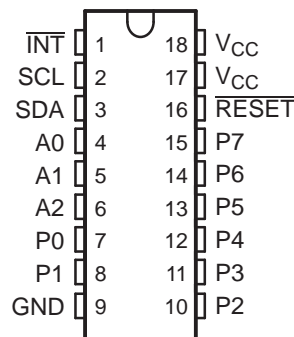


REMOTE 8-BIT I²C AND SMBus LOW-POWER I/O EXPANDER WITH INTERRUPT OUTPUT, RESET, AND CONFIGURATION REGISTERS

FEATURES

- Low Standby Current Consumption of 1 μ A Max
- I²C to Parallel Port Expander
- Open-Drain Active-Low Interrupt Output
- Active-Low Reset Input
- Operating Power-Supply Voltage Range of 2.3 V to 5.5 V
- 5-V Tolerant I/O Ports
- 400-kHz Fast I²C Bus
- Three Hardware Address Pins Allow for Use of up to Eight Devices on the I²C/SMBus
- Input/Output Configuration Register
- Polarity Inversion Register
- Internal Power-On Reset
- High-Impedance Open Drain on P0
- Power Up With All Channels Configured as Inputs
- No Glitch on Power Up
- Noise Filter on SCL/SDA Inputs
- Latched Outputs With High-Current Drive Maximum Capability for Directly Driving LEDs
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

DW PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

This 8-bit I/O expander for the two-line bidirectional bus (I²C) is designed for 2.3-V to 5.5-V V_{CC} operation. It provides general-purpose remote I/O expansion for most microcontroller families via the I²C interface [serial clock (SCL) and serial data (SDA)].

ORDERING INFORMATION

T _A	PACKAGE ⁽¹⁾⁽²⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – DW	Tube of 40	PCA6107DW
			PCA6107DWG4
		Reel of 2000	PCA6107DWR
			PCA6107DWRG4
			PCA6107

(1) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(2) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The PCA6107 consists of one 8-bit Configuration (input or output selection), Input Port, Output Port, and Polarity Inversion (active high) registers. At power on, the I/Os are configured as inputs. However, the system master can enable the I/Os as either inputs or outputs by writing to the I/O configuration bits. The data for each input or output is kept in the corresponding input or output register. The polarity of the Input Port register can be inverted with the Polarity Inversion register. All registers can be read by the system master.

The system master can reset the PCA6107 in the event of a timeout or other improper operation by asserting a low in the active-low reset ($\overline{\text{RESET}}$) input. The power-on reset puts the registers in their default states and initializes the I²C/SMBus state machine. Asserting $\overline{\text{RESET}}$ causes the same reset/initialization to occur without depowering the part.

The PCA6107 open-drain interrupt ($\overline{\text{INT}}$) output is activated when any input state differs from its corresponding Input Port register state and is used to indicate to the system master that an input state has changed.

$\overline{\text{INT}}$ can be connected to the interrupt input of a microcontroller. By sending an interrupt signal on this line, the remote I/O can inform the microcontroller if there is incoming data on its ports without having to communicate via the I²C bus. Thus, the PCA6107 can remain a simple slave device.

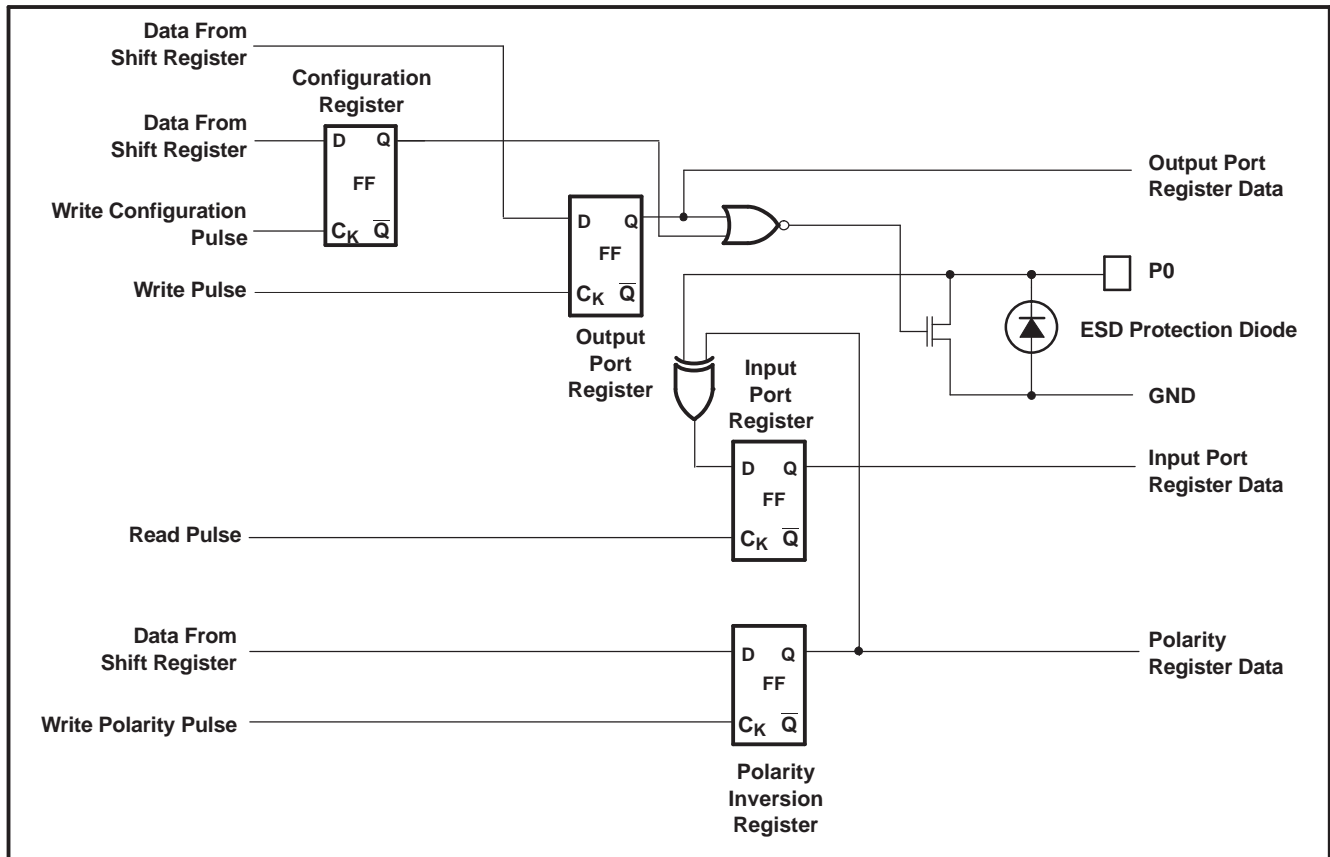
The device outputs (latched) have high-current drive capability for directly driving LEDs. The device has low current consumption and a high-impedance open-drain output pin, P0.

Three hardware pins (A0, A1, and A2) are used to program and vary the fixed I²C address, allowing up to eight devices to share the same I²C bus or SMBus.

