±15kV ESD-Protected, 1µA, 3.0V to 5.5V, 250kbps,RS-232 Transceivers with AutoShutdown

1 FEATURES

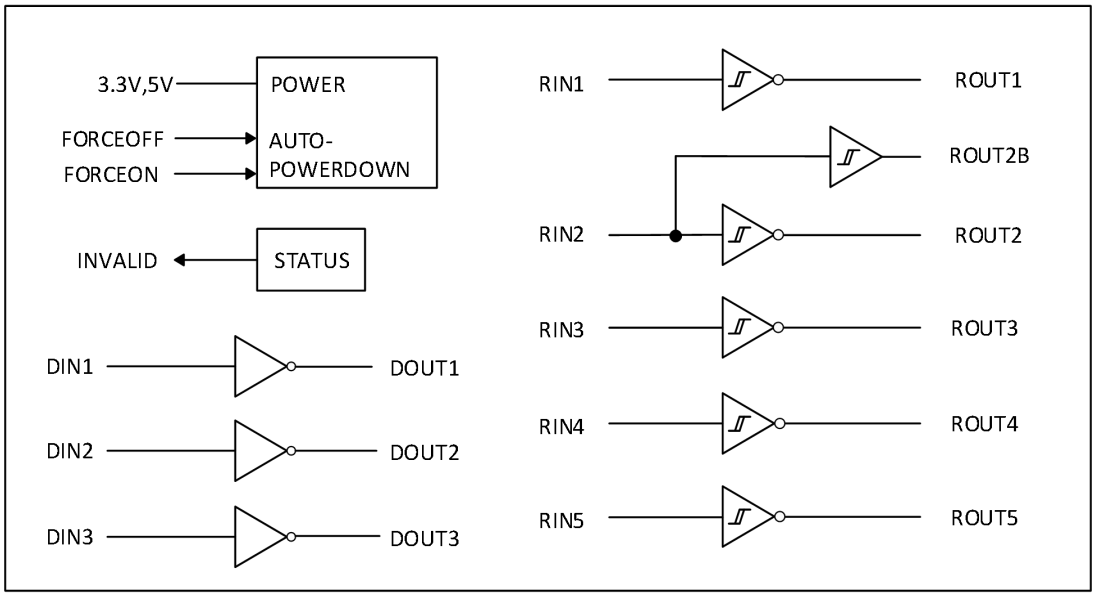
- True RS-232 Operation from Vcc = +3.0V to +5.5V
- 1µA Supply Current Achieved with AutoShutdown
- Guaranteed 250kbps Data Rate
- Auto Power-Off Feature to Disable Driver Outputs when No Valid RS-232 Signal is Sensed
- Accept 5V logic input and 3.3V power supply
- Interoperable with EIA / TIA-232 and adheres to EIA /TIA-562 down to a +2.7V power source
- Enhanced ESD specifications:
  ±15kV Human Body Model
  ±15kV IEC61000-4-2 Air Discharge
  ±8kV IEC61000-4-2 Contact Discharge

2 APPLICATIONS

- Notebook, Subnotebook, and Palmtop Computers
- Cellular Phones
- Battery-Powered Equipment
- Handheld Equipment
- Peripherals
- Printers

3 DESCRIPTION

The GM3243E is 3V/5.5V powered communications interfaces with automatic shutdown/wake up features, high data rate capabilities, and enhanced electrostatic discharge (ESD) protection . All transmitter outputs and receiver inputs are protected to ±15kV using IEC 1000-4-2 Air Gap Discharge, to ±8kV using IEC 1000-4-2 Contact Discharge, and to ±15kV using the Human Body Model.It saves power without changes to the existing BIOS or operating system by entering low-power shutdown mode when the RS-232 cable is disconnected, or when the transmitters of the connected peripherals are off.The transceivers have a proprietary low-dropout transmitter output stage, delivering true RS-232 performance from a +3.0V to +5.5V supply with a dual charge pump.The charge pump requires only four small 0.1µF capacitors for operation from a +3.3V supply. Each device is guaranteed to run at data rates of 250kbps while maintaining RS-232 output levels.



