

MAX3243 3V~5.5V マルチチャネル RS-232 ラインドライバ/レシーバ、±15kV ESD (HBM) 保護

1 特長

- 3V~5.5V の V_{CC} 電源で動作
- IBM™ PC/AT™ シリアルポート用のシングルチップおよび単一電源インターフェイス
- 人体モデル (HBM) で ±15kV の RS-232 バスピン ESD 保護
- TIA/EIA-232-F および ITU V.28 規格の要件に適合
- 3 つのドライバと 5 つのレシーバ
- 最大 250kbit/s で動作
- 小さいアクティブ電流: 300 μ A (標準値)
- 小さいスタンバイ電流: 1 μ A (標準値)
- 外付けコンデンサ: 4 × 0.1 μ F
- 3.3V 電源で 5V ロジック入力を許容
- 常時アクティブの非反転レシーバ出力 (ROUT2B)
- 動作温度
 - MAX3243C: 0°C~70°C
 - MAX3243I: -40°C~85°C
- シリアルマウス駆動可能
- 有効な RS-232 信号が検出されない場合、自動パワーダウン機能によりドライバ出力をディスエーブル

2 アプリケーション

- バッテリ駆動システム
- タブレット
- ノート PC
- ノート PC
- ハンドヘルド機器

3 概要

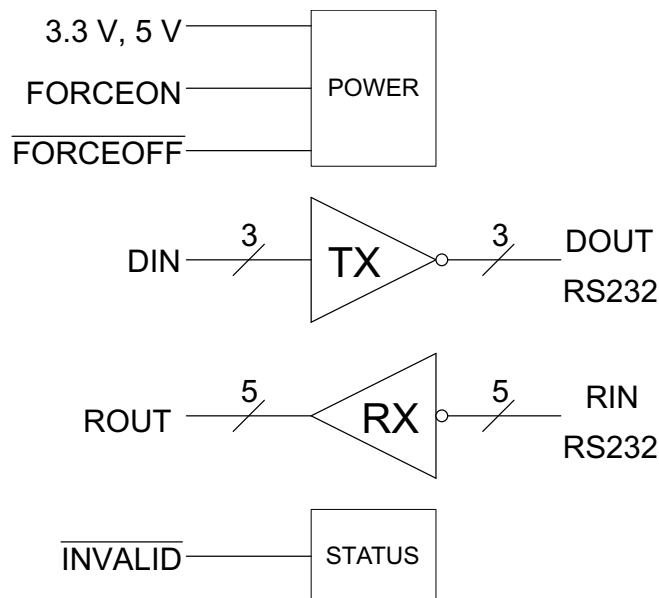
MAX3243 デバイスは、3 つのラインドライバと 5 つのラインレシーバで構成されており、DE-9 DTE インターフェイスに理想的です。±15kV のピン間 (シリアルポート接続ピン、GND を含む) ESD (HBM) 保護機能を備えています。フレキシブルな電源機能は自動的に電力を節約します。リングインジケータと有効な RS232 入力をチェックできるように、特別な出力 (ROUT2B、INVALID) は常に有効化されています。

パッケージ情報

| 部品番号 | パッケージ ⁽¹⁾ | パッケージサイズ ⁽²⁾ |
|---------|----------------------|-------------------------|
| MAX3243 | SSOP (28) | 10.2mm × 7.8 mm |
| | SOIC (28) | 17.9mm × 10.3 mm |
| | TSSOP (28) | 9.7mm × 6.4 mm |

(1) 詳細については、[セクション 11](#) を参照してください。

(2) パッケージサイズ (長さ × 幅) は公称値であり、該当する場合はピンも含まれます。



簡略ブロック図



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4 Pin Configuration and Functions

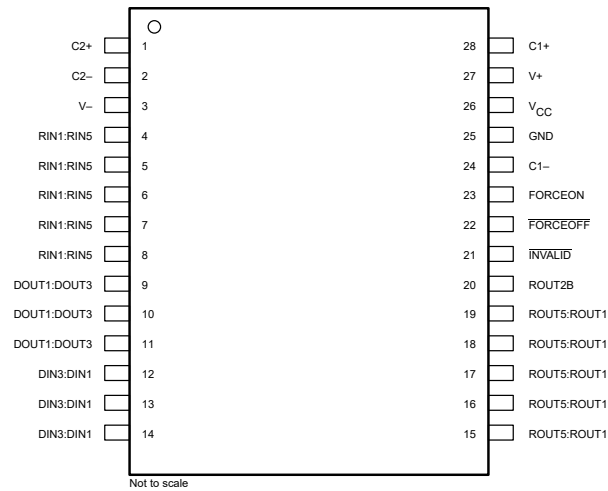


図 4-1. DB, DW, or PW Package
(Top View)

表 4-1. Pin Functions

| PIN | | TYPE | DESCRIPTION |
|-----------------|--------------------|------|--|
| NAME | NO. | | |
| C2+ | 1 | — | Positive lead of C2 capacitor |
| C2- | 2 | — | Negative lead of C2 capacitor |
| V- | 3 | O | Negative charge pump output for storage capacitor only |
| RIN1:RIN5 | 4, 5, 6, 7, 8 | I | RS232 line data input (from remote RS232 system) |
| DOUT1:DOUT3 | 9, 10, 11 | O | RS232 line data output (to remote RS232 system) |
| DIN3:DIN1 | 12, 13, 14 | I | Logic data input (from UART) |
| ROUT5:ROUT1 | 15, 16, 17, 18, 19 | O | Logic data output (to UART) |
| ROUT2B | 20 | O | Always Active non-inverting output for RIN2 (normally used for ring indicator) |
| INVALID | 21 | O | Active low output when all RIN are unpowered |
| FORCEOFF | 22 | I | Low input forces DOUT1-5, ROUT1-5 high Z per セクション 7.4 |
| FORCEON | 23 | I | High forces drivers on. Low is automatic mode per セクション 7.4 |
| C1- | 24 | — | Negative lead on C1 capacitor |
| GND | 25 | — | Ground |
| V _{CC} | 26 | — | Supply Voltage, Connect to 3V to 5.5V power supply |
| V+ | 27 | O | Positive charge pump output for storage capacitor only |
| C1+ | 28 | — | Positive lead of C1 capacitor |

5 Specifications

5.1 Absolute Maximum Ratings

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

| | | MIN | MAX | UNIT | |
|------------------|---|---------------------------|-------|-----------------------|---|
| V _{CC} | Supply voltage range ⁽²⁾ | -0.3 | 6 | V | |
| V+ | Positive output supply voltage range ⁽²⁾ | -0.3 | 7 | V | |
| V- | Negative output supply voltage range ⁽²⁾ | 0.3 | -7 | V | |
| V+ – V- | Supply voltage difference ⁽²⁾ | | 13 | V | |
| V _I | Input voltage range | Driver, FORCEOFF, FORCEON | -0.3 | 6 | V |
| | | Receiver | -25 | 25 | |
| V _O | Output voltage range | Driver | -13.2 | 13.2 | V |
| | | Receiver, INVALID | -0.3 | V _{CC} + 0.3 | |
| T _J | Operating virtual junction temperature | | 150 | °C | |
| 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 [セクション 5.3](#) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltages are with respect to network GND.

