



2-Kb Microwire Serial CMOS EEPROM

FEATURES

- High speed operation: 2MHz
- 1.8V to 5.5V supply voltage range
- Selectable x8 or x16 memory organization
- Sequential read
- Software write protection
- Power-up inadvertant write protection
- Low power CMOS technology
- 1,000,000 Program/erase cycles
- 100 year data retention
- Industrial temperature ranges
- RoHS-compliant 8-pin PDIP, SOIC, TSSOP and 8-pad TDFN packages



PIN CONFIGURATION

| | PDIP (L) | | | SOIC (W*) | | | |
|----|------------------|---|-----------------|-----------------|---|---|-----|
| | SOIC (V, X) | | | SOIC (W*) | | | |
| | TSSOP (Y) | | | SOIC (W*) | | | |
| | TDFN (VP2, ZD4*) | | | SOIC (W*) | | | |
| CS | 1 | 8 | V _{CC} | NC | 1 | 8 | ORG |
| SK | 2 | 7 | NC | V _{CC} | 2 | 7 | GND |
| DI | 3 | 6 | ORG | CS | 3 | 6 | DO |
| DO | 4 | 5 | GND | SK | 4 | 5 | DI |

* TDFN 3x3mm (ZD4) and SOIC (W) rotated pin-out packages are available for CAT93C57 and CAT93C56, Rev. E only (not recommended for new designs of CAT93C56)

PIN FUNCTION

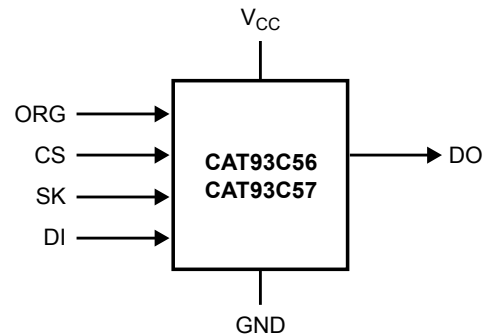
| Pin Name | Function |
|-----------------|---------------------|
| CS | Chip Select |
| SK | Clock Input |
| DI | Serial Data Input |
| DO | Serial Data Output |
| V _{CC} | Power Supply |
| GND | Ground |
| ORG | Memory Organization |
| NC | No Connection |

DESCRIPTION

The CAT93C56/57 is a 2-Kb CMOS Serial EEPROM device which is organized as either 128 registers of 16 bits (ORG pin at V_{CC}) or 256 registers of 8 bits (ORG pin at GND). Each register can be written (or read) serially by using the DI (or DO) pin. The CAT93C56/57 features sequential read and self-timed internal write with auto-clear. On-chip Power-On Reset circuitry protects the internal logic against powering up in the wrong state.

For Ordering Information details, see page 16.

FUNCTIONAL SYMBOL



Note: When the ORG pin is connected to VCC, the x16 organization is selected. When it is connected to ground, the x8 pin is selected. If the ORG pin is left unconnected, then an internal pullup device will select the x16 organization

Absolute Maximum Ratings⁽¹⁾

| Parameters | Ratings | Units |
|--|--------------|-------|
| Storage Temperature | -65 to +150 | °C |
| Voltage on Any Pin with Respect to Ground ⁽²⁾ | -0.5 to +6.5 | V |

Reliability Characteristics⁽³⁾

| Symbol | Parameter | Min | Units |
|---------------------|----------------|-----------|-----------------------|
| NEND ⁽⁴⁾ | Endurance | 1,000,000 | Program/ Erase Cycles |
| TDR | Data Retention | 100 | Years |

D.C. OPERATING CHARACTERISTICS, CAT93C56, Die Rev. G – New Product

$V_{CC} = +1.8V$ to $+5.5V$, $T_A = -40^\circ C$ to $+85^\circ C$ unless otherwise specified.

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|-----------|---|--|---------------------|---------------------|---------|
| I_{CC1} | Power Supply Current (Write) | $f_{SK} = 1MHz$, $V_{CC} = 5.0V$ | | 1 | mA |
| I_{CC2} | Power Supply Current (Read) | $f_{SK} = 1MHz$, $V_{CC} = 5.0V$ | | 500 | μA |
| I_{SB1} | Power Supply Current (Standby) (x8 Mode) | $V_{IN} = GND$ or V_{CC} , $CS = GND$ $ORG = GND$ | | 2 | μA |
| I_{SB2} | Power Supply Current (Standby) (x16 Mode) | $V_{IN} = GND$ or V_{CC} , $CS = GND$ $ORG = Float$ or V_{CC} | | 1 | μA |
| I_{LI} | Input Leakage Current | $V_{IN} = GND$ to V_{CC} | | 1 | μA |
| I_{LO} | Output Leakage Current | $V_{OUT} = GND$ to V_{CC} , $CS = GND$ | | 1 | μA |
| V_{IL1} | Input Low Voltage | $4.5V \leq V_{CC} < 5.5V$ | -0.1 | 0.8 | V |
| V_{IH1} | Input High Voltage | $4.5V \leq V_{CC} < 5.5V$ | 2 | $V_{CC} + 1$ | V |
| V_{IL2} | Input Low Voltage | $1.8V \leq V_{CC} < 4.5V$ | 0 | $V_{CC} \times 0.2$ | V |
| V_{IH2} | Input High Voltage | $1.8V \leq V_{CC} < 4.5V$ | $V_{CC} \times 0.7$ | $V_{CC} + 1$ | V |
| V_{OL1} | Output Low Voltage | $4.5V \leq V_{CC} < 5.5V$, $I_{OL} = 2.1mA$ | | 0.4 | V |
| V_{OH1} | Output High Voltage | $4.5V \leq V_{CC} < 5.5V$, $I_{OH} = -400\mu A$ | 2.4 | | V |
| V_{OL2} | Output Low Voltage | $1.8V \leq V_{CC} < 4.5V$, $I_{OL} = 1mA$ | | 0.2 | V |
| V_{OH2} | Output High Voltage | $1.8V \leq V_{CC} < 4.5V$, $I_{OH} = -100\mu A$ | $V_{CC} - 0.2$ | | V |

Notes:

- (1) Stresses above 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 outside of those listed in the operational sections of this specification is not implied. Exposure to any absolute maximum rating for extended periods may affect device performance and reliability.
- (2) The DC input voltage on any pin should not be lower than -0.5V or higher than $V_{CC} + 0.5V$. During transitions, the voltage on any pin may undershoot to no less than -1.5V or overshoot to no more than $V_{CC} + 1.5V$, for periods of less than 20 ns.
- (3) These parameters are tested initially and after a design or process change that affects the parameter according to appropriate AEC-Q100 and JEDEC test methods.
- (4) Block Mode, $V_{CC} = 5V$, $25^\circ C$

**D.C. OPERATING CHARACTERISTICS, CAT93C56/57, Die Rev. E – Mature Product
 (CAT93C56, Rev. E – NOT RECOMMENDED FOR NEW DESIGNS)**
 $V_{CC} = +1.8V$ to $+5.5V$, $T_A = -40^{\circ}C$ to $+125^{\circ}C$ unless otherwise specified.

