



Product Change Notification / SYST-17ZKFY392

Date:

18-Dec-2020

Product Category:

Analog Multiplexer/Switch ICs

PCN Type:

Document Change

Notification Subject:

Data Sheet - HV2607/2707/2708 Data Sheet Data Sheet Document Revision

Affected CPNs:

[SYST-17ZKFY392_Affected_CPN_12182020.pdf](#)

[SYST-17ZKFY392_Affected_CPN_12182020.csv](#)

Notification Text:

SYST-17ZKFY392

Microchip has released a new Product Documents for the HV2607/2707/2708 Data Sheet of devices. If you are using one of these devices please read the document located at [HV2607/2707/2708 Data Sheet](#).

Notification Status: Final

Description of Change: 1. Updated the Block Diagram. 2. Added the Negative Supply Voltage throughout Section 1.0 "Electrical Characteristics". 3. Updated Figure 2-1. 4. Updated Table 2-1 with the Negative Supply Voltage pin. 5. Updated all the figures in Section 3.0 "Test Circuit Examples". 6. Updated Section 5.4 "Power-up/Down Sequence and Decoupling Capacitor" and Section 5.5 "Layout Considerations".

Impacts to Data Sheet: None

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 18 Dec 2020

NOTE: Please be advised that this is a change to the document only the product has not been changed.

Markings to Distinguish Revised from Unrevised Devices: N/A

Attachments:

[HV2607/2707/2708 Data Sheet](#)

Please contact your local [Microchip sales office](#) with questions or concerns regarding this notification.

Terms and Conditions:

If you wish to receive Microchip PCNs via email please register for our PCN email service at our [PCN home page](#) select register then fill in the required fields. You will find instructions about registering for Microchips PCN email service in the [PCN FAQ](#) section.

If you wish to change your PCN profile, including opt out, please go to the [PCN home page](#) select login and sign into your myMicrochip account. Select a profile option from the left navigation bar and make the applicable selections.

Affected Catalog Part Numbers (CPN)

HV2607T-C/R8X

HV2707T-C/R8X

HV2708T-C/R8X

No High-Voltage Bias, Low Harmonic Distortion, 16-Channel, High-Voltage Analog Switch

Features

- 16-Channel High-Voltage Analog Switch
- Analog Signal Voltage Up to $\pm 100V$
- Only +5V Bias Supply Required
- 3.3V and 5V CMOS Input Logic Level
- 66 MHz Data Shift Clock Frequency
- Ultra-Low Quiescent Current $< 10 \mu A$
- Low Parasitic Capacitance
- Low Harmonic Distortion
- DC to 100 MHz Analog Small Signal Frequency
- 200 kHz to 50 MHz Large Signal Frequency
- -76 dB Typical Off Isolation at 5.0 MHz
- Excellent Noise Immunity
- Cascadable Serial Data Register with Latches
- Integrated Bleed Resistors on the Outputs (both sides for HV2707, one side for HV2708)

Application

- Medical Ultrasound Imaging
- Non-Destructive Testing (NDT) Metal Flaw Detection
- Piezoelectric Transducer Drivers
- Inkjet Printer Head
- Optical MEMS Module

General Description

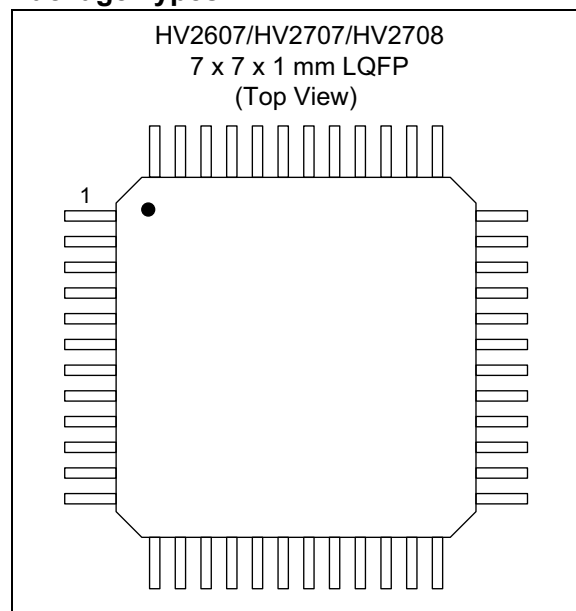
HV2607/HV2707/HV2708 devices are low harmonic distortion, low charge injection, 16-channel, high-voltage analog switches without high-voltage supplies. They are intended for use in applications requiring high-voltage switching controlled by low-voltage control signals, such as medical ultrasound imaging, driving piezoelectric transducers and printers.

The HV2707 has integrated bleed resistors at both sides of the switches. The HV2708 has integrated bleed resistors at the SWA side only. The HV2607 has no bleed resistors. The bleed resistor eliminates voltage build up on capacitive loads, such as piezoelectric transducers.

The HV2607/HV2707/HV2708 devices require no high-voltage supplies and require only +5V or +6V bias supply. The analog input voltage range is up to $\pm 100V$, even though there are no high-voltage supplies.

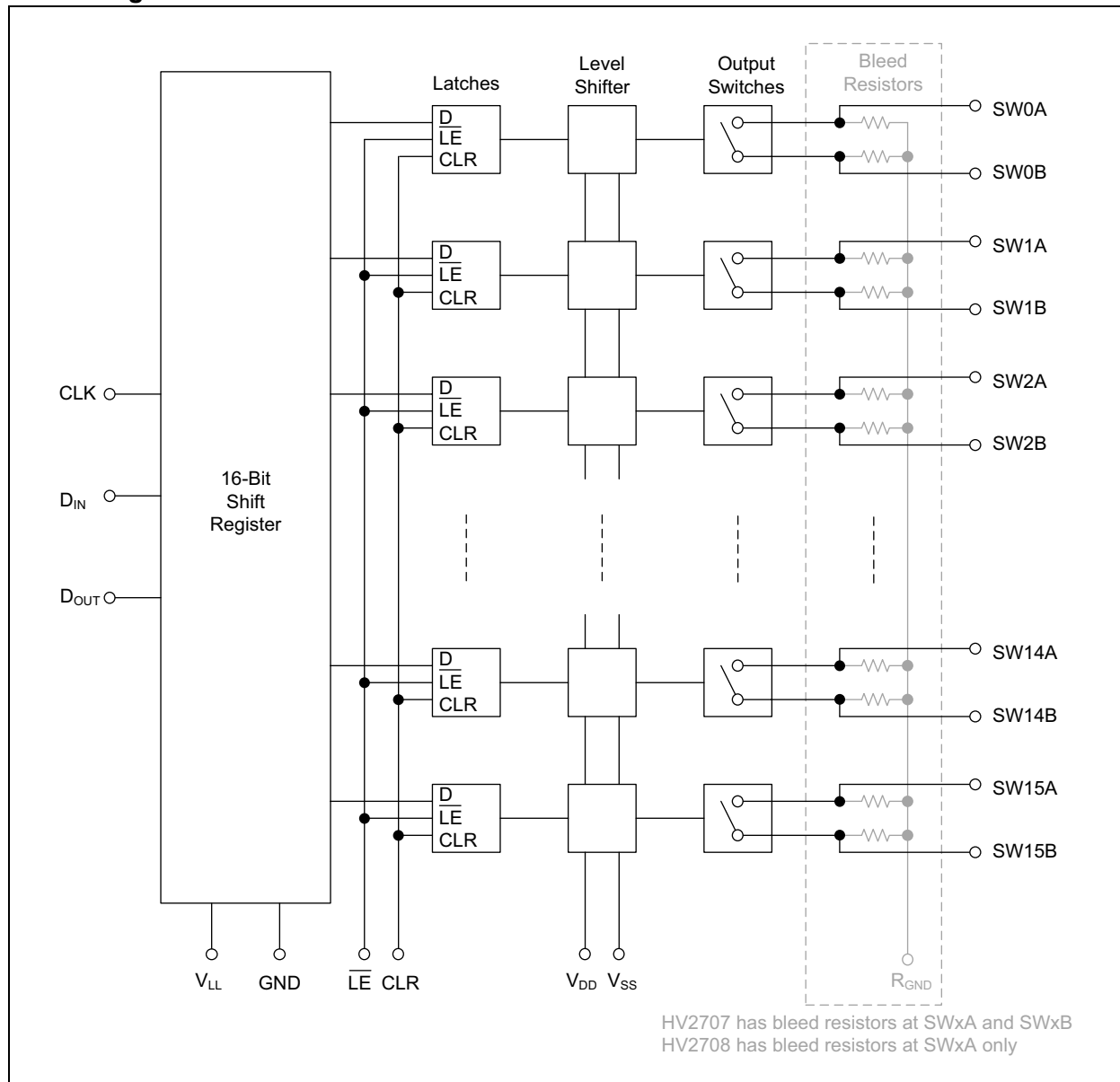
The HV2607/HV2707/HV2708 devices are offered in a 48-pin LQFP package, which is pin-to-pin compatible with HV2601/HV2701 and HV2605/HV2705 devices, except power supply pins.

