## 1 FEATURES

- Meets or exceeds the requirements of the TIA/EIA-485A and TIA/EIA-422B standards
- Functional Safety-Capable
  -- Documentation available to aid functional safety system design
- 3V to 5.5V supply voltage
- Differential output exceeds 2.1 V for PROFIBUS compatibility with 5V supply
- Bus I/O protection
  -- ±70V DC bus fault
  -- ±16kV HBM ESD
  -- ±12kV IEC 61000-4-2 contact discharge
  -- ±12kV IEC 61000-4-2 air-gap discharge
  -- ±4kV IEC 61000-4-4 fast transient burst
- Half-duplex devices
- Extended ambient temperature range: -40°C to 125°C
- Extended operational common-mode range: ±25V
- Enhanced receiver hysteresis for noise immunity
- Low power consumption
  -- Low shutdown supply current: < 2μA
  -- Current during operation: < 1mA
- Glitch-free power-up/down for hot plug-in capability
- Open, short, and idle bus failsafe
- Thermal shutdown
- 1/8 unit load (up to 256 bus nodes)
- Small MSOP8 and DFN8 packages to save board space or SOIC for drop-in compatibility

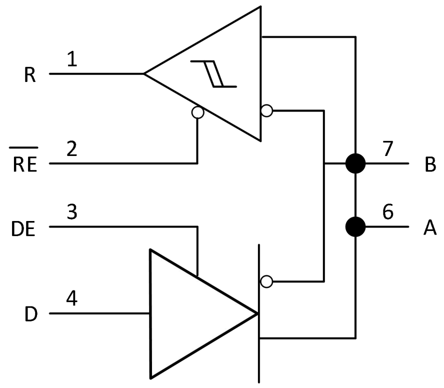
## 2 APPLICATIONS

- Motor drives
- Factory automation and control
- HVAC systems
- Building automation
- Grid infrastructure
- Electricity meters
- Process analytics
- Video surveillance

## 3 DESCRIPTION

GM2410 is ±70V fault-protected, half-duplex, RS-422/RS-485 transceivers operating on a single 3V to 5.5V supply. Bus interface pins are protected against overvoltage conditions during all modes of operation ensuring robust communication in rugged industrial environments.
These devices feature integrated IEC ESD protection, eliminating the need for external system-level protection components. Extended ±25V input common-mode range guarantees reliable data communication over longer cable run lengths and/or in the presence of large ground loop voltages. Enhanced 150-mV receiver hysteresis ensures high noise rejection. In addition, the receiver fail-safe feature guarantees a logic high when the inputs are open or shorted together.
GM2410 devices is available in small MSOP8 and DFN8 packages for space-constrained applications. These devices are characterized over ambient free-air temperatures from –40°C to 125°C.

### Block Diagram





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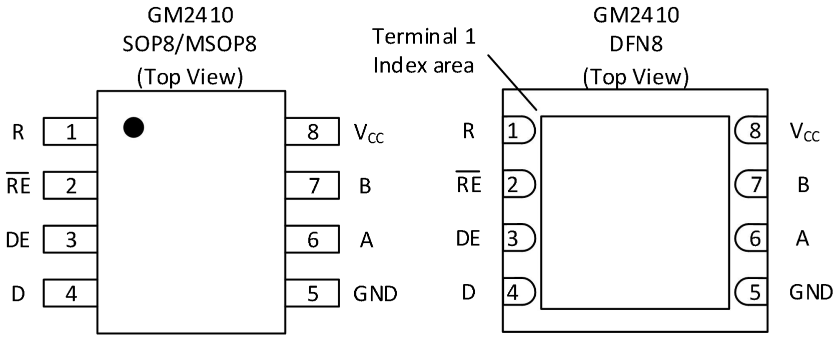
## 4 Pin Configuration and Functions




| Pin | | TYP | Description |
|---|---|---|---|
| **Name** | **NO.** | | |
| A | 6 | Bus input/output | Bus I/O port, A (complementary to B) |
| B | 7 | Bus input/output | Bus I/O port, B (complementary to A) |
| D | 4 | Digital input | Driver data input |
| DE | 3 | Digital input | Driver enable, active high |
| GND | 5 | Ground | Device ground |
| R | 1 | Digital output | Receive data output |
| $V_{CC}$ | 8 | Power | 3.3V to 5V supply |
| $\overline{RE}$ | 2 | Digital input | Receiver enable, active low |
| Terminal 1 Index area | - | - | No electrical connection. Should be connected to GND plane for optimal thermal performance |

## 5 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

| Parameter | | MIN | MAX | UNIT |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | -0.5 | 7 | V |
| Bus Voltage | Range at any bus pin (A or B) as differential or common-mode with respect to GND | -70 | 70 | V |
| Input Voltage | Range at any logic pin (D, DE, or $\overline{RE}$) | -0.3 | 5.7 | V |
| Receiver Output Current | $I_O$ | -24 | 24 | mA |
| Storage Temperature | $T_{stg}$ | -65 | 170 | °C |

1.Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute maximum ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If briefly operating outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not sustain damage, but it may not be fully functional. Operating the device in this manner may affect device reliability, functionality, performance, and shorten the device lifetime.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## 6 Recommended Operating Conditions

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

| Parameter | Symbol | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 3 | - | 5.5 | V |
| Input Voltage At Any Bus Terminal (Separately Or Common Mode)[2] | $V_I$ | -25 | - | 25 | V |
| High-level input voltage (driver, driver enable, and receiver enable inputs) | $V_{IH}$ | 2 | - | - | V |
| Low-level input voltage (driver, driver enable, and receiver enable inputs) | $V_{IL}$ | - | - | 0.8 | V |
| Differential input voltage | $V_{ID}$ | -25 | - | 25 | V |
| Output current, driver | $I_O$ | -60 | - | 60 | mA |
| Output current, receiver | $I_{OR}$ | -8 | - | 8 | mA |
| Differential load resistance | $R_L$ | 54 | 60 | - | Ω |
| Signaling rate | $1/T_{UI}$ | | - | 500 | kbps |
| Operating ambient temperature | $T_A$ | -40 | - | 125 | °C |
| Junction temperature | $T_J$ | -40 | - | 150 | °C |

2.The algebraic convention, in which the least positive (most negative) limit is designated as minimum is used in this data sheet.