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|-----------|---|--|---------------------|---------------------|---------|
| I_{CC1} | Power Supply Current (Write) | $f_{SK} = 1MHz, V_{CC} = 5.0V$ | | 3 | mA |
| I_{CC2} | Power Supply Current (Read) | $f_{SK} = 1MHz, V_{CC} = 5.0V$ | | 500 | μA |
| I_{SB1} | Power Supply Current (Standby) (x8 Mode) | $V_{IN} = GND$ or V_{CC} , $CS = GND$ $ORG = GND$ | | 10 | μA |
| I_{SB2} | Power Supply Current (Standby) (x16 Mode) | $V_{IN} = GND$ or V_{CC} , $CS = GND$ $ORG = Float$ or V_{CC} | | 10 | μA |
| I_{LI} | Input Leakage Current | $V_{IN} = GND$ to V_{CC} | | 1 | μA |
| I_{LO} | Output Leakage Current | $V_{OUT} = GND$ to V_{CC} , $CS = GND$ | | 1 | μA |
| V_{IL1} | Input Low Voltage | $4.5V \leq V_{CC} < 5.5V$ | -0.1 | 0.8 | V |
| V_{IH1} | Input High Voltage | $4.5V \leq V_{CC} < 5.5V$ | 2 | $V_{CC} + 1$ | V |
| V_{IL2} | Input Low Voltage | $1.8V \leq V_{CC} < 4.5V$ | 0 | $V_{CC} \times 0.2$ | V |
| V_{IH2} | Input High Voltage | $1.8V \leq V_{CC} < 4.5V$ | $V_{CC} \times 0.7$ | $V_{CC} + 1$ | V |
| V_{OL1} | Output Low Voltage | $4.5V \leq V_{CC} < 5.5V, I_{OL} = 2.1mA$ | | 0.4 | V |
| V_{OH1} | Output High Voltage | $4.5V \leq V_{CC} < 5.5V, I_{OH} = -400\mu A$ | 2.4 | | V |
| V_{OL2} | Output Low Voltage | $1.8V \leq V_{CC} < 4.5V, I_{OL} = 1mA$ | | 0.2 | V |
| V_{OH2} | Output High Voltage | $1.8V \leq V_{CC} < 4.5V, I_{OH} = -100\mu A$ | $V_{CC} - 0.2$ | | V |

PIN CAPACITANCE
 $T_A = 25^{\circ}C$, $f = 1MHz$, $V_{CC} = 5V$

| Symbol | Test | Conditions | Min | Typ | Max | Units |
|-----------------|-------------------------------------|----------------|-----|-----|-----|-------|
| $C_{OUT}^{(1)}$ | Output Capacitance (DO) | $V_{OUT} = 0V$ | | | 5 | pF |
| $C_{IN}^{(1)}$ | Input Capacitance (CS, SK, DI, ORG) | $V_{IN} = 0V$ | | | 5 | pF |

Notes:

- (1) These parameters are tested initially and after a design or process change that affects the parameter according to appropriate AEC-Q100 and JEDEC test methods.

A.C. CHARACTERISTICS⁽¹⁾, CAT93C56, Die Rev. G – New Product

V_{CC} = +1.8V to +5.5V, T_A = -40°C to +85°C, unless otherwise specified.

| Symbol | Parameter | Limits | | Units |
|--------------------------------|------------------------------|--------|------|-------|
| | | Min | Max | |
| t _{CSS} | CS Setup Time | 50 | | ns |
| t _{CSH} | CS Hold Time | 0 | | ns |
| t _{DIS} | DI Setup Time | 100 | | ns |
| t _{DIH} | DI Hold Time | 100 | | ns |
| t _{PD1} | Output Delay to 1 | | 0.25 | µs |
| t _{PD0} | Output Delay to 0 | | 0.25 | µs |
| t _{HZ} ⁽²⁾ | Output Delay to High-Z | | 100 | ns |
| t _{EW} | Program/Erase Pulse Width | | 5 | ms |
| t _{CSMIN} | Minimum CS Low Time | 0.25 | | µs |
| t _{SKHI} | Minimum SK High Time | 0.25 | | µs |
| t _{SKLOW} | Minimum SK Low Time | 0.25 | | µs |
| t _{SV} | Output Delay to Status Valid | | 0.25 | µs |
| SK _{MAX} | Maximum Clock Frequency | DC | 2000 | kHz |

**A.C. CHARACTERISTICS⁽¹⁾, CAT93C56/57, Die Rev. E – Mature Product
(CAT93C56 Rev. E - NOT RECOMMENDED FOR NEW DESIGNS)**

| Symbol | Parameter | Limits | | | | | | Units |
|--------------------------------|------------------------------|-------------------------------|-----|-------------------------------|-----|-------------------------------|------|-------|
| | | V _{CC} = 1.8V - 5.5V | | V _{CC} = 2.5V - 5.5V | | V _{CC} = 4.5V - 5.5V | | |
| | | Min | Max | Min | Max | Min | Max | |
| t _{CSS} | CS Setup Time | 200 | | 100 | | 50 | | ns |
| t _{CSH} | CS Hold Time | 0 | | 0 | | 0 | | ns |
| t _{DIS} | DI Setup Time | 400 | | 200 | | 100 | | ns |
| t _{DIH} | DI Hold Time | 400 | | 200 | | 100 | | ns |
| t _{PD1} | Output Delay to 1 | | 1 | | 0.5 | | 0.25 | µs |
| t _{PD0} | Output Delay to 0 | | 1 | | 0.5 | | 0.25 | µs |
| t _{HZ} ⁽²⁾ | Output Delay to High-Z | | 400 | | 200 | | 100 | ns |
| t _{EW} | Program/Erase Pulse Width | | 10 | | 10 | | 10 | ms |
| t _{CSMIN} | Minimum CS Low Time | 1 | | 0.5 | | 0.25 | | µs |
| t _{SKHI} | Minimum SK High Time | 1 | | 0.5 | | 0.25 | | µs |
| t _{SKLOW} | Minimum SK Low Time | 1 | | 0.5 | | 0.25 | | µs |
| t _{SV} | Output Delay to Status Valid | | 1 | | 0.5 | | 0.25 | µs |
| SK _{MAX} | Maximum Clock Frequency | DC | 250 | DC | 500 | DC | 1000 | kHz |

Notes:

- (1) Test conditions according to "A.C. Test Conditions" table.
- (2) These parameters are tested initially and after a design or process change that affects the parameter according to appropriate AEC-Q100 and JEDEC test methods.

POWER-UP TIMING^{(1) (2)}

| Symbol | Parameter | Max | Units |
|-----------|-----------------------------|-----|-------|
| t_{PUR} | Power-up to Read Operation | 1 | ms |
| t_{PUW} | Power-up to Write Operation | 1 | ms |

Notes:

- (1) These parameters are tested initially and after a design or process change that affects the parameter according to appropriate AEC-Q100 and JEDEC test methods.
- (2) t_{PUR} and t_{PUW} are the delays required from the time V_{CC} is stable until the specified operation can be initiated.

