

16-Channel Discrete-to-Digital
28V / Open and Open / Ground Sensors
with Integrated Lightning Protection

DESCRIPTION

The HI-84220 is a sixteen channel discrete-to-digital interface device. The device has eight channels designed to sense 28 V / Open signals and eight channels that sense Open / Ground signals. Data is multiplexed from each bank of sensors to an eight bit digital databus. All sense inputs are internally lightning protected to RTCA/DO160G, Section 22 Level 3 Pin Injection Test Waveform Set A (3 & 4), Set B (3 & 5A) and Set Z (3 & 5B) without using external components. The device outputs are CMOS / TTL compatible and may be disabled (tri-state) using the \overline{CE} and \overline{OE} pins.

The HI-84220 is offered in a small footprint 32-pin Plastic Quad Flat Package (PQFP).

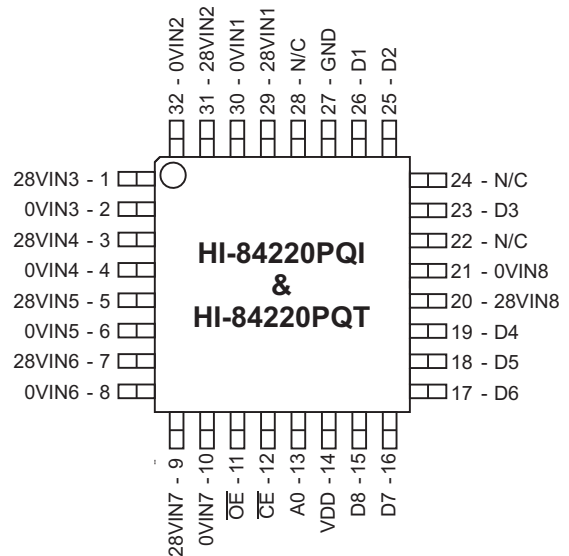
FUNCTION TABLE

28V Inputs	0V Inputs	A0	\overline{CE}	\overline{OE}	Output
Open	X	1	0	0	1
28 Volts	X	1	0	0	0
X	Open	0	0	0	0
X	Ground	0	0	0	1
X	X	X	1	X	High Z
X	X	X	X	1	High Z

FEATURES

- 8 independent 28V / Open sensing channels
- 8 independent Open / Ground sensing channels
- Sense inputs internally lightning protected to RTCA/DO160G, Section 22 Level 3 Pin Injection Test Waveform Set A (3 & 4), Set B (3 & 5A) and Set Z (3 & 5B) without using external components
- 5.0V single supply operation
- Low power CMOS technology
- Industrial and Extended temperature ranges