5.2 ESD Ratings

| | | | MAX | UNIT |
|--------------------|-------------------------|---|-------|------|
| V _(ESD) | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 RIN, DOUT, and GND pins ⁽¹⁾ | 15000 | V |
| | | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 All other pins ⁽¹⁾ | 3000 | |
| | | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾ | 1000 | |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

⁽¹⁾ (See [図 8-1](#))

| | | MIN | NOM | MAX | UNIT | |
|-----------------|---|-------------------------|-------------------------|-----|------|---|
| V _{CC} | Supply voltage | V _{CC} = 3.3 V | 3 | 3.3 | 3.6 | V |
| | | V _{CC} = 5 V | 4.5 | 5 | 5.5 | |
| V _{IH} | Driver and control high-level input voltage | DIN, FORCEOFF, FORCEON | V _{CC} = 3.3 V | 2 | 5.5 | V |
| | | | V _{CC} = 5 V | 2.4 | 5.5 | |
| V _{IL} | Driver and control low-level input voltage | DIN, FORCEOFF, FORCEON | 0 | 0.8 | V | |
| V _I | Driver and control input voltage | DIN, FORCEOFF, FORCEON | 0 | 5.5 | V | |
| V _I | Receiver input voltage | | -25 | 25 | V | |
| T _A | Operating free-air temperature | MAX3243C | 0 | 70 | °C | |
| | | MAX3243I | -40 | 85 | | |

- (1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 μF, C2–C4 = 0.33 μF at V_{CC} = 5 V ± 0.5 V.

5.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | DB | DW | PW | UNIT |
|--|---------|---------|---------|------|
| | 28 PINS | 28 PINS | 28 PINS | |
| R _{θJA} Junction-to-ambient thermal resistance | 76.1 | 59.0 | 70.3 | °C/W |
| R _{θJC(top)} Junction-to-case (top) thermal resistance | 35.8 | 28.8 | 21.0 | °C/W |
| R _{θJB} Junction-to-board thermal resistance | 37.4 | 30.3 | 29.2 | °C/W |
| ψ _{JT} Junction-to-top characterization parameter | 7.4 | 7.8 | 1.3 | °C/W |
| ψ _{JB} Junction-to-board characterization parameter | 37.0 | 30.0 | 28.8 | °C/W |
| R _{θJC(bot)} Junction-to-case (bottom) thermal resistance | N/A | N/A | N/A | °C/W |

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report (SPRA953).

5.5 Electrical Characteristics — Auto Power Down

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)⁽¹⁾ (see [8-1](#))

| PARAMETER | TEST CONDITIONS | MIN | TYP ⁽¹⁾ | MAX | UNIT | |
|------------------|--|--|-----------------------|-----|------|----|
| I _{CC} | Supply current Auto-powerdown disabled | | 0.3 | 1.2 | mA | |
| | Supply current Auto-powerdown disabled | No load, FORCEOFF and FORCEON at V _{CC} . T _A = 25°C For DW package | 0.3 | 1 | mA | |
| | Supply current Powered off | No load, FORCEOFF at GND. T _A = 25°C | | 1 | 10 | μA |
| | Supply current Auto-powerdown enabled | No load, FORCEOFF at V _{CC} , FORCEON at GND, All RIN are open or grounded, All DIN are grounded. T _A = 25°C | | 1 | 10 | |
| I _I | Input leakage current of FORCEOFF, FORCEON | V _I = V _{CC} or V _I at GND | ±0.01 | ±1 | μA | |
| V _{IT+} | Receiver input threshold for INVALID high-level output voltage | FORCEON = GND, FORCEOFF = V _{CC} | | 2.7 | V | |
| V _{IT-} | Receiver input threshold for INVALID high-level output voltage | FORCEON = GND, FORCEOFF = V _{CC} | -2.7 | | V | |
| V _T | Receiver input threshold for INVALID low-level output voltage | FORCEON = GND, FORCEOFF = V _{CC} | -0.3 | 0.3 | V | |
| V _{OH} | INVALID high-level output voltage | I _{OH} = -1 mA, FORCEON = GND, FORCEOFF = V _{CC} | V _{CC} - 0.6 | | V | |
| V _{OL} | INVALID low-level output voltage | I _{OL} = 1.6 mA, FORCEON = GND, FORCEOFF = V _{CC} | | 0.4 | V | |

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 μF, C2–C4 = 0.33 μF at V_{CC} = 5 V ± 0.5 V.

5.6 Electrical Characteristics — Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)⁽¹⁾ (see [8-1](#))

| PARAMETER | | TEST CONDITIONS | MIN | TYP ⁽²⁾ | MAX | UNIT |
|------------------|---|--|--|--------------------|-----|------|
| V _{OH} | High-level output voltage | All DOUT at R _L = 3 kΩ to GND | 5 | 5.4 | | V |
| V _{OL} | Low-level output voltage | All DOUT at R _L = 3 kΩ to GND | –5 | –5.4 | | V |
| V _O | Output voltage (mouse driveability) | DIN1 = DIN2 = GND, DIN3 = V _{CC} , 3-kΩ to GND at DOUT3, DOUT1 = DOUT2 = 2.5 mA | ±5 | | | V |
| I _{IH} | High-level input current | V _I = V _{CC} | | ±0.01 | ±1 | μA |
| I _{IL} | Low-level input current | V _I at GND | | ±0.01 | ±1 | μA |
| V _{hys} | Input hysteresis | | | | ±1 | V |
| I _{OS} | Short-circuit output current ⁽³⁾ | V _{CC} = 3.6 V, V _O = 0 V | | ±35 | ±60 | mA |
| | | V _{CC} = 5.5 V, V _O = 0 V | | | | |
| r _o | Output resistance | V _{CC} , V+, and V– = 0 V, V _O = ±2 V | 300 | 10M | | Ω |
| I _{off} | Output leakage current | FORCEOFF = GND, V _O = ±12 V, V _{CC} = 3 to 3.6 V | | | ±25 | μA |
| | | | V _O = ±10 V, V _{CC} = 4.5 to 5.5 V | | | |

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 μF, C2–C4 = 0.33 μF at V_{CC} = 5 V ± 0.5 V.

(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

(3) Short-circuit durations should be controlled to prevent exceeding the device absolute power dissipation ratings, and not more than one output should be shorted at a time.