A.C. Test Conditions

| | | |
|---------------------------|---|------------------------------|
| Input Rise and Fall Times | ≤ 50 ns | |
| Input Pulse Voltages | 0.4V to 2.4V | $4.5V \leq V_{CC} \leq 5.5V$ |
| Timing Reference Voltages | 0.8V, 2.0V | $4.5V \leq V_{CC} \leq 5.5V$ |
| Input Pulse Voltages | $0.2V_{CC}$ to $0.7V_{CC}$ | $1.8V \leq V_{CC} \leq 4.5V$ |
| Timing Reference Voltages | $0.5V_{CC}$ | $1.8V \leq V_{CC} \leq 4.5V$ |
| Output Load | Current Source I_{OLmax}/I_{OHmax} ; $CL=100pF$ | |

DEVICE OPERATION

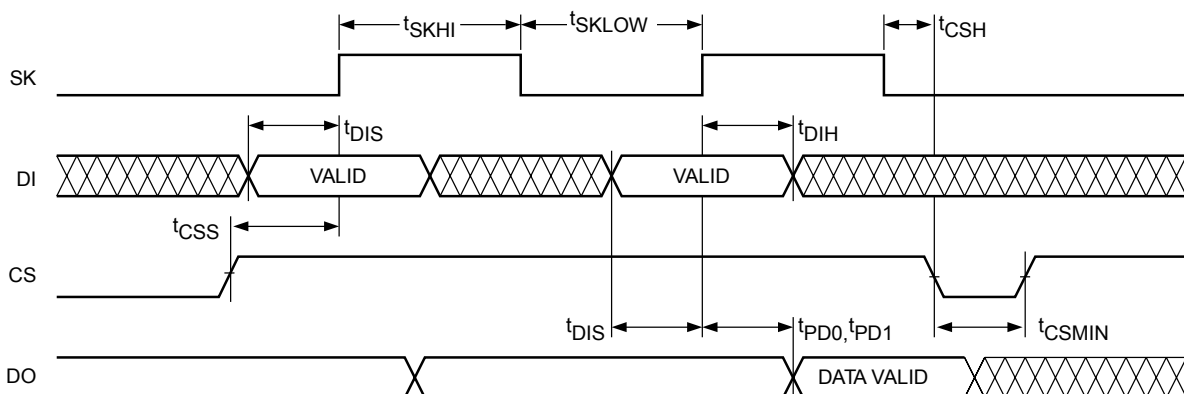
The CAT93C56/57 is a 2048-bit nonvolatile memory intended for use with industry standard microprocessors. The CAT93C56/57 can be organized as either registers of 16 bits or 8 bits. When organized as X16, seven 10-bit instructions for 93C57 or seven 11-bit instructions for 93C56 control the reading, writing and erase operations of the device. When organized as X8, seven 11-bit instructions for 93C57 or seven 12-bit instructions for 93C56 control the reading, writing and erase operations of the device. The CAT93C56/57 operates on a single power supply and will generate on chip, the high voltage required during any write operation.

Instructions, addresses, and write data are clocked into the DI pin on the rising edge of the clock (SK). The DO pin is normally in a high impedance state

except when reading data from the device, or when checking the ready/busy status after a write operation. The serial communication protocol follows the timing shown in Figure 1.

The ready/busy status can be determined after the start of internal write cycle by selecting the device (CS high) and polling the DO pin; DO low indicates that the write operation is not completed, while DO high indicates that the device is ready for the next instruction. If necessary, the DO pin may be placed back into a high impedance state during chip select by shifting a dummy "1" into the DI pin. The DO pin will enter the high impedance state on the rising edge of the clock (SK). Placing the DO pin into the high impedance state is recommended in applications where the DI pin and the DO pin are to be tied together to form a common DI/O pin.

Figure 1. Synchronous Data Timing



The format for all instructions sent to the device is a logical "1" start bit, a 2-bit (or 4-bit) opcode, 7-bit address (CAT93C57) / 8-bit address (CAT93C56) (an additional bit when organized X8) and for write

operations a 16-bit data field (8-bit for X8 organizations). The instruction format is shown in Instruction Set table.

INSTRUCTION SET

| Instruction | Device Type | Start Bit | Opcode | Address | | Data | | Comments |
|-------------|----------------------|-----------|--------|------------|----------|-------|--------|---------------------|
| | | | | x8 | x16 | x8 | x16 | |
| READ | 93C56 ⁽¹⁾ | 1 | 10 | A8-A0 | A7-A0 | | | Read Address AN-A0 |
| | 93C57 | 1 | 10 | A7-A0 | A6-A0 | | | |
| ERASE | 93C56 ⁽¹⁾ | 1 | 11 | A8-A0 | A7-A0 | | | Clear Address AN-A0 |
| | 93C57 | 1 | 11 | A7-A0 | A6-A0 | | | |
| WRITE | 93C56 ⁽¹⁾ | 1 | 01 | A8-A0 | A7-A0 | D7-D0 | D15-D0 | Write Address AN-A0 |
| | 93C57 | 1 | 01 | A7-A0 | A6-A0 | D7-D0 | D15-D0 | |
| EWEN | 93C56 ⁽¹⁾ | 1 | 00 | 11XXXXXXXX | 11XXXXXX | | | Write Enable |
| | 93C57 | 1 | 00 | 11XXXXXX | 11XXXXX | | | |
| EWDS | 93C56 ⁽¹⁾ | 1 | 00 | 00XXXXXXXX | 00XXXXXX | | | Write Disable |
| | 93C57 | 1 | 00 | 00XXXXXX | 00XXXXX | | | |
| ERAL | 93C56 ⁽¹⁾ | 1 | 00 | 10XXXXXXXX | 10XXXXXX | | | Clear All Addresses |
| | 93C57 | 1 | 00 | 10XXXXXX | 10XXXXX | | | |
| WRAL | 93C56 ⁽¹⁾ | 1 | 00 | 01XXXXXXXX | 01XXXXXX | D7-D0 | D15-D0 | Write All Addresses |
| | 93C57 | 1 | 00 | 01XXXXXX | 01XXXXX | D7-D0 | D15-D0 | |

Note:

(1) Address bit A8 for 256x8 organization and A7 for 128x16 organization are "Don't Care" bits, but must be kept at either a "1" or "0" for READ, WRITE and ERASE commands.

Read

Upon receiving a READ command and an address (clocked into the DI pin), the DO pin of the CAT93C56/57 will come out of the high impedance state and, after sending an initial dummy zero bit, will begin shifting out the data addressed (MSB first). The output data bits will toggle on the rising edge of the SK clock and are stable after the specified time delay (t_{PD0} or t_{PD1}).

For the CAT93C56/57, after the initial data word has been shifted out and CS remains asserted with the SK clock continuing to toggle, the device will automatically increment to the next address and shift out the next data word in a sequential READ mode. As long as CS is continuously asserted and SK continues to toggle, the device will keep incrementing to the next address automatically until it reaches to the end of the

address space, then loops back to address 0. In the sequential READ mode, only the initial data word is preceded by a dummy zero bit. All subsequent data words will follow without a dummy zero bit. The READ instruction timing is illustrated in Figure 2.

Erase/Write Enable and Disable

The CAT93C56/57 powers up in the write disable state. Any writing after power-up or after an EWDS (erase/write disable) instruction must first be preceded by the EWEN (erase/write enable) instruction. Once the write instruction is enabled, it will remain enabled until power to the device is removed, or the EWDS instruction is sent. The EWDS instruction can be used to disable all CAT93C56/57 write and erase instructions, and will prevent any accidental writing or clearing of the device. Data can be read normally from the device regardless of the write enable/disable status. The EWEN and EWDS instructions timing is shown in Figure 3.