Package Types



HV2607/HV2707/HV2708

Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Logic Supply Voltage (V_{LL})	-0.5V to 6.6V
Positive Supply Voltage (V_{DD})	-0.5V to 6.6V
Negative Supply Voltage (V_{SS})	-6.6V to 0.5V
Logic Input Voltage (V_{IN})	-0.5V to $V_{LL} + 0.3V$
Analog Signal Range (V_{SIG})	-110V to +110V
Peak Analog Signal Current/Channel (I_{PK})	1.9A

† **Notice:** Stresses above those listed under “Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS^(1,2,3)

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Logic Supply Voltage	V_{LL}	3	—	5.5	V	
Positive Supply Voltage	V_{DD}	4.5	—	6.3	V	
Negative Supply Voltage	V_{SS}	-6.3	—	-4.5	V	Or floating
High-Level Input Voltage	V_{IH}	$0.9 V_{LL}$	—	V_{LL}	V	
Low-Level Input Voltage	V_{IL}	0	—	$0.1 V_{LL}$	V	
Analog Signal Voltage Peak-to-Peak	V_{SIG}	-100	—	100	V	

- Note 1:** Power-up sequence is V_{LL} first and then V_{DD}/V_{SS} . Power-down sequence is the reverse of power-up.
Note 2: V_{SIG} must be $GND \leq V_{SIG} \leq V_{DD}$ or floating during power-up/down transition.
Note 3: Rise and fall times of power supplies, V_{LL} , V_{SS} and V_{DD} , should be greater than 1.0 ms.

HV2607/HV2707/HV2708

DC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $V_{LL} = +5V$, $V_{DD} = +5V$, $V_{SS} = NC$, $T_A = +25^\circ C$.

Boldface specifications apply over the full operating temperature range.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions/Comments
Small Signal Switch On-Resistance	R_{ONS}	—	14	23	Ω	$I_{SIG} = 5 \text{ mA}$
		—	14.5	23	Ω	$I_{SIG} = 200 \text{ mA}$
Small Signal Switch On-Resistance Matching	ΔR_{ONS}	—	5	20	%	$I_{SIG} = 5 \text{ mA}$
Large Signal Switch On-Resistance	R_{ONL}	—	12	—	Ω	$V_{SIG} = 90V$, $R_{LOAD} = 70\Omega$ (Note 1)
Value of Output Bleed Resistor (HV2707/HV2708 only)	R_{INT}	20	35	50	$k\Omega$	$I_{RINT} = 0.1 \text{ mA}$
Switch Off Leakage per Switch	I_{SOL}	—	—	10	μA	$V_{SIG} = +100V$, 500 μs pulse, see Figure 3-1
		—	—	10	μA	$V_{SIG} = -100V$, 100 μs pulse, see Figure 3-1 (Note 1)
HV2607						
Switch Off Bias per Switch	I_{SOB}	—	—	3	μA	$V_{SIG} = +100V$, 500 μs pulse, see Figure 3-2
		—	—	100	μA	$V_{SIG} = -100V$, 100 μs pulse, see Figure 3-2 (Note 1)
HV2707						
Switch Off Bias of All SWA and SWB Switches	I_{SOB}	—	—	3	μA	$V_{SIG} = +100V$, 500 μs pulse, see Figure 3-2
		—	—	3	mA	$V_{SIG} = -100V$, 100 μs pulse, see Figure 3-2 (Note 1)
HV2708						
Switch Off Bias of All SWA (with Bleed Resistor) Switches	I_{SOB}	—	—	3	μA	$V_{SIG} = +100V$, 500 μs pulse, see Figure 3-2
		—	—	1.5	mA	$V_{SIG} = -100V$, 100 μs pulse, see Figure 3-2 (Note 1)
Switch Off Bias per SWB (without Bleed Resistor) Switch	I_{SOB}	—	—	3	μA	$V_{SIG} = +100V$, 500 μs pulse, see Figure 3-2
		—	—	100	μA	$V_{SIG} = -100V$, 100 μs pulse, see Figure 3-2 (Note 1)
Switch Off DC Offset	V_{OS}	—	1	10	mV	$R_{LOAD} = 25 \text{ k}\Omega$ (HV2607)/50 $k\Omega$ (HV2708), no load (HV2707), see Figure 3-3 (Note 1)
Switch On DC Offset		—	1	10		
Quiescent V_{DD} Supply Current	I_{DDQ}	—	—	10	μA	All switches off
		—	—	10		All switches on, $V_{SW} = 1V$
		—	—	20		All switches off, $V_{SS} = -5V$ (Note 1)
		—	—	20		All switches on, $V_{SW} = 1V$, $V_{SS} = -5V$ (Note 1)
Quiescent V_{SS} Supply Current	I_{SSQ}	—	—	20	μA	$V_{SS} = -5V$ (Note 1)
Quiescent V_{LL} Supply Current	I_{LLQ}	—	1	10	μA	All logic inputs are GND
Switch Output Peak Current	I_{SW}	1.3	1.9	—	A	V_{SIG} duty cycle < 0.1% (Note 1)
Output Switching Frequency	f_{SW}	—	—	50	kHz	Duty cycle = 50% (Note 1)
Average V_{DD} Supply Current	I_{DD}	—	3.7	6	mA	All output switches are turning on and off at 50 kHz with no load
		—	3	5	mA	All output switches are turning on and off at 50 kHz with no load, $V_{SS} = -5V$ (Note 1)
Average V_{SS} Supply Current	I_{SS}	—	1	2	mA	All output switches are turning on and off at 50 kHz with no load, $V_{SS} = -5V$ (Note 1)

DC ELECTRICAL CHARACTERISTICS (CONTINUED)

Unless otherwise specified, $V_{LL} = +5V$, $V_{DD} = +5V$, $V_{SS} = NC$, $T_A = +25^\circ C$.

Boldface specifications apply over the full operating temperature range.

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions/Comments
Average V_{LL} Supply Current	I_{LL}	—	0.3	0.5	mA	$f_{CLK} = 5.0 \text{ MHz}$, $f_{DIN} = 2.5 \text{ MHz}$
Data Out Source Current	I_{SOR}	10	—	—	mA	$V_{OUT} = V_{LL} - 0.7V$
Data Out Sink Current	I_{SINK}	10	—	—	mA	$V_{OUT} = 0.7V$
Logic Input Capacitance	C_{IN}	—	8	—	pF	Note 2

Note 1: Specification is obtained by characterization and is not 100% tested.

2: Design guidance only.

HV2607/HV2707/HV2708

AC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $V_{LL} = +5V$, $V_{DD} = +5V$, $V_{SS} = NC$, $t_R = t_F \leq 5.0$ ns, 50% duty cycle, $T_A = +25^\circ C$. Boldface specifications apply over the full operating temperature range.						
Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions/Comments
Setup Time Before \overline{LE} Rises	t_{SD}	25	—	—	ns	Note 1
Time Width of \overline{LE}	t_{WLE}	12	—	—	ns	Note 1
Clock Delay Time to Data Out	t_{DO}	—	—	13.5	ns	
Time Width of CLR	t_{WCLR}	55	—	—	ns	Note 1
Setup Time Data to Clock	t_{SU}	1.5	—	—	ns	Note 1
Hold Time Data from Clock	t_H	1.5	—	—	ns	Note 1
Clock Frequency	f_{CLK}	—	—	66	MHz	50% duty cycle, $f_{DIN} = (1/2)f_{CLK}$, $C_{DOUT} = 20$ pF (Note 1)
Clock Rise and Fall Times	t_R, t_F	—	—	50	ns	
Turn-On Time	t_{ON}	—	—	5	μs	$V_{SIG} = 5V$, $R_{LOAD} = 550\Omega$, see Figure 3-4
Turn-Off Time	t_{OFF}	—	—	5	μs	$V_{SIG} = 5V$, $R_{LOAD} = 550\Omega$, see Figure 3-4
Input Large Signal Pulse Width	t_{PW}	—	—	2.5	μs	$V_{PULSE} = 0V$ to $\pm 100V$, measured at 90% amplitude, see Figure 3-5 (Note 1)
Maximum V_{SIG} Slew Rate	dV/dt	—	—	20	V/ns	Note 1
Analog Small Signal Frequency	f_{BWS}	—	100	—	MHz	Note 1
Off Isolation	K_O	—	-64	-60	dB	$f = 5.0$ MHz, 1.0 k Ω /15 pF load, see Figure 3-6 (Note 1)
		—	-76	-70	dB	$f = 5.0$ MHz, 50 Ω load, see Figure 3-6 (Note 1)
Switch Crosstalk	K_{CR}	—	-70	-60	dB	$f = 5.0$ MHz, 50 Ω load, see Figure 3-7 (Note 1)
Off Capacitance SW to GND	$C_{SG(OFF)}$	—	9	—	pF	$V_{SIG} = 50$ mV @ 1 MHz, no load (Note 1)
On Capacitance SW to GND	$C_{SG(ON)}$	—	17	—	pF	$V_{SIG} = 50$ mV @ 1 MHz, no load (Note 1)
Output Voltage Spike at SWA, SWB	V_{SPK}	—	—	50	mVpp	$R_{LOAD} = 50\Omega$, see Figure 3-8 (Note 1)
Charge Injection	QC	—	110	—	pC	See Figure 3-8 (Note 1)
Second Harmonic Distortion	HD2	—	-64	—	dBc	$V_{SIG} = 1.5V$ @ 5 MHz, 50 Ω load (Note 1)
		—	-60	—	dBc	$V_{SIG} = 1.5V$ @ 5 MHz, 1 k Ω /15 pF load (Note 1)

Note 1: Specification is obtained by characterization and is not 100% tested.