TERMINAL FUNCTIONS

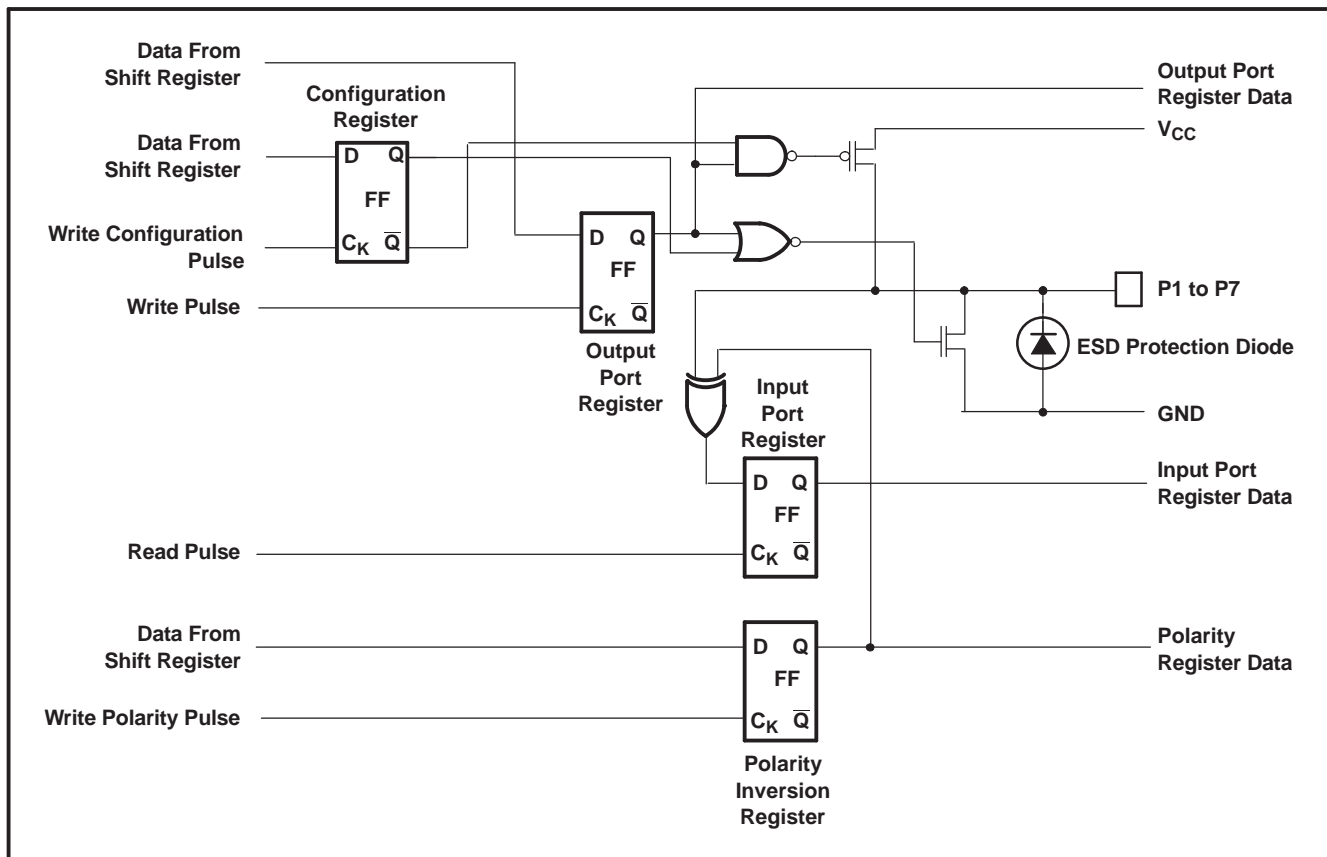
TERMINAL		DESCRIPTION
NO.	NAME	
1	$\overline{\text{INT}}$	Interrupt output. Connect to V_{CC} through a pullup resistor.
2	SCL	Serial clock bus. Connect to V_{CC} through a pullup resistor.
3	SDA	Serial data bus. Connect to V_{CC} through a pullup resistor.
4	A0	Address input. Connect directly to V_{CC} or ground.
5	A1	Address input. Connect directly to V_{CC} or ground.
6	A2	Address input. Connect directly to V_{CC} or ground.
7	P0	P-port input/output. Open-drain design structure. Connect to V_{CC} through a pullup resistor.
8	P1	P-port input/output. Push-pull design structure.
9	GND	Ground
10	P2	P-port input/output. Push-pull design structure.
11	P3	P-port input/output. Push-pull design structure.
12	P4	P-port input/output. Push-pull design structure.
13	P5	P-port input/output. Push-pull design structure.
14	P6	P-port input/output. Push-pull design structure.
15	P7	P-port input/output. Push-pull design structure.
16	$\overline{\text{RESET}}$	Active-low reset input. Connect to V_{CC} through a pullup resistor if no active connection is used.
17	V_{CC}	Supply voltage
18	V_{CC}	Supply voltage

SIMPLIFIED SCHEMATIC OF P0



A. On power up or reset, all registers return to default values.

SIMPLIFIED SCHEMATIC OF P1 TO P7



A. On power up or reset, all registers return to default values.

I²C Interface

The bidirectional I²C bus consists of the serial clock (SCL) and serial data (SDA) lines. Both lines must be connected to a positive supply through a pullup resistor when connected to the output stages of a device. Data transfer may be initiated only when the bus is not busy.

I²C communication with this device is initiated by a master sending a start condition, a high-to-low transition on the SDA input/output while the SCL input is high (see Figure 1). After the start condition, the device address byte is sent, MSB first, including the data direction bit (R/W).

After receiving the valid address byte, this device responds with an acknowledge (ACK), a low on the SDA input/output during the high of the ACK-related clock pulse. The address inputs (A0–A2) of the slave device must not be changed between the start and the stop conditions.

On the I²C bus, only one data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the high pulse of the clock period, as changes in the data line at this time are interpreted as control commands (start or stop) (see Figure 2).

A stop condition, a low-to-high transition on the SDA input/output while the SCL input is high, is sent by the master (see Figure 1).

Any number of data bytes can be transferred from the transmitter to the receiver between the start and the stop conditions. Each byte of eight bits is followed by one ACK bit. The transmitter must release the SDA line before the receiver can send an ACK bit. The device that acknowledges must pull down the SDA line during the ACK clock pulse, so that the SDA line is stable low during the high pulse of the ACK-related clock period (see Figure 3). When a slave receiver is addressed, it must generate an ACK after each byte is received. Similarly, the master must generate an ACK after each byte that it receives from the slave transmitter. Setup and hold times must be met to ensure proper operation.

A master receiver signals an end of data to the slave transmitter by not generating an acknowledge (NACK) after the last byte has been clocked out of the slave. This is done by the master receiver by holding the SDA line high. In this event, the transmitter must release the data line to enable the master to generate a stop condition.

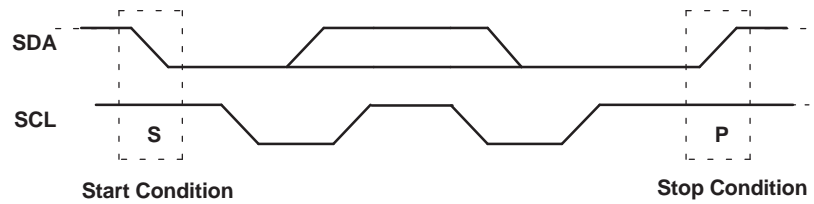


Figure 1. Definition of Start and Stop Conditions

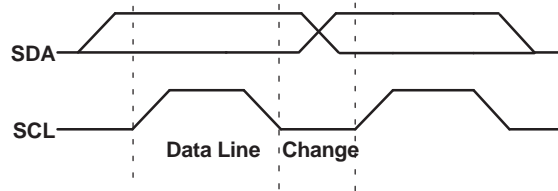


Figure 2. Bit Transfer

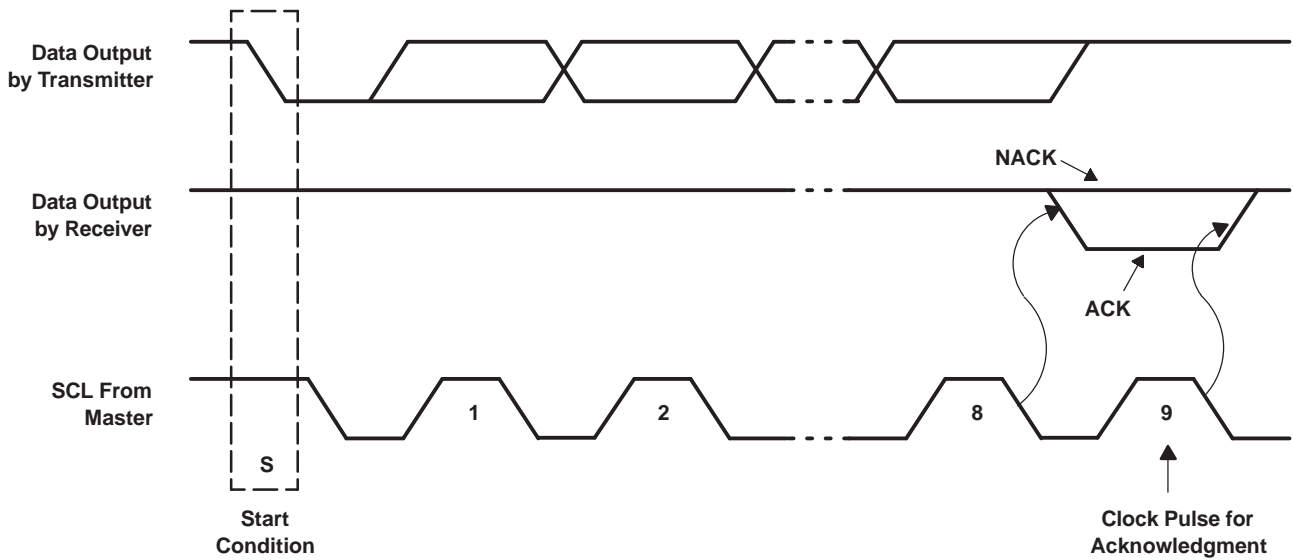


Figure 3. Acknowledgment on the I²C Bus

Interface Definition

BYTE	BIT							
	7 (MSB)	6	5	4	3	2	1	0 (LSB)
I ² C slave address	L	L	H	H	A2	A1	A0	R/W
Px I/O data bus	P7	P6	P5	P4	P3	P2	P1	P0

Device Address

The address of the PCA6107 is shown in [Figure 4](#).

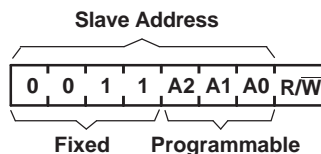


Figure 4. PCA6107 Address

Address Reference

INPUTS			I ² C BUS SLAVE ADDRESS
A2	A1	A0	
L	L	L	24 (decimal), 18 (hexadecimal)
L	L	H	25 (decimal), 19 (hexadecimal)
L	H	L	26 (decimal), 1A (hexadecimal)
L	H	H	27 (decimal), 1B (hexadecimal)
H	L	L	28 (decimal), 1C (hexadecimal)
H	L	H	29 (decimal), 1D (hexadecimal)
H	H	L	30 (decimal), 1E (hexadecimal)
H	H	H	31 (decimal), 1F (hexadecimal)

The last bit of the slave address defines the operation (read or write) to be performed. A high (1) selects a read operation, while a low (0) selects a write operation.