Figure 2. READ Instruction Timing

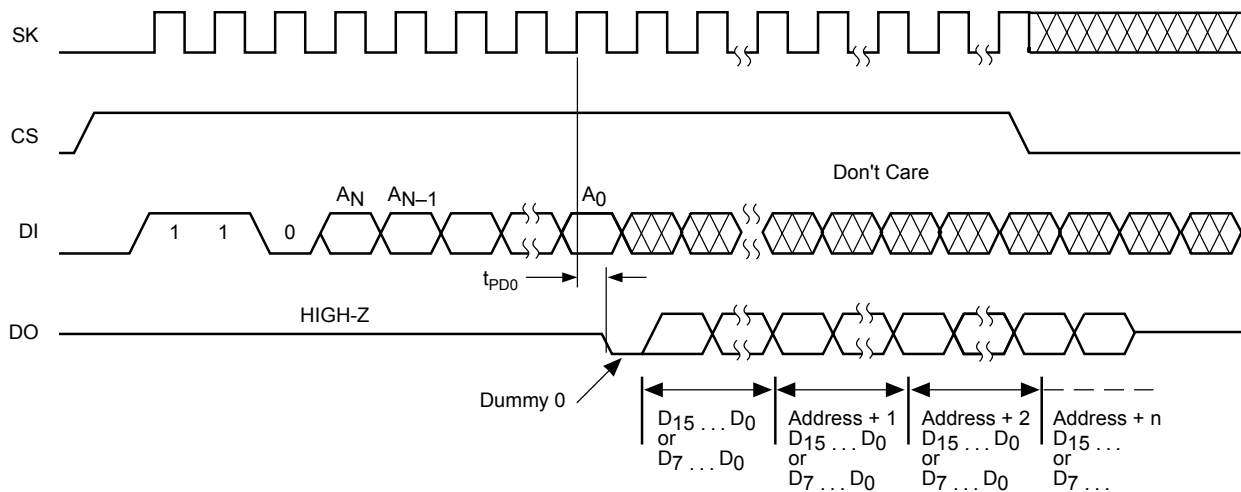
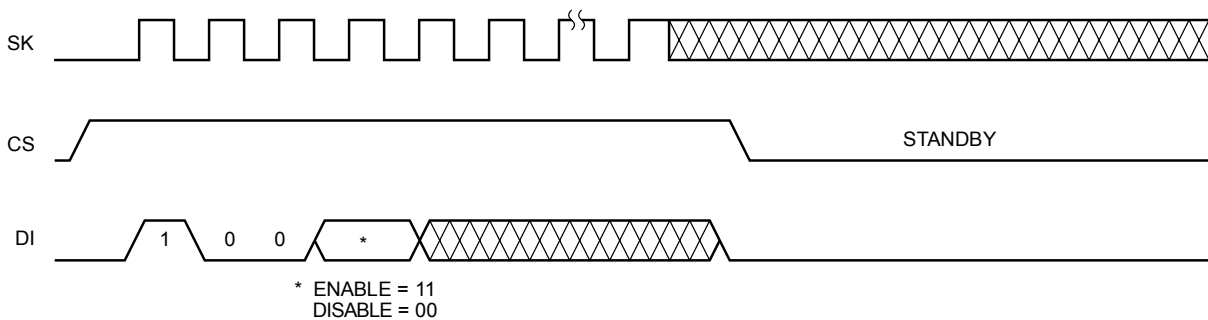


Figure 3. EWEN/EWDS Instruction Timing



Write

After receiving a WRITE command (Figure 4), address and the data, the CS (Chip Select) pin must be deselected for a minimum of t_{CSMIN} . The falling edge of CS will start the self clocking clear and data store cycle of the memory location specified in the instruction. The clocking of the SK pin is not necessary after the device has entered the self clocking mode. The ready/busy status of the CAT93C56/57 can be determined by selecting the device and polling the DO pin. Since this device features Auto-Clear before write, it is NOT necessary to erase a memory location before it is written into.

Erase

Upon receiving an ERASE command and address, the CS (Chip Select) pin must be deasserted for a minimum of t_{CSMIN} (Figure 5). The falling edge of CS will start the self clocking clear cycle of the selected memory location. The clocking of the SaK pin is not necessary after the device has entered the self clocking mode. The ready/busy status of the CAT93C56/57 can be determined by selecting the device and polling the DO pin. Once cleared, the content of a cleared location returns to a logical “1” state.

Figure 4. Write Instruction Timing

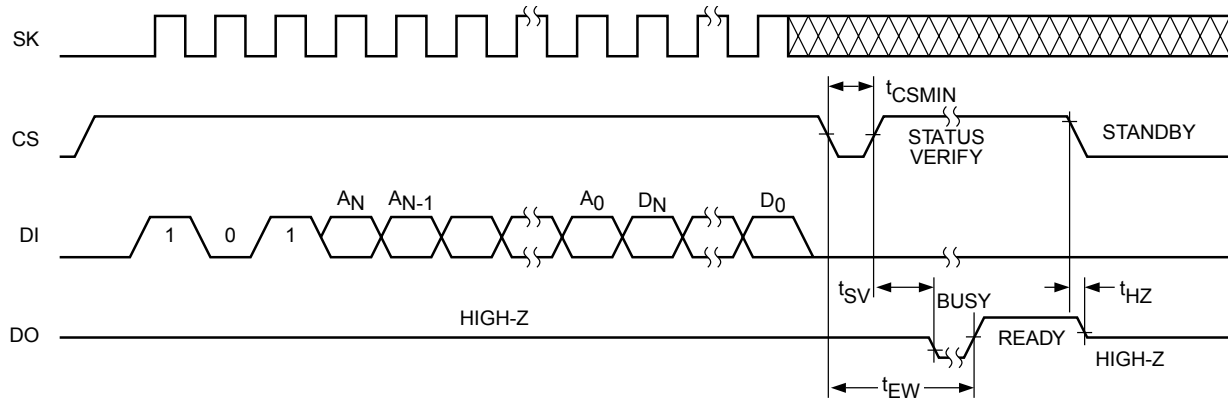
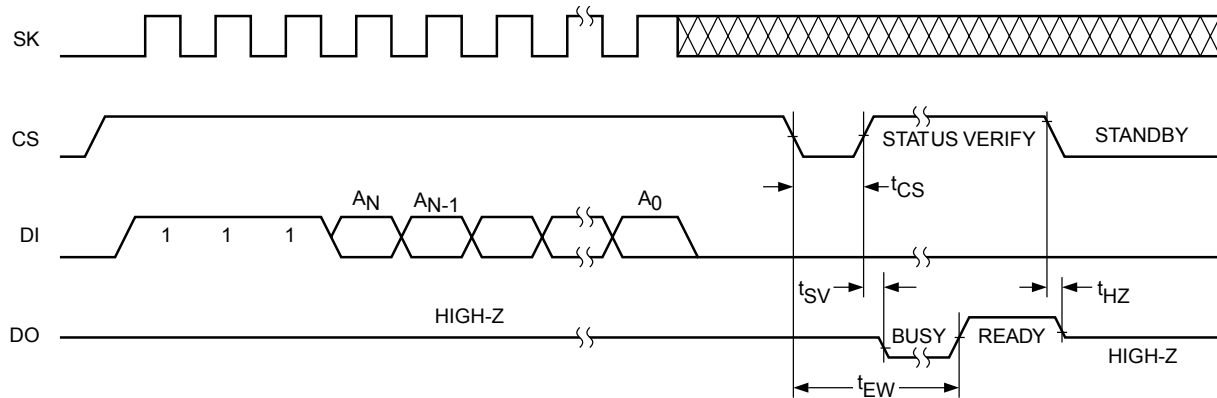


Figure 5. Erase Instruction Timing



Erase All

Upon receiving an ERAL command (Figure 6), the CS (Chip Select) pin must be deselected for a minimum of t_{CSMIN} . The falling edge of CS will start the self clocking clear cycle of all memory locations in the device. The clocking of the SK pin is not necessary after the device has entered the self clocking mode. The ready/busy status of the CAT93C56/57 can be determined by selecting the device and polling the DO pin. Once cleared, the contents of all memory bits return to a logical "1" state.