TEMPERATURE SPECIFICATION

Parameters	Sym	Min	Typ	Max	Units	Conditions
Temperature Range						
Operating Temperature	T_A	0	—	+70	°C	
Storage Temperature	T_S	-65	—	+150	°C	
Maximum Junction Temperature	T_J	—	—	+125	°C	
Package Thermal Resistance						
Thermal Resistance, LQFP	Θ_{JA}	—	52	—	°C/W	

TABLE 1-1: TRUTH TABLE ^(1,2,3,4,5,6)

D0	D1	...	D7	D8	...	D15	\overline{LE}	CLR	SW0	SW1	...	SW7	SW8	...	SW15
L	—		—	—		—	L	L	OFF	—		—	—		—
H	—		—	—		—	L	L	ON	—		—	—		—
—	L		—	—		—	L	L	—	OFF		—	—		—
—	H		—	—		—	L	L	—	ON		—	—		—
—	—		—	—		—	L	L	—	—		—	—		—
—	—		—	—		—	L	L	—	—		—	—		—
—	—		—	—		—	L	L	—	—		—	—		—
—	—		L	—		—	L	L	—	—		OFF	—		—
—	—	...	H	—	...	—	L	L	—	—		ON	—	...	—
—	—		—	L		—	L	L	—	—		—	OFF		—
—	—		—	H		—	L	L	—	—		—	ON		—
—	—		—	—		—	L	L	—	—		—	—		—
—	—		—	—		—	L	L	—	—		—	—		—
—	—		—	—		L	L	L	—	—		—	—		OFF
—	—		—	—		H	L	L	—	—		—	—		ON
X	X	X	X	X	X	X	H	L	HOLD PREVIOUS STATE						
X	X	X	X	X	X	X	X	H	ALL SWITCHES OFF						

Note 1: The 16 switches operate independently.

2: Serial data are clocked in on the L to H transition of the CLK.

3: All 16 switches go to a state retaining their latched condition at the rising edge of \overline{LE} . When \overline{LE} is low, the shift registers' data flow through the latch.

4: D_{OUT} is high when the data in Register 15 are high.

5: Shift register clocking has no effect on the switch states if \overline{LE} is high.

6: The CLR (clear) input overrides all of the inputs.

HV2607/HV2707/HV2708

1.1 Typical Timing Diagram

Figure 1-1 shows the timing of AC characteristic parameters graphically.

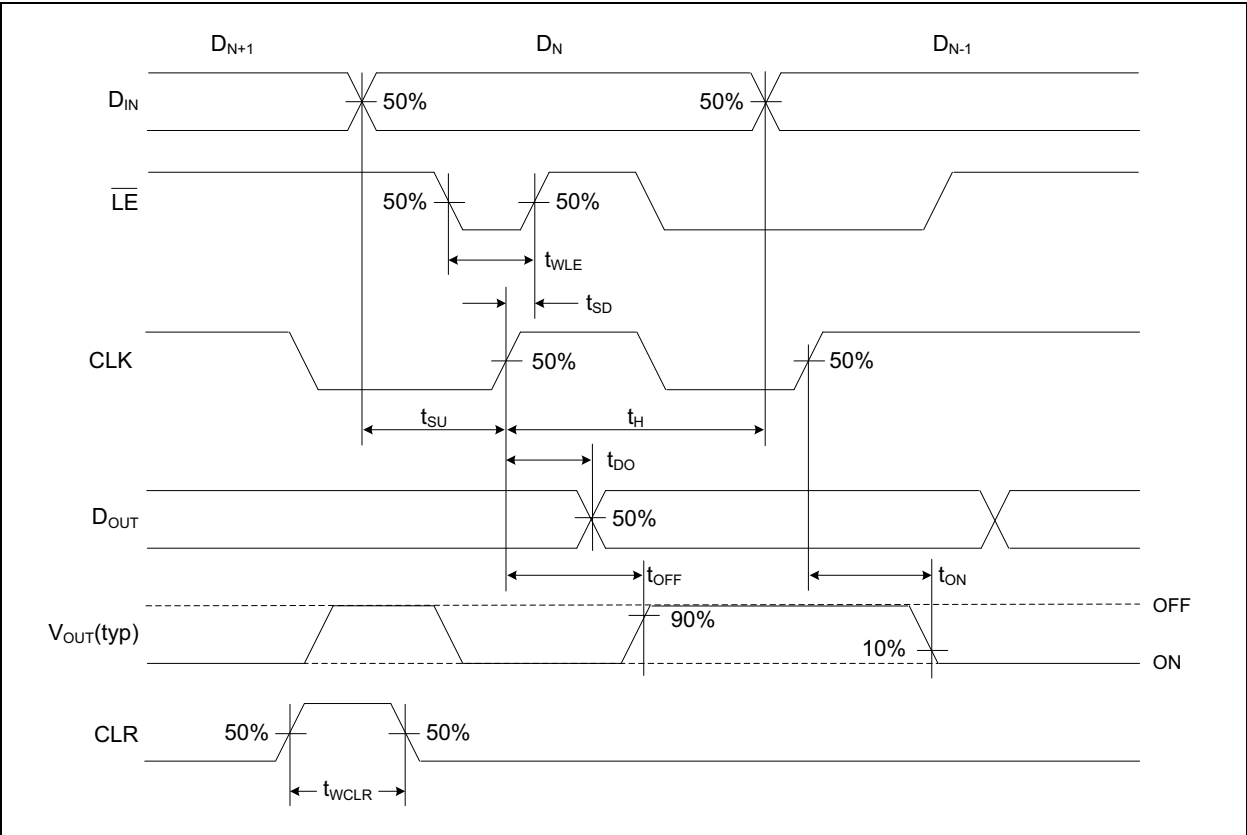


FIGURE 1-1: Logic Input Timing Diagram.

2.0 PIN DESCRIPTION

This section details the pin description for the 48-Lead LQFP package (Figure 2-1). The descriptions of the pins are listed in Table 2-1.