Control Register and Command Byte

Following the successful acknowledgment of the address byte, the bus master sends a command byte that is stored in the control register in the PCA6107. Two bits of this data byte state the operation (read or write) and the internal registers (input, output, polarity inversion or configuration) that will be affected. This register can be written or read through the I²C bus. The command byte is sent only during a write transmission.

Once a new command byte has been sent, the register that was addressed continues to be accessed by reads until a new command byte has been sent.

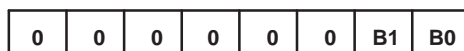


Figure 5. Control Register Bits

Command Byte

CONTROL REGISTER BITS		COMMAND BYTE (HEX)	REGISTER	PROTOCOL	POWER-UP DEFAULT
B1	B0				
0	0	0x00	Input Port	Read byte	xxxx xxxx
0	1	0x01	Output Port	Read/write byte	0000 0000
1	0	0x02	Polarity Inversion	Read/write byte	1111 0000
1	1	0x03	Configuration	Read/write byte	1111 1111

Register Descriptions

The Input Port register (register 0) reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by the Configuration register. It acts only on read operation. Writes to these registers have no effect. The default value, X, is determined by the externally applied logic level. Before a read operation, a write transmission is sent with the command byte to indicate to the I²C device that the Input Port register will be accessed next.

Register 0 (Input Port Register)

BIT	I7	I6	I5	I4	I3	I2	I1	I0
DEFAULT	X	X	X	X	X	X	X	X

The Output Port register (register 1) shows the outgoing logic levels of the pins defined as outputs by the Configuration register. Bit values in this register have no effect on pins defined as inputs. In turn, reads from this register reflect the value that is in the flip-flop controlling the output selection, not the actual pin value.

Register 1 (Output Port Register)

BIT	O7	O6	O5	O4	O3	O2	O1	O0
DEFAULT	0	0	0	0	0	0	0	0

The Polarity Inversion register (register 2) allows polarity inversion of pins defined as inputs by the Configuration register. If a bit in this register is set (written with 1), the corresponding port pin's polarity is inverted. If a bit in this register is cleared (written with a 0), the corresponding port pin's original polarity is retained.

Register 2 (Polarity Inversion Register)

BIT	N7	N6	N5	N4	N3	N2	N1	N0
DEFAULT	1	1	1	1	0	0	0	0

The Configuration register (register 3) configures the directions of the I/O pins. If a bit in this register is set to 1, the corresponding port pin is enabled as an input with high-impedance output driver. If a bit in this register is cleared to 0, the corresponding port pin is enabled as an output.

Register 3 (Configuration Register)

BIT	C7	C6	C5	C4	C3	C2	C1	C0
DEFAULT	1	1	1	1	1	1	1	1

Power-On Reset

When power (from 0 V) is applied to V_{CC} , an internal power-on reset holds the PCA6107 in a reset condition until V_{CC} has reached V_{POR} . At that time, the reset condition is released, and the PCA6107 registers and I²C/SMBus state machine initializes to their default states. After that, V_{CC} must be lowered to below 0.2 V and back up to the operating voltage for a power-reset cycle. The \overline{RESET} input can be asserted to reset the system, while keeping the V_{CC} at its operating level.

\overline{RESET} Input

A reset can be accomplished by holding the \overline{RESET} pin low for a minimum of t_W . The PCA6107 registers and I²C/SMBus state machine are held in their default states until the \overline{RESET} input is again high. This input requires a pullup resistor to V_{CC} , if no active connection is used.

Interrupt ($\overline{\text{INT}}$) Output

An interrupt is generated by any rising or falling edge of the port inputs in the input mode. After time, t_{iv} , the signal $\overline{\text{INT}}$ is valid. Resetting the interrupt circuit is achieved when data on the port is changed to the original setting, data is read from the port that generated the interrupt or in a stop event. Resetting occurs in the read mode at the acknowledge (ACK) or not acknowledge (NACK) bit after the rising edge of the SCL signal. Interrupts that occur during the ACK or NACK clock pulse can be lost (or be very short) due to the resetting of the interrupt during this pulse. Each change of the I/Os after resetting is detected and is transmitted as $\overline{\text{INT}}$.

Reading from or writing to another device does not affect the interrupt circuit, and a pin configured as an output cannot cause an interrupt. Changing an I/O from an output to an input may cause a false interrupt to occur, if the state of the pin does not match the contents of the Input Port Register.

The $\overline{\text{INT}}$ output has an open-drain structure and requires pullup resistor to V_{CC} .

Bus Transactions

Data is exchanged between the master and PCA6107 through write and read commands.

Writes

Data is transmitted to the PCA6107 by sending the device address and setting the least-significant bit to a logic 0 (see Figure 4 for device address). The command byte is sent after the address and determines which register receives the data that follows the command byte. There is no limitation on the number of data bytes sent in one write transmission.

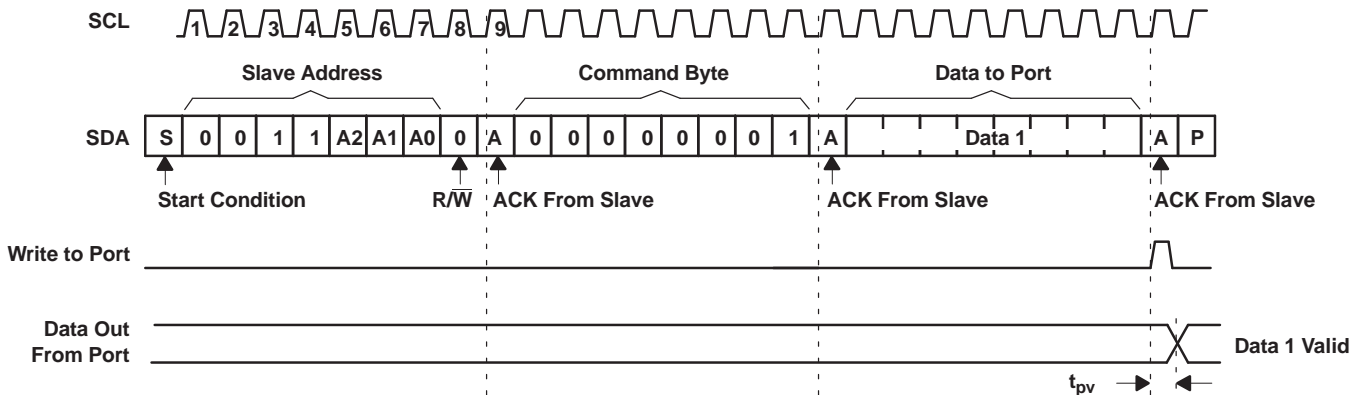


Figure 6. Write to Output Port Register

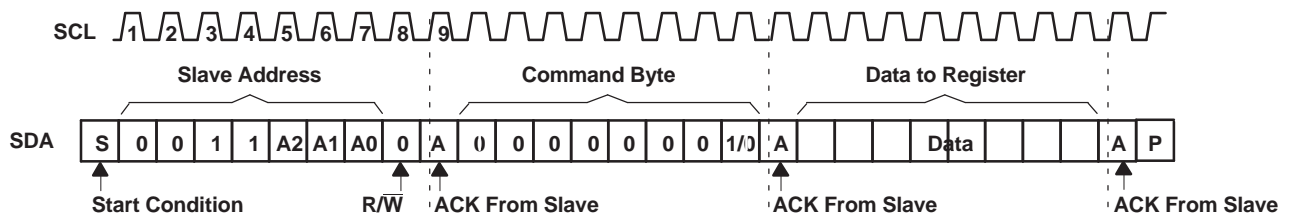


Figure 7. Write to Configuration or Polarity Inversion Registers

Reads

The bus master first must send the PCA6107 address with the least-significant bit set to a logic 0 (see Figure 4 for device address). The command byte is sent after the address and determines which register is accessed. After a restart, the device address is sent again, but this time, the least-significant bit is set to a logic 1. Data from the register defined by the command byte then is sent by the PCA6107 (see Figure 8 and Figure 9). After a restart, the value of the register defined by the command byte matches the register being accessed when the restart occurred. Data is clocked into the register on the rising edge of the ACK clock pulse. There is no limitation on the number of data bytes received in one read transmission, but when the final byte is received, the bus master must not acknowledge the data.

