HOLT INC.
INTEGRATED CIRCUITS

September 2014

DESCRIPTION

The HI-8422 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. Mixed-signal CMOS technology is used to provide superior low-power performance. The device outputs are CMOS / TTL compatible and may be disabled (tri-state) using the $\overline{CE}$ and $\overline{OE}$ pins.

The HI-8422 is offered in a small footprint 32-pin Plastic Quad Flat Package (PQFP). Please contact the Holt sales department for other packaging options.
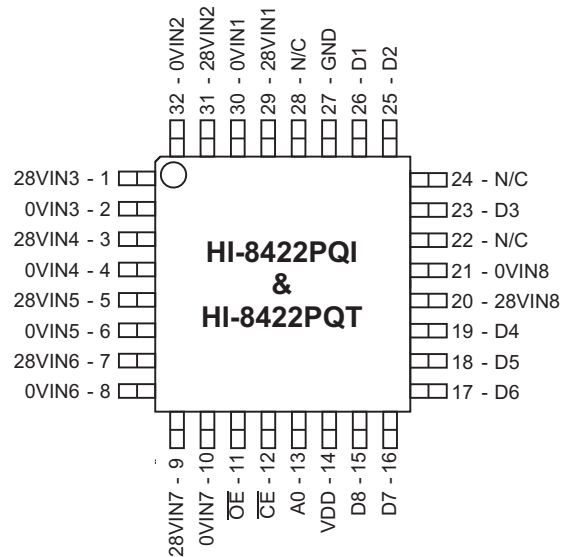
FEATURES

- 8 independent 28 Volt / Open sensing channels

- 8 independent Open / Ground sensing channels

- 5.0 V single supply operation

- Low power CMOS technology

- Industrial and Extended temperature ranges

FUNCTION TABLE

28V Inputs	0 V 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

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
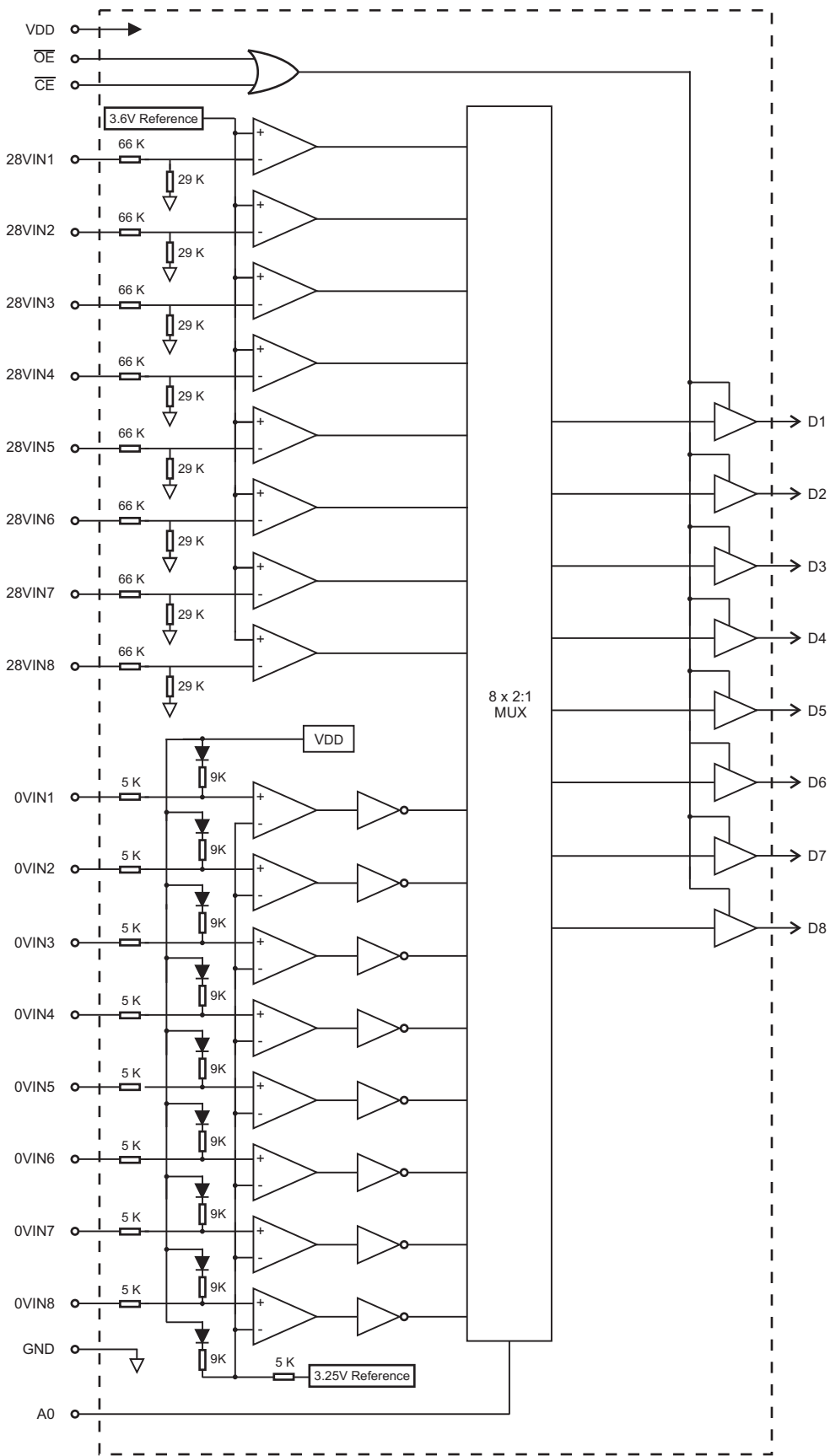
ABSOLUTE MAXIMUM RATINGS