5.7 Electrical Characteristics — Receiver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)⁽¹⁾ (see [8-1](#))

| PARAMETER | | TEST CONDITIONS | MIN | TYP ⁽²⁾ | MAX | UNIT |
|------------------|---|--------------------------------|-----------------------|-----------------------|-----|------|
| V _{OH} | High-level output voltage | I _{OH} = –1 mA | V _{CC} – 0.6 | V _{CC} – 0.1 | | V |
| V _{OL} | Low-level output voltage | I _{OH} = 1.6 mA | | | 0.4 | V |
| V _{IT+} | Positive-going input threshold voltage | V _{CC} = 3.3 V | | 1.6 | 2.4 | V |
| | | V _{CC} = 5 V | | 1.9 | 2.4 | |
| V _{IT–} | Negative-going input threshold voltage | V _{CC} = 3.3 V | 0.6 | 1.1 | | V |
| | | V _{CC} = 5 V | 0.8 | 1.4 | | |
| V _{hys} | Input hysteresis (V _{IT+} – V _{IT–}) | | | 0.5 | | V |
| I _{off} | Output leakage current (except ROUT2B) | FORCEOFF = 0 V | | ±0.05 | ±10 | μA |
| r _I | Input resistance | V _I = ±3 V or ±25 V | 3 | 5 | 7 | kΩ |

(1) Test conditions are C1–C4 = 0.1 μF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 μF, C2–C4 = 0.33 μF at V_{CC} = 5 V ± 0.5 V.

(2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

5.8 Switching Characteristics — Auto Power Down

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [6-5](#))

| PARAMETER | | TEST CONDITIONS | TYP ⁽¹⁾ | UNIT |
|----------------------|---|-----------------------|--------------------|------|
| t _{valid} | Propagation delay time, low- to high-level output | V _{CC} = 5 V | 1 | μs |
| t _{invalid} | Propagation delay time, high- to low-level output | V _{CC} = 5 V | 30 | μs |
| t _{en} | Supply enable time | V _{CC} = 5 V | 100 | μs |

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

5.9 Switching Characteristics — Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)⁽²⁾ (see 8-1)
MAX3243C, MAX3243I

| PARAMETER | TEST CONDITIONS | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|--|--|-----|--------------------|-----|------------|
| Maximum data rate | $R_L = 3\text{ k}\Omega$ One DOUT switching, $C_L = 1000\text{ pF}$ See 6-1 | 150 | 250 | | kbit/s |
| $t_{sk(p)}$ Pulse skew ⁽³⁾ | $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ $C_L = 150\text{ pF}$ to 2500 pF See 6-3 | | 100 | | ns |
| $SR(tr)$ Slew rate, transition region (see 6-1) | $V_{CC} = 3.3\text{ V}$, $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$ | 6 | | 30 | V/ μ s |
| | $C_L = 150\text{ pF}$ to 1000 pF $C_L = 150\text{ pF}$ to 2500 pF | 4 | | 30 | |

- (1) All typical values are at $V_{CC} = 3.3\text{ V}$ or $V_{CC} = 5\text{ V}$, and $T_A = 25^\circ\text{C}$.
(2) Test conditions are C1–C4 = 0.1 μF at $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$; C1 = 0.047 μF , C2–C4 = 0.33 μF at $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$.
(3) Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

5.10 Switching Characteristics — Receiver

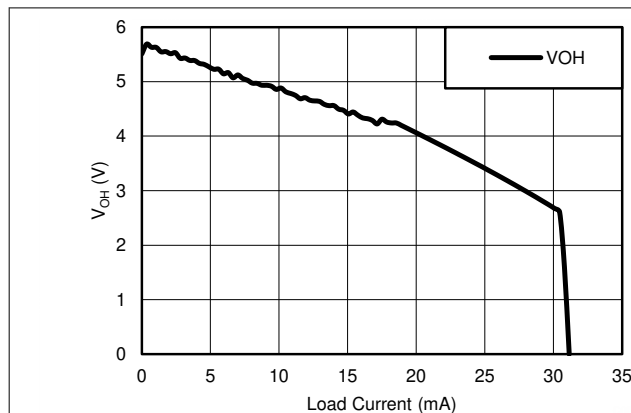
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)⁽²⁾

| PARAMETER | TEST CONDITIONS | TYP ⁽¹⁾ | UNIT |
|---|---|--------------------|------|
| t_{PLH} Propagation delay time, low- to high-level output | $C_L = 150\text{ pF}$, See 6-3 | 150 | ns |
| t_{PHL} Propagation delay time, high- to low-level output | | 150 | ns |
| t_{en} Output enable time | $C_L = 150\text{ pF}$, $R_L = 3\text{ k}\Omega$, See 6-4 | 200 | ns |
| t_{dis} Output disable time | See 6-4 | 200 | ns |
| $t_{sk(p)}$ Pulse skew ⁽³⁾ | See 6-3 | 50 | ns |

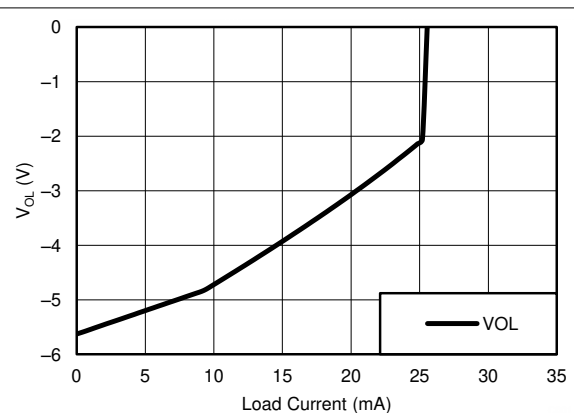
- (1) All typical values are at $V_{CC} = 3.3\text{ V}$ or $V_{CC} = 5\text{ V}$, and $T_A = 25^\circ\text{C}$.
(2) Test conditions are C1–C4 = 0.1 μF at $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$; C1 = 0.047 μF , C2–C4 = 0.33 μF at $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$.
(3) Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