Simplified Circuit Diagram

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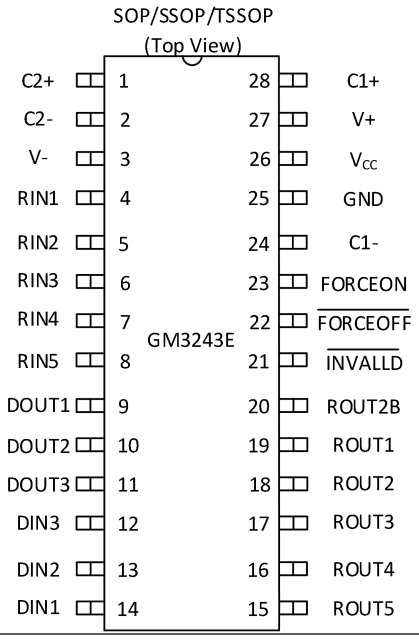
4 Pin Configuration and Functions



Pin		Type	Description
Name	No.		
C2+	1	-	Positive terminal of the voltage-doubler charge-pump capacitor
C2-	2	-	Negative terminal of the voltage-doubler charge-pump capacitor
V-	3		Negative charge pump output voltage
RIN1	4	I	RS-232 receiver input
RIN2	5	I	RS-232 receiver input
RIN3	6	I	RS-232 receiver input
RIN4	7	I	RS-232 receiver input
RIN5	8	I	RS-232 receiver input
DOUT1	9	O	RS-232 driver output
DOUT2	10	O	RS-232 driver output
DOUT3	11	O	RS-232 driver output
DIN3	12	I	TTL/CMOS driver input
DIN2	13	I	TTL/CMOS driver input
DIN1	14	I	TTL/CMOS driver input
ROUT5	15	O	TTL/CMOS Receiver Output
ROUT4	16	O	TTL/CMOS Receiver Output
ROUT3	17	O	TTL/CMOS Receiver Output
ROUT2	18	O	TTL/CMOS Receiver Output
ROUT1	19	O	TTL/CMOS Receiver Output
ROUT2B	20	O	Always-active noninverting receiver output
$\overline{\text{INVALLD}}$	21	O	$\overline{\text{INVALLD}}$ Output Pin
$\overline{\text{FORCEOFF}}$	22	I	Auto Powerdown Control input (Refer to Truth Table)
FORCEON	23	I	Auto Powerdown Control input (Refer to Truth Table)
C1-	24	-	Negative terminal of the voltage-doubler charge-pump capacitor
GND	25	-	Ground
Vcc	26	-	3V to 5.5V supply voltage
V+	27	-	Positive terminal of the voltage-doubler charge-pump capacitor
C1+	28	-	Negative terminal of the voltage-doubler charge-pump capacitor

5 Specifications

5.1 Absolute Maximum Ratings(1)

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

Parameter	Description		MIN	MAX	UNIT
Vcc	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-	Output supply voltage difference(2)			13	V
V_I	Input voltage range	Driver ($\overline{FORCEOFF}$, FORCEON)	-0.3	6	V
		Receiver	-25	25	
V_O	Output voltage range	Driver	-13.2	13.2	V
		Receiver ($\overline{INVALLD}$)	-0.3	Vcc+0.3	
T_{stg}	Storage temperature range		-65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltages are with respect to network GND.

5.2 ESD Ratings

Parameter	Limit	Unit
HBM (Human Body Model), Driver Outputs and Receiver Inputs	±15	KV
IEC61000-4-2 Air Discharge, Driver Outputs and Receiver Inputs	±15	
IEC61000-4-2 Contact Discharge, Driver Outputs and Receiver Inputs	±8	

5.3 Recommended Operating Conditions

See Figure 6 (1)

Parameter	Description			MIN	NOM	MAX	UNIT
Vcc	Supply Voltage range		Vcc=3.3V	3	3.3	3.6	V
			Vcc=5V	4.5	5	5.5	
V_{IH}	Driver and control high-level input voltage	D_{IN}, $\overline{FORCEOFF}$ FORCEON	Vcc=3.3V	2		5.5	V
			Vcc=5V	2.4		5.5	
V_{IL}	Driver and control low-level input voltage	D_{IN}, $\overline{FORCEOFF}$, FORCEON				0.8	V
V_I	Driver and control input voltage	D_{IN}, $\overline{FORCEOFF}$, FORCEON		0		5.5	V
V_I	Receiver input voltage			-25		25	V
T_A	Operating free-air temperature			-40		85	°C

