage	Active State	0	V _{CC}	V
		3-STATE	0	5.5	V
t _r , t _f	Input Rise and Fall Time	V_{CC} = 1.8 V, 2.5 V ±0.2 V	0	20	ns/V
		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	0	10	
		$V_{CC} = 5.5 \text{ V} \pm 0.5 \text{ V}$	0	5	
T _A	Operating Temperature		-40	+85	°C
θ_{JA}	Thermal Resistance	SC-88	-	377	°C/W
		MicroPak	-	154	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability. 1. Unused inputs must be held HIGH or LOW. They may not float.



DC ELECTICAL CHARACTERISTICS

						م = +25 °	°C	T _A = -40	to +85°C	
Symbol	Parameter	V _{CC} (V)	Co	nditions	Min	Тур	Max	Min	Max	Unit
V _{IH}	HIGH Level Control	1.65 to 1.95			0.65 V _{CC}	-	-	0.65 V _{CC}	-	V
	Input Voltage	2.3 to 5.5			0.7 V _{CC}	-	-	0.7 V _{CC}	-	1
V _{IL}	LOW Level Control	1.65 to 1.95			-	-	0.35 V _{CC}	-	0.35 V _{CC}	V
	Input Voltage	2.3 to 5.5			-	-	0.3 V _{CC}	-	0.3 V _{CC}	1
V _{OH}	HIGH Level Control	1.65	$V_{IN} = V_{IH}$	I_{OH} = -100 μ A	1.55	1.65	-	1.55	-	V
	Output Voltage	1.8	or V _{IL}		1.7	1.8	-	1.7	-	1
		2.3			2.2	2.3	-	2.2	-	
		3.0			2.9	3.0	-	2.9	-	
		4.5			4.4	4.5	-	4.4	-	
		1.65		I _{OH} = -4 mA	1.24	1.52	-	1.29	-	1
		2.3		I _{OH} = -8 mA	1.9	2.15	-	1.9	-	1
		3.0		I _{OH} = -16 mA	2.4	2.8	-	2.4	-	1
		3.0		I _{OH} = -24 mA	2.3	2.68	-	2.3	-	1
		4.5		I _{OH} = -32 mA	3.8	4.2	-	3.8	-	1
V _{OL}		1.65	V _{IN} = V _{IH}	I _{OL} = 100 μA	-	0.0	0.1	-	0.1	V
	Output Voltage	1.8	or V _{IL}		-	0.0	0.1	-	0.1	
		2.3			-	0.0	0.1	-	0.1	1
		3.0			-	0.0	0.1	-	0.1	1
		4.5			-	0.0	0.1	-	0.1	1
		1.65		I _{OL} = 4 mA	-	0.08	0.24	-	0.24	1
		2.3		I _{OL} = 8 mA	-	0.10	0.3	_	0.3	1
		3.0		I _{OL} = 16 mA	-	0.15	0.4	-	0.4	1
		3.0		I _{OL} = 24 mA	-	0.22	0.55	-	0.55	1
		4.5		I _{OL} = 32 mA	-	0.22	0.55	-	0.55	1
I _{IN}	Input Leakage Current	1.65 to 5.5	$0 \le V_{IN} \le 5$	5.5 V	-	_	±0.1	-	±1.0	μΑ
I _{OZ}	3–STATE Output Leakage	1.65 to 5.5	$V_{IN} = V_{IL} \text{ or } V_{IH}$ 0 $\leq V_{OUT} \leq 5.5 \text{ V}$		-	_	±0.5	-	±5.0	μA
I _{OFF}	Power Off Leakage Current	0.0	V _{IN} or V _{OUT} = 5.5 V		-	-	1.0	-	10	μA
I _{CC}	Quiescent Supply Current	1.65 to 5.5	V _{IN} = 5.5 \	/, GND	-	-	1.0	-	10.0	μΑ