5.11 Typical Characteristics

$V_{CC} = 3.3\text{ V}$

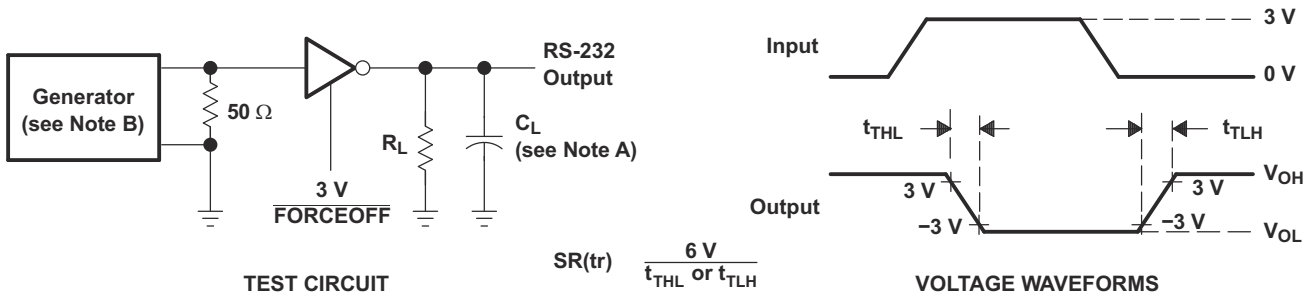


5-1. DOUT VOH vs Load Current



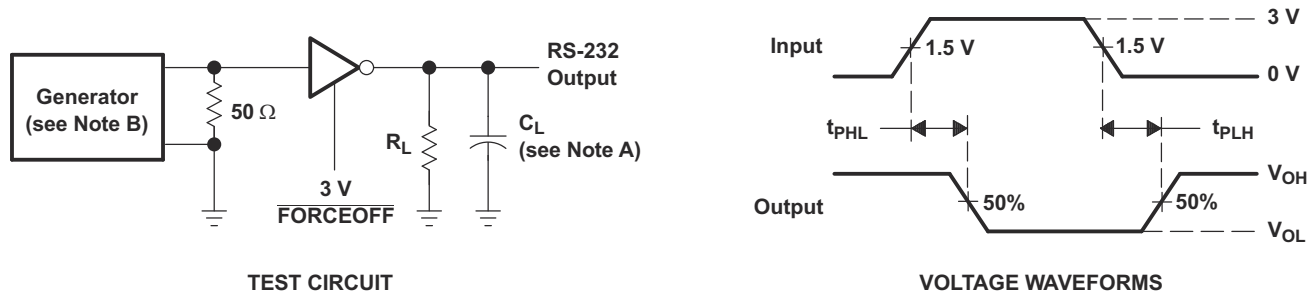
5-2. DOUT VOL vs Load Current

6 Parameter Measurement Information



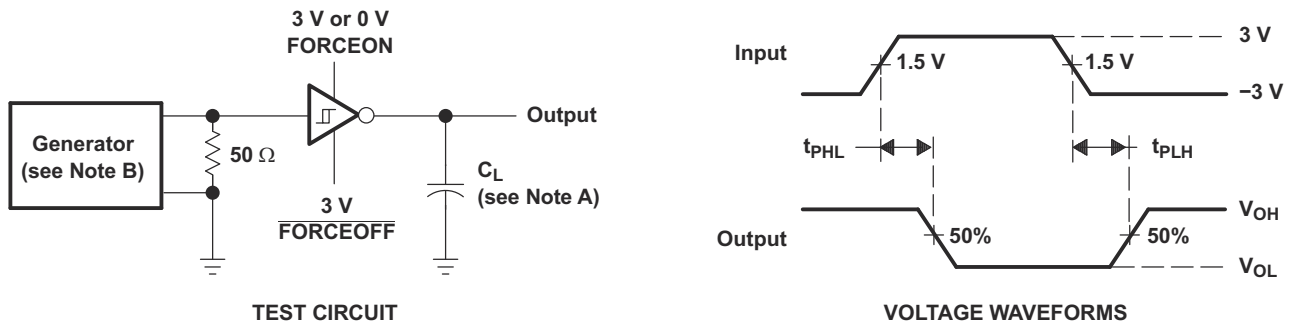
NOTES: A. C_L includes probe and jig capacitance.
 B. The pulse generator has the following characteristics: PRR = 250 kbit/s (MAX3243C/I) and 1 Mbit/s (MAX3243FC/I), $Z_O = 50 \Omega$, 50% duty cycle, $t_r \leq 10 \text{ ns}$, $t_f \leq 10 \text{ ns}$.

图 6-1. Driver Slew Rate



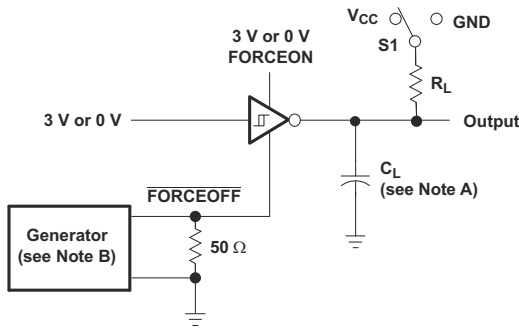
NOTES: A. C_L includes probe and jig capacitance.
 B. The pulse generator has the following characteristics: PRR = 250 kbit/s (MAX3243C/I) and 1 Mbit/s (MAX3243FC/I), $Z_O = 50 \Omega$, 50% duty cycle, $t_r \leq 10 \text{ ns}$, $t_f \leq 10 \text{ ns}$.

图 6-2. Driver Pulse Skew

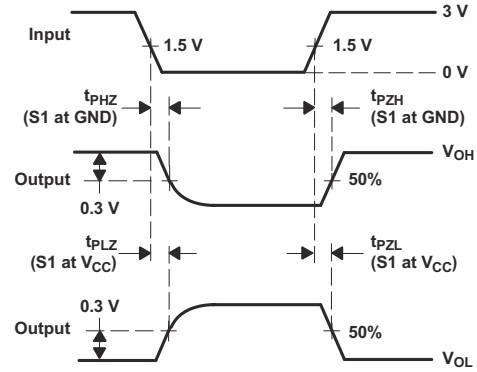


NOTES: A. C_L includes probe and jig capacitance.
 B. The pulse generator has the following characteristics: $Z_O = 50 \Omega$, 50% duty cycle, $t_r \leq 10 \text{ ns}$, $t_f \leq 10 \text{ ns}$.

图 6-3. Receiver Propagation Delay Times



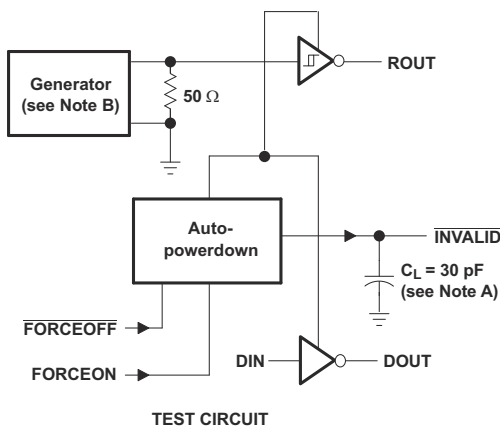
TEST CIRCUIT



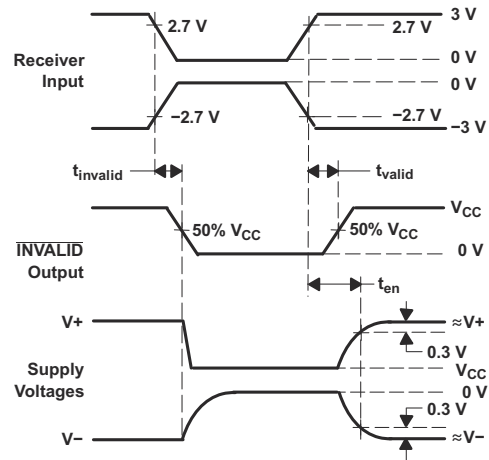
VOLTAGE WAVEFORMS

- NOTES: A. C_L includes probe and jig capacitance.
 B. The pulse generator has the following characteristics: $Z_O = 50 \Omega$, 50% duty cycle, $t_r \leq 10$ ns, $t_f \leq 10$ ns.
 C. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 D. t_{PZL} and t_{PZH} are the same as t_{en} .