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

5.4 Thermal Information

Parameter	THERMAL METRIC	SSOP	SOIC	TSSOP	UNIT
		28 PINS	28 PINS	28 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	76.1	59.0	70.3	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	35.8	28.8	21.0	°C/W
$R_{\theta JB}$	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
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	°C/W

5.5 Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter			TEST CONDITIONS	MIN	TYP(2)	MAX	UNIT
I_I	Input leakage current	$\overline{FORCEOFF}$, FORCEON			±0.01	±1	μA
I_{CC}	Supply current (T_A = 25°C)	Auto-powerdown disabled	No load, $\overline{FORCEOFF}$ and FORCEON at Vcc		0.3	1.2	mA
		Powered off	No load, $\overline{FORCEOFF}$ at GND		1	10	μA
		Auto-powerdown enabled	No load, $\overline{FORCEOFF}$ at Vcc, FORCEON at GND,All R_{IN} are open or grounded,All D_{IN} are grounded		1	10	μA

(1) Test conditions are C1–C4 = 0.1μF at Vcc = 3.3 V ± 0.3 V; C1 = 0.047μF, C2–C4 = 0.33μF at Vcc = 5 V ± 0.5 V.
(2) All typical values are at Vcc = 3.3 V or Vcc = 5 V, and T_A = 25°C.

5.6 Driver Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter		TEST CONDITIONS	MIN	TYP(2)	MAX	UNIT
V_{OH}	High-level output voltage	All D_{OUT} at RL = 3kΩ to GND	5	5.4		V
V_{OL}	Low-level output voltage	All D_{OUT} at RL = 3kΩ to GND		-5.4	-5	V
V_O	Output voltage	D_{IN1} = D_{IN2} = GND, D_{IN3} = Vcc, 3kΩ to GND at D_{OUT3},D_{OUT1} = D_{OUT2} = 2.5mA	±5			V
I_{IH}	High-level input current	V_I= Vcc		±0.01	±1	μA
I_{IL}	Low-level input current	V_I at GND		±0.01	±1	μA
V_{hys}	Input hysteresis			0.5	±1	V
I_{OS}	Short-circuit output current(3)	Vcc = 3.6 V, V_O = 0 V		±30	±60	mA
		Vcc = 5.5 V, V_O = 0 V				
r_o	Output resistance	Vcc, V+, and V– = 0 V, V_O = ±2 V	300	10M		Ω
I_{off}	Output leakage current	$\overline{FORCEOFF}$ = GND, V_O = ±12 V, Vcc = 0 to 5.5 V		0.2	±25	μA

(1) Test conditions are C1–C4 = 0.1μF at Vcc = 3.3 V ± 0.3 V; C1 = 0.047μF, C2–C4 = 0.33μF at Vcc = 5 V ± 0.5 V.
(2) All typical values are at Vcc = 3.3 V or Vcc = 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.

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5.7 Receiver Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter		TEST CONDITIONS	MIN	TYP(2)	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –1mA	Vcc – 0.6	Vcc – 0.1		V
V_{OL}	Low-level output voltage	I_{OH} = 1.6mA		0.1	0.4	V
V_{IT+}	Positive-going input threshold voltage	Vcc = 3.3 V		1.4	2.4	V
		Vcc = 5 V		1.7	2.4	
$V_{IT–}$	Negative-going input threshold voltage	Vcc = 3.3 V	0.6	1.1		V
		Vcc = 5 V	0.8	1.3		
V_{hys}	Input hysteresis (V_{IT+} – $V_{IT–}$)			0.4		V
I_{off}	Output leakage current (except ROUT2B)	$\overline{FORCEOFF}$ = 0V		±0.03	±10	μA
ri	Input resistance	V_I= ±3 V or ±25V	3	6	8	KΩ

(1) Test conditions are C1–C4 = 0.1μF at Vcc = 3.3 V ± 0.3 V; C1 = 0.047μF, C2–C4 = 0.33μF at Vcc = 5 V ± 0.5 V.
(2) All typical values are at Vcc = 3.3 V or Vcc = 5 V, and T_A = 25°C.