Write All

Upon receiving a WRAL command and data, the CS (Chip Select) pin must be deselected for a minimum of t_{CSMIN} (Figure 7). The falling edge of CS will start the self clocking data write to all memory locations in the device. The clocking of the SK pin is not necessary after the device has entered the self clocking mode. The ready/busy status of the CAT93C56/57 can be determined by selecting the device and polling the DO pin. It is not necessary for all memory locations to be cleared before the WRAL command is executed.

Figure 6. ERAL Instruction Timing

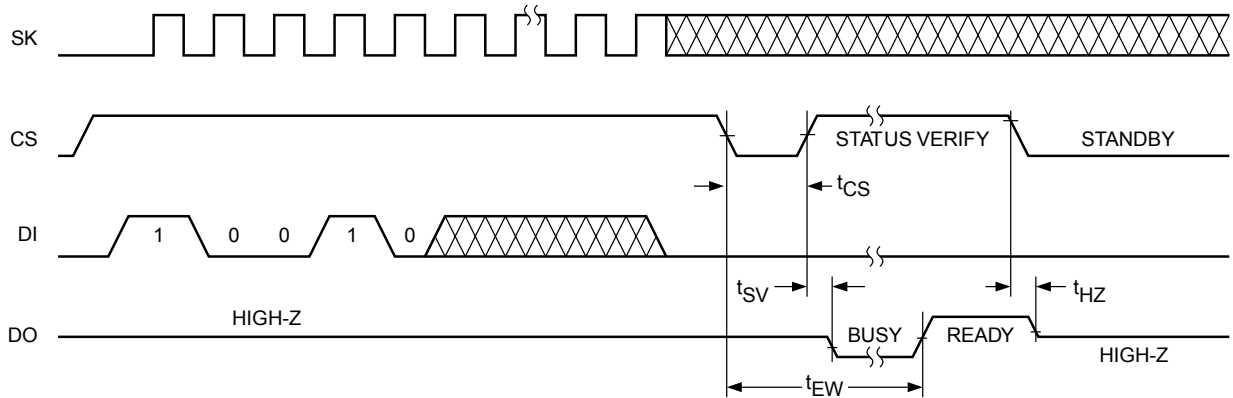
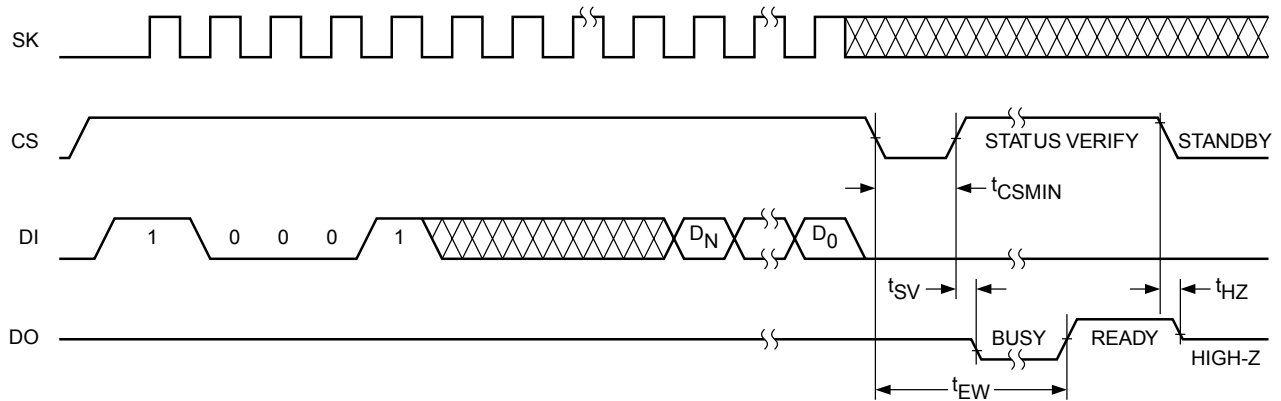
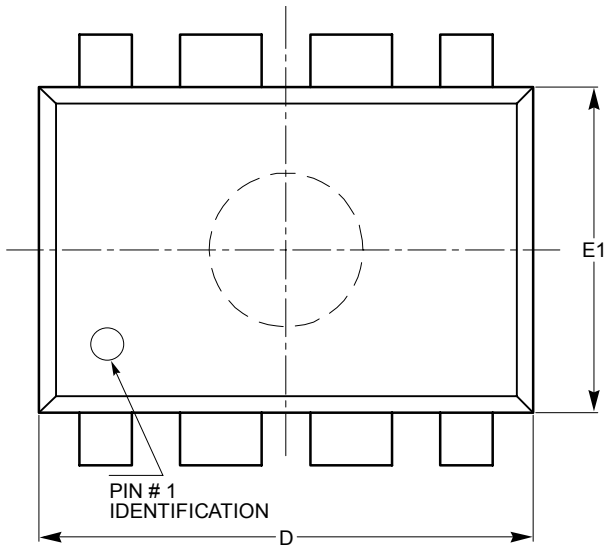


Figure 7. WRAL Instruction Timing



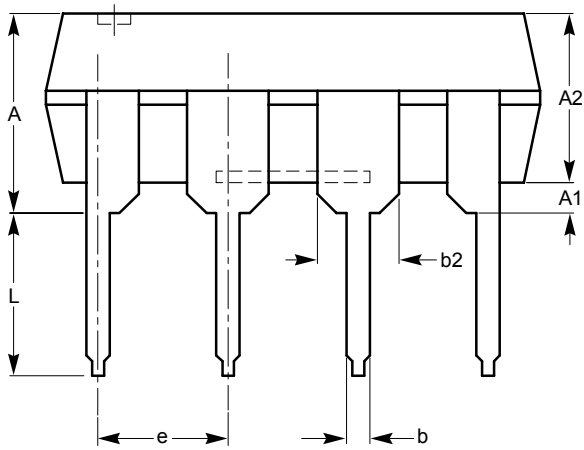
PACKAGE OUTLINE DRAWINGS

PDIP 8-Lead 300mils (L)

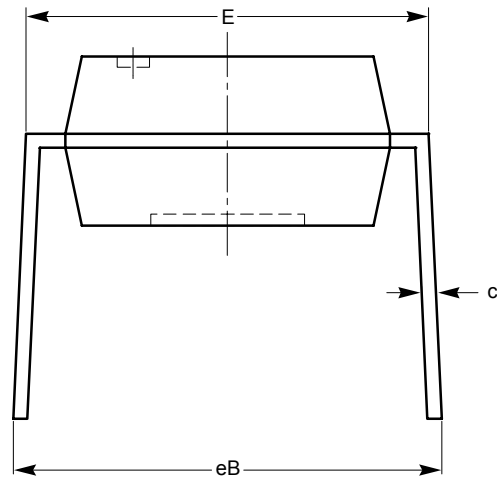


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|--------|----------|------|-------|
| A | | | 5.33 |
| A1 | 0.38 | | |
| A2 | 2.92 | 3.30 | 4.95 |
| b | 0.36 | 0.46 | 0.56 |
| b2 | 1.14 | 1.52 | 1.78 |
| c | 0.20 | 0.25 | 0.36 |
| D | 9.02 | 9.27 | 10.16 |
| E | 7.62 | 7.87 | 8.25 |
| e | 2.54 BSC | | |
| E1 | 6.10 | 6.35 | 7.11 |
| eB | 7.87 | | 10.92 |
| L | 2.92 | 3.30 | 3.80 |