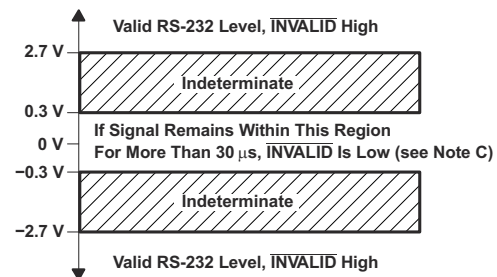
6-4. Receiver Enable and Disable Times



TEST CIRCUIT



VOLTAGE WAVEFORMS



- NOTES: A. C_L includes probe and jig capacitance.
 B. The pulse generator has the following characteristics: PRR = 5 kbit/s, $Z_O = 50 \Omega$, 50% duty cycle, $t_r \leq 10$ ns, $t_f \leq 10$ ns.
 C. Auto-powerdown disables drivers and reduces supply current to $1 \mu A$.

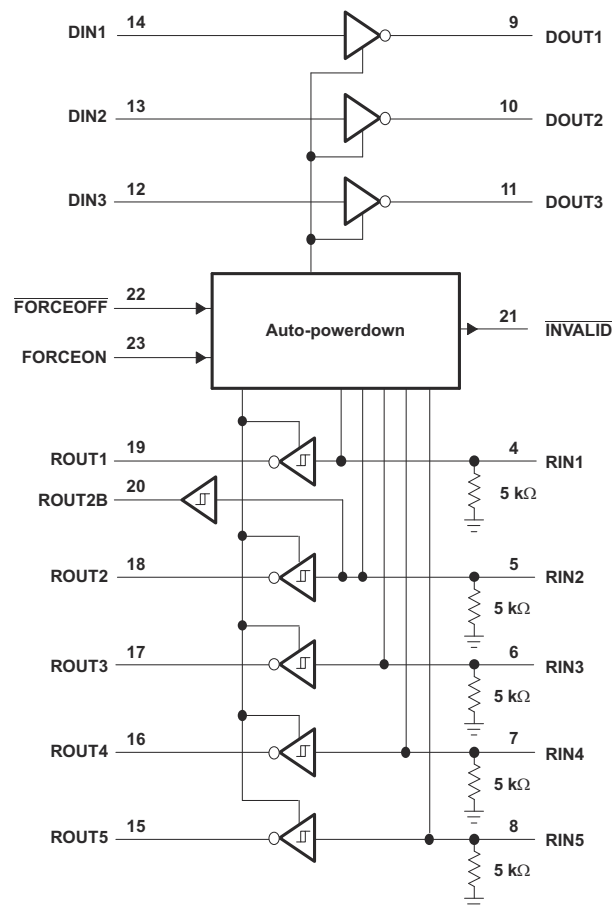
6-5. INVALID Propagation Delay Times and Supply Enabling Time

7 Detailed Description

7.1 Overview

The MAX3243 device consists of three line drivers, five line receivers, and a dual charge-pump circuit with $\pm 15\text{kV}$ ESD (HBM) protection pin to pin (serial-port connection pins, including GND). The device meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. This combination of drivers and receivers matches that needed for the typical serial port used in an IBM PC/AT, or compatible. The charge pump and four small external capacitors allow operation from a single 3V to 5.5V supply. In addition, the device includes an always-active noninverting output (ROUT2B), which allows applications using the ring indicator to transmit data while the device is powered down. Flexible control options for power management are available when the serial port is inactive. The auto-power-down feature functions when FORCEON is low and FORCEOFF is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If FORCEOFF is set low, both drivers and receivers (except ROUT2B) are shut off, and the supply current is reduced to $1\mu\text{A}$. Disconnecting the serial port or turning off the peripheral drivers causes the auto-powerdown condition to occur. Auto-powerdown can be disabled when FORCEON and FORCEOFF are high and should be done when driving a serial mouse. With auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input. The INVALID output is used to notify the user if an RS-232 signal is present at any receiver input. INVALID is high (valid data) if any receiver input voltage is greater than 2.7V or less than -2.7V or has been between -0.3V and 0.3V for less than $30\mu\text{s}$. INVALID is low (invalid data) if all receiver input voltages are between -0.3V and 0.3V for more than $30\mu\text{s}$.

7.2 Functional Block Diagram



7.3 Feature Description

7.3.1 Auto-Power-Down

Auto-Power-Down can be used to automatically save power when the receivers are unconnected or connected to a powered down remote RS232 port. FORCEON being high will override Auto power down and the drivers will be active. FORCEOFF being low will override FORCEON and will power down all outputs except for ROUT2B and INVALID.

7.3.2 Charge Pump

The charge pump increases, inverts, and regulates voltage at V+ and V– pins and requires four external capacitors.

7.3.3 RS232 Driver

Three drivers interface standard logic level to RS232 levels. All DIN inputs must be valid high or low.

7.3.4 RS232 Receiver

Five receivers interface RS232 levels to standard logic levels. An open input will result in a high output on ROUT. Each RIN input includes an internal standard RS232 load.

7.3.5 ROUT2B Receiver

ROUT2B is an always-active noninverting output of RIN2 input, which allows applications using the ring indicator to transmit data while the device is powered down.

7.3.6 Invalid Input Detection

The $\overline{\text{INVALID}}$ output goes active low when all RIN inputs are unpowered. The $\overline{\text{INVALID}}$ output goes inactive high when any RIN input is connected to an active RS232 voltage level.

7.4 Device Functional Modes

表 7-1. Each Driver ⁽¹⁾

| INPUTS | | | | OUTPUT | DRIVER STATUS |
|--------|---------|----------|------------------------|--------|---|
| DIN | FORCEON | FORCEOFF | VALID RIN RS-232 LEVEL | DOUT | |
| X | X | L | X | Z | Powered off |
| L | H | H | X | H | Normal operation with auto-powerdown disabled |
| H | H | H | X | L | |
| L | L | H | YES | H | Normal operation with auto-powerdown enabled |
| H | L | H | YES | L | |
| X | L | H | NO | Z | Power off by auto-powerdown feature |

(1) H = high level, L = low level, X = irrelevant, Z = high impedance, YES = any RIN valid, NO = all RIN invalid

表 7-2. Each Receiver ⁽¹⁾

| INPUTS | | | OUTPUTS | RECEIVER STATUS |
|--------|---------|----------|---------|------------------|
| RIN | FORCEON | FORCEOFF | ROUT | |
| X | X | L | Z | Powered off |
| L | X | H | H | Normal operation |
| H | X | H | L | |
| Open | X | H | H | |