AC ELECTRICAL CHARACTERISTICS

					T _A = +25°C	;	T _A = -40	to +85°C	
Symbol	Parameter	V _{CC} (V)	Conditions	Min	Тур	Max	Min	Max	Unit
f _{MAX}	Maximum Clock Frequency	1.65	$C_{L} = 50 \text{ pF},$	-	-	-	100	-	MHz
	(Figures 5, 7)	1.8	$R_{D} = 500 \Omega$, S ₁ = Open	-	-	-	100	-	
		2.5 ±0.2		-	-	-	125	-	
		3.3 ±0.3		-	-	-	150	-	
		5.0 ±0.5		-	-	-	175	-	
t _{PLH} , t _{PHL}	Propagation Delay, CP to Q	1.65	C _L = 15 pF,	-	9.7	1.50	-	16.5	ns
	(Figures 5, 7)	1.8	$R_{D} = 1 M\Omega,$ S ₁ = Open	-	6.5	10.0	-	11.0	
		2.5 ±0.2		-	3.8	6.5	-	7.0	
		3.3 ±0.3		-	2.8	4.5	-	5.0	
		5.0 ±0.5		-	2.2	3.5	-	3.8	
		3.3 ±0.3	C _L = 50 pF,	-	3.4	5.5	-	6.2	
		5.0 ±0.5	- R _D = 500 Ω, S ₁ = Open	-	2.6	4.0	-	4.7	
t _{PZL,} t _{PZH}	Output Enable Time	1.65	C _L = 50 pF,	-	9.0	13.5	-	14.3	ns
	(Figures 5, 8)	1.8	$V_{I} = 2 \times V_{CC},$ $R_{U}, R_{D} = 500 \Omega,$	-	6.0	9.0	-	9.5	
		2.5 ±0.2	$S_1 = GND$ for t_{PZH} $S_1 = V_I$ for t_{PZL}	-	3.7	6.0	-	6.6	
		3.3 ±0.3		-	2.8	5.0	-	5.3	
		5.0 ±0.5		-	2.2	3.7	-	3.9	
t _{PLZ,} t _{PHZ}	Output Disable Time	1.65	C _L = 50 pF,	-	7.7	12.0	-	13.0	ns
	(Figures 5, 8)	1.8	$V_{I} = 2 \times V_{CC},$ $R_{U}, R_{D} = 500 \Omega,$	-	5.1	8.0	-	8.5	
		2.5 ±0.2	$S_1 = GND$ for t_{PHZ} $S_1 = V_I$ for t_{PLZ}	-	3.5	6.0	-	6.3	
		3.3 ±0.3		-	2.8	4.5	-	4.7	
		5.0 ±0.5		-	2.23	3.7	-	3.9	
ts	Setup Time, CP to D	2.5 ±0.2	C _L = 50 pF,	-	-	-	2.5	-	ns
	(Figures 5, 9)	3.3 ±0.3	$R_D = 500 \Omega,$ S ₁ = Open	-	-	-	2.0	-	
		5.0 ±0.5			-	-	1.5	-	
t _H	Hold Time, CP to D	2.5 ±0.2	C _L = 50 pF,	-	-	-	1.5	-	ns
	(Figures 5, 9)	3.3 ±0.3	$R_D = 500 \Omega,$ S ₁ = Open	-	-	-	1.5	-	
		5.0 ±0.5		-	-	-	1.5	-	
t _W	Pulse Width, CP	2.5 ±0.2	C _L = 50 pF,	-	-	-	3.0	-	ns
	(Figures 5, 9)	3.3 ±0.3	· R _D = 500 Ω, S ₁ = Open	-	-	-	2.8	-	
		5.0 ±0.5		-	-	-	2.5	-	

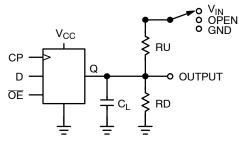
$\textbf{CAPACITANCE}~(T_A=+25^\circ C,~f=1~MHz)$

Symbol	Parameter	Condition	Тур	Max	Units
C _{IN}	Input Capacitance	V_{CC} = Open, V_{IN} = 0 V or V_{CC}	3	-	pF
C _{OUT}	Output Capacitance	V_{CC} = 3.3 V, V_{IN} = 0 V or V_{CC}	4	-	pF
C _{PD}	Power Dissipation Capacitance (Note 2)	V _{CC} = 3.3 V V _{CC} = 5.0 V	10 12	-	pF

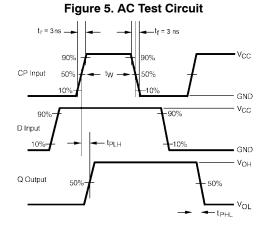
2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 6) C_{PD} is related to I_{CCD} dynamic operating current by the expression: $I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CC} \text{static})$.