PIN CONFIGURATION

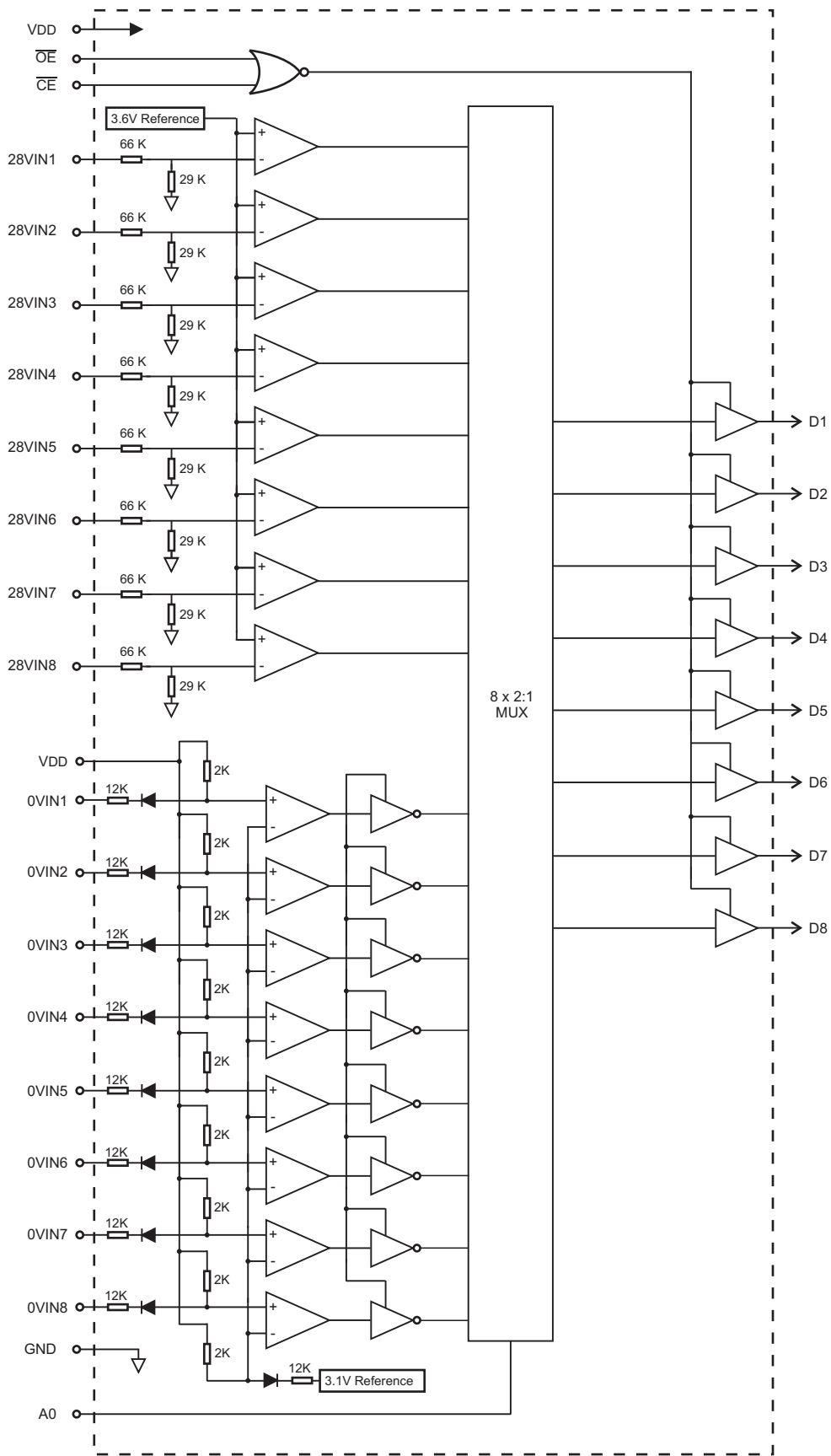


32 Pin PQFP package

PIN DESCRIPTIONS

PIN	SYMBOL	FUNCTION	DESCRIPTION
1	28VIN3	Discrete Input	28 Volt / Open sensing input, channel 3
2	0VIN3	Discrete Input	Open / Ground sensing input, channel 3
3	28VIN4	Discrete Input	28 Volt / Open sensing input, channel 4
4	0VIN4	Discrete Input	Open / Ground sensing input, channel 4
5	28VIN5	Discrete Input	28 Volt / Open sensing input, channel 5
6	0VIN5	Discrete Input	Open / Ground sensing input, channel 5
7	28VIN6	Discrete input	28 Volt / Open sensing input, channel 6
8	0VIN6	Discrete Input	Open / Ground sensing input, channel 6
9	28VIN7	Discrete Input	28 Volt / Open sensing input, channel 7
10	0VIN7	Discrete Input	Open / Ground sensing input, channel 7
11	\overline{OE}	Digital input	Output Enable. D1-D8 are high-impedance if \overline{OE} is high
12	\overline{CE}	Digital input	Chip Enable. D1-D8 are high-impedance if \overline{CE} is high
13	A0	Digital input	When A0 is high D1 - D8 outputs data from 28V comparators When A0 is low D1 - D8 show results from 0V comparators
14	VDD	Power	Positive supply voltage 5.0 V
15	D8	Tri-state output	Logic output, channel 8
16	D7	Tri-state output	Logic output, channel 7
17	D6	Tri-state output	Logic output, channel 6
18	D5	Tri-state output	Logic output, channel 5
19	D4	Tri-state output	Logic output, channel 4
20	28VIN8	Discrete Input	28 Volt / Open sensing input, channel 8
21	0VIN8	Discrete Input	Open / Ground sensing input, channel 8
22	N/C		Not connected
23	D3	Tri-state output	Logic output, channel 3
24	N/C		Not connected
25	D2	Tri-state output	Logic output, channel 2
26	D1	Tri-state output	Logic output, channel 1
27	GND	Power	Ground
28	N/C		Not connected
29	28VIN1	Discrete Input	28 Volt / Open sensing input, channel 1
30	0VIN1	Discrete Input	Open / Ground sensing input, channel 1
31	28VIN2	Discrete Input	28 Volt / Open sensing input, channel 2
32	0VIN2	Discrete Input	Open / Ground sensing input, channel 2