(1) H = high level, L = low level, X = irrelevant, Z = high impedance (off), Open = input disconnected or connected driver off

表 7-3. INVALID and ROUT2B Outputs ⁽¹⁾

| INPUTS | | | | OUTPUTS | | OUTPUT STATUS |
|------------------------|------|---------|----------|---------|--------|---------------|
| VALID RIN RS-232 LEVEL | RIN2 | FORCEON | FORCEOFF | INVALID | ROUT2B | |
| YES | L | X | X | H | L | Always Active |
| YES | H | X | X | H | H | |
| YES | OPEN | X | X | H | L | Always Active |
| NO | OPEN | X | X | L | L | |

(1) H = high level, L = low level, X = irrelevant, Z = high impedance (off), OPEN = input disconnected or connected driver off, YES = any RIN valid, NO = all RIN invalid

8 Application and Implementation

注

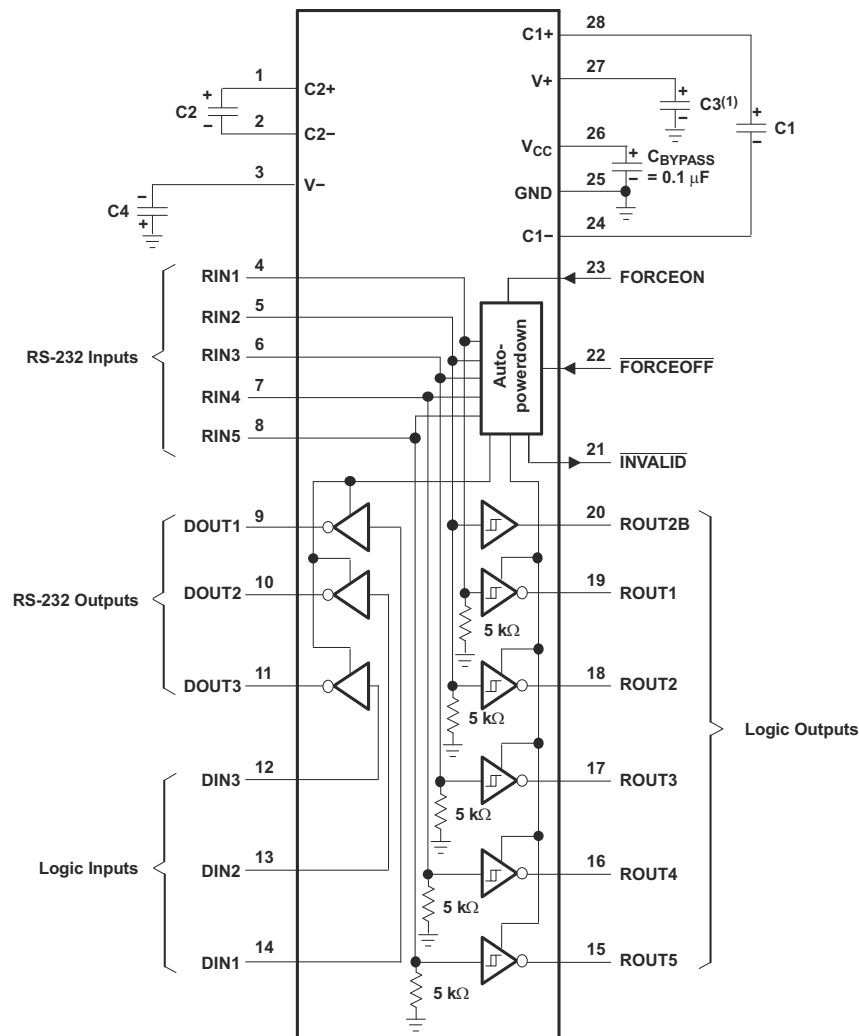
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8.1 Application Information

It is recommended to add capacitors as shown in [図 8-1](#).

8.2 Typical Application

ROUT and DIN connect to UART or general purpose logic lines. RIN and DOUT lines connect to a RS232 connector or cable.



(1) C3 can be connected to V_{CC} or GND.

NOTES: A. Resistor values shown are nominal.

B. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

V_{CC} vs CAPACITOR VALUES

| V_{CC} | C1 | C2, C3, and C4 |
|-------------------|---------------|----------------|
| 3.3 V \pm 0.3 V | 0.1 μ F | 0.1 μ F |
| 5 V \pm 0.5 V | 0.047 μ F | 0.33 μ F |
| 3 V to 5.5 V | 0.1 μ F | 0.47 μ F |

図 8-1. Typical Operating Circuit and Capacitor Values

8.2.1 Design Requirements

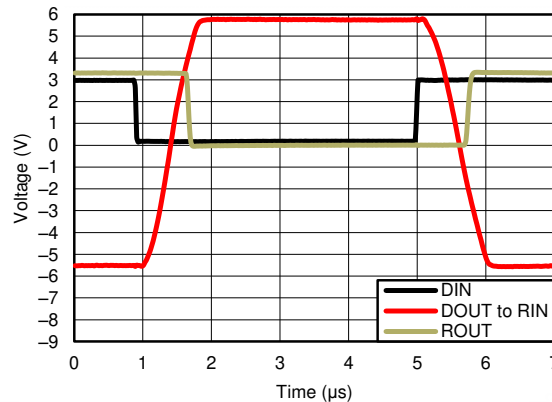
- V_{CC} minimum is 3 V and maximum is 5.5V.
- Maximum recommended bit rate is 250 kbit/s.

8.2.2 Detailed Design Procedure

- All DIN, $\overline{\text{FORCEOFF}}$ and FORCEON inputs must be connected to valid low or high logic levels.
- Select capacitor values based on V_{CC} level for best performance.

8.2.3 Application Curves

$V_{CC} = 3.3\text{ V}$



☒ 8-2. Driver to Receiver Loopback Timing Waveform

8.3 Power Supply Recommendations

V_{CC} should be between 3V and 5.5V. Charge pump capacitors should be chosen using table in ☒ 8-1.