5.8 Auto-Powerdown Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter		TEST CONDITIONS	MIN	MAX	UNIT
$V_{IT+(valid)}$	Receiver input threshold for $\overline{INVALLD}$ high-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = Vcc		2.7	V
$V_{IT–(valid)}$	Receiver input threshold for $\overline{INVALLD}$ high-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = Vcc	-2.7		V
$V_{T(invalid)}$	Receiver input threshold for $\overline{INVALLD}$ low-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = Vcc	-0.3	0.3	V
V_{OH}	$\overline{INVALLD}$ high-level output voltage	I_{OH} = -1mA, FORCEON = GND, $\overline{FORCEOFF}$ = Vcc	Vcc-0.6		V
V_{OL}	$\overline{INVALLD}$ low-level output voltage	I_{OL} = 1.6mA, FORCEON = GND, $\overline{FORCEOFF}$ = Vcc		0.4	V

5.9 Driver Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter		TEST CONDITIONS		MIN	TYP(2)	MAX	UNIT
	Maximum data rate	C_L = 1000pF,One D_{OUT} switching, R_L = 3kΩ.See Figure 1		125	250		kbit/s
$t_{sk(p)}$	Pulse skew(3)	C_L = 150pF to 2500pF, RL = 3kΩ to 7kΩ,See Figure 2			100		ns
$SR_{(tr)}$	Slew rate, transition region (see Figure 1)	Vcc = 3.3 V,R_L = 3kΩ to 7kΩ, PRR = 250kbit/s	C_L = 150pF to 1000pF	6		30	V/μs
			C_L = 150pF to 2500pF	4		30	

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

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5.10 Receiver Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 6)

Parameter		TEST CONDITIONS	TYP(2)	UNIT
t_{PLH}	Propagation delay time, low to high level output	C_L = 150pF, See Figure 3	30	ns
t_{PHL}	Propagation delay time, high to low level output		30	ns
t_{en}	Output enable time	C_L = 150pF, RL = 3kΩ, See Figure 4	200	ns
t_{dis}	Output disable time		200	ns
$t_{sk(p)}$	Puse skew(3)	$t_{sk(p)}$ Puse skew(3) See Figure 3	10	ns

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

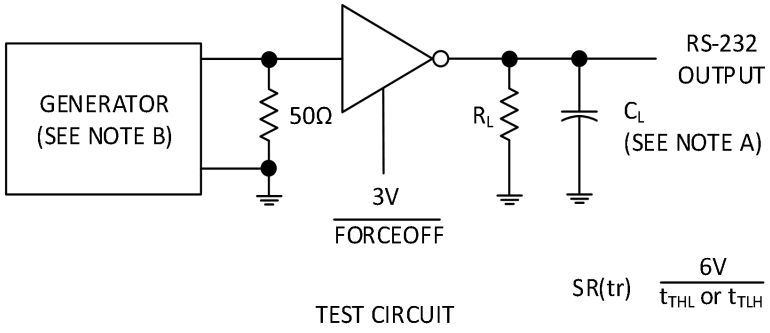
5.11 Auto-Powerdown Switching Characteristics

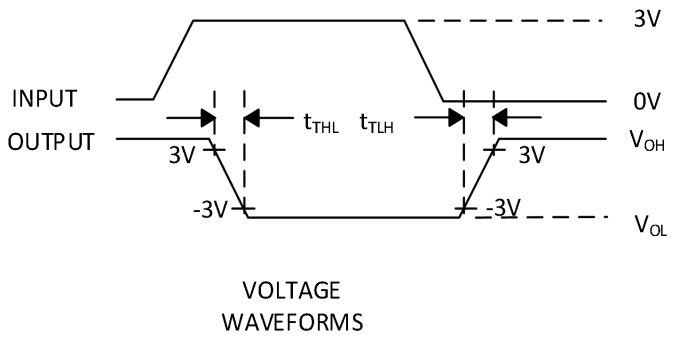
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1)
(see Figure 5)