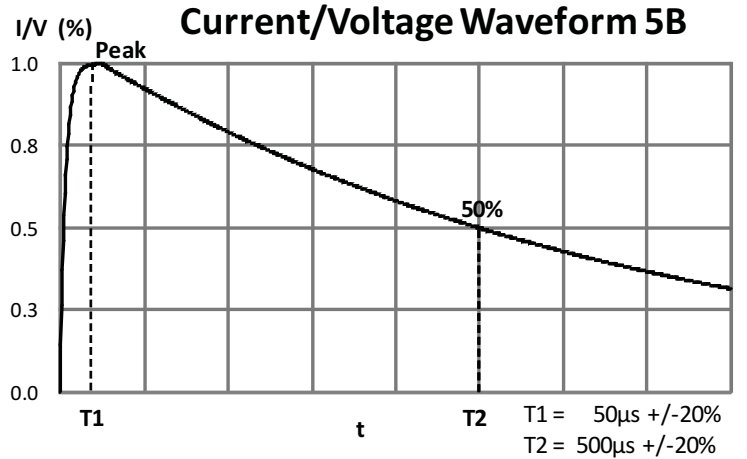
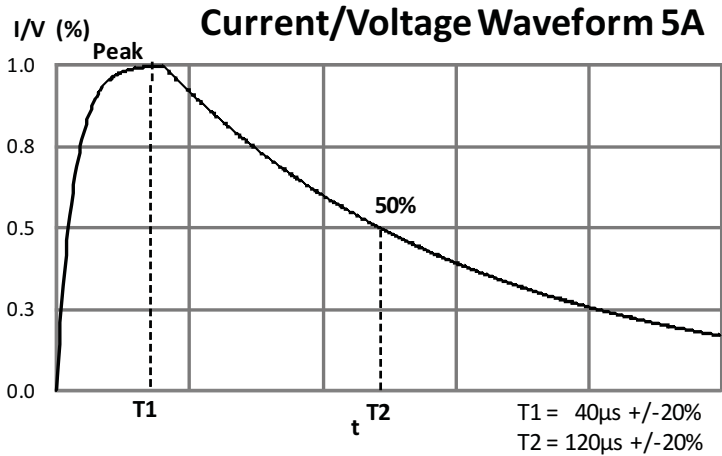
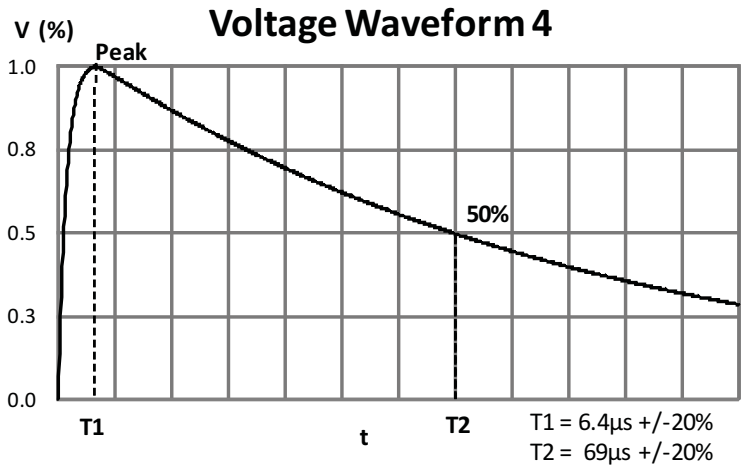
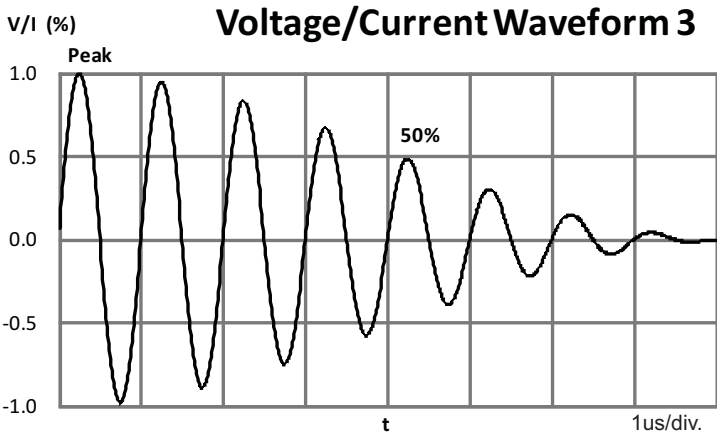
BLOCK DIAGRAM