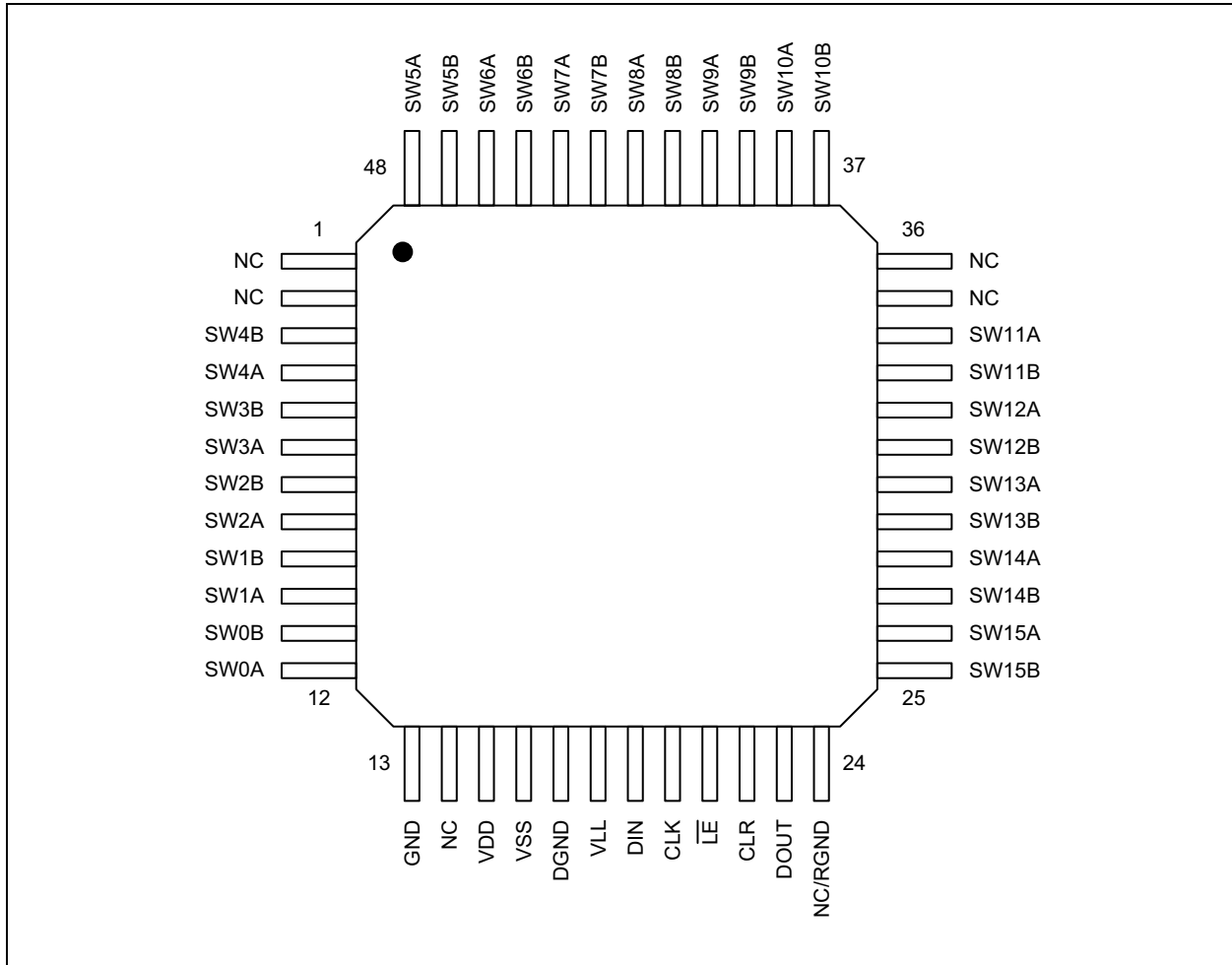


FIGURE 2-1: 48-Lead LQFP Package – Top View.

HV2607/HV2707/HV2708

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Symbol		Description
	HV2607	HV2707/HV2708	
1	NC	NC	No Connection
2	NC	NC	No Connection
3	SW4B	SW4B	Analog Switch 4 Terminal B
4	SW4A	SW4A	Analog Switch 4 Terminal A
5	SW3B	SW3B	Analog Switch 3 Terminal B
6	SW3A	SW3A	Analog Switch 3 Terminal A
7	SW2B	SW2B	Analog Switch 2 terminal B
8	SW2A	SW2A	Analog Switch 2 Terminal A
9	SW1B	SW1B	Analog Switch 1 Terminal B
10	SW1A	SW1A	Analog Switch 1 Terminal A
11	SW0B	SW0B	Analog Switch 0 Terminal B
12	SW0A	SW0A	Analog Switch 0 Terminal A
13	GND	GND	Ground
14	NC	NC	No Connection
15	V _{DD}	V _{DD}	Positive Supply Voltage
16	V _{SS}	V _{SS}	Negative Supply Voltage. Connect -5V or floating.
17	DGND	DGND	Digital Ground
18	V _{LL}	V _{LL}	Logic Supply Voltage
19	D _{IN}	D _{IN}	Data In Logic Input
20	CLK	CLK	Clock Logic Input for Shift Register
21	LE	LE	Latch Enable Logic Input, Low Active
22	CLR	CLR	Latch Clear Logic Input
23	D _{OUT}	D _{OUT}	Data Out Logic Output
24	NC	RGND	No Connection/Ground for Bleed Resistor
25	SW15B	SW15B	Analog Switch 15 Terminal B
26	SW15A	SW15A	Analog Switch 15 Terminal A
27	SW14B	SW14B	Analog Switch 14 Terminal B
28	SW14A	SW14A	Analog Switch 14 Terminal A
29	SW13B	SW13B	Analog Switch 13 Terminal B
30	SW13A	SW13A	Analog Switch 13 Terminal A
31	SW12B	SW12B	Analog Switch 12 Terminal B
32	SW12A	SW12A	Analog Switch 12 Terminal A
33	SW11B	SW11B	Analog Switch 11 Terminal B
34	SW11A	SW11A	Analog Switch 11 Terminal A
35	NC	NC	No Connection
36	NC	NC	No Connection
37	SW10B	SW10B	Analog Switch 10 Terminal B
38	SW10A	SW10A	Analog Switch 10 Terminal A
39	SW9B	SW9B	Analog Switch 9 Terminal B
40	SW9A	SW9A	Analog Switch 9 Terminal A
41	SW8B	SW8B	Analog Switch 8 Terminal B
42	SW8A	SW8A	Analog Switch 8 Terminal A
43	SW7B	SW7B	Analog Switch 7 Terminal B
44	SW7A	SW7A	Analog Switch 7 Terminal A
45	SW6B	SW6B	Analog Switch 6 Terminal B
46	SW6A	SW6A	Analog Switch 6 Terminal A
47	SW5B	SW5B	Analog Switch 5 Terminal B
48	SW5A	SW5A	Analog Switch 5 Terminal A

3.0 TEST CIRCUIT EXAMPLES

This section details a few examples of test circuits.

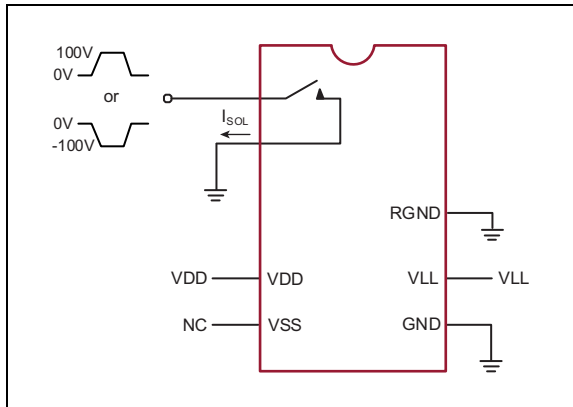


FIGURE 3-1: Switch Off Leakage per Switch.

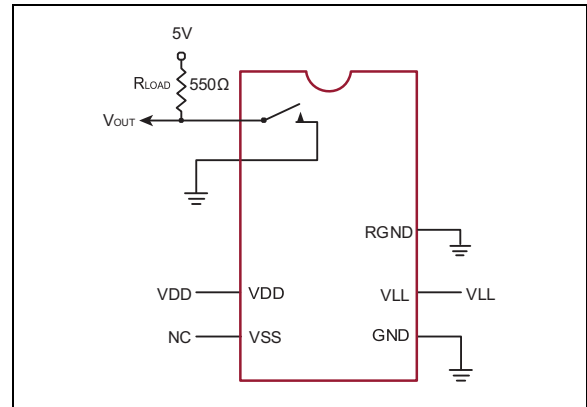


FIGURE 3-4: T_{ON}/T_{OFF} Test Circuit.

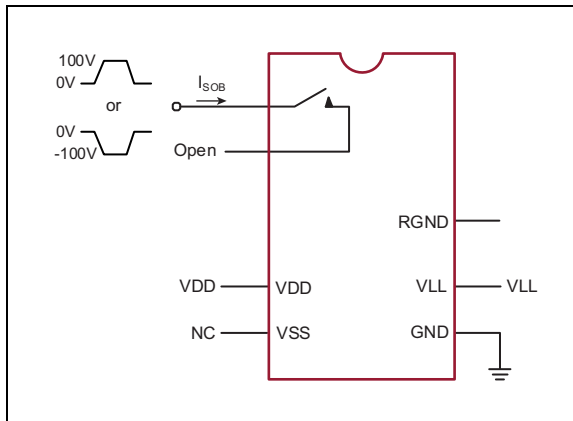


FIGURE 3-2: Switch Off Bias per Switch.

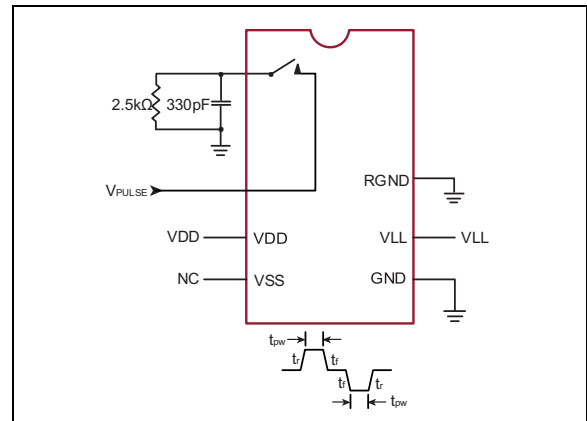


FIGURE 3-5: Tx Pulse Width.