## 7 Thermal Information

| THERMAL METRIC[3] | | SOP | MSOP | DFN | UNIT |
|---|---|---|---|---|---|
| Parameter | Symbol | 8 PINS | 8 PINS | 8 PINS | |
| Junction-to-ambient thermal resistance | $R_{\Theta JA}$ | 115.9 | 164.0 | 47.6 | °C/W |
| Junction-to-case (top) thermal resistance | $R_{\Theta JC(TOP)}$ | 53.1 | 49.5 | 49.4 | °C/W |
| Junction-to-board thermal resistance | $R_{\Theta JB}$ | 60.1 | 85.5 | 20.3 | °C/W |
| Junction-to-top characterization parameter | $\Psi_{JT}$ | 10.1 | 5.1 | 0.9 | °C/W |
| Junction-to-board characterization parameter | $\Psi_{JB}$ | 59.2 | 83.7 | 20.2 | °C/W |
| Junction-to-case (bottom) thermal resistance | $R_{\Theta JC(BOT)}$ | N/A | N/A | 5.6 | °C/W |

3.For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

## 8 Power Dissipation

| Parameter | Symbol | Condition | | VALUE | UNIT |
|---|---|---|---|---|---|
| Driver and receiver enabled, $V_{CC}$ = 5.5V, $T_A$ = 125 °C, random data (PRBS7) at signaling rate | $P_D$ | Unterminated $R_L$ = 300 Ω, $C_L$ = 50pF (driver) | 500kbps | 130 | mW |
| | | RS-422 load $R_L$ = 100 Ω, $C_L$ = 50pF (driver) | 500kbps | 170 | mW |
| | | RS-485 load $R_L$ = 54 Ω, $C_L$ = 50pF (driver) | 500kbps | 240 | mW |


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# 9 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted). All typical values are at 25°C and supply voltage of $V_{CC}$ = 5V.

| Parameter | Symbol | Condition | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **Driver** | | | | | | |
| Driver differential output voltage magnitude | $\|V_{OD}\|$ | $R_L$ = 60 Ω, –25V ≤ $V_{TEST}$ ≤ 25V(See Figure 1) | 1.5 | 2.6 | | V |
| | | $R_L$ = 60 Ω, –25V ≤ $V_{TEST}$ ≤ 25 V, 4.5V ≤ $V_{CC}$ ≤ 5.5V (See Figure 1) | 2.1 | 2.6 | | V |
| | | $R_L$ = 100 Ω (See Figure 2) | 2 | 3.1 | | V |
| | | $R_L$ = 54 Ω (See Figure 2) | 1.5 | 2.6 | | V |
| Change in differential output voltage | $\Delta\|V_{OD}\|$ | $R_L$ = 54 Ω or 100 Ω (See Figure 2) | -50 | | 50 | mV |
| Common-mode output voltage | $V_{OC}$ | $R_L$ = 54 Ω or 100 Ω (See Figure 2) | 1 | $V_{CC}/2$ | 3 | V |
| Change in steady-state common-mode output voltage | $\Delta V_{OC(SS)}$ | $R_L$ = 54 Ω or 100 Ω (See Figure 2) | -50 | | 50 | mV |
| Short-circuit output current | $I_{OS}$ | DE = $V_{CC}$, -70 V ≤ ($V_A$ or $V_B$) ≤ 70 V | -200 | | 200 | mA |
| **Receiver** | | | | | | |
| Bus input current | $I_I$ | DE = 0 V, $V_{CC}$ = 0 V or 5.5 V; $V_I$ = 12 V | | 75 | 125 | µA |
| | | $V_I$ = 25 V | | 250 | 300 | µA |
| | | $V_I$ = -7 V | -100 | -80 | | µA |
| | | $V_I$ = -25 V | -350 | -300 | | µA |
| Positive-going input threshold voltage(4) | $V_{TH+}$ | Over common-mode range of ± 25 V | | -100 | -50 | mV |
| Negative-going input threshold voltage(4) | $V_{TH-}$ | Over common-mode range of ± 25 V | -200 | -150 | | mV |
| Input hysteresis | $V_{HYS}$ | Over common-mode range of ± 25 V | | 50 | | mV |
| Input fail-safe threshold | $V_{TH\_FSH}$ | Over common-mode range of ± 25 V | -40 | | 40 | mV |
| Input differential capacitance | $C_{A,B}$ | Measured between A and B, f = 1 MHz | | 50 | | pF |
| Output high voltage | $V_{OH}$ | $I_{OH}$ = –8mA | $V_{CC}$-0.6 | $V_{CC}$-0.4 | | V |
| Output low voltage | $V_{OL}$ | $I_{OL}$ = 8mA | | 0.3 | 0.5 | V |
| Output high-impedance current | $I_{OZ}$ | $V_O$ = 0 V or $V_{CC}$, $\overline{RE}$ = $V_{CC}$ | -1 | | 1 | µA |
| **Logic** | | | | | | |
| Input current (DE) | $I_{IN}$ | 3V ≤ $V_{CC}$ ≤ 5.5V, 0 V ≤ $V_{IN}$ ≤ $V_{CC}$ | | | 5 | µA |
| Input current (D,$\overline{RE}$) | $I_{IN}$ | 3V ≤ $V_{CC}$≤ 5.5V, 0 V ≤ $V_{IN}$ ≤ $V_{CC}$ | -5 | | | µA |
| **Thermal Protection** | | | | | | |
| Thermal shutdown threshold | $T_{SHDN}$ | Temperature rising | 150 | 170 | | °C |
| Thermal shutdown hysteresis | $T_{HYS}$ | | | 10 | | °C |



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## 9 Electrical Characteristics (continued)

| Parameter | Symbol | Condition | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **Supply** | | | | | | | |
| Supply current (quiescent) | $I_{CC}$ | Driver and receiver enabled | $\overline{RE}$= 0 V, DE = $V_{CC}$, No load | | 0.6 | 1 | mA |
| | | Driver enabled, receiver disabled | $\overline{RE}$= $V_{CC}$, DE = $V_{CC}$, No load | | 0.6 | 1 | mA |
| | | Driver disabled, receiver enabled | $\overline{RE}$= 0V, DE = 0V, No load | | 0.5 | 0.7 | mA |
| | | Driver and receiver disabled | $\overline{RE}$= $V_{CC}$, DE = 0V, No load | | 1.6 | 3 | μA |

4.Under any specific conditions, $V_{TH+}$ is assured to be at least $V_{HYS}$ higher than $V_{TH-}$.