LIGHTNING PROTECTION

All discrete inputs are protected to RTCA/DO-160G, Section 22, Categories A3 and B3, Waveforms 3, 4, 5A, 5B with no external components. See table and waveforms below.

Level	Waveforms			
	3/3	4/4	5A/5A	5B/5B
	Voc (V) / Isc (A)	Voc (V) / Isc (A)	Voc (V) / Isc (A)	Voc (V) / Isc (A)
3	600/24	300/60	300/300	300/300



ABSOLUTE MAXIMUM RATINGS

Supply voltage (VDD)	-0.3 V to +7 V
Logic input voltage range	-0.3 V to (VDD + 0.3) V
Discrete input voltage range: 28V / Open Sensing Open / Ground Sensing	-80 V to + 80 V -80 V to + 80 V
Power dissipation at 25°C	350 mW
Solder Temperature (Reflow)	260°C
Storage Temperature	-65°C to +150°C

RECOMMENDED OPERATING CONDITIONS

Supply Voltage	
VDD	4.5 V to 5.5 V
Operating Temperature Range	
Industrial Screening	-40°C to +85°C
Hi-Temp Screening	-55°C to +125°C

NOTE: Stresses above absolute maximum ratings or outside recommended operating conditions may cause permanent damage to the device. These are stress ratings only. Operation at the limits is not recommended.

DC ELECTRICAL CHARACTERISTICS

VDD = 5.0V ± 10%, GND = 0V, TA = Operating Temperature Range (unless otherwise specified).

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNITS
28 V / OPEN DISCRETE INPUTS						
Open state input voltage	V _{SO}	Input voltage to give high output	-5		10	V
28 V state input voltage	V _{S28}	Input voltage to give low output	14			V
Open state input current	I _{SO}	Maximum input current to give high output			84	µA
28 V state input current	I _{S28}	Minimum input current to give low output	197			µA
Input resistance	R _{IN}	0 V < V _{IN} < 16 V	71		119	kΩ
Input current at 28 V	I _{IN28}	V _{IN} = 28 V			394	µA
OPEN / GROUND DISCRETE INPUTS						
Ground state input voltage	V _{SG}	Input voltage to give high output			3.0	V
Open state input voltage	V _{SO}	Input voltage to give low output	3.5			V
Ground state input resistor	R _{IG}	Resistor from input to ground to give high output	0		100	Ω
Open state input resistor	R _{IO}	Resistor from input to ground to give low output (TA = 25C) Operating Temp. Range	100 160			kΩ kΩ
Input source current	I _{IO}	Current sourced into 100Ω to ground	-100	-330		µA
Reverse leakage current	I _{IR}	V _{IN} = 35 V, V _{DD} = 0 V			100.0	µA

DC ELECTRICAL CHARACTERISTICS (cont.)