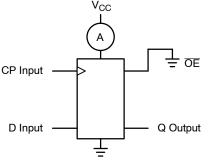
AC Loading and Waveforms



 C_L includes load and stray capacitance Input PRR = 1.0 MHz, t_W = 500 ns.







CP Input = AC Waveform; $t_r = t_f = 1.8$ ns; CP Input PRR = 10 MHz; Duty Cycle = 50% D Input PRR = 5 MHz; Duty Cycle = 50%.

Figure 6. I_{CCD} Test Circuit

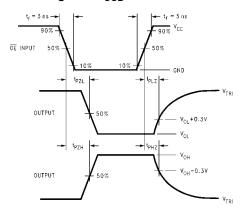


Figure 8. AC Waveforms

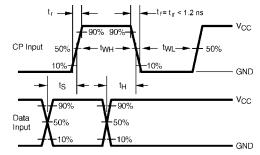


Figure 9. AC Waveforms



ORDERING INFORMATION

Device	Top Mark	Packages	Shipping [†]
NC7SZ374P6X	Z74	SC-88	3000 / Tape & Reel

DISCONTINUED (Note 3)

NC7SZ374P6X-L22347	Z74	SC-88	3000 / Tape & Reel
NC7SZ374L6X	C9	SIP6, MicroPak	5000 / Tape & Reel
NC7SZ374L6X-L22175	C9	SIP6, MicroPak	5000 / Tape & Reel

+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

DISCONTINUED: These devices are not recommended for new design. Please contact your onsemi representative for information. The most current information on these devices may be available on <u>www.onsemi.com</u>.

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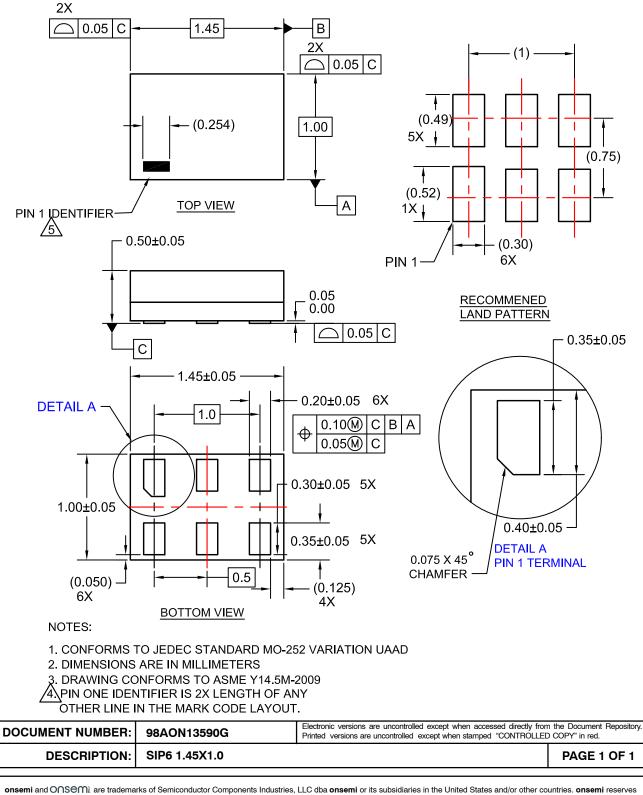




PACKAGE DIMENSIONS

SIP6 1.45X1.0 CASE 127EB ISSUE O

DATE 31 AUG 2016



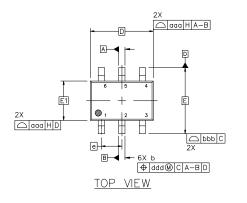
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PACKAGE DIMENSIONS

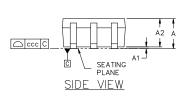
SC-88 2.00x1.25x0.90, 0.65P CASE 419B-02 **ISSUE Z**

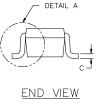
DATE 18 APR 2024

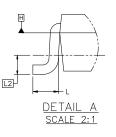




- DIMENSIONING AND TOLERANCING CONFORM TO ASME 1. Y14.5-2018.
- 2.
- ALL DIMENSION ARE IN MILLIMETERS. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 3. PER END.
- 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF DATUMS A AND B ARE DETERMINED AT DATUM H.
- 5.
- DIMENSIONS & AND C APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP. 6.
- DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. 7 ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION & AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.