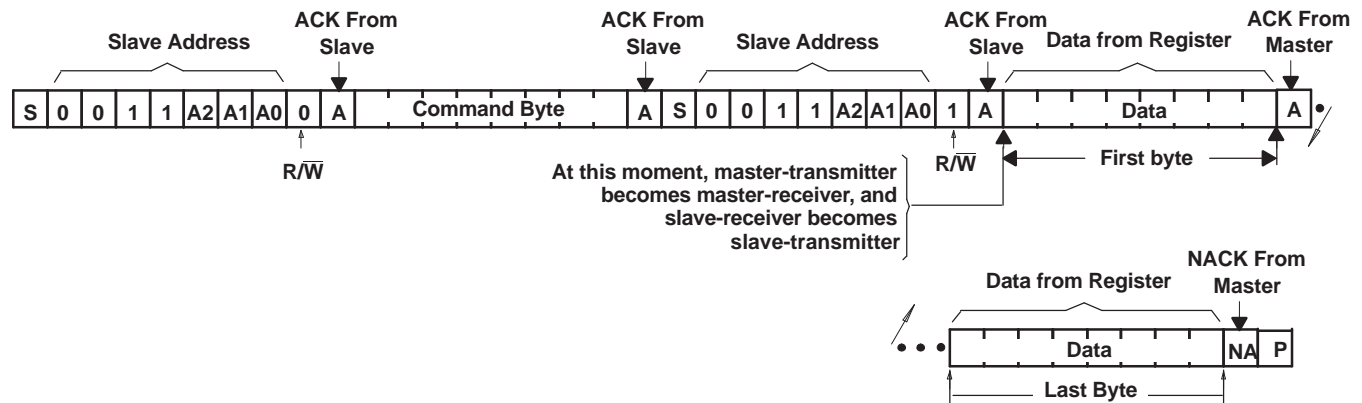
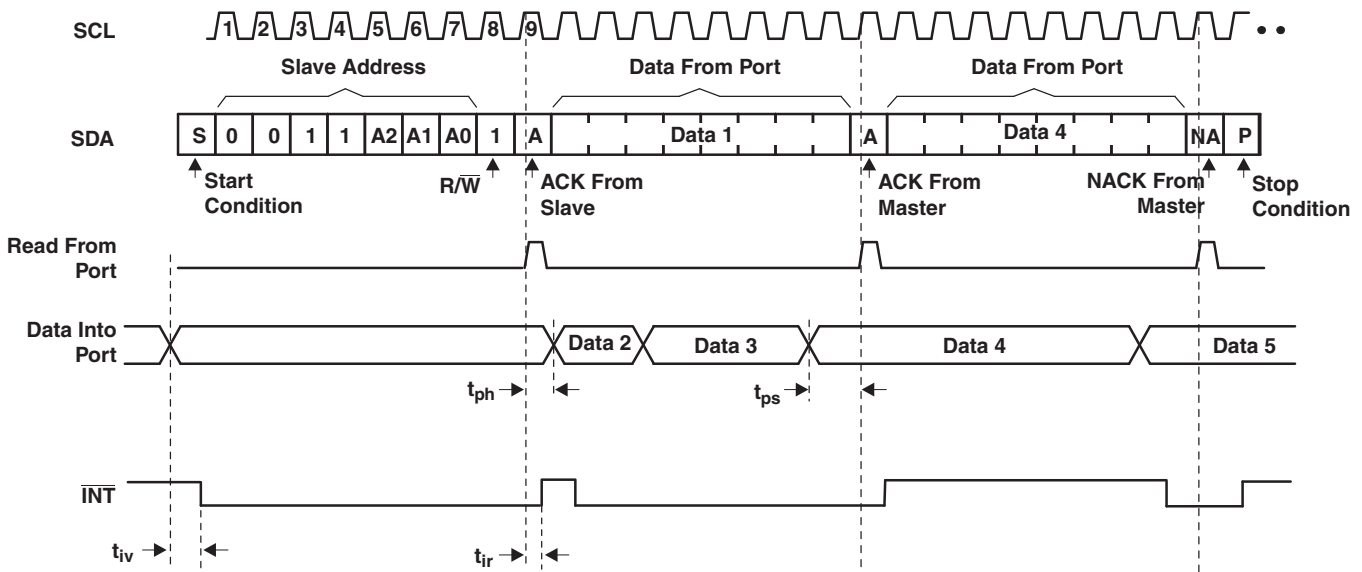


Figure 8. Read From Register



- A. This figure assumes the command byte has been programmed previously with 00h.
- B. Transfer of data can be stopped at any moment by a stop condition. When this occurs, data present at the last acknowledge phase is valid (output mode). Input data is lost.
- C. This figure eliminates the command byte transfer, a restart and slave address call between the initial slave address call and actual data transfer from the P port (see Figure 8 for these details).

Figure 9. Read Input Port Register

Absolute Maximum Ratings⁽¹⁾

over operating free-air temperature range (unless otherwise noted)

			MIN	MAX	UNIT
V _{CC}	Supply voltage range		–0.5	6	V
V _I	Input voltage range ⁽²⁾		–0.5	6	V
V _O	Output voltage range ⁽²⁾		–0.5	6	V
I _{IK}	Input clamp current	V _I < 0		–20	mA
I _{OK}	Output clamp current	V _O < 0		–20	mA
I _{IOK}	Input/output clamp current	V _O < 0 or V _O > V _{CC}		±20	mA
I _{OL}	Continuous output low current	V _O = 0 to V _{CC}		50	mA
I _{OH}	Continuous output high current, P7–P1	V _O = 0 to V _{CC}		–50	mA
I _{CC}	Continuous current through GND			–250	mA
	Continuous current through V _{CC}			160	
θ _{JA}	Package thermal impedance ⁽³⁾			73	°C/W
T _{stg}	Storage temperature range		–65	150	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

			MIN	MAX	UNIT
V _{CC}	Supply voltage		2.3	5.5	V
V _{IH}	High-level input voltage	SCL, SDA	0.7 × V _{CC}	5.5	V
		A2–A0, P7–P0, RESET	2	5.5	
V _{IL}	Low-level input voltage	SCL, SDA	–0.5	0.3 × V _{CC}	V
		A2–A0, P7–P0, RESET	–0.5	0.8	
I _{OH}	High-level output current	P7–P1		–10	mA
I _{OL}	Low-level output current	P7–P0		25	mA
T _A	Operating free-air temperature		–40	85	°C

Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	V _{CC}	MIN	TYP ⁽¹⁾	MAX	UNIT	
V _{IK}	Input diode clamp voltage	I _I = -18 mA	2.3 V to 5.5 V	-1.2			V	
V _{POR}	Power-on reset voltage	V _I = V _{CC} or GND, I _O = 0	V _{POR}		1.65	2.1	V	
V _{OH}	P-port high-level output voltage ⁽²⁾	I _{OH} = -8 mA	2.3 V		1.8		V	
			3 V		2.6			
			4.5 V		3			
			4.75 V		4.1			
		I _{OH} = -10 mA	2.3 V		1.5			
			3 V		2.5			
			4.5 V		3			
			4.75 V		4			
I _{OL}	SDA	V _{OL} = 0.4 V	2.3 V to 5.5 V		3		mA	
	P port ⁽³⁾	V _{OL} = 0.5 V	2.3 V to 5.5 V		8	20		
		V _{OL} = 0.55 V			8	20		
		V _{OL} = 0.7 V			10	24		
INT	V _{OL} = 0.4 V	2.3 V to 5.5 V		3				
I _{OH}	P port, except for P0 ⁽³⁾	V _{OH} = V _{CC} - 0.4 V	2.3 V to 5.5 V		-4		mA	
	P0 ⁽³⁾	V _{OH} = 4.6 V	4.6 V to 5.5 V			1	μA	
		V _{OH} = 3.3 V	3.3 V to 5.5 V				1	
I _I	SCL, SDA	V _I = V _{CC} or GND	2.3 V to 5.5 V			±1	μA	
	A2–A0, RESET					±1		
I _{IH}	P port	V _I = V _{CC}	2.3 V to 5.5 V			1	μA	
I _{IL}	P port	V _I = GND	2.3 V to 5.5 V			1	μA	
I _{CC}	Operating mode	V _I = V _{CC} or GND, I _O = 0, I/O = inputs, f _{SCL} = 400 kHz	5.5 V		19	25	μA	
			3.6 V		12	22		
			2.7 V		8	20		
		V _I = V _{CC} or GND, I _O = 0, I/O = inputs, f _{SCL} = 100 kHz	5.5 V		1.5	5		
			3.6 V		1	4		
			2.7 V		0.6	3		
	Standby mode	V _I = V _{CC} or GND, I _O = 0, I/O = inputs, f _{SCL} = 0 kHz	5.5 V		0.25	1		
			3.6 V		0.25	0.9		
2.7 V				0.2	0.8			
ΔI _{CC}	Additional current in Standby mode	One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	2.3 V to 5.5 V			0.2	mA	
		Every LED I/O at V _I = 4.3 V, f _{SCL} = 0 kHz	5.5 V			0.4		
C _I	SCL	V _I = V _{CC} or GND	2.3 V to 5.5 V		4	6	pF	
C _{io}	SDA	V _{IO} = V _{CC} or GND	2.3 V to 5.5 V		5.5	8	pF	
	P port				7.5	9.5		

(1) All typical values are at nominal supply voltage (2.5-V, 3.3-V, or 5-V V_{CC}) and T_A = 25°C.

(2) Each I/O must be externally limited to a maximum of 25 mA, and the P port (P7–P1) must be limited to a maximum current of 200 mA.

(3) The total current sourced by all I/Os must be limited to 85 mA per bit.