Supply voltage (VDD)	-0.3 V to +7 V
Logic input voltage range	-0.3 V to +5.5 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 .... Hi-Temp Screening	 -40°C to +85°C -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

$VDD = 5.0V \pm 10\%$, GND = 0V, T_A = 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	100			KΩ
Input source current		I_{IO}	Current sourced into 100Ω to ground	-100	-330		µA
Reverse leakage current		I_{IR}	$V_{IN} = 35 V$, $V_{DD} = 0 V$			5.0	mA
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}	$V_{IH} = V_{DD}$			1.0	µA
	Input source	I_{IL}	$V_{IL} = 0 V$	-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}	$I_{OH} = -100 uA$	$V_{DD} - 0.2$			V
	Low	V_{OL}	$IOL = 100 uA$			0.2	V
Tri-state output current		I_{OZ}	$V_{OUT} = 0 V$ or V_{DD}			±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, T_A = 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}	From $\overline{CE}$ or $\overline{OE}$			25	ns
Output disable time		t_{LZ}, t_{HZ}	From $\overline{CE}$ or $\overline{OE}$			25	ns
A0 Set-up time		t_{SU}		0			ns
A0 Hold time		t_{HOLD}		0			ns

TIMING DIAGRAMS

Output Enable Timing

Input to Output Propagation Delay
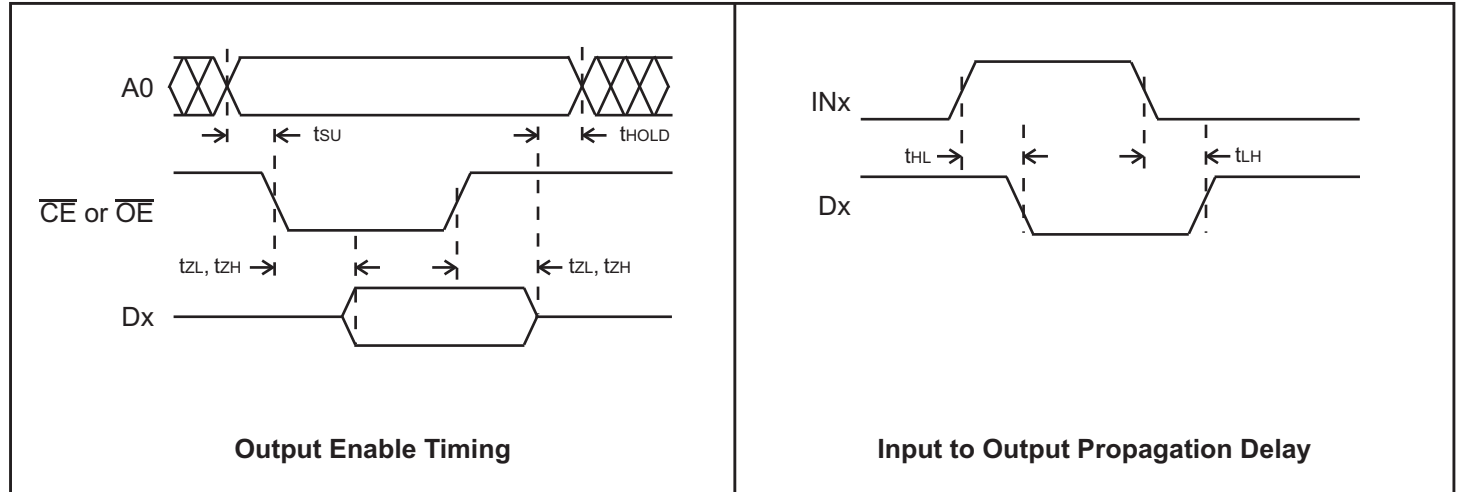
INPUT SWITCHING THRESHOLD