SIDE VIEW



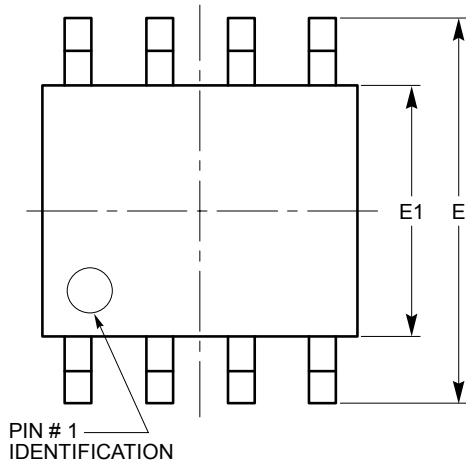
END VIEW

**For current Tape and Reel information, download the PDF file from:
<http://www.catsemi.com/documents/tapeand reel.pdf>.**

Notes:

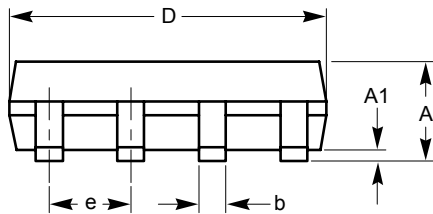
- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MS-001.

SOIC 8-Lead 150mils (V, W)

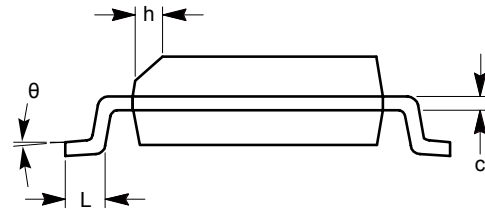


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|----------|----------|-----|------|
| A | 1.35 | | 1.75 |
| A1 | 0.10 | | 0.25 |
| b | 0.33 | | 0.51 |
| c | 0.19 | | 0.25 |
| D | 4.80 | | 5.00 |
| E | 5.80 | | 6.20 |
| E1 | 3.80 | | 4.00 |
| e | 1.27 BSC | | |
| h | 0.25 | | 0.50 |
| L | 0.40 | | 1.27 |
| θ | 0° | | 8° |



SIDE VIEW



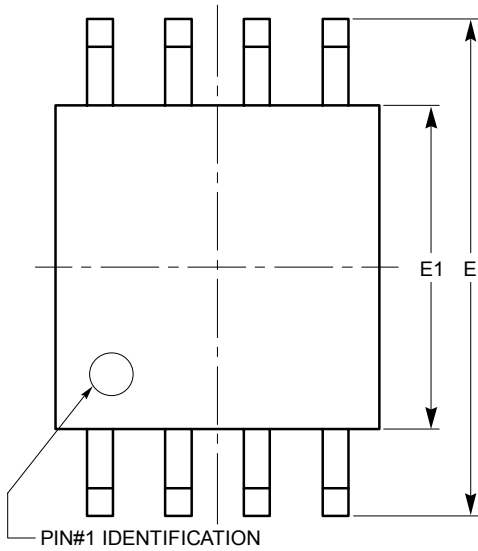
END VIEW

For current Tape and Reel information, download the PDF file from:
<http://www.catsemi.com/documents/tapeandreel.pdf>.

Notes:

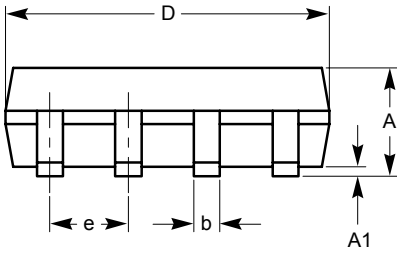
- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-012.

SOIC 8-Lead EIAJ (208mils) (X)

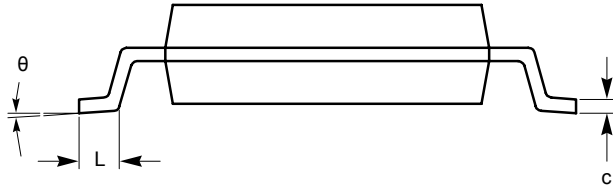


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|----------|----------|-----|------|
| A | | | 2.03 |
| A1 | 0.05 | | 0.25 |
| b | 0.36 | | 0.48 |
| c | 0.19 | | 0.25 |
| D | 5.13 | | 5.33 |
| E | 7.75 | | 8.26 |
| E1 | 5.13 | | 5.38 |
| e | 1.27 BSC | | |
| L | 0.51 | | 0.76 |
| θ | 0° | | 8° |



SIDE VIEW



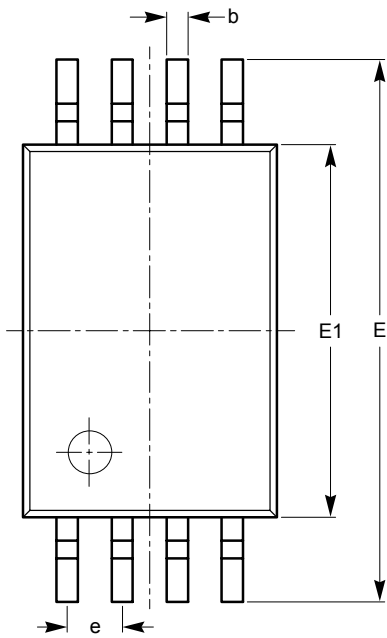
END VIEW

For current Tape and Reel information, download the PDF file from:
<http://www.catsemi.com/documents/tapeandreel.pdf>.

Notes:

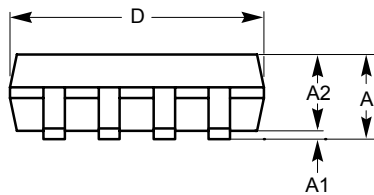
- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with EIAJ EDR-7320.

TSSOP 8-Lead 4.4mm (Y)

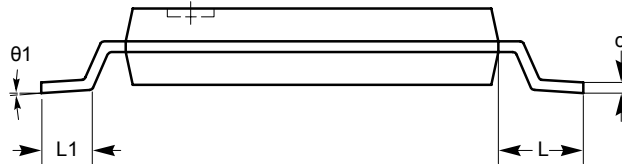


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|------------|----------|------|------|
| A | | | 1.20 |
| A1 | 0.05 | | 0.15 |
| A2 | 0.80 | 0.90 | 1.05 |
| b | 0.19 | | 0.30 |
| c | 0.09 | | 0.20 |
| D | 2.90 | 3.00 | 3.10 |
| E | 6.30 | 6.40 | 6.50 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | 0.65 BSC | | |
| L | 1.00 REF | | |
| L1 | 0.50 | 0.60 | 0.75 |
| $\theta 1$ | 0° | | 8° |