I²C Interface Timing Requirements

 over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 10](#))

		STANDARD MODE I ² C BUS		FAST MODE I ² C BUS		UNIT
		MIN	MAX	MIN	MAX	
t _{scl}	I ² C clock frequency	0	100	0	400	kHz
t _{sch}	I ² C clock high time	4		0.6		μs
t _{scl}	I ² C clock low time	4.7		1.3		μs
t _{sp}	I ² C spike time		50		50	ns
t _{sds}	I ² C serial data setup time	250		100		ns
t _{sdh}	I ² C serial data hold time	0		0		ns
t _{icr}	I ² C input rise time		1000	20 + 0.1C _b ⁽¹⁾	300	ns
t _{icf}	I ² C input fall time		300	20 + 0.1C _b ⁽¹⁾	300	ns
t _{ocf}	I ² C output fall time (10-pF to 400-pF bus)		300	20 + 0.1C _b ⁽¹⁾	300	ns
t _{buf}	I ² C bus free time between stop and start	4.7		1.3		μs
t _{sts}	I ² C start or repeater start condition setup time	4.7		0.6		μs
t _{sth}	I ² C start or repeater start condition hold time	4		0.6		μs
t _{sps}	I ² C stop condition setup time	4		0.6		μs
t _{vd(data)}	Valid data time; SCL low to SDA output valid		1		0.9	μs
t _{vd(ack)}	Valid data time of ACK condition; ACK signal from SCL low to SDA (out) low		1		0.9	μs
C _b	I ² C bus capacitive load		400		400	pF

 (1) C_b = total capacitance of one bus line in pF

Reset Timing Requirements

 over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 13](#))

		STANDARD MODE I ² C BUS		FAST MODE I ² C BUS		UNIT
		MIN	MAX	MIN	MAX	
t _w	Reset pulse duration	16		16		ns
t _{REC}	Reset recovery time	0		0		ns
t _{RESET}	Time to reset ⁽¹⁾	400		400		ns

(1) The PCA6107 requires a minimum of 400 ns to be reset.

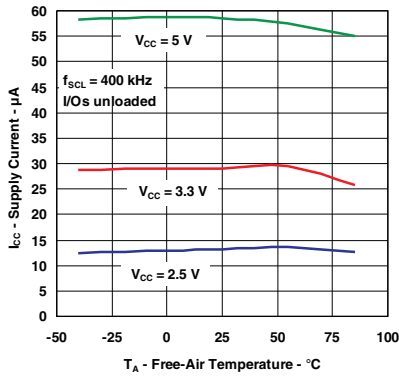
Switching Characteristics

 over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 10](#))

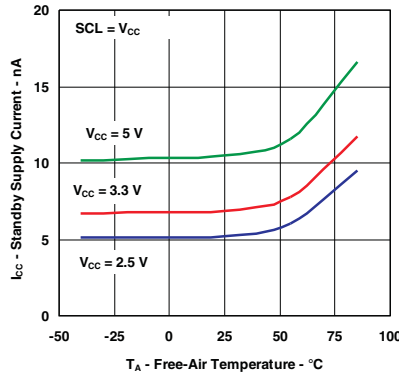
PARAMETER	FROM	TO	STANDARD MODE I ² C BUS		FAST MODE I ² C BUS		UNIT
			MIN	MAX	MIN	MAX	
t _{iv}	Interrupt valid time	P port		4		4	μs
t _{ir}	Interrupt reset delay time	SCL		4		4	μs
t _{pV}	Output data valid	SCL		250		250	ns
		SCL	P1–P7		200		
t _{ps}	Input data setup time	P port	0		0		ns
t _{ph}	Input data hold time	P port	200		200		ns

TYPICAL CHARACTERISTICS

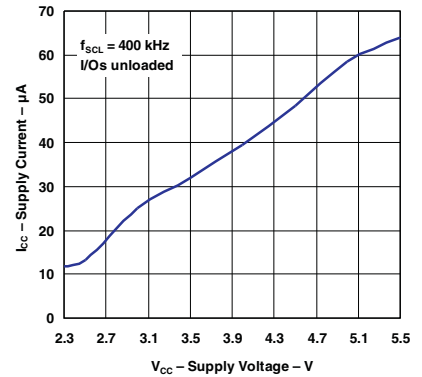
SUPPLY CURRENT VS TEMPERATURE



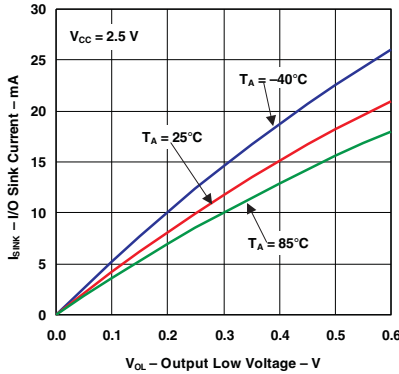
STANDBY SUPPLY CURRENT VS TEMPERATURE



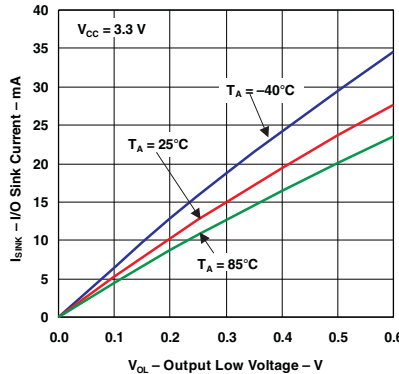
SUPPLY CURRENT VS SUPPLY VOLTAGE



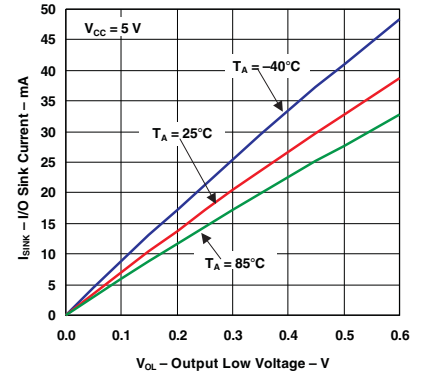
I/O SINK CURRENT VS OUTPUT LOW VOLTAGE



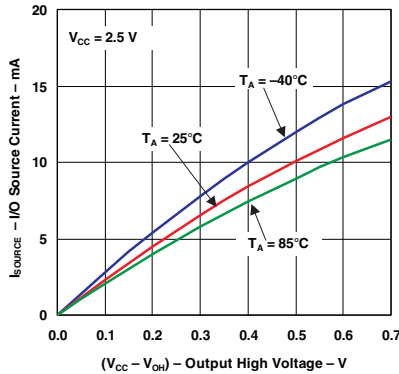
I/O SINK CURRENT VS OUTPUT LOW VOLTAGE



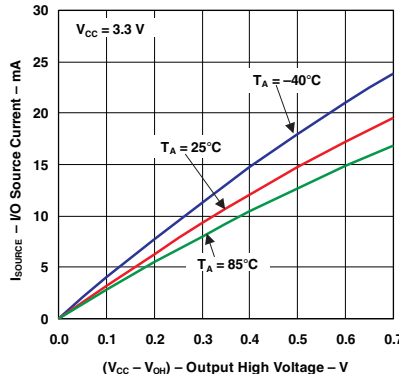
I/O SINK CURRENT VS OUTPUT LOW VOLTAGE



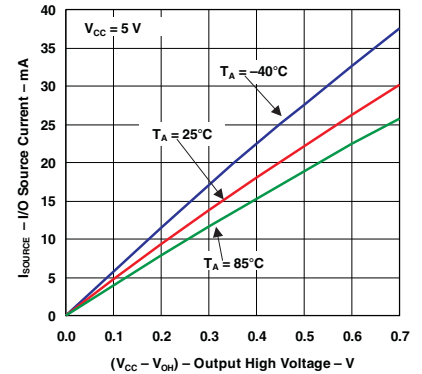
I/O SOURCE CURRENT VS OUTPUT HIGH VOLTAGE (P7-P1)



I/O SOURCE CURRENT VS OUTPUT HIGH VOLTAGE (P7-P1)

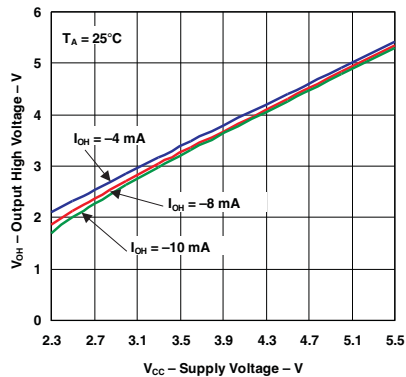


I/O SOURCE CURRENT VS OUTPUT HIGH VOLTAGE (P7-P1)

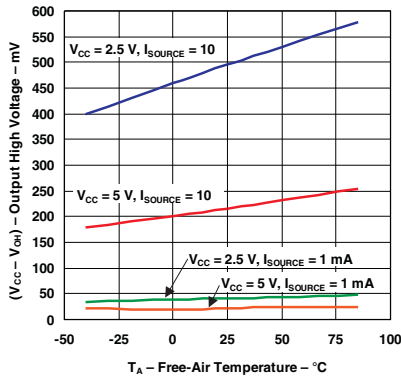


TYPICAL CHARACTERISTICS (continued)

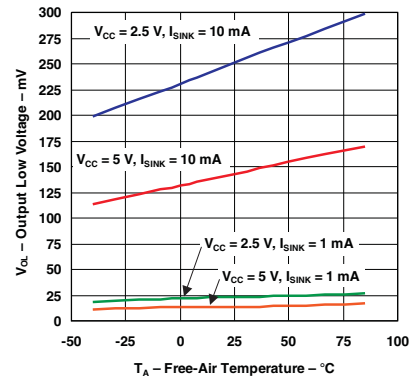
OUTPUT HIGH VOLTAGE
vs
SUPPLY VOLTAGE
(P7–P1)