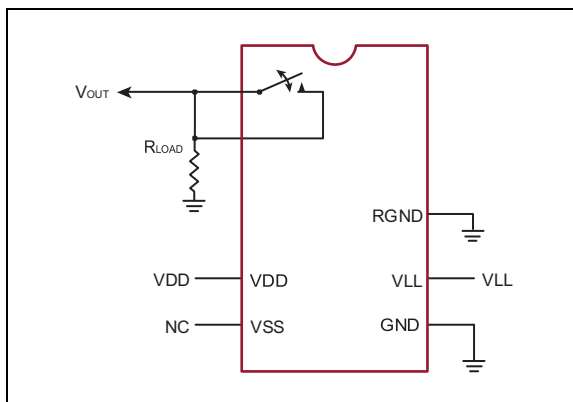


FIGURE 3-3: Switch DC Offset.

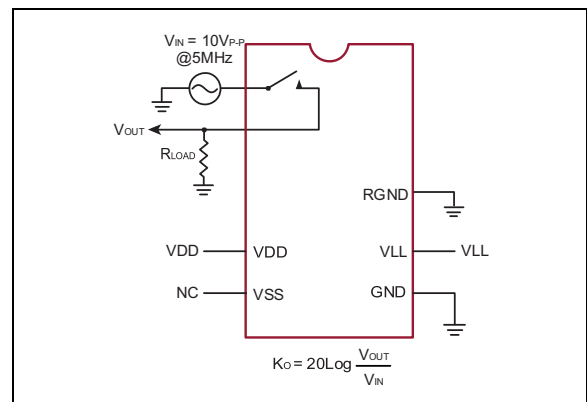


FIGURE 3-6: Off Isolation.

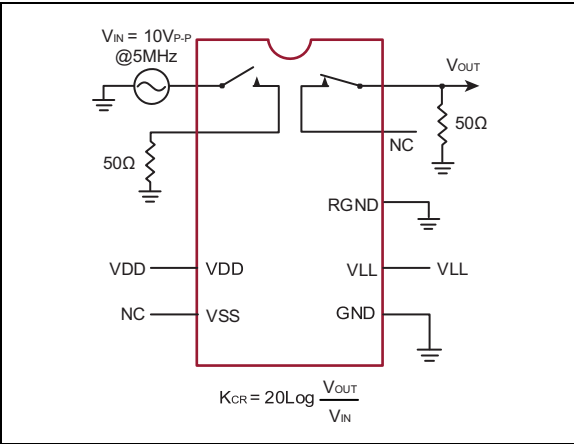


FIGURE 3-7: Switch Crosstalk.

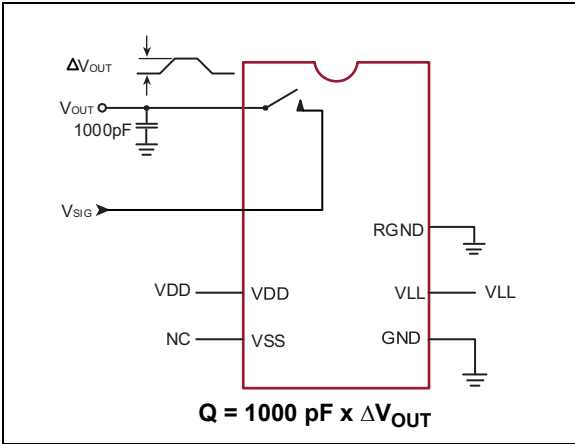


FIGURE 3-9: Charge Injection.

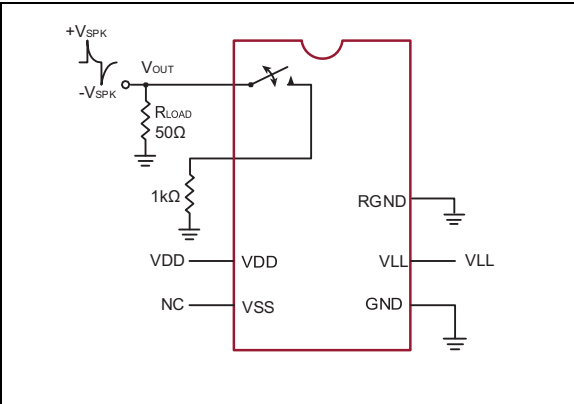


FIGURE 3-8: Output Voltage Spike.

4.0 TYPICAL PERFORMANCE CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

Note: Unless otherwise specified, $V_{LL} = +5V$, $V_{DD} = +5V$, $T_A = +25^\circ C$.

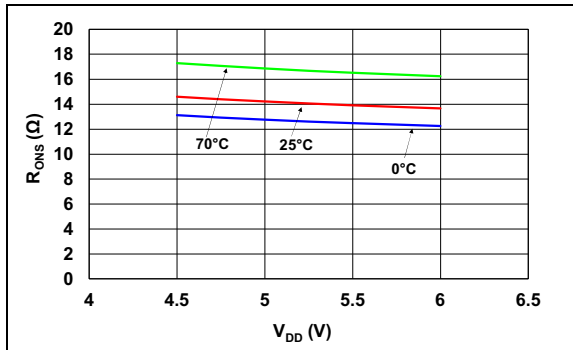


FIGURE 4-1: R_{ONS} at 5 mA vs V_{DD} .

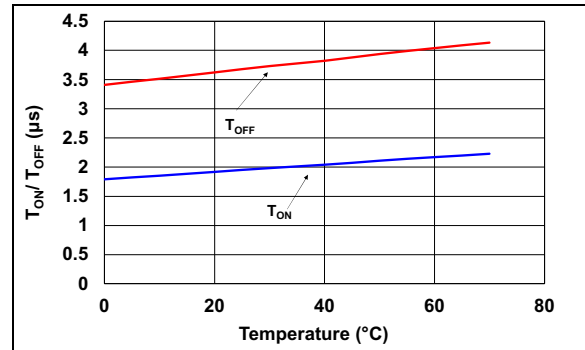


FIGURE 4-4: T_{ON}/T_{OFF} vs. Temperature.

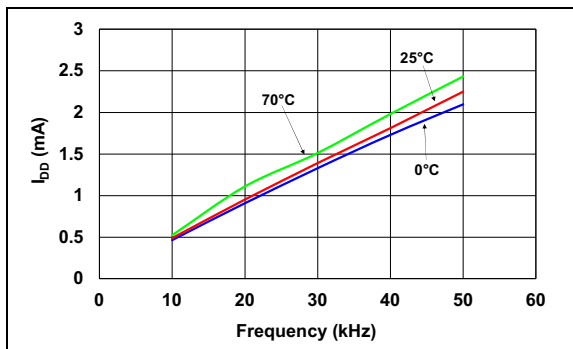


FIGURE 4-2: I_{DD} vs. Switching Frequency.

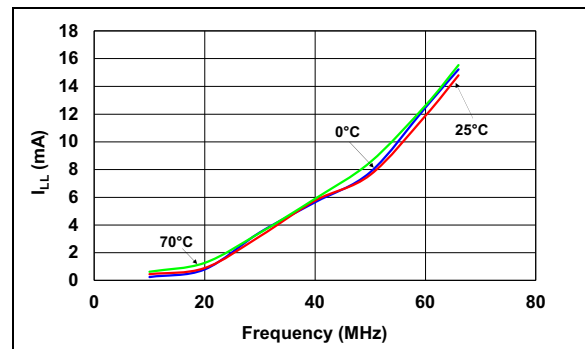


FIGURE 4-5: I_{LL} vs. CLK Frequency.

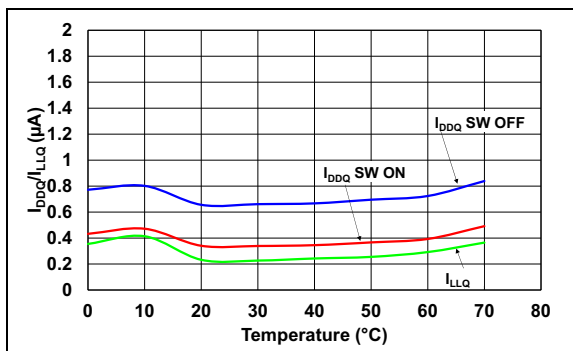


FIGURE 4-3: I_{DDQ}/I_{LLQ} vs. Temperature.