## 10 Switching Characteristics

500kbps device over recommended operating conditions. All typical values are at 25°C and supply voltage of $V_{CC}$ = 5 V.

| Parameter | Symbol | Condition | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **Driver** | | | | | | | |
| Differential output rise/fall time | $t_r$, $t_f$ | $R_L$ = 54Ω, $C_L$ = 50pF | See Figure 3 | 85 | 115 | 150 | ns |
| Propagation delay | $t_{PHL}$, $t_{PLH}$ | | | | 100 | 150 | ns |
| Pulse skew, \|$t_{PHL}$ − $t_{PLH}$\| | $t_{SK(P)}$ | | | | | 10 | ns |
| Disable time | $t_{PHZ}$, $t_{PLZ}$ | | See Figure 4 and Figure 5 | | 45 | 95 | ns |
| Enable time | $t_{PZH}$, $t_{PZL}$ | $\overline{RE}$ = 0V | | | 200 | 300 | ns |
| | | $\overline{RE}$ = $V_{CC}$ | | | 4 | 15 | µs |
| Time to shutdown | $t_{SHDN}$ | $\overline{RE}$ = $V_{CC}$ | | 50 | | 500 | ns |
| **Receiver** | | | | | | | |
| Output rise/fall time | $t_r$, $t_f$ | $C_L$ = 15 pF | See Figure 6 | | 10 | 20 | ns |
| Propagation delay | $t_{PHL}$, $t_{PLH}$ | | | | 50 | 80 | ns |
| Pulse skew, \|$t_{PHL}$ − $t_{PLH}$\| | $t_{SK(P)}$ | | | | | 7 | ns |
| Disable time | $t_{PHZ}$, $t_{PLZ}$ | | | | 30 | 40 | ns |
| Enable time | $t_{PZH(1)}$, $t_{PZL(1)}$, | DE = $V_{CC}$ | See Figure 7 | | 80 | 120 | ns |
| | $t_{PZH(2)}$, $t_{PZL(2)}$ | DE = 0V | See Figure 8 | | 3 | 9 | µs |
| Delay to enter fail-safe operation | $t_{D(OFS)}$ | $C_L$ = 15pF | See Figure 9 | 7 | 10 | 18 | µs |
| Delay to exit fail-safe operation | $t_{D(FSO)}$ | | | 35 | 45 | 60 | ns |
| Time to shutdown | $t_{SHDN}$ | DE = 0V | See Figure 8 | 50 | | 500 | ns |


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## 11 Parameter Measurement Information