VDD = 5.0V ± 10%, GND = 0V, TA = Operating Temperature Range (unless otherwise specified).

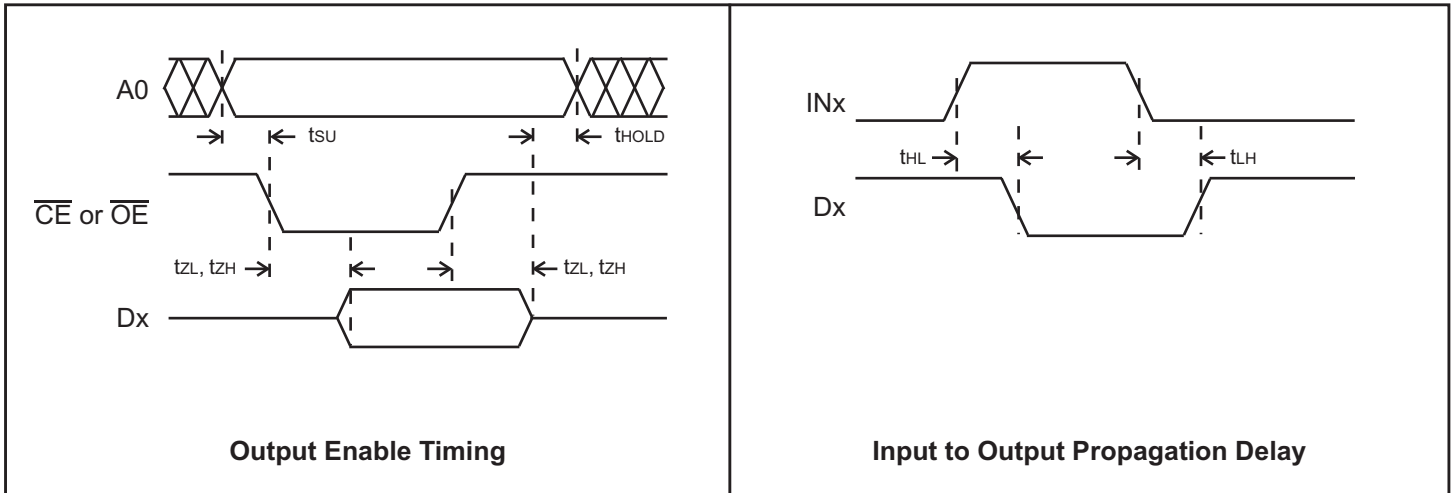
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNITS
LOGIC INPUTS (\overline{CE} , \overline{OE})						
Input Voltage	Input voltage HI	V _{IH}	2.0			V
	Input voltage LO	V _{IL}			0.8	V
Input current	Input sink	I _{IH}			1.0	μA
	Input source	I _{IL}	V _{IH} = V _{DD} V _{IL} = 0 V		-1.0	μA
OUTPUTS						
Logic output voltage	High	V _{OH}	I _{OH} = -5 mA	2.4		V
	Low	V _{OL}	I _{OL} = 5 mA		0.4	V
Logic output voltage (CMOS)	High	V _{OH}	I _{OH} = -100 μA	V _{DD} - 0.05		V
	Low	V _{OL}	I _{OL} = 100 μA		V _{SS} + 0.05	V
Tri-state output current	I _{oz}	V _{OUT} = 0 V or V _{DD} V _{DD} = 5.5V			±10	μA
SUPPLY CURRENT						
V _{DD} current	I _{DD}	V _{IN} = 0 V (28V inputs) V _{IN} = V _{DD} (other inputs)		10	20	mA

AC ELECTRICAL CHARACTERISTICS

VDD = 5.0V ± 10%, GND = 0V, TA = Operating Temperature Range (unless otherwise specified).