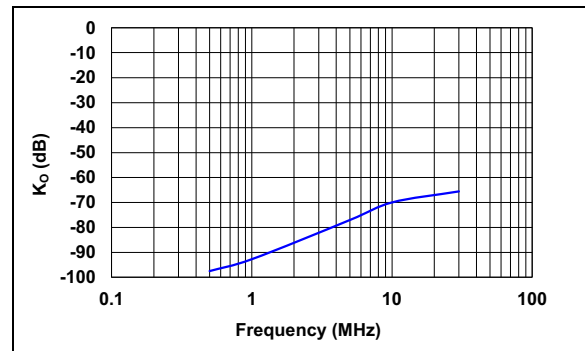


FIGURE 4-6: K_O vs. Frequency with 50Ω Load.

HV2607/HV2707/HV2708

5.0 DETAILED DESCRIPTION AND APPLICATION INFORMATION

5.1 Device Overview

The HV2607/HV2707/HV2708 devices are low harmonic distortion, low charge injection, 16-channel, high-voltage analog switches without high-voltage supplies. The high-voltage analog switches are used for multiplexing a piezoelectric transducer array in a probe to multiple channel transmitter (Tx) arrays in a medical ultrasound system.

The HV2607/HV2707/HV2708 devices are distinguished by bleed resistors that eliminate voltage build-up in capacitance load, such as piezoelectric transducers. These devices can pass $\pm 100\text{V}$ high-voltage pulses without high-voltage bias, such as $\pm 100\text{V}$. These devices have typical 14Ω on-resistance and 100 MHz bandwidth for small signals.

Figure 5-1 shows a typical medical ultrasound image system consisting of 64 channels of transmit pulsers, 64 channels of receivers (LNA and ADC) and 64 channels of T/R switches connecting to 192 elements of an ultrasound probe via a HV2XXX high-voltage analog switch array.

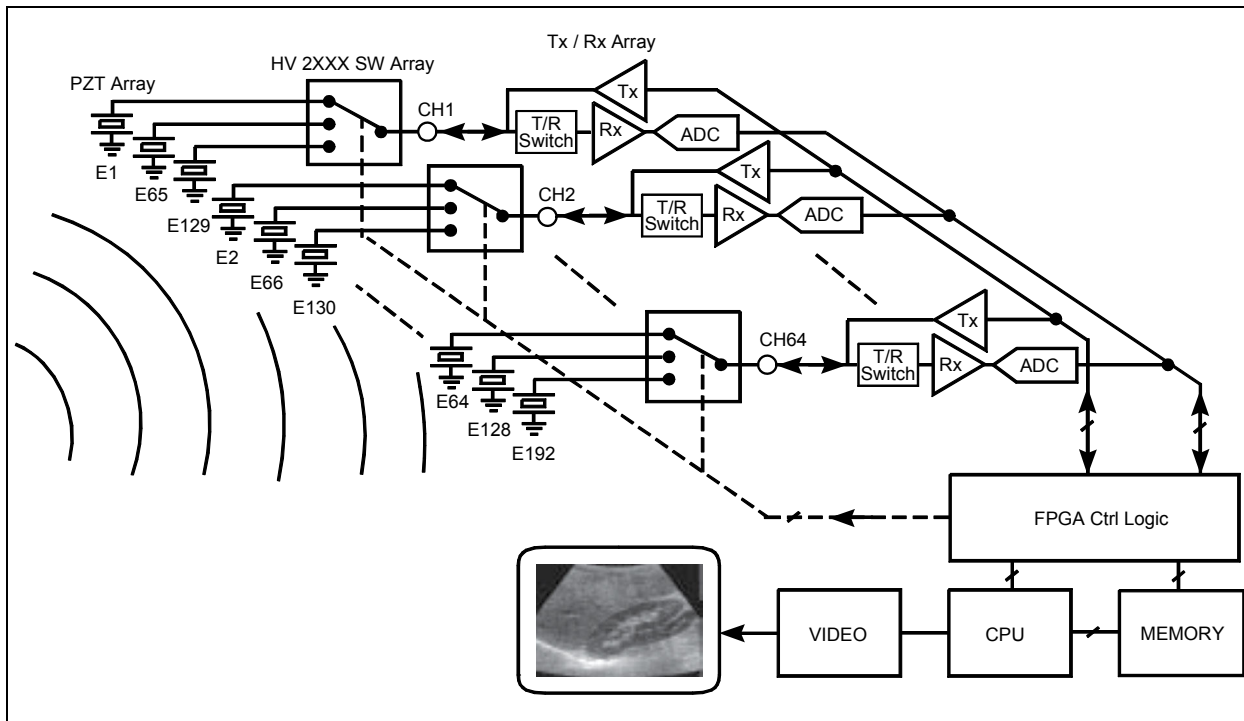


FIGURE 5-1: Typical Medical Ultrasound Imaging System.

5.2 Logic Input Timing

The HV2607/HV2707/HV2708 devices have a digital serial interface consisting of Data In (D_{IN}), Clock (CLK), Data Out (D_{OUT}), Latch Enable (\overline{LE}) and Clear (CLR) to control 16 switches individually. The digital circuits are supplied by V_{LL} and connected to DGND. The serial clock frequency is up to 66 MHz.

The switch state configuration data are shifted into the shift registers on the rising edge (low-to-high transition) of the clock. The switch Configuration bit of SW15 is shifted in first and the Configuration bit of SW0 is shifted in last. To change all the switch states at the same time, the Latch Enable (\overline{LE}) input should remain high while the 16-bit Data In signal is shifted into the 16-bit register. After the valid 16-bit data complete shifting into the shift registers, the high-to-low transition of the \overline{LE} signal transfers the contents of

the shift registers into the latches. Finally, setting the \overline{LE} high again allows all the latches to keep the current state, while new data can now be shifted into the shift registers without disturbing the latches.

It is recommended to change all the latch states at the same time through this method to avoid possible clock feed through noise (see Figure 5-2 for details).

When the CLR input is set high, it resets the data of all 16 latches to low. Consequently, all the high-voltage switches are set to the OFF state. However, the CLR signal does not affect the contents of the shift register, so the shift register can operate independently of the CLR signal. Therefore, when the CLR input is low, the shift register still retains the previous data.

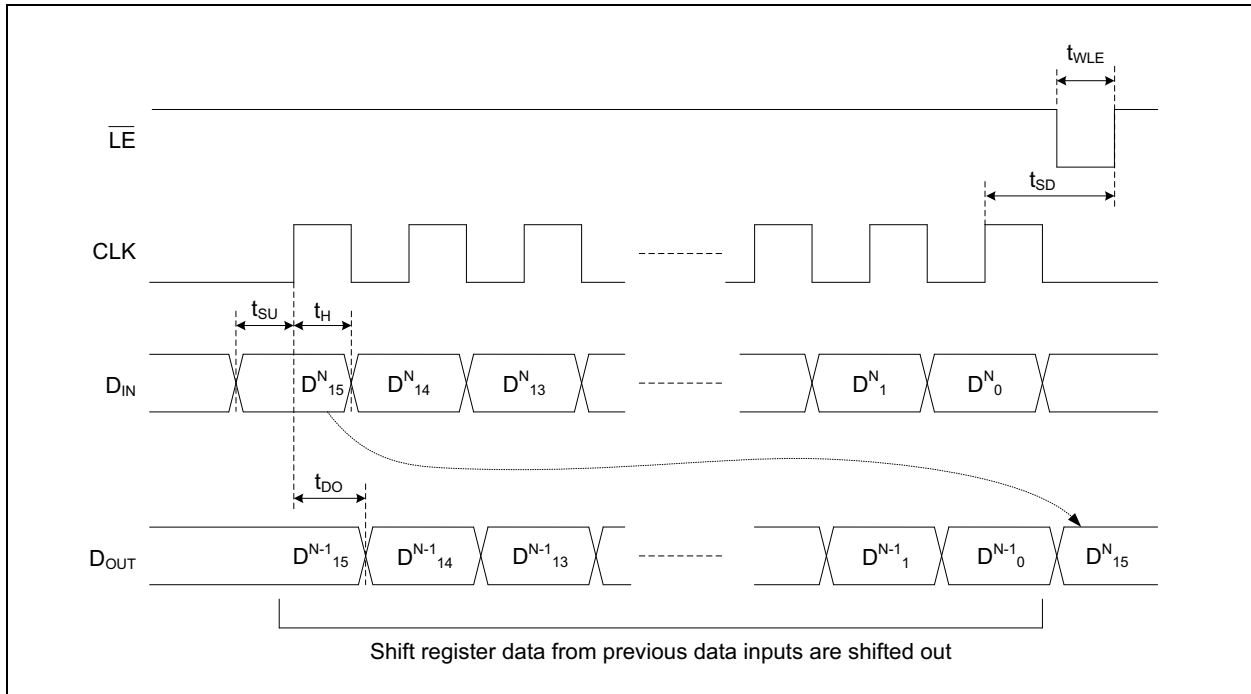


FIGURE 5-2: Latch Enable Timing Diagram.