	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
А			1.10
A1	0.00		0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
С	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
е	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ссс	0.10		
ddd	0.10		

6X 0.66 6X 0.30-2.50 0.65 PITCH

RECOMMENDED MOUNTING FOOTPRINT*

FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

XXXM.

. 0

GENERIC **MARKING DIAGRAM***

6

XXX = Specific Device Code Μ

= Date Code*

= Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42985B	Electronic versions are uncontrolled except when accessed directly from Printed versions are uncontrolled except when stamped "CONTROLLED	
DESCRIPTION:	SC-88 2.00x1.25x0.90, 0.65P		PAGE 1 OF 2
the right to make changes without furth	er notice to any products herein. onsemi make	LLC dba onsemi or its subsidiaries in the United States and/or other courses no warranty, representation or guarantee regarding the suitability of its pr of any product or circuit, and specifically disclaims any and all liability, inc	roducts for any particular

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SC-88 2.00x1.25x0.90, 0.65P CASE 419B-02 ISSUE Z

DATE 18 APR 2024

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13:	STYLE 14:	STYLE 15:	STYLE 16:	STYLE 17:	STYLE 18:
PIN 1. ANODE	PIN 1. VREF	PIN 1. ANODE 1	PIN 1. BASE 1	PIN 1. BASE 1	PIN 1. VIN1
2. N/C	2. GND	2. ANODE 2	2. EMITTER 2	2. EMITTER 1	2. VCC
3. COLLECTOR	3. GND	3. ANODE 3	3. COLLECTOR 2	3. COLLECTOR 2	3. VOUT2
4. EMITTER	4. IOUT	4. CATHODE 3	4. BASE 2	4. BASE 2	4. VIN2
5. BASE	5. VEN	5. CATHODE 2	5. EMITTER 1	5. EMITTER 2	5. GND
6. CATHODE	6. VCC	6. CATHODE 1	6. COLLECTOR 1	6. COLLECTOR 1	6. VOUT1
STYLE 19:	STYLE 20:	STYLE 21:	STYLE 22:	STYLE 23:	STYLE 24:
PIN 1. I OUT	PIN 1. COLLECTOR	PIN 1. ANODE 1	PIN 1. D1 (i)	PIN 1. Vn	PIN 1. CATHODE
2. GND	2. COLLECTOR	2. N/C	2. GND	2. CH1	2. ANODE
3. GND	3. BASE	3. ANODE 2	3. D2 (i)	3. Vp	3. CATHODE
4. V CC	4. EMITTER	4. CATHODE 2	4. D2 (c)	4. N/C	4. CATHODE
5. V EN	5. COLLECTOR	5. N/C	5. VBUS	5. CH2	5. CATHODE
6. V REF	6. COLLECTOR	6. CATHODE 1	6. D1 (c)	6. N/C	6. CATHODE
STYLE 25:	STYLE 26:	STYLE 27:	STYLE 28:	STYLE 29:	STYLE 30:
PIN 1. BASE 1	PIN 1. SOURCE 1	PIN 1. BASE 2	PIN 1. DRAIN	PIN 1. ANODE	PIN 1. SOURCE 1
2. CATHODE	2. GATE 1	2. BASE 1	2. DRAIN	2. ANODE	2. DRAIN 2
3. COLLECTOR 2	3. DRAIN 2	3. COLLECTOR 1	3. GATE	3. COLLECTOR	3. DRAIN 2
4. BASE 2	4. SOURCE 2	4. EMITTER 1	4. SOURCE	4. EMITTER	4. SOURCE 2
5. EMITTER	5. GATE 2	5. EMITTER 2	5. DRAIN	5. BASE/ANODE	5. GATE 1
6. COLLECTOR 1	6. DRAIN 1	6. COLLECTOR 2	6. DRAIN	6. CATHODE	6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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DESCRIPTION:	SC-88 2.00x1.25x0.90, 0.65P		PAGE 2 OF 2

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