SIDE VIEW



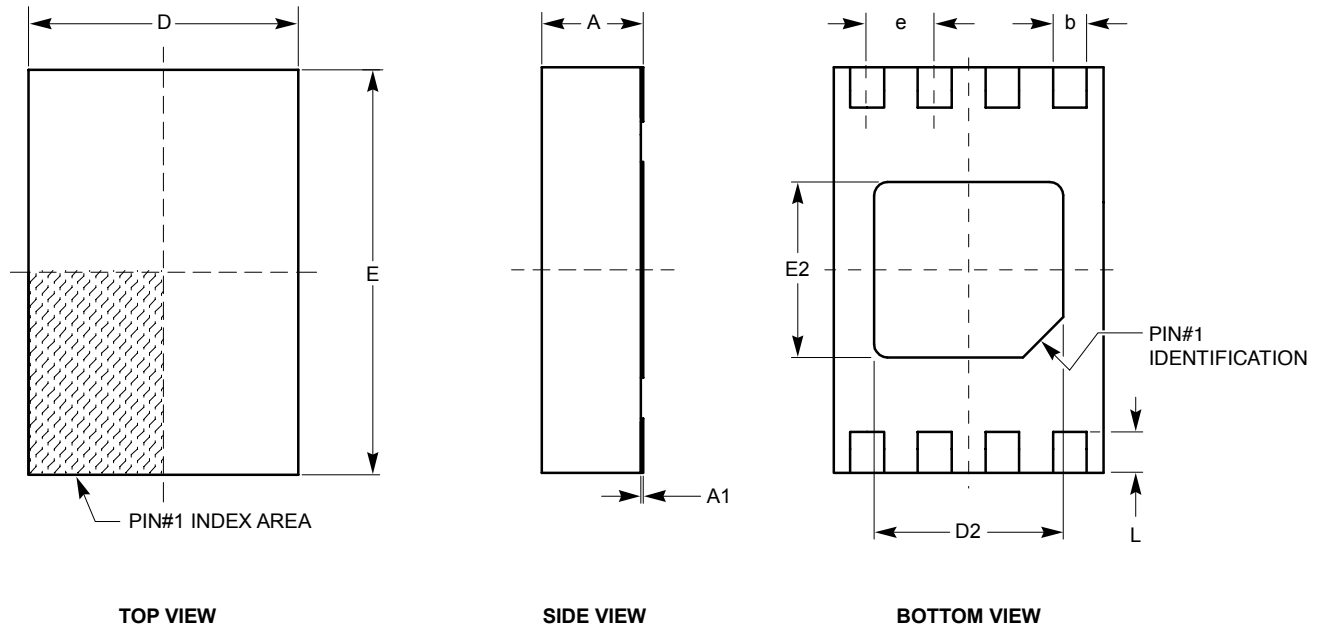
END VIEW

**For current Tape and Reel information, download the PDF file from:
<http://www.catsemi.com/documents/tapeandreel.pdf>.**

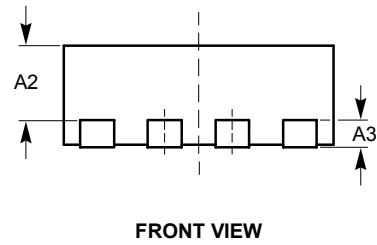
Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

TDFN 8-Pad 2 x 3mm (VP2)



| SYMBOL | MIN | NOM | MAX |
|--------|----------|------|------|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.02 | 0.05 |
| A2 | 0.45 | 0.55 | 0.65 |
| A3 | 0.20 REF | | |
| b | 0.20 | 0.25 | 0.30 |
| D | 1.90 | 2.00 | 2.10 |
| D2 | 1.30 | 1.40 | 1.50 |
| E | 2.90 | 3.00 | 3.10 |
| E2 | 1.20 | 1.30 | 1.40 |
| e | 050 TYP | | |
| L | 0.20 | 0.30 | 0.40 |

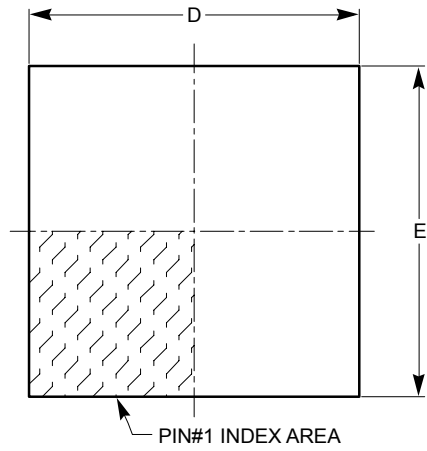


For current Tape and Reel information, download the PDF file from: <http://www.catsemi.com/documents/tapeandreeel.pdf>.

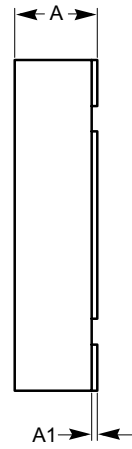
Notes:

- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MO-229.

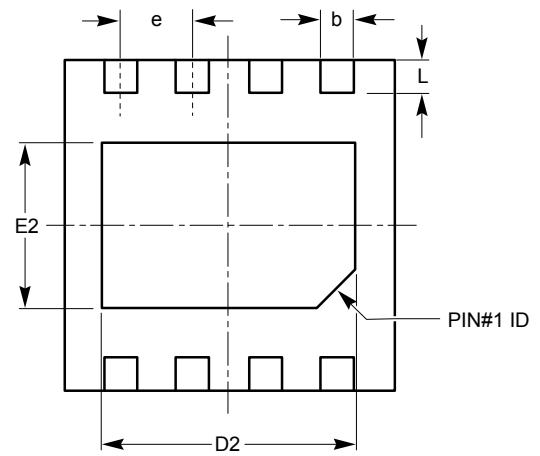
TDFN 8-Pad 3 x 3mm (ZD4)



TOP VIEW

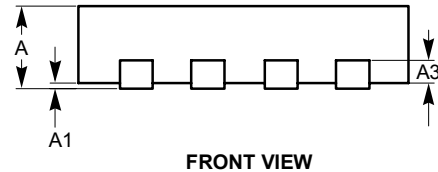


SIDE VIEW



BOTTOM VIEW

| SYMBOL | MIN | NOM | MAX |
|--------|----------|------|------|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | 0.20 REF | | |
| b | 0.23 | 0.30 | 0.37 |
| D | 2.90 | 3.00 | 3.10 |
| D2 | 2.20 | 2.30 | 2.40 |
| E | 2.90 | 3.00 | 3.10 |
| E2 | 1.40 | 1.50 | 1.60 |
| e | 0.65 TYP | | |
| L | 0.20 | 0.30 | 0.40 |



FRONT VIEW

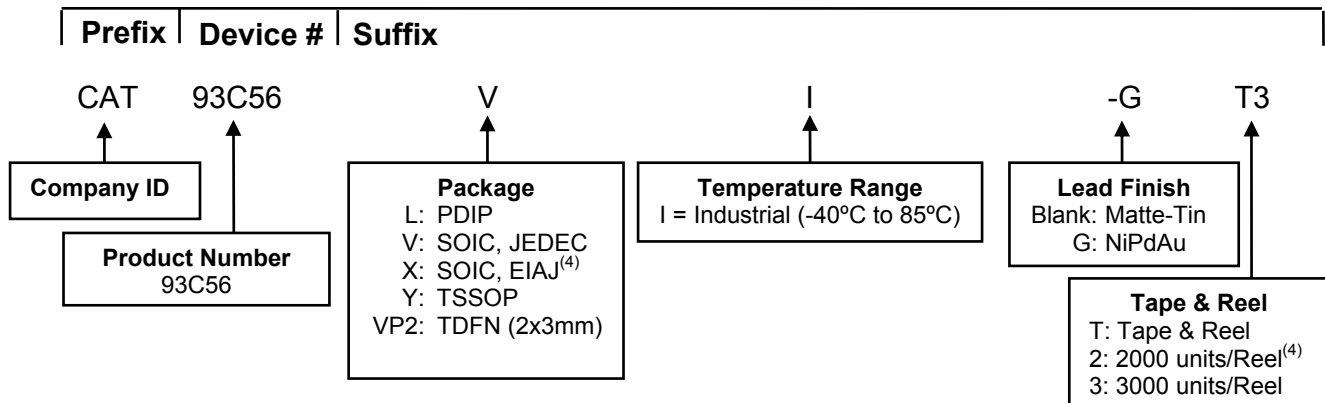
For current Tape and Reel information, download the PDF file from:
<http://www.catsemi.com/documents/tapeandreel.pdf>.