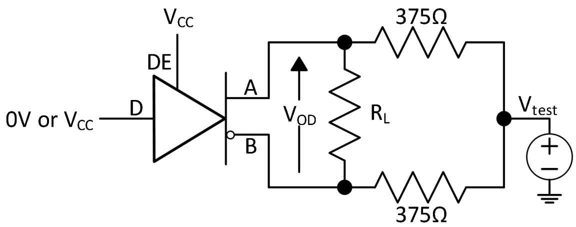


**Figure 1. Measurement of Driver Differential Output Voltage With Common-Mode Load**

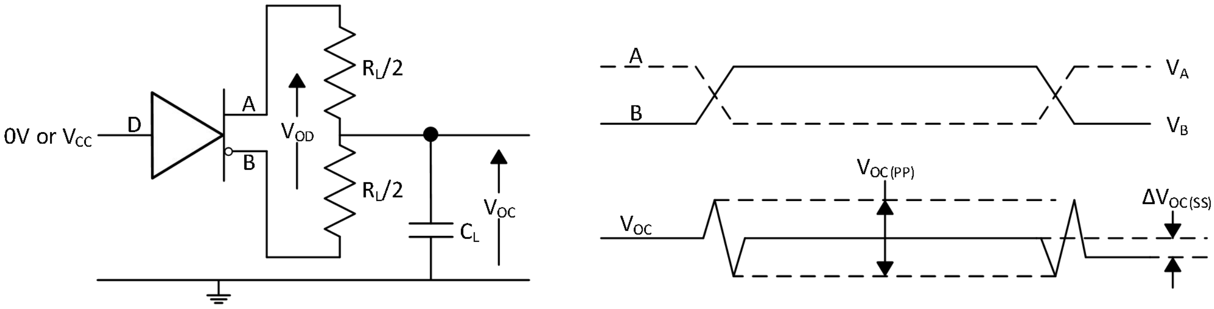


**Figure 2. Measurement of Driver Differential and Common-Mode Output With RS-485 Load**

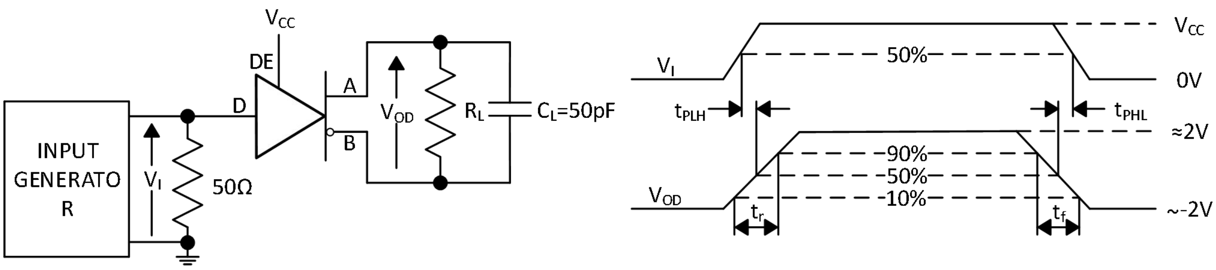


**Figure 3. Measurement of Driver Differential Output Rise and Fall Times and Propagation Delays**

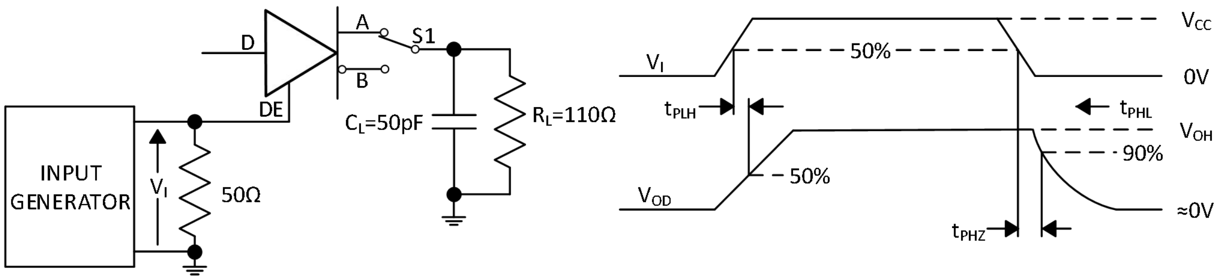


**Figure 4. Measurement of Driver Enable and Disable Times With Active High Output and Pull-Down Load**

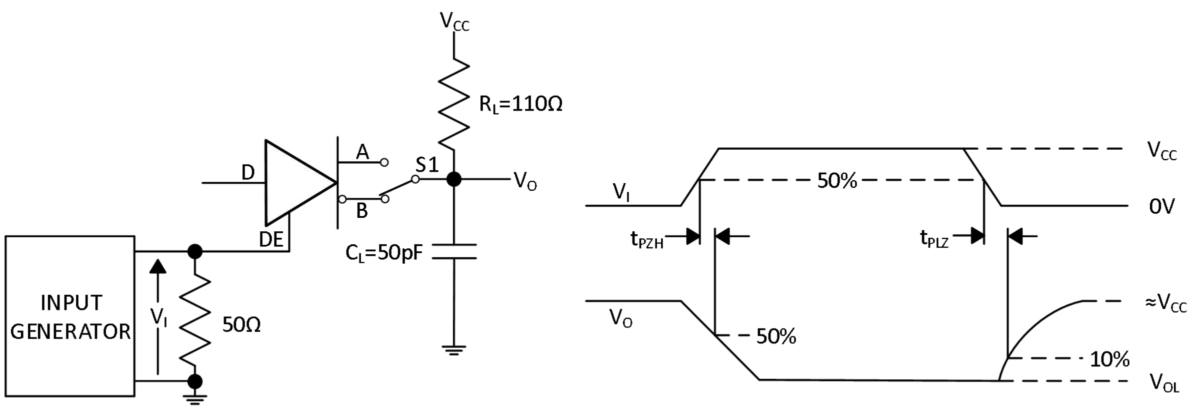


**Figure 5. Measurement of Driver Enable and Disable Times With Active Low Output and Pull-up Load**

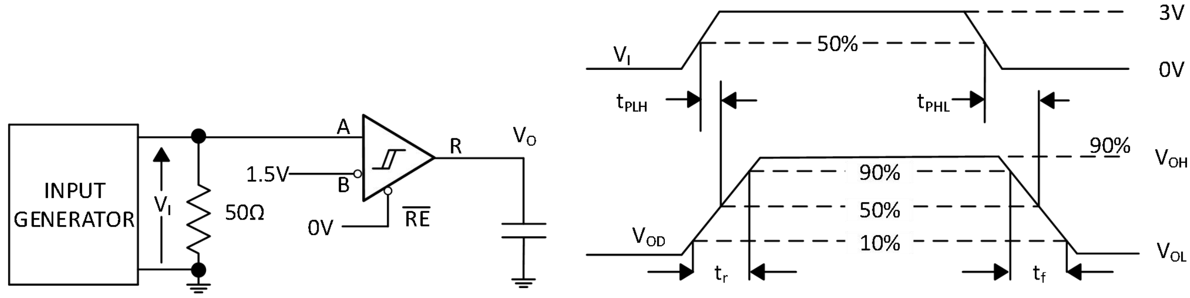

**Figure 6. Measurement of Receiver Output Rise and Fall Times and Propagation Delays**

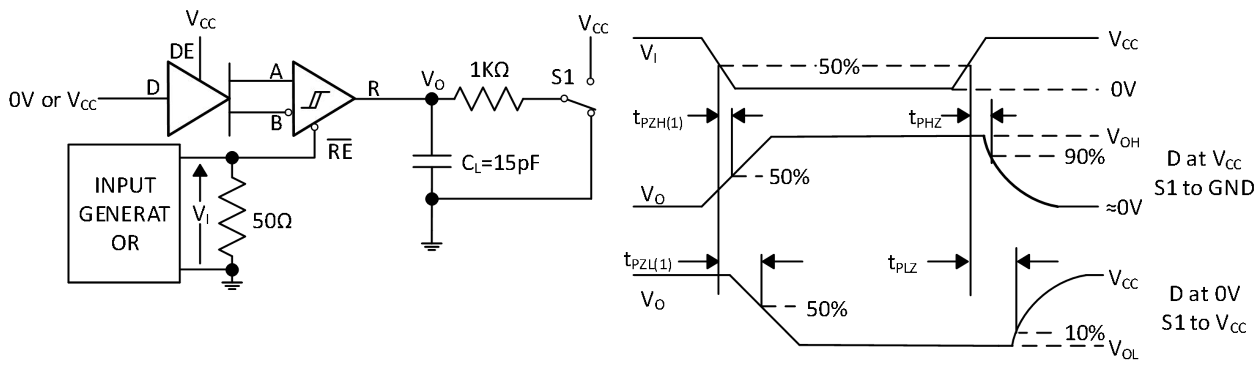

**Figure 7. Measurement of Receiver Enable/Disable Times With Driver Enabled**

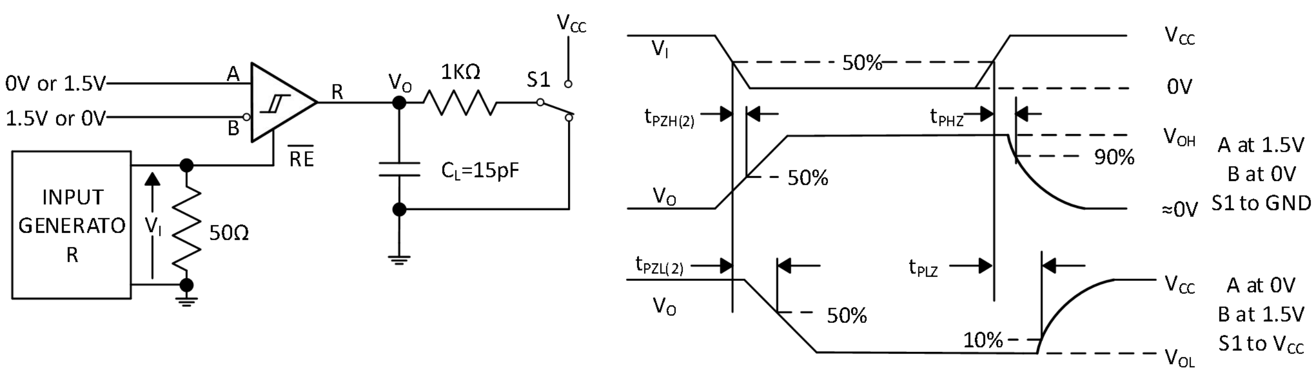

**Figure 8. Measurement of Receiver Enable Times With Driver Disabled**

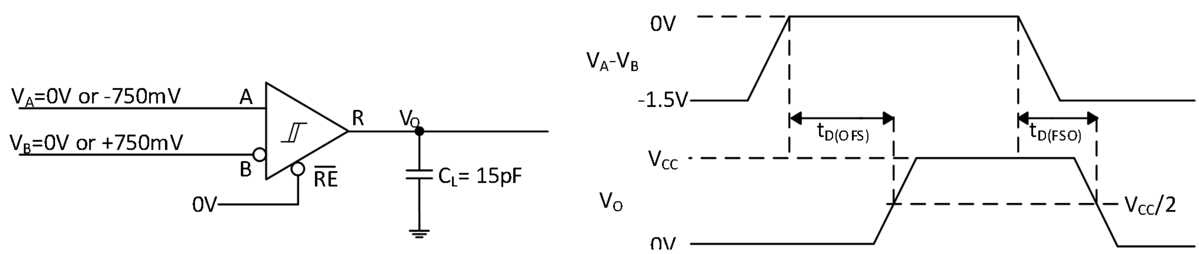

**Figure 9. Measurement of Fail-Safe Delay**

# 12 Detailed Description

## 12.1 Overview

GM2410 is fault-protected, half duplex RS-485 transceivers available in two speed grades suitable for data transmission up to 500kbps. The devices have active-high driver enables and active-low receiver enables. A shutdown current of less than 2µA can be achieved by disabling both driver and receiver.

## 12.2 Functional Block Diagrams

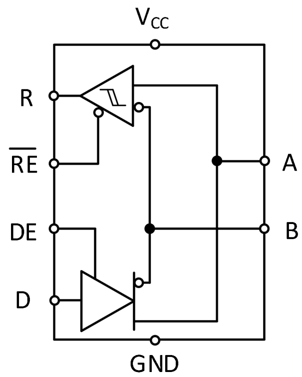


**Figure 10. THVD2410 Block Diagram**

## 12.3 Feature Description

### 12.3.1 ±70V Fault Protection

GM2410 transceivers have extended bus fault protection compared to standard RS-485 devices. Transceivers that operate in rugged industrial environments are often exposed to voltage transients greater than the -7V to +12V defined by the TIA/EIA-485A standard. To protect against such conditions, the generic RS-485 devices with lower absolute maximum ratings requires expensive external protection components. To simplify system design and reduce overall system cost,GM2410 devices are protected up to ±70V without the need for any external components.

### 12.3.2 Integrated IEC ESD and EFT Protection

Internal ESD protection circuits protect the transceivers against electrostatic discharges (ESD) according to IEC 61000-4-2 of up to ±12kV and against electrical fast transients (EFT) according to IEC 61000-4-4 of up to ±4kV. GM2410 ESD structures help to limit voltage excursions and recover from them quickly that they allow EFT Criterion A at the system level (no data loss when transient noise is present).

### 12.3.3 Driver Overvoltage and Overcurrent Protection

The GM2410 drivers are protected against any DC supply shorts in the range of -70V to +70V. The devices internally limit the short circuit current to ±200mA in order to comply with the TIA/EIA-485A standard. In addition, a fold-back current limiting circuit further reduces the driver short circuit current to less than ±5mA if the output fault voltage exceeds |±25V|.

All devices feature thermal shutdown protection that disables the driver and the receiver if the junction temperature exceeds the $T_{SHDN}$ threshold due to excessive power dissipation.