5.3 Multiple Devices Connection

The serial input interface of the HV2607/HV2707/HV2708 allows multiple devices to daisy-chain together. In this configuration, the D_{OUT} of a device is connected to the D_{IN} of the subsequent device, and so forth. The last D_{OUT} of the daisy-chained HV2607/HV2707/HV2708 can either be floating or fed back to an FPGA to check the previously stored shift register data.

To control all the high-voltage analog switch states in daisy-chained N devices, N-times 16 clocks and N-times 16 bits of data are shifted into shift registers, while \overline{LE} remains high and CLR remains low. After all the data finish shifting in, one single negative pulse of \overline{LE} transfers the data from all shift registers to all the latches simultaneously. Consequently, all N-times 16 high-voltage analog switches change states simultaneously.

5.4 Power-Up/Down Sequence and Decoupling Capacitor

The recommended power-up sequence of the HV2607/HV2707/HV2708 is V_{LL} first, then V_{DD}/V_{SS} . The power-down sequence is in reverse order of power-up. During the power-up/down period, all the analog switch inputs should be within V_{DD} and GND or floating.

5.5 Layout Considerations

The HV2607/HV2707/HV2708 devices have two separate ground connections. DGND is the ground connection for digital circuitry and GND is the ground connection for substrate and analog switches. Since the analog switch passes large transient current from the pulser, the GND should be shared with the pulser output stage ground. It is important to have a good PCB layout which minimizes noise and ground bounce. It is recommended to use two separate ground planes in the PCB, connected together at the return terminal of the input power line, as shown in [Figure 5-3](#). It is recommended that 0.1 μ F or larger ceramic decoupling capacitors with low-ESR (Equivalent Series Resistance) and appropriate voltage ratings be connected between ground and power supplies, as shown in [Figure 5-3](#). The decoupling capacitor of V_{LL} , V_{SS} and V_{DD} should be connected to DGND. These decoupling capacitors should be placed as close as possible to the device.

HV2607/HV2707/HV2708

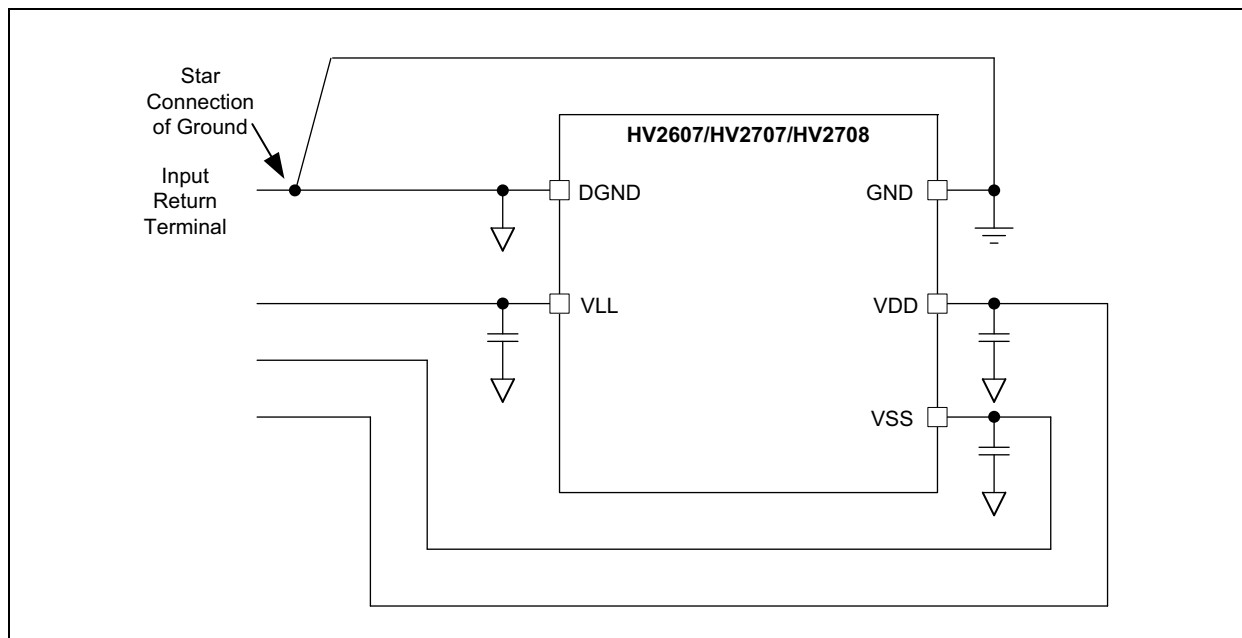


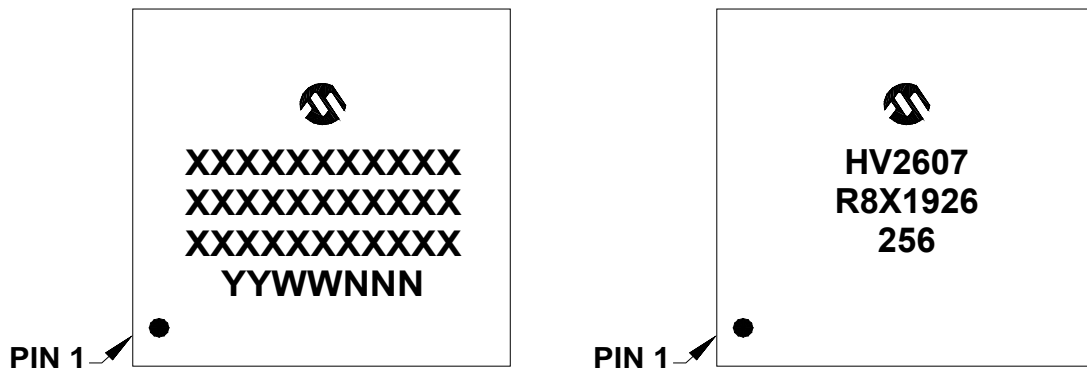
FIGURE 5-3: *Layout Guidelines.*

6.0 PACKAGING INFORMATION

6.1 Package Marking Information

48-Lead LQFP

Example



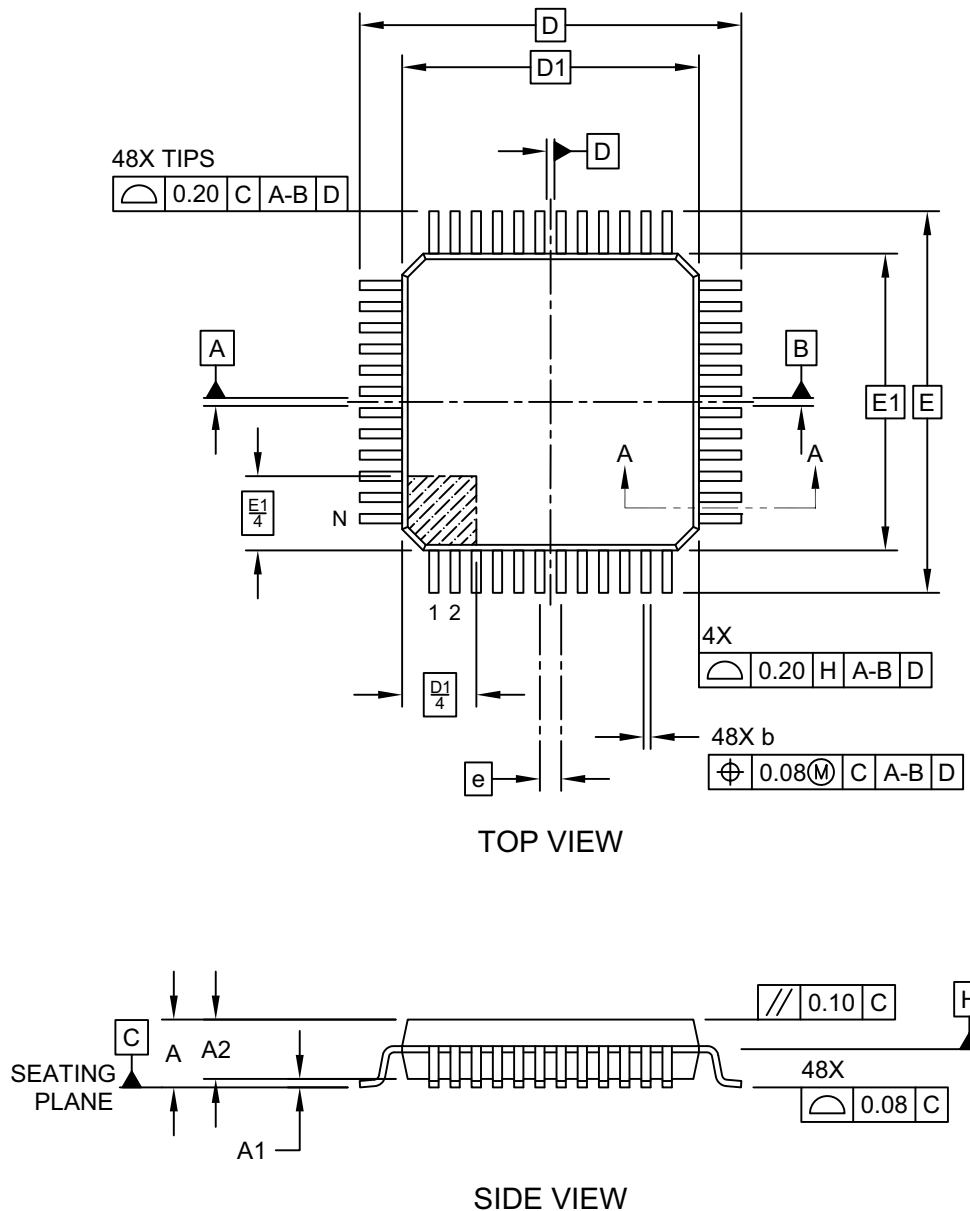
Legend: XX...X Product Code or Customer-specific information
Y Year code (last digit of calendar year)
YY Year code (last 2 digits of calendar year)
WW Week code (week of January 1 is week '01')
NNN Alphanumeric traceability code
can be found on the outer packaging for this package.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.