Notes:

- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MO-229.

EXAMPLE OF ORDERING INFORMATION

CAT93C56, Die Rev. G, New Product

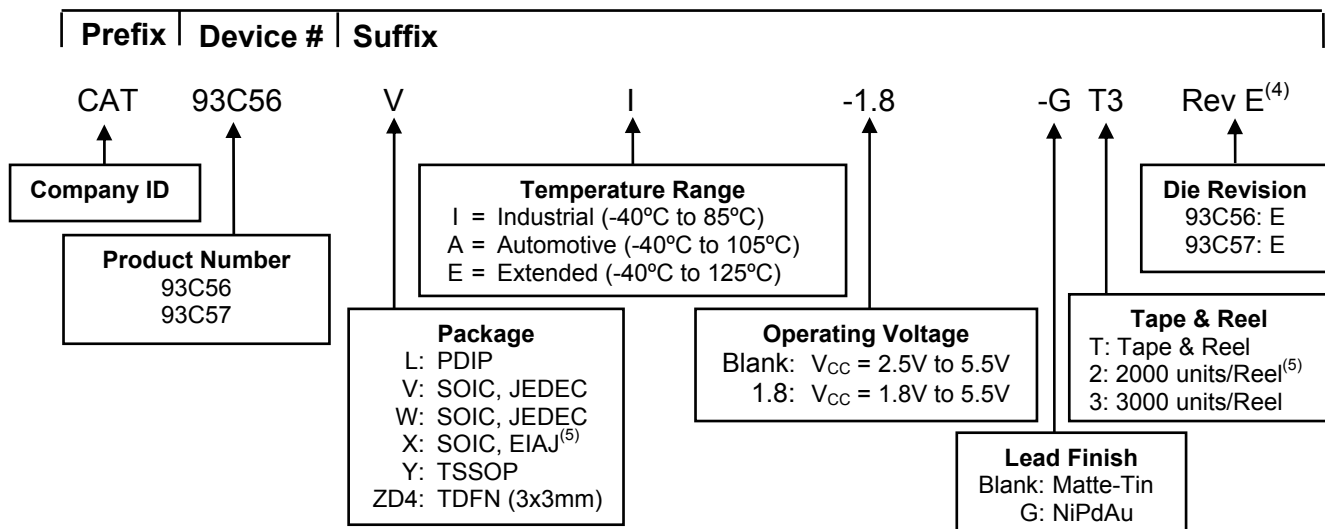


Notes:

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard lead finish is NiPdAu.
- (3) The device used in the above example is a CAT93C56VI-GT3 (SOIC, Industrial Temperature, NiPdAu, Tape & Reel).
- (4) For SOIC, EIAJ (X) package the standard lead finish is Matte-Tin. This package is available in 2000 pcs/reel, i.e. CAT93C56XI-T2.
- (5) For additional package and temperature options, please contact your nearest Catalyst Semiconductor Sales office.

CAT93C56/57, Die Rev. E, Mature Product

(CAT93C56, Rev. E – Not Recommended for new Designs)



Notes:

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard finish is NiPdAu.
- (3) The device used in the above example is a CAT93C56VI-1.8-GT3 (SOIC green package, Industrial Temperature, 1.8 Volt to 5.5 Volt Operating Voltage, NiPdAu finish, Tape & Reel.)
- (4) Product die revision letter is marked on top of the package as a suffix to the production date code (e.g., AYWWE). For additional information, please contact your Catalyst sales office.
- (5) For SOIC, EIAJ (X) package the standard lead finish is Matte-Tin. This package is available in 2000 pcs/reel, i.e. CAT93C56XI-T2.
- (6) For additional package and temperature options, please contact your nearest Catalyst Semiconductor Sales office.

REVISION HISTORY

| Date | Rev. | Comments |
|----------|------|--|
| 05/14/04 | L | New Data Sheet Created From CAT93C46/56/57/66/86. Parts CAT93C56, CAT93C56, CAT93C57, CAT93C56/57, CAT93C76 and CAT93C86 have been separated into single data sheets |
| 10/13/06 | M | Updated Instruction Set |
| 03/18/05 | N | Updated Description |
| 10/13/06 | O | Update Features Update Pin Configuration Update Functional Symbol Update Pin Functions Update D.C. Operating Characteristics (V_{CC} Range) Update A.C. Characteristics (V_{CC} Range) Update Ordering Information |
| 08/21/07 | P | Updated Features/Description Remove "Die Rev E" from the title Update Pin Configuration / Packages Update Absolute Maximum Rating Update Reliability Characteristics Update D.C. Operating Characteristics Added D.C. / A.C. Characteristics for CAT93C56 Die Rev G Rearrange / Format Text and Figures Update Package Outline Drawings Added Example of Ordering Information for CAT93C56 Die Rev. G Add MD- to document number |

Copyrights, Trademarks and Patents

© Catalyst Semiconductor, Inc.

Trademarks and registered trademarks of Catalyst Semiconductor include each of the following:

Beyond Memory™, DPP™, EZDim™, LDD™, MiniPot™ and Quad-Mode™

Catalyst Semiconductor has been issued U.S. and foreign patents and has patent applications pending that protect its products.

CATALYST SEMICONDUCTOR MAKES NO WARRANTY, REPRESENTATION OR GUARANTEE, EXPRESS OR IMPLIED, REGARDING THE SUITABILITY OF ITS PRODUCTS FOR ANY PARTICULAR PURPOSE, NOR THAT THE USE OF ITS PRODUCTS WILL NOT INFRINGE ITS INTELLECTUAL PROPERTY RIGHTS OR THE RIGHTS OF THIRD PARTIES WITH RESPECT TO ANY PARTICULAR USE OR APPLICATION AND SPECIFICALLY DISCLAIMS ANY AND ALL LIABILITY ARISING OUT OF ANY SUCH USE OR APPLICATION, INCLUDING BUT NOT LIMITED TO, CONSEQUENTIAL OR INCIDENTAL DAMAGES.

Catalyst Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Catalyst Semiconductor product could create a situation where personal injury or death may occur.

Catalyst Semiconductor reserves the right to make changes to or discontinue any product or service described herein without notice. Products with data sheets labeled "Advance Information" or "Preliminary" and other products described herein may not be in production or offered for sale.

Catalyst Semiconductor advises customers to obtain the current version of the relevant product information before placing orders. Circuit diagrams illustrate typical semiconductor applications and may not be complete.



Catalyst Semiconductor, Inc.
Corporate Headquarters
2975 Stender Way
Santa Clara, CA 95054
Phone: 408.542.1000
Fax: 408.542.1200
www.catsemi.com

Document No: MD-1088
Revision: P
Issue date: 08/21/07