### 12.3.4 Enhanced Receiver Noise Immunity

The differential receivers of GM2410 feature fully symmetric thresholds to maintain duty cycle of the signal even with small input amplitudes. In addition, 100mV (typical) hysteresis ensures excellent noise immunity.

### 12.3.5 Receiver Fail-Safe Operation

The receivers are fail-safe to invalid bus states caused by the following:

- Open bus conditions, such as a disconnected connector
- Shorted bus conditions, such as cable damage shorting the twisted-pair together
- Idle bus conditions that occur when no driver on the bus is actively driving

In any of these cases, the receiver outputs a fail-safe logic high state if the input amplitude stays for longer than $t_{D(OFS)}$ at less than $|V_{TH\_FSH}|$.

### 12.3.6 Low-Power Shutdown Mode

Driving DE low and $\overline{RE}$ high for longer than 500ns puts the devices into the shutdown mode. If either DE goes high or $\overline{RE}$ goes low, the counters reset. The devices does not enter the shutdown mode if the enable pins are in disable state for less than 50ns. This feature prevents the devices from accidentally going into shutdown mode due to skew between DE and $\overline{RE}$.

## 12.4 Device Functional Modes

When the driver enable pin, DE, is logic high, the differential outputs A and B follow the logic states at data input D. A logic high at D causes A to turn high and B to turn low. In this case, the differential output voltage defined as $V_{OD} = V_A - V_B$ is positive. When D is low, the output states reverse: B turns high, A becomes low, and $V_{OD}$ is negative.
When DE is low, both outputs turn high-impedance. In this condition, the logic state at D is irrelevant. The DE pin has an internal pull-down resistor to ground, thus when left open the driver is disabled (high-impedance) by default. The D pin has an internal pull-up resistor to $V_{CC}$, thus, when left open while the driver is enabled, output A turns high and B turns low.

**Table 1. Driver Function Table**

| INPUT | ENABLE | OUTPUTS | | FUNCTION |
|---|---|---|---|---|
| **D** | **DE** | **A** | **B** | |
| H | H | H | L | Actively drive bus high |
| L | H | L | H | Actively drive bus low |
| X | L | Z | Z | Driver disabled |
| X | OPEN | Z | Z | Driver disabled by default |
| OPEN | H | H | L | Actively drive bus high by default |

When the receiver enable pin, $\overline{RE}$ , is logic low, the receiver is enabled. When the differential input voltage defined as $V_{ID} = V_A - V_B$ is higher than the positive input threshold, $V_{TH+}$, the receiver output, R, turns high. When $V_{ID}$ is lower than the negative input threshold, $V_{TH-}$, the receiver output, R, turns low. If $V_{ID}$ is between $V_{TH+}$ and $V_{TH-}$, the output is indeterminate.
When $\overline{RE}$ is logic high or left open, the receiver output is high-impedance and the magnitude and polarity of $V_{ID}$ are irrelevant. Internal biasing of the receiver inputs causes the output to go failsafe-high when the transceiver is disconnected from the bus (open-circuit), or he bus lines are shorted to one another (short-circuit), or the bus is not actively driven (idle bus).