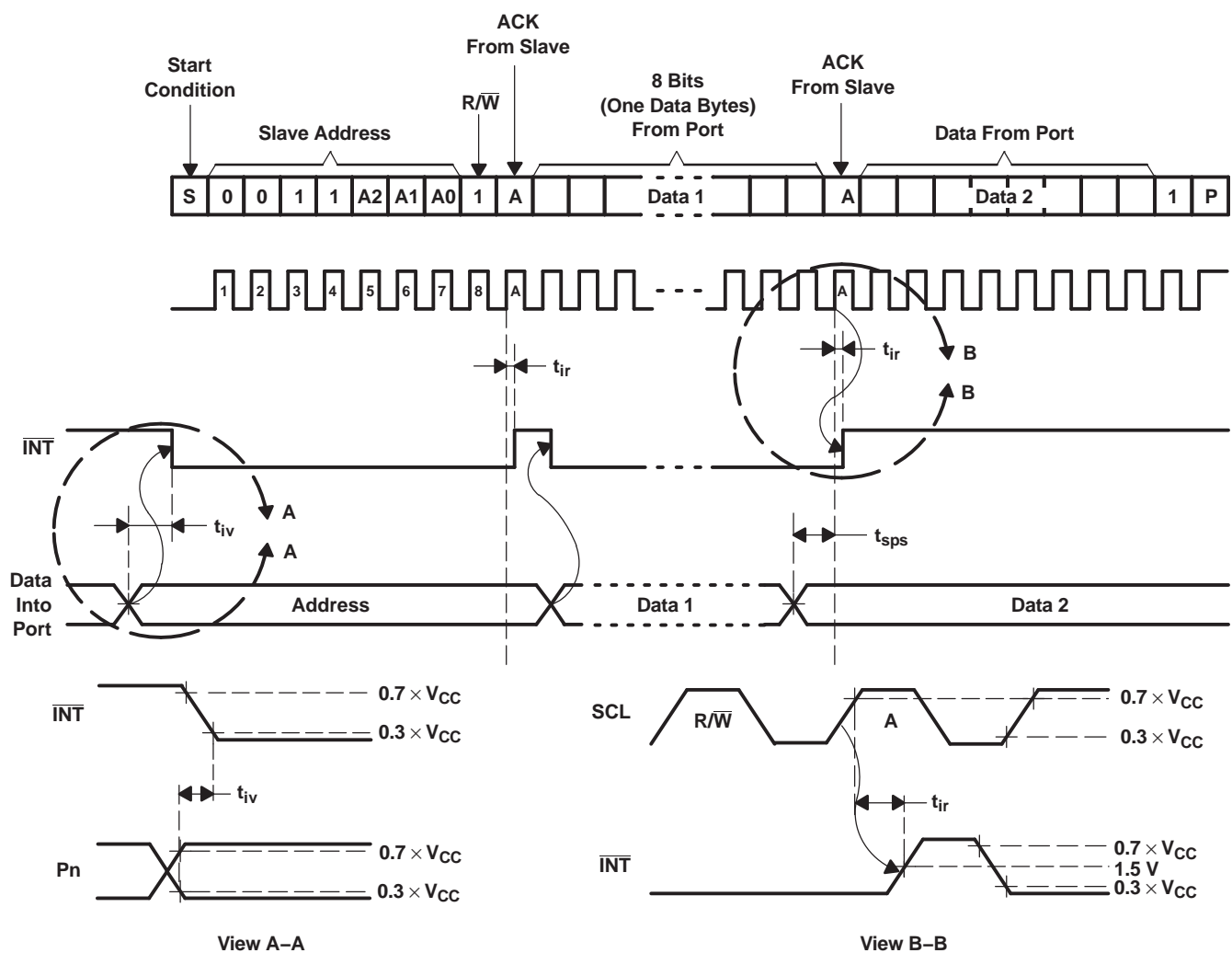
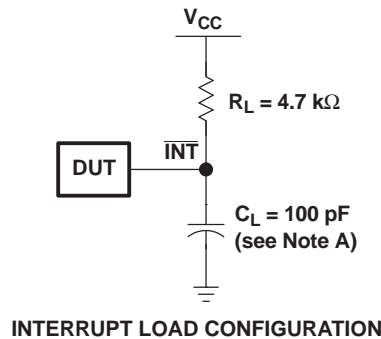
OUTPUT HIGH VOLTAGE
vs
TEMPERATURE
(P7–P1)



OUTPUT LOW VOLTAGE
vs
TEMPERATURE



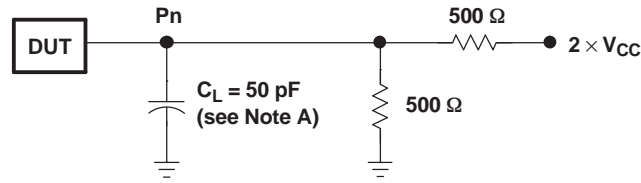
PARAMETER MEASUREMENT INFORMATION (continued)



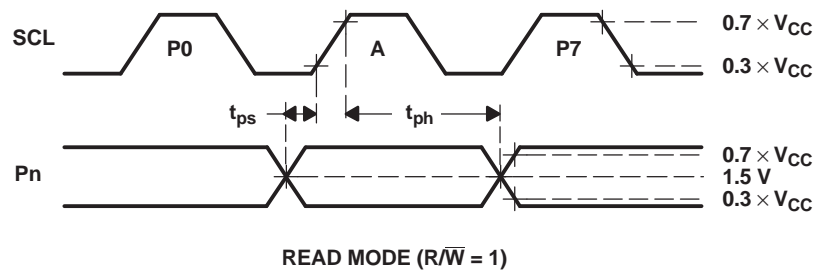
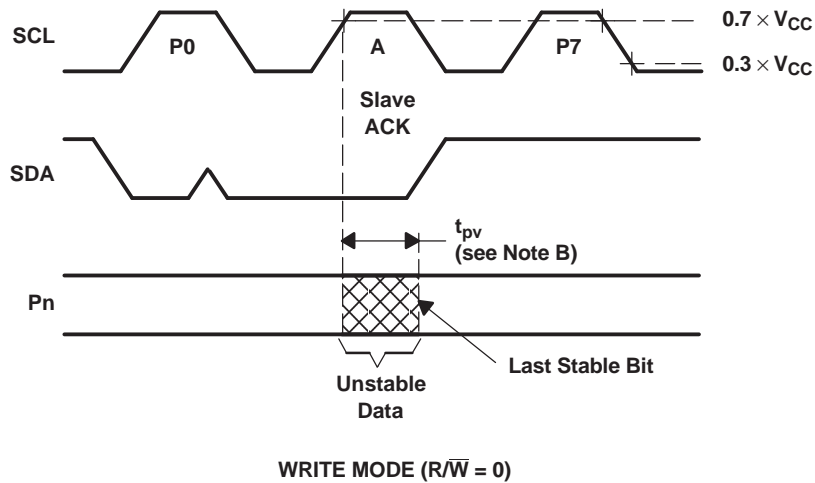
- A. C_L includes probe and jig capacitance.
- B. All inputs are supplied by generators having the following characteristics: PRR = 10 MHz, $Z_0 = 50 \Omega$, $t_r/t_f \leq 30$ ns.
- C. All parameters and waveforms are not applicable to all devices.

Figure 11. Interrupt Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION (continued)