Parameter		TEST CONDITIONS	TYP(1)	UNIT
t_{valid}	Propagation delay time, low- to high-level output	Vcc = 5 V	1	μs
$t_{invalid}$	Propagation delay time, high- to low-level output	Vcc = 5 V	30	μs
t_{en}	Supply enable time	Vcc = 5 V	100	μs

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

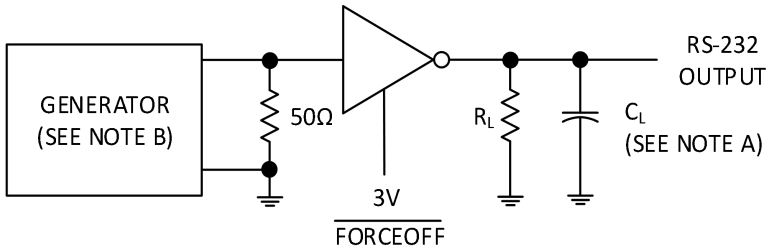
6 Parameter Measurement Information



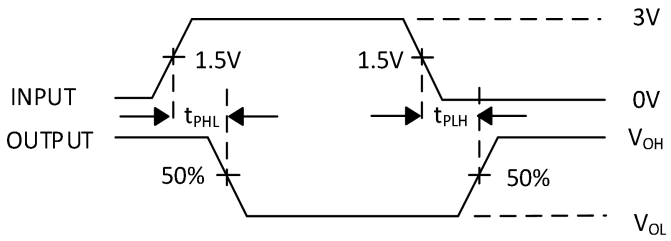


A. CL includes probe and jig capacitance
B. The pulse generator has the following characteristics: PRR = 5kbit/s, Z_O = 50 Ω, 50 % duty cycle, tr ≤ 10ns, tf ≤ 10ns.

Figure 1. Driver Slew Rate



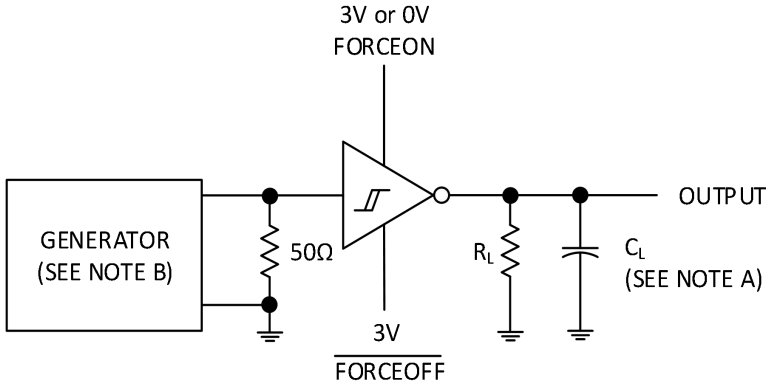
TEST CIRCUIT



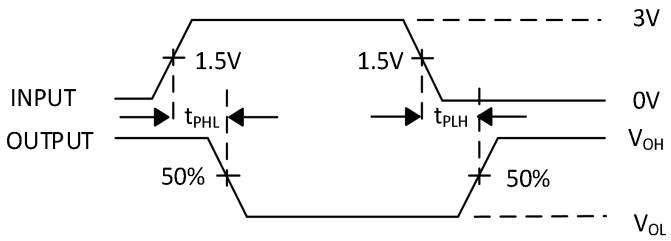
VOLTAGE
WAVEFORMS

A. CL includes probe and jig capacitance
B. The pulse generator has the following characteristics: PRR = 5kbit/s, Z_O = 50 Ω, 50 % duty cycle, tr ≤ 10ns, tf ≤ 10ns.