**Table 2. Receiver Function Table**

| DIFFERENTIAL INPUT | ENABLE | OUTPUTS | FUNCTION |
|---|---|---|---|
| **$V_{ID} = V_A - V_B$** | **$\overline{RE}$** | **R** | |
| $V_{TH+} < V_{ID}$ | L | H | Receive valid bus high |
| $V_{TH-} < V_{ID} < V_{TH+}$ | L | ? | Indeterminate bus state |
| $V_{ID} < V_{TH}$ | L | L | Receive valid bus low |
| X | H | Z | Receiver disabled |
| X | OPEN | Z | Receiver disabled by default |
| Open-circuit bus | L | H | Fail-safe high output |
| Short-circuit bus | L | H | Fail-safe high output |
| Idle (terminated) bus | L | H | Fail-safe high output |

# 13 Application and Implementation

**Note:**Information in the following applications sections is not part of the GM component specification, and GM does not warrant its accuracy or completeness. GM's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

## 13.1 Application Information

GM2410 is fault-protected, half-duplex RS-485 transceivers commonly used for asynchronous data transmissions. For these devices, the driver and receiver enable pins allow for the configuration of different operating modes.

## 13.2 Typical Application

An RS-485 bus consists of multiple transceivers connecting in parallel to a bus cable. To eliminate line reflections, each cable end is terminated with a termination resistor, $R_T$, whose value matches the characteristic impedance, $Z_0$, of the cable. This method, known as parallel termination, generally allows for higher data rates over longer cable length.

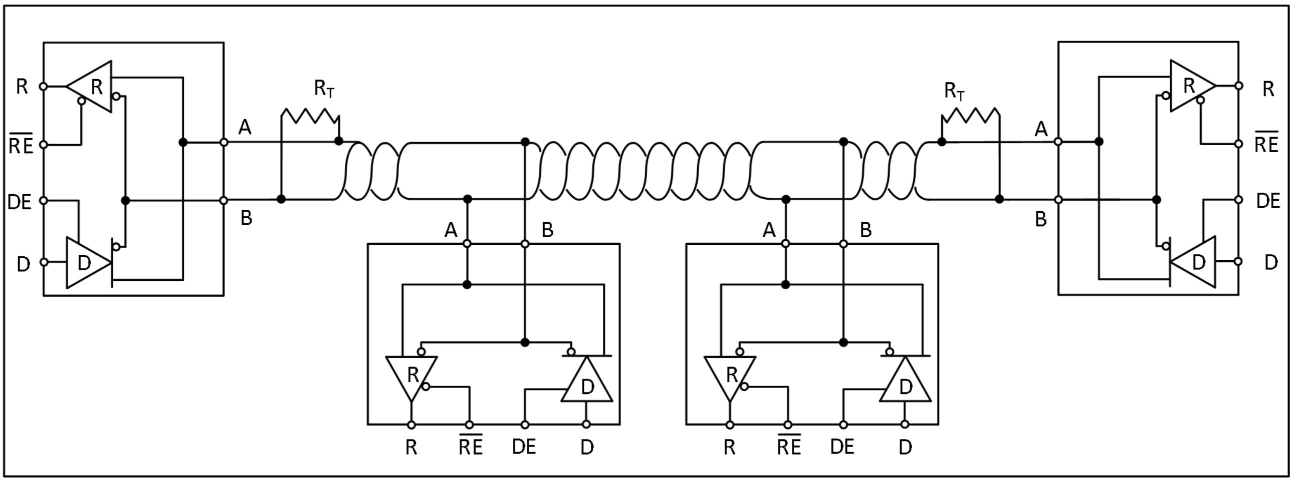


**Figure 11. Typical RS-485 Network With Half-Duplex Transceivers**

### 13.2.1 Design Requirements

RS-485 is a robust electrical standard suitable for long-distance networking that may be used in a wide range of applications with varying requirements, such as distance, data rate, and number of nodes.

#### 13.2.1.1 Bus Loading

The RS-485 standard specifies that a compliant driver must be able to drive 32 unit loads (UL), where 1 unit load represents a load impedance of approximately 12kΩ. Because the GM2410 devices consist of 1/8 UL transceivers, connecting up to 256 receivers to the bus is possible.

#### 13.2.1.2 Transient Protection

The bus pins of the GM2410 transceivers include on-chip ESD protection against ±30kV HBM and ±12kV IEC 61000-4-2 contact discharge. The International Electrotechnical Commission (IEC) ESD test is far more severe than the HBM ESD test. The 50% higher charge capacitance, $C_{(S)}$, and 78% lower discharge resistance, $R_{(D)}$, of the IEC model produce significantly higher discharge currents than the HBM model. As stated in the IEC 61000-4-2 standard, contact discharge is the preferred transient protection test method.

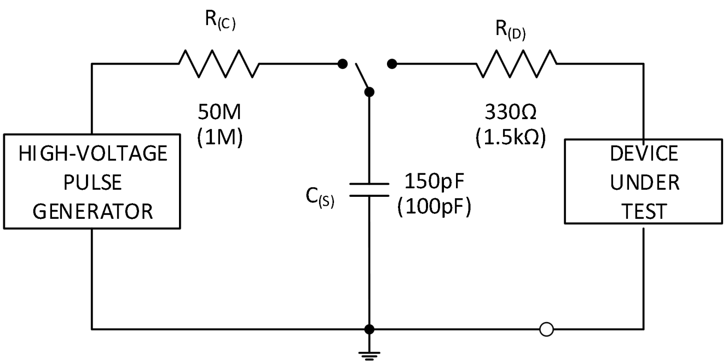


**Figure 12. HBM and IEC ESD Models and Currents in Comparison (HBM Values in Parenthesis)**

The on-chip implementation of IEC ESD protection significantly increases the robustness of equipment. Common discharge events occur because of human contact with connectors and cables. Designers may choose to implement protection against longer duration transients, typically referred to as surge transients.
EFTs are generally caused by relay-contact bounce or the interruption of inductive loads. Surge transients often result from lightning strikes (direct strike or an indirect strike which induce voltages and currents), or the switching of power

systems, including load changes and short circuit switching. These transients are often encountered in industrial environments, such as factory automation and power-grid systems.

In the case of surge transients, high-energy content is characterized by long pulse duration and slow decaying pulse power. The electrical energy of a transient that is dumped into the internal protection cells of a transceiver is converted into thermal energy, which heats and destroys the protection cells, thus destroying the transceiver.