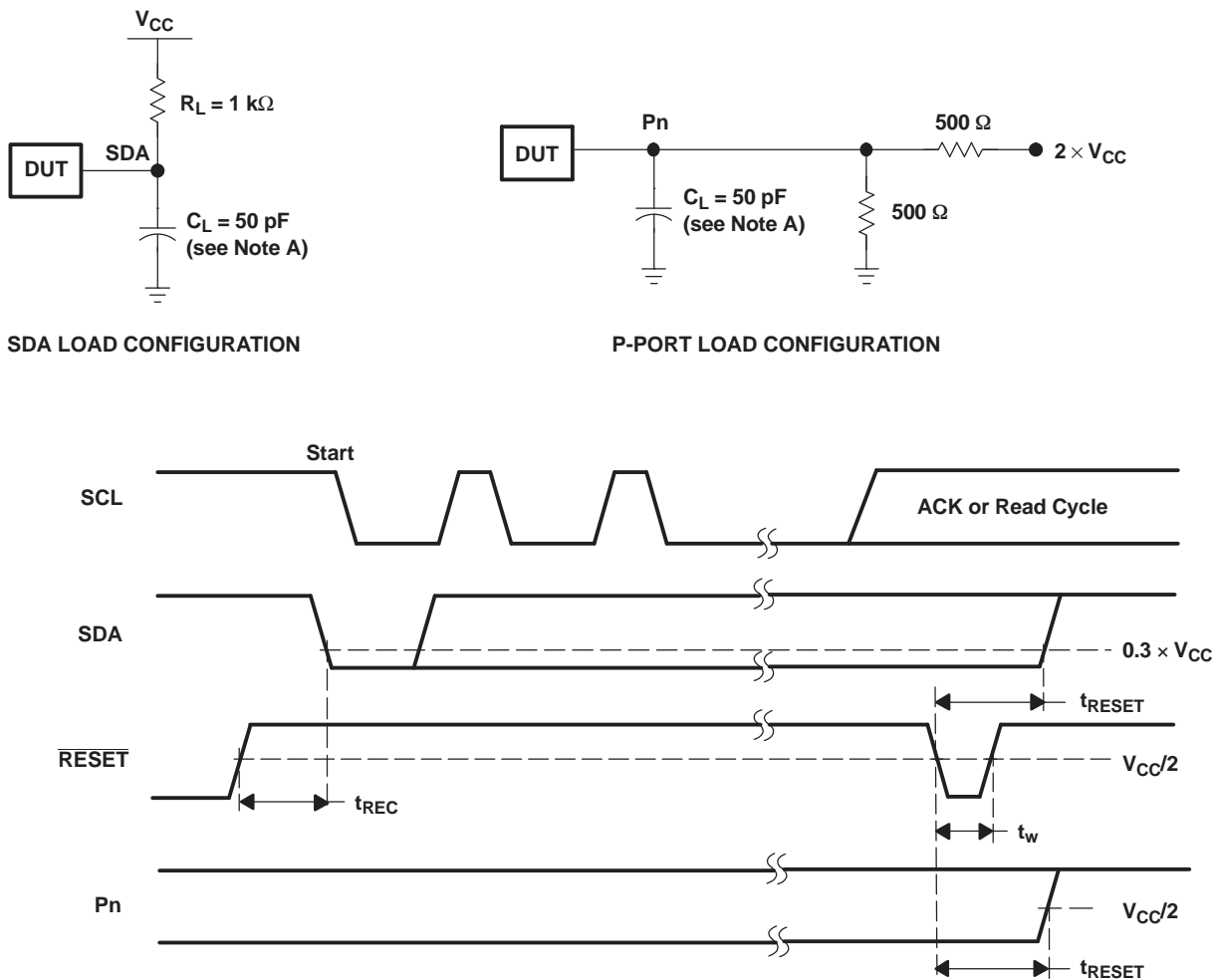
P-PORT LOAD CONFIGURATION



- C_L includes probe and jig capacitance.
- t_{pv} is measured from $0.7 \times V_{CC}$ on SCL to 50% I/O (P_n) output.
- All inputs are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r/t_f \leq 30$ ns.
- The outputs are measured one at a time, with one transition per measurement.
- All parameters and waveforms are not applicable to all devices.

Figure 12. P-Port Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION (continued)

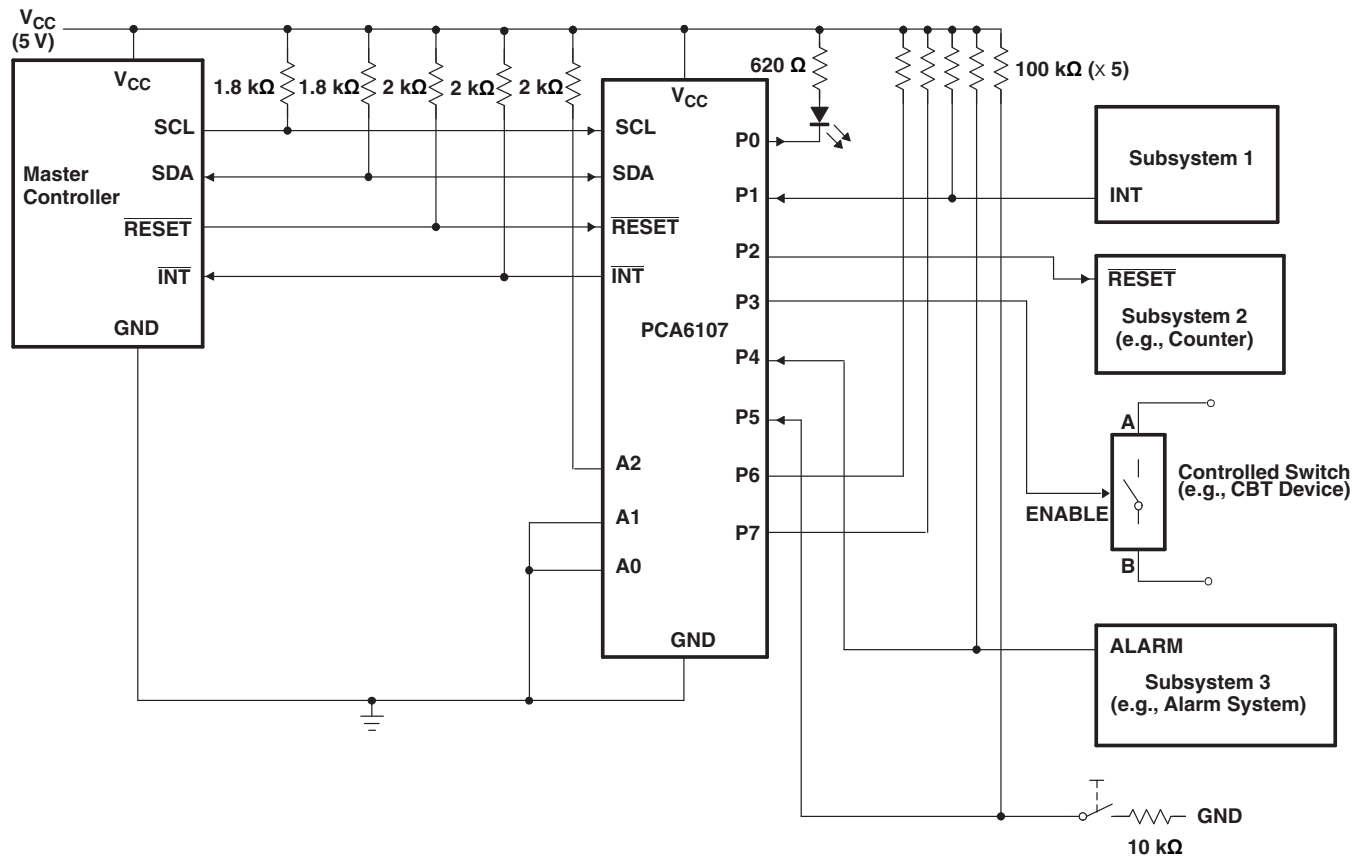


- A. C_L includes probe and jig capacitance.
- B. All inputs are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r/t_f \leq 30$ ns.
- C. I/Os are configured as inputs.
- D. All parameters and waveforms are not applicable to all devices.

Figure 13. Reset Load Circuits and Voltage Waveforms

APPLICATION INFORMATION

Figure 14 shows an application where the PCA6107 can be used.



- Device address is configured as 0011100 for this example.
- P1, P4, and P5 are configured as inputs.
- P0, P2, and P3 are configured as outputs.
- P6 and P7 are not used and must be configured as outputs.

Figure 14. Typical Application

Minimizing I_{CC} When I/O Is Used to Control LED

When an I/O is used to control an LED, normally it is connected to V_{CC} through a resistor as shown in Figure 14. The LED acts as a diode so, when the LED is off, the I/O V_{IN} is about 1.2 V less than V_{CC} . The ΔI_{CC} parameter in *Electrical Characteristics* shows how I_{CC} increases as V_{IN} becomes lower than V_{CC} . Designs needing to minimize current consumption, such as battery power applications, should consider maintaining the I/O pin greater than or equal to V_{CC} when the LED is off.

Figure 15 shows a high-value resistor in parallel with the LED. Figure 16 shows V_{CC} less than the LED supply voltage by at least 1.2 V. Both of these methods maintain the I/O V_{IN} at or above V_{CC} and prevent additional supply-current consumption when the LED is off.

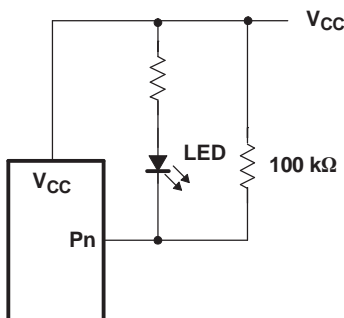


Figure 15. High-Value Resistor in Parallel With the LED

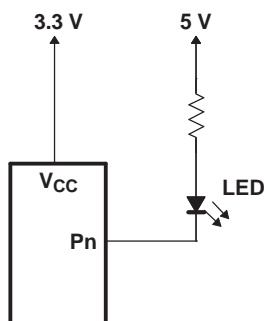


Figure 16. Device Supplied by a Low Voltage

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
PCA6107DW	ACTIVE	SOIC	DW	18	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	PCA6107	Samples
PCA6107DWG4	ACTIVE	SOIC	DW	18	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	PCA6107	Samples
PCA6107DWR	ACTIVE	SOIC	DW	18	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	PCA6107	Samples
PCA6107DWRG4	ACTIVE	SOIC	DW	18	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	PCA6107	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