HV2607/HV2707/HV2708

48-Lead Low-profile Plastic Quad Flat Pack Package (R8) -7x7 mm Body [LQFP] Supertex Legacy Package

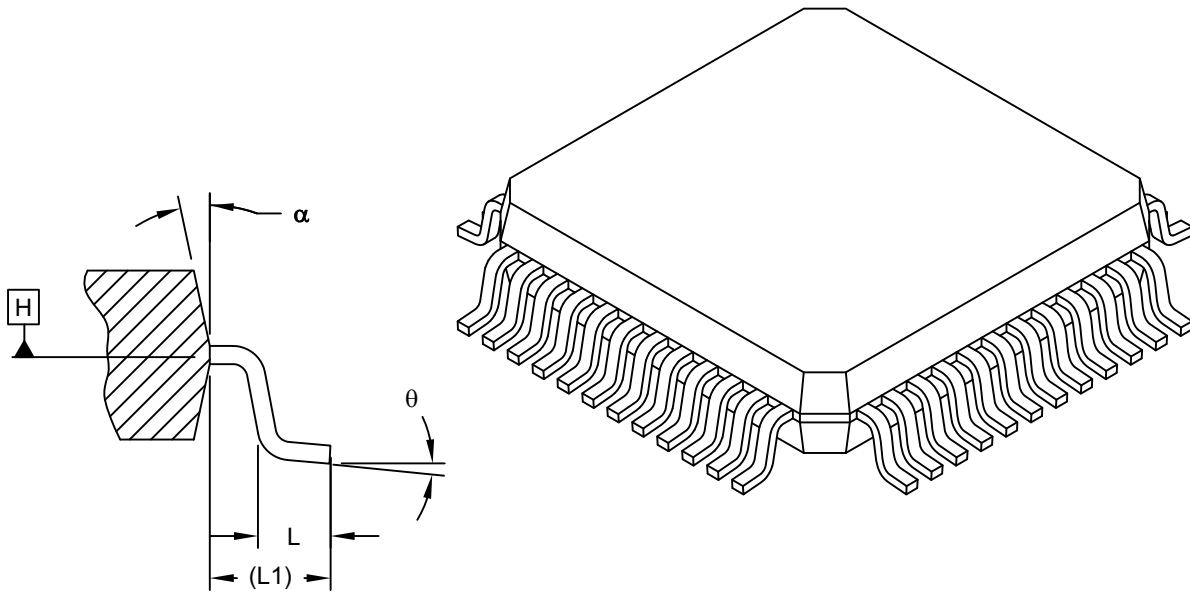
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-278 Rev A Sheet 1 of 2

48-Lead Low-profile Plastic Quad Flat Pack Package (R8) -7x7 mm Body [LQFP] Supertex Legacy Package

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



SECTION A-A

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Leads	N	48		
Lead Pitch	e	0.50 BSC		
Overall Height	A	1.40	1.50	1.60
Standoff	A1	0.05	0.10	0.15
Molded Package Thickness	A2	1.35	1.40	1.45
Foot Length	L	0.45	0.60	0.75
Footprint	L1	1.00 REF		
Foot Angle	θ	0°	3.5°	7°
Overall Width	E	9.00 BSC		
Overall Length	D	9.00 BSC		
Molded Package Width	E1	7.00 BSC		
Molded Package Length	D1	7.00 BSC		
Lead Width	b	0.17	0.22	0.27
Mold Draft Angle Top	α	11°	12°	13°

Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

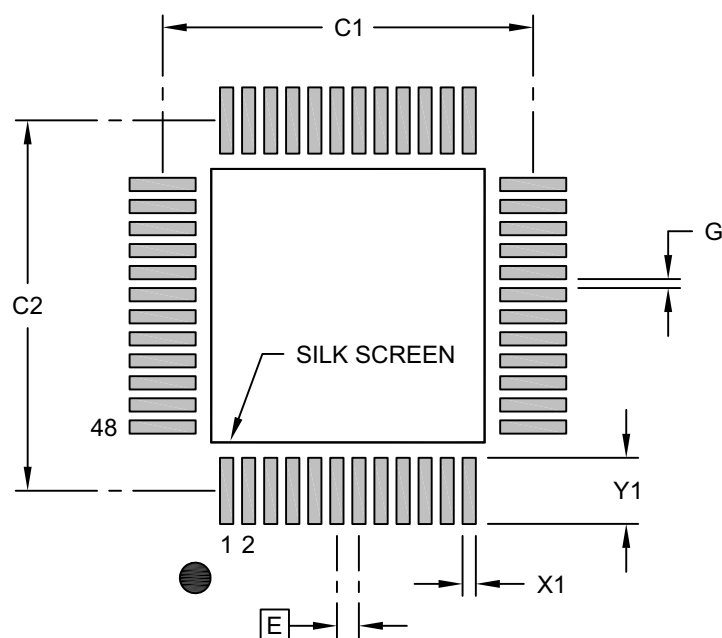
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-278 Rev A Sheet 2 of 2

HV2607/HV2707/HV2708

48-Lead Low-profile Plastic Quad Flat Pack Package (R8) -7x7 mm Body [LQFP] Supertex Legacy Package

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Contact Pad Spacing	C1		8.40	
Contact Pad Spacing	C2		8.40	
Contact Pad Width (X48)	X1			0.30
Contact Pad Length (X48)	Y1			1.50
Contact Pad to Contact Pad (X44)	G	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-2278 Rev A

APPENDIX A: REVISION HISTORY

Revision B (December 2020)

The following is the list of modifications:

1. Updated the Block Diagram.
2. Added the Negative Supply Voltage throughout [Section 1.0 “Electrical Characteristics”](#).
3. Updated [Figure 2-1](#).
4. Updated [Table 2-1](#) with the Negative Supply Voltage pin.
5. Updated all the figures in [Section 3.0 “Test Circuit Examples”](#).
6. Updated [Section 5.4 “Power-Up/Down Sequence and Decoupling Capacitor”](#) and [Section 5.5 “Layout Considerations”](#).

Revision A (July 2020)

- Original release of this document.

HV2607/HV2707/HV2708

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X</u>	<u>-X</u>	<u>/XX</u>
Device	Tape and Reel	Environmental	Package
Device: HV2607: No High-Voltage Bias, 16-Channel High-Voltage Analog Switch (Tape and Reel) HV2707: No High-Voltage Bias, 16-Channel High-Voltage Analog Switch with Bleed Resistor at Both Sides of Switch (Tape and Reel) HV2708: No High-Voltage Bias, 16-Channel High-Voltage Analog Switch with Bleed Resistor at One Side of Switch (Tape and Reel)			
Environmental:	C	=	Lead (Pb)-Free/ROHS-Compliant Package
Package:	R8X=		Low Profile Plastic Quad Flat Pack Package, 7x7 mm Body, 48-Lead (LQFP)

Examples:

a) HV2607T-C/R8X: No High-Voltage Bias, 16-Channel High-Voltage Analog Switch, 48-Lead LQFP package

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

HV2607/HV2707/HV2708

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable". Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication is provided for the sole purpose of designing with and using Microchip products. Information regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2020, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-7294-0

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880-3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820