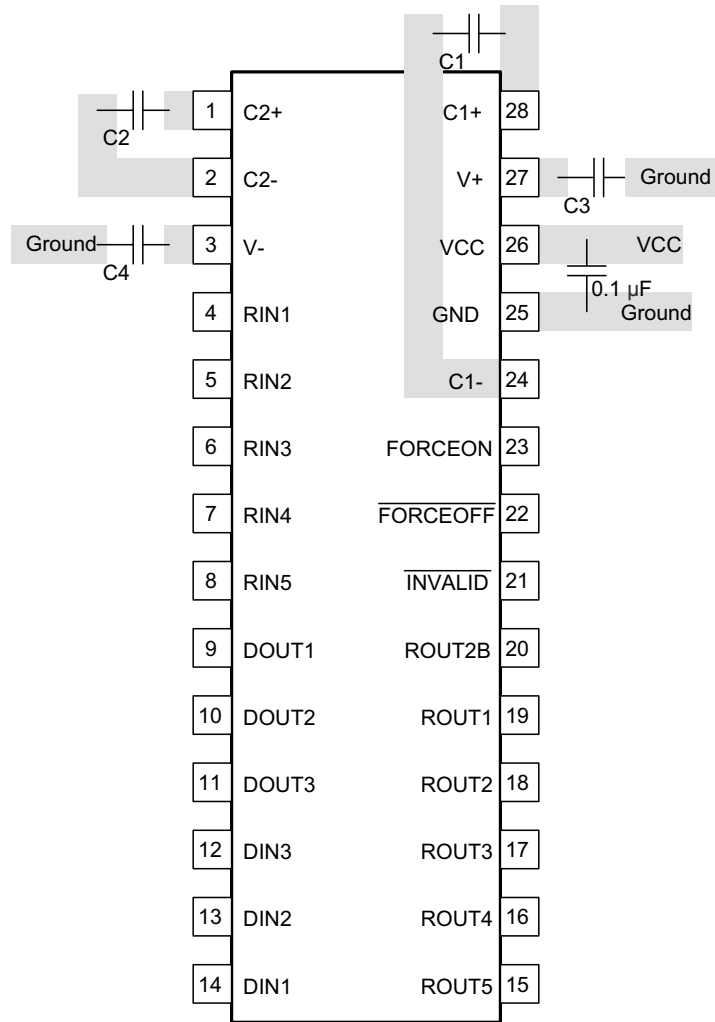
8.4 Layout

8.4.1 Layout Guidelines

Keep the external capacitor traces short. This is more important on C1 and C2 nodes that have the fastest rise and fall times.

In the [Layout Example](#) diagram, only critical layout sections are shown. Input and output traces will vary in shape and size depending on the customer application. FORCEON and $\overline{\text{FORCEOFF}}$ should be pulled up to V_{CC} or GND via a pullup resistor, depending on which configuration the user desires upon power-up.

8.4.2 Layout Example



8-3. Layout Diagram

9 Device and Documentation Support

9.1 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、www.tij.co.jp のデバイス製品フォルダを開いてください。[通知] をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取ることができます。変更の詳細については、改訂されたドキュメントに含まれている改訂履歴をご覧ください。

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[テキサス・インスツルメンツ用語集](#) この用語集には、用語や略語の一覧および定義が記載されています。

10 Revision History

Changes from Revision P (October 2022) to Revision Q (August 2024) Page

- | | |
|---|---|
| • 「製品情報」表を「パッケージ情報」表に変更 | 1 |
| • Changed 16 PINS to 28 PINS in the <i>Thermal Information</i> table..... | 5 |

Changes from Revision O (January 2015) to Revision P (October 2022) Page

- | | |
|--|---|
| • Changed the <i>Thermal Information</i> table..... | 5 |
| • Changed the MAX value of I _{CC} Supply current auto-powerdown disabled from 1 mA to 1.2 mA in <i>Electrical Characteristics—Auto Power Down</i> | 5 |

Changes from Revision N (May 2009) to Revision O (January 2015) Page

- | | |
|---|---|
| • 「アプリケーション」、「製品情報」表、「ピンの機能」表、「ESD 定格」表、「熱に関する情報」表、「代表的特性」、「機能説明」セクション、「デバイスの機能モード」、「アプリケーションと実装」セクション、「電源に関する推奨事項」セクション、「レイアウト」セクション、「デバイスおよびドキュメントのサポート」セクション、および「メカニカル、パッケージ、および注文情報」セクションを追加。 | 1 |
| • 「注文情報」表を削除。 | 1 |

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| MAX3243CDBR | ACTIVE | SSOP | DB | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MAX3243C | Samples |
| MAX3243CDBRE4 | ACTIVE | SSOP | DB | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MAX3243C | Samples |
| MAX3243CDBRG4 | ACTIVE | SSOP | DB | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MAX3243C | Samples |
| MAX3243CDW | OBSOLETE | SOIC | DW | 28 | | TBD | Call TI | Call TI | 0 to 70 | MAX3243C | |
| MAX3243CDWR | ACTIVE | SOIC | DW | 28 | 1000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MAX3243C | Samples |
| MAX3243CDWRG4 | ACTIVE | SOIC | DW | 28 | 1000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MAX3243C | Samples |
| MAX3243CPWR | ACTIVE | TSSOP | PW | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MA3243C | Samples |
| MAX3243CPWRG4 | ACTIVE | TSSOP | PW | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | MA3243C | Samples |
| MAX3243IDBR | ACTIVE | SSOP | DB | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | MAX3243I | Samples |
| MAX3243IDW | ACTIVE | SOIC | DW | 28 | 20 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | MAX3243I | Samples |
| MAX3243IDWR | ACTIVE | SOIC | DW | 28 | 1000 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -40 to 85 | MAX3243I | Samples |
| MAX3243IPWR | ACTIVE | TSSOP | PW | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | MB3243I | Samples |
| MAX3243IPWRE4 | ACTIVE | TSSOP | PW | 28 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | MB3243I | Samples |

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OTHER QUALIFIED VERSIONS OF MAX3243 :

- Enhanced Product : [MAX3243-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

DW (R-PDSO-G28)