Figure 2. Driver Pulse Skew



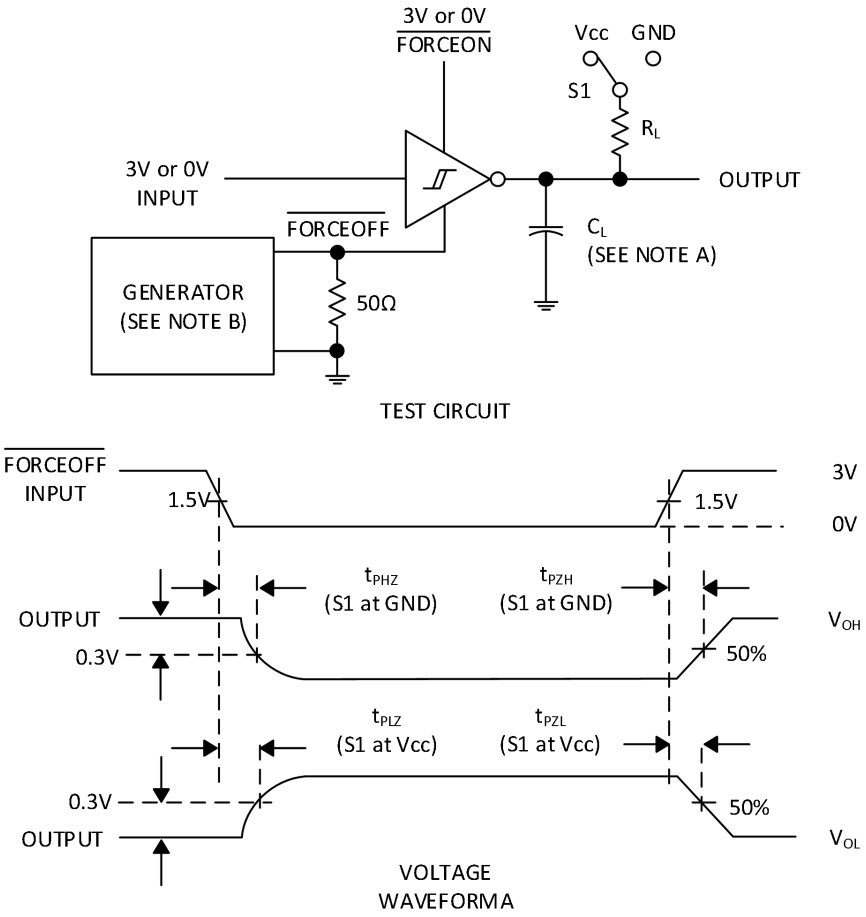
TEST CIRCUIT



VOLTAGE
WAVEFORMS

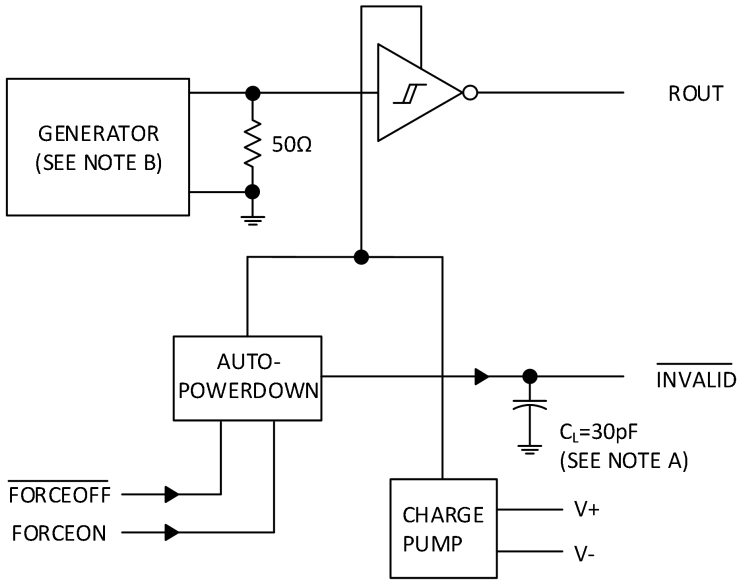
A. CL includes probe and jig capacitance
B. The pulse generator has the following characteristics: PRR = 5kbit/s, ZO = 50 Ω, 50 % duty cycle, tr ≤ 10ns, tf ≤ 10ns.