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 - 8422PQ 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
8422PQ	32 PIN PLASTIC QUAD FLATPACK PQFP (32PTQS)

REVISION HISTORY

P/N	Rev	Date	Description of Change
DS8422	G	08/04/10	Removed reference to lightning protected inputs throughout datasheet, changed discrete input voltage range and clarified temperature ranges in Features.
	H	09/08/14	Clarified reflow solder temperature in Absolute Maximum Ratings. Updated 32PTQS package drawing to 32PQS.

32 PIN PLASTIC QUAD FLAT PACK (PQFP)

millimeters (inches)

Package Type: 32PQS

$\frac{9.00}{(0.354)}$ BSC sq.

$\frac{7.00}{(0.276)}$ BSC sq.

$\frac{0.145 \pm 0.055}{(0.006 \pm 0.002)}$

$\frac{0.80}{(0.031)}$ BSC

$\frac{0.375 \pm 0.075}{(0.015 \pm 0.003)}$

$\frac{0.60 \pm 0.150}{(0.024 \pm 0.006)}$

See Detail A

$\frac{1.20}{(0.047)}$ max

$\frac{1.00 \pm 0.05}{(0.039 \pm 0.002)}$

$\frac{0.20}{(0.008)}$ R_{max}

$0° \leq \Theta \leq 7°$

$\frac{0.004 \pm 0.002}{(0.10 \pm 0.05)}$

$\frac{0.08}{(0.003)}$ R_{min}
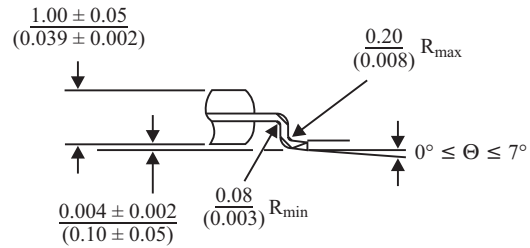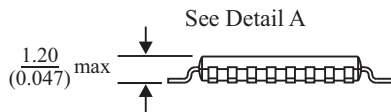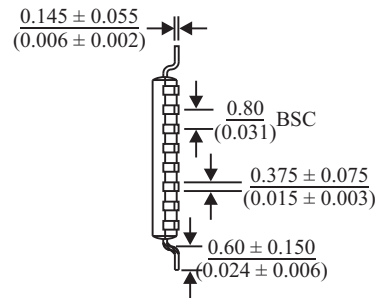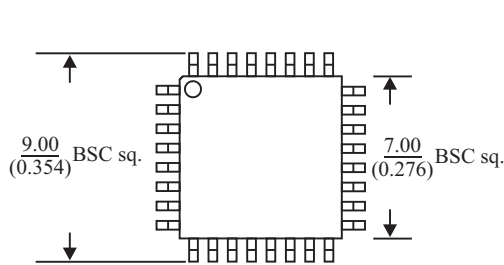
Detail A

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