### 13.2.2 Detailed Design Procedure

Figure 13 suggests a protection circuit against 1kV surge (IEC 61000-4-5) transients. Table 3 shows the associated bill of materials. SMAJ30CA TVS diodes are rated to operate up to 30V. This ensures the protection diodes do not conduct if a direct RS-485 bus shorts to 24V DC industrial power rail.

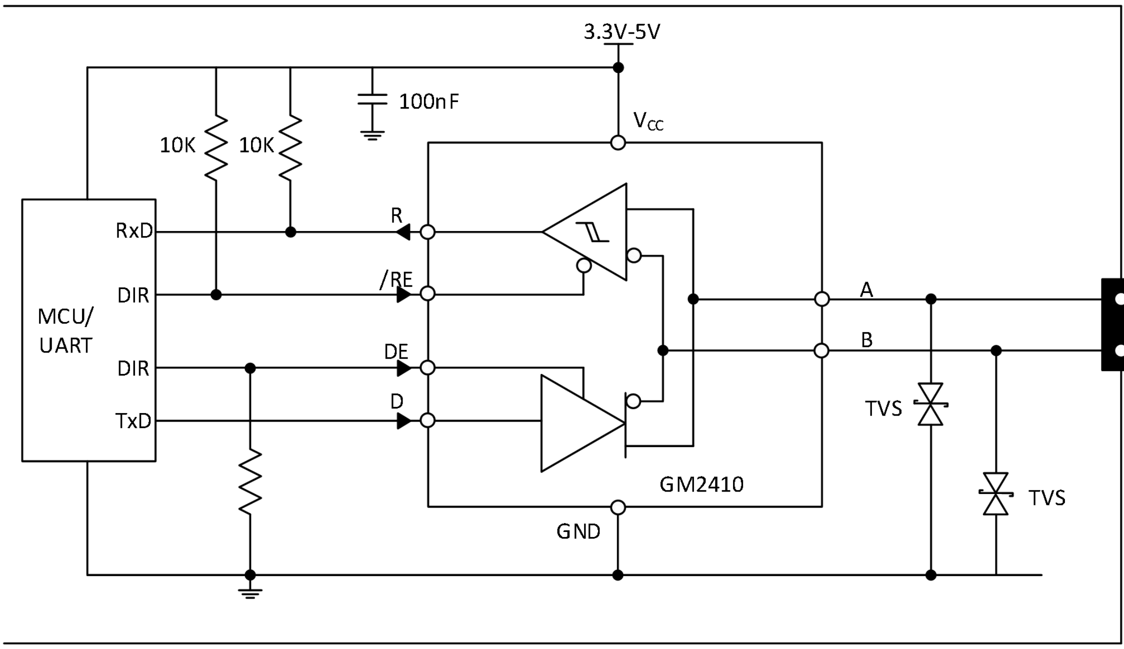


**Figure 13. Transient Protection Against Surge Transients for Half-Duplex Devices**

**Table 3. Components List(5)**

| DEVICE | FUNCTION | ORDER NUMBER | MANUFACTURER |
|---|---|---|---|
| XCVR | RS-485 transceiver | GM2410 | Gatemode |
| TVS | Bidirectional 400-W transient suppressor | SMAJ30CA | |

5.See Device Support

## 14 Power Supply Recommendations

To ensure reliable operation at all data rates and supply voltages, each supply should be decoupled with a 100nF ceramic capacitor located as close to the supply pins as possible. This helps to reduce supply voltage ripple present on the outputs of switched-mode power supplies and also helps to compensate for the resistance and inductance of the PCB power planes.



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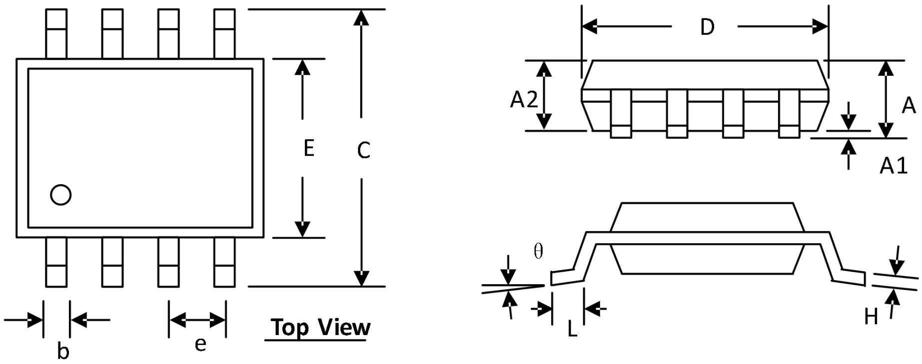
## PACKAGE DIMENSION

### SOP8




| SYMBOLS | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 1.5 | - | 1.7 |
| A1 | 0.1 | - | 0.25 |
| A2 | 1.3 | 1.4 | 1.5 |
| b | 0.33 | 0.4 | 0.47 |
| C | 0.2 | - | 0.25 |
| D | 4.7 | 4.9 | 5.1 |
| E | 5.9 | 6 | 6.1 |
| E1 | 3.8 | 3.9 | 4 |
| e | 1.27(BSC) | | |
| L | 0.55 | 0.6 | 0.75 |
| L1 | 1.05(BSC) | | |
| θ | 0° | 4° | 8° |