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNITS
SWITCHING CHARACTERISTICS						
Propagation delay	IN to OUT	t _{LH} , t _{HL}			500	ns
Output enable time		t _{ZL} , t _{ZH}			25	ns
Output disable time		t _{LZ} , t _{HZ}			25	ns
A0 Set-up time		t _{SU}	0			ns
A0 Hold time		t _{HOLD}	0			ns

TIMING DIAGRAMS



INPUT SWITCHING THRESHOLD

The input switching threshold of the Open / Ground inputs will decrease with increasing series resistance according to the function

$$V_T = 3.25 - 0.1R$$

where V_T is the nominal input switching threshold, and R is the value of the external series resistor in Kohms.

ORDERING INFORMATION

HI - 84220PQ x x

PART NUMBER	LEAD FINISH
Blank	Tin / Lead (Sn / Pb) Solder
F	100% Matte Tin (Pb-free, RoHS compliant)

PART NUMBER	TEMPERATURE RANGE	FLOW	BURN IN
I	-40°C TO +85°C	I	NO
T	-55°C TO +125°C	T	NO

PART NUMBER	PACKAGE DESCRIPTION
84220PQ	32 PIN PLASTIC QUAD FLATPACK PQFP (32PTQS)

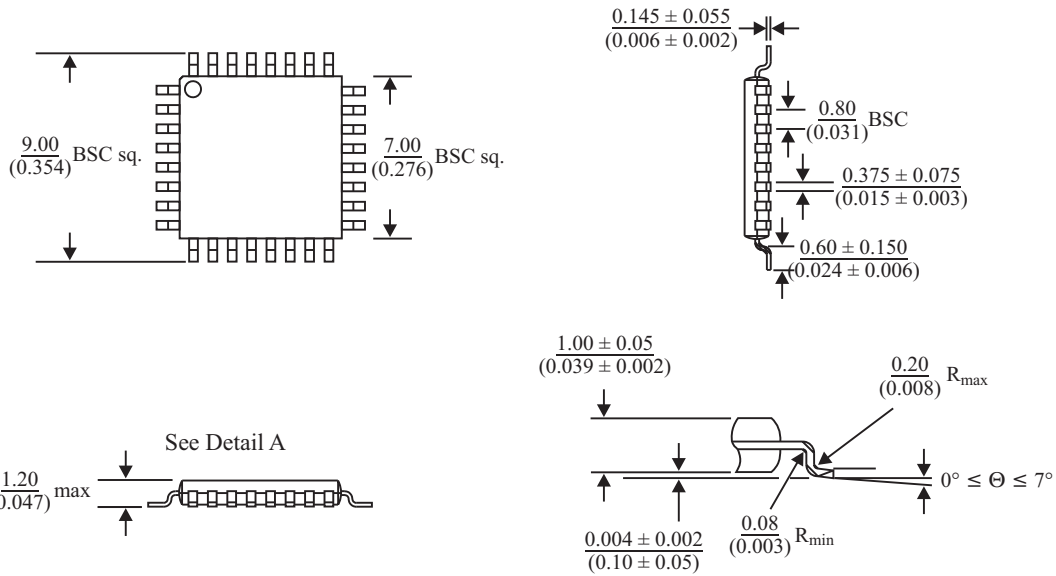
REVISION HISTORY

P/N	Rev	Date	Description of Change
DS84220	New	08/27/18	Initial Release.

32 PIN PLASTIC QUAD FLAT PACK (PQFP)

millimeters (inches)

Package Type: 32PQS



BSC = "Basic Spacing between Centers" is theoretical true position dimension and has no tolerance. (JEDEC Standard 95)