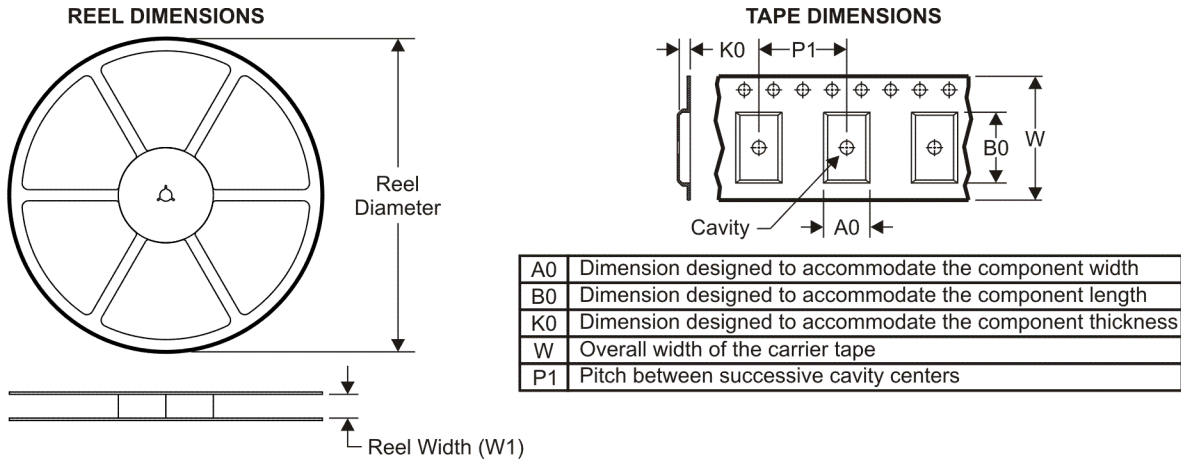
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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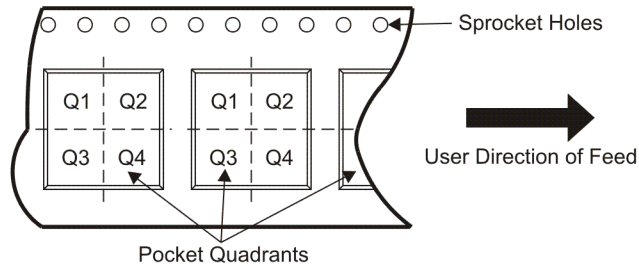
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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PCA6107DWR	SOIC	DW	18	2000	330.0	24.4	10.9	12.0	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS

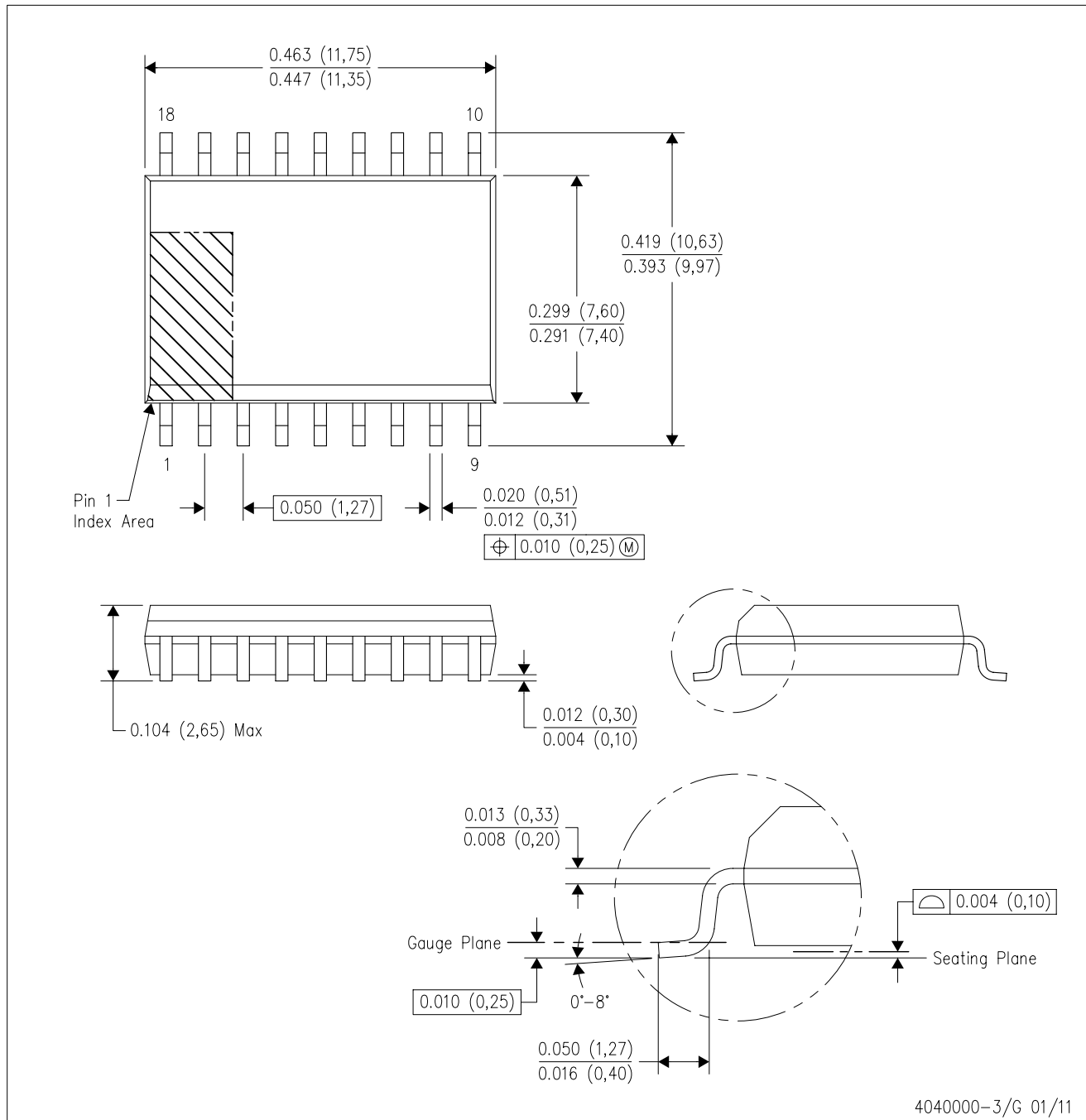


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
PCA6107DWR	SOIC	DW	18	2000	370.0	355.0	55.0

DW (R-PDSO-G18)

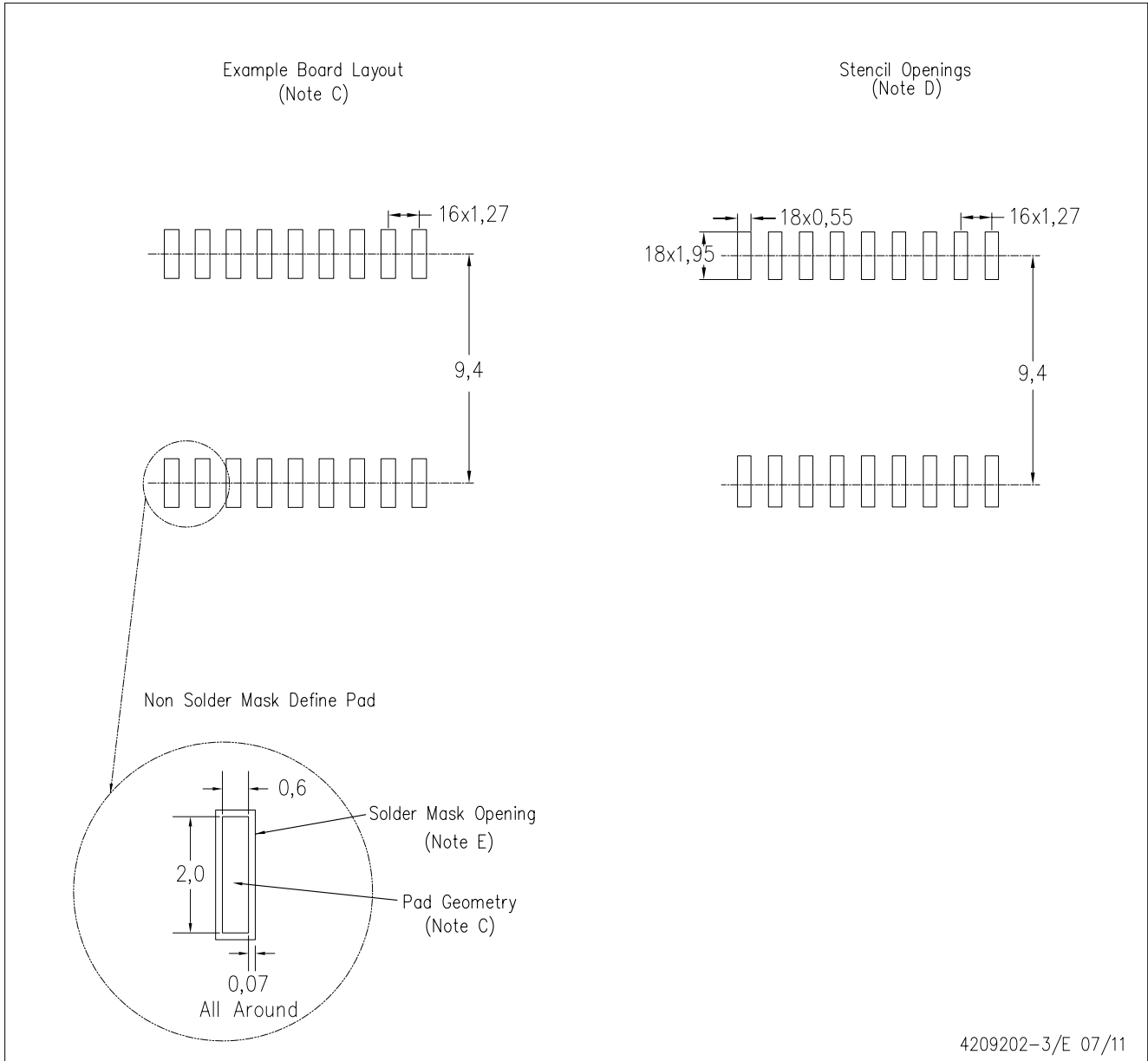
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AB.

DW (R-PDSO-G18)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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