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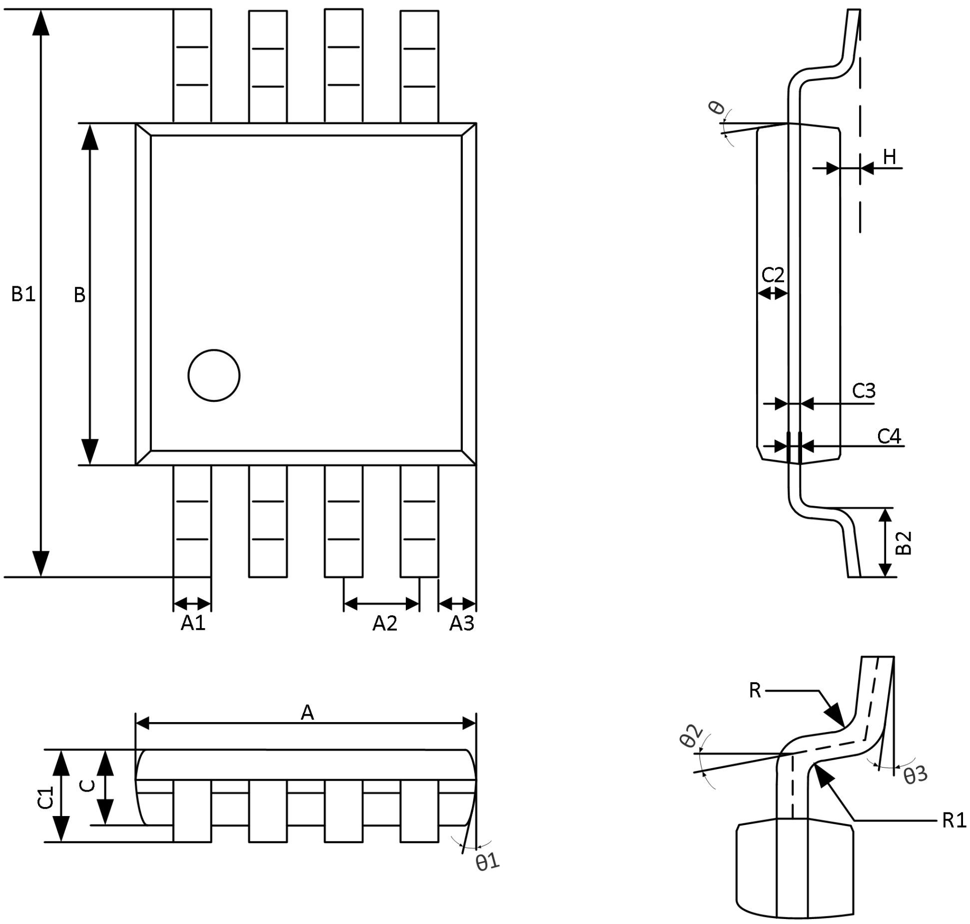
## MSOP8




| DIMENSION / SYMBOLS | MIN (mm) | MAX (mm) | DIMENSION / SYMBOLS | MIN (mm) | MAX (mm) |
|---|---|---|---|---|---|
| A | 2.90 | 3.10 | C3 | 0.152 | |
| A1 | 0.28 | 0.35 | C4 | 0.15 | 0.23 |
| A2 | 0.65TYP | | H | 0.00 | 0.09 |
| A3 | 0.375TYP | | θ | 12° TYP4 | |
| B | 2.90 | 3.10 | θ1 | 12° TYP4 | |
| B1 | 4.70 | 5.10 | θ2 | 14° TYP | |
| B2 | 0.45 | 0.75 | θ3 | 0° ~ 6° | |
| C | 0.75 | 0.95 | R | 0.15TYP | |
| C1 | -- | 1.10 | R1 | 0.15TYP | |
| C2 | 0.328TYP | | | | |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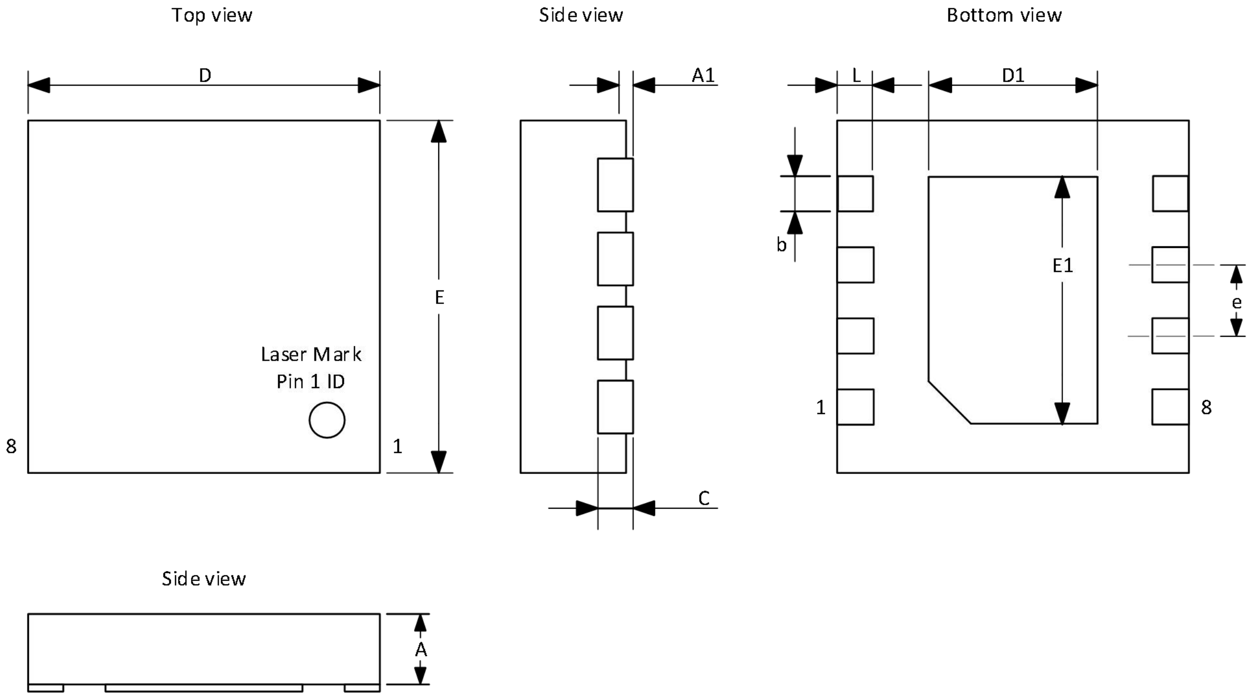
## DFN8




**COMMON DIMENSIONS**
**(UNITS OF MEASURE=MILLIMETER)**

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | - | 0.05 |
| b | 0.23 | 0.28 | 0.33 |
| c | 0.203REF | | |
| D | 2.925 | 3.00 | 3.075 |
| D1 | 1.40 | 1.50 | 1.60 |
| E | 2.925 | 3.00 | 3.075 |
| E1 | 2.20 | 2.30 | 2.40 |
| e | 0.650BSC | | |
| L | 0.25 | 0.30 | 0.35 |

## Order Information

| Order number | Package | Marking information | Operation Temperature Range | MSL Grade | Ship, Quantity | Green |
|---|---|---|---|---|---|---|
| GM2410ESA | SOP8 | GM2410E | -40 to125°C | 3 | T&R, 2500 | Rohs |
| GM2410EMA | MSOP8 | GM2410E | -40 to 125°C | 3 | T&R, 2500 | Rohs |
| GM2410ENA | DFN8 | GM2410E | -40 to 125°C | 3 | T&R, 3000 | Rohs |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