PLASTIC SMALL OUTLINE

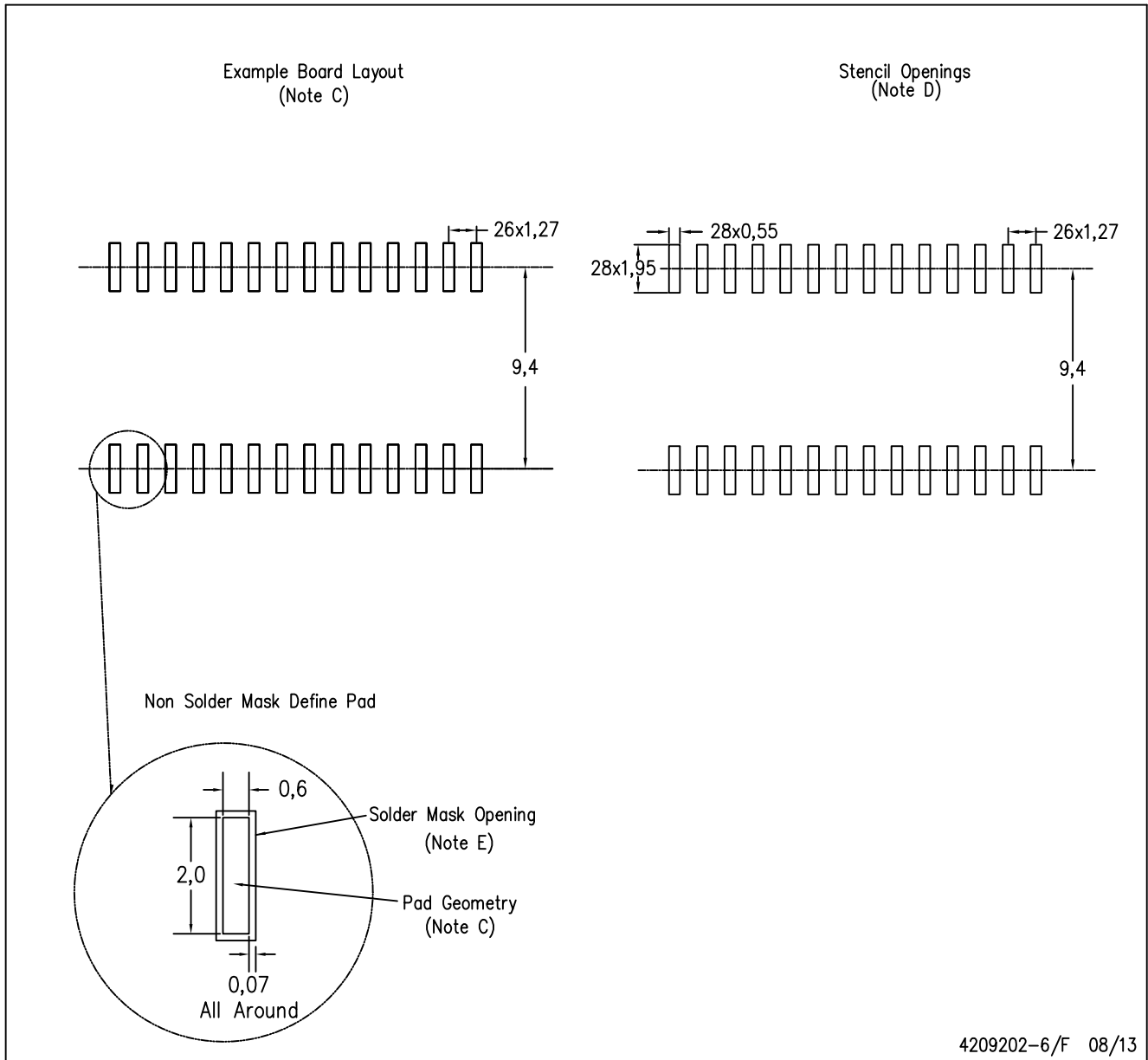


4040000-6/G 01/11

- 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 AE.

DW (R-PDSO-G28)

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.

MECHANICAL DATA

PW (R-PDSO-G28)

PLASTIC SMALL OUTLINE



4040064-7/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

DB0028A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214853/B 03/2018

NOTES:

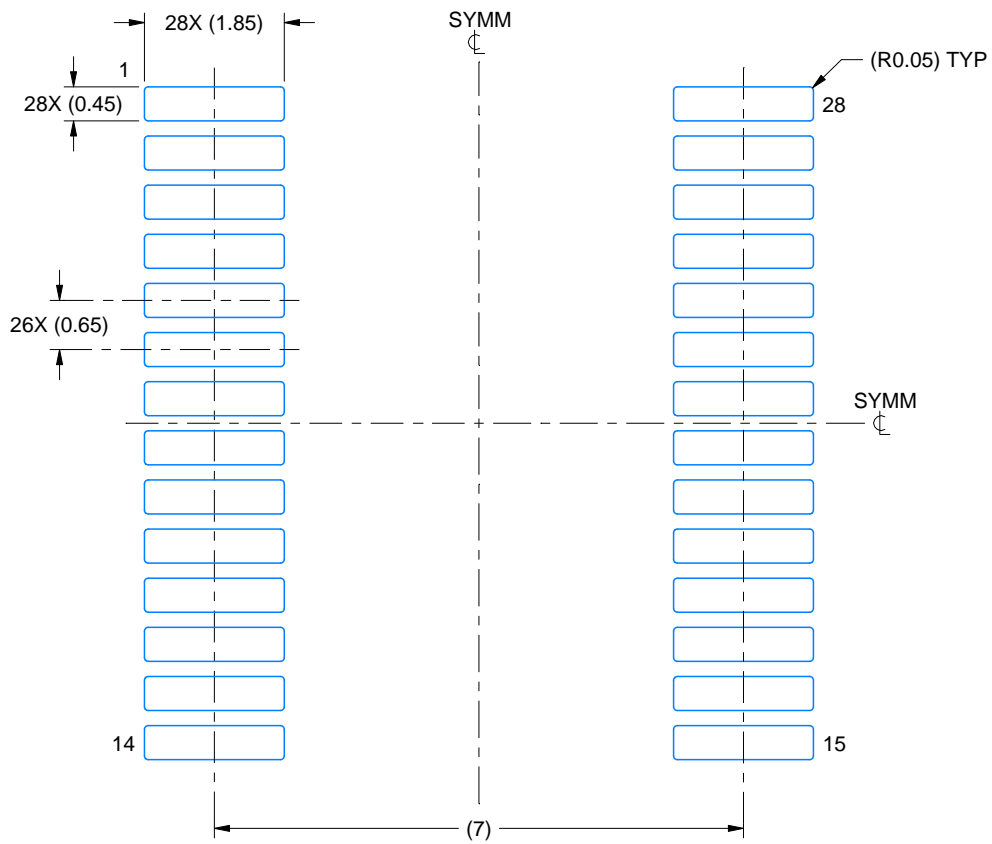
- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- Reference JEDEC registration MO-150.

EXAMPLE BOARD LAYOUT

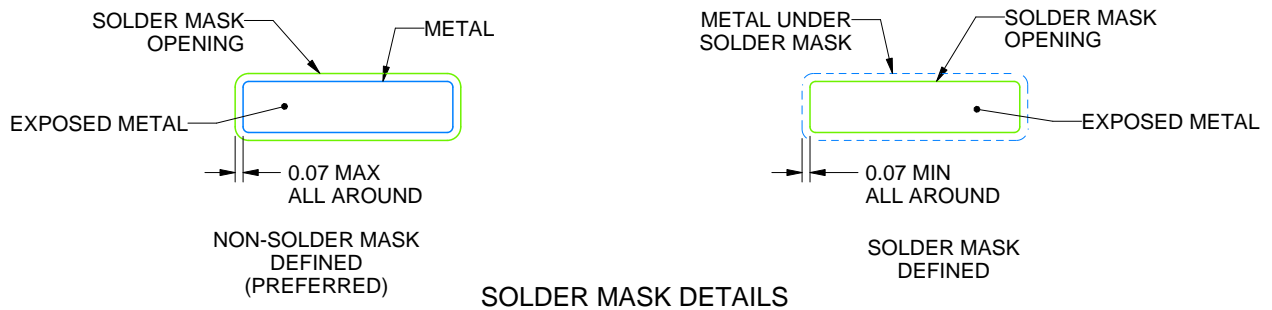
DB0028A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4214853/B 03/2018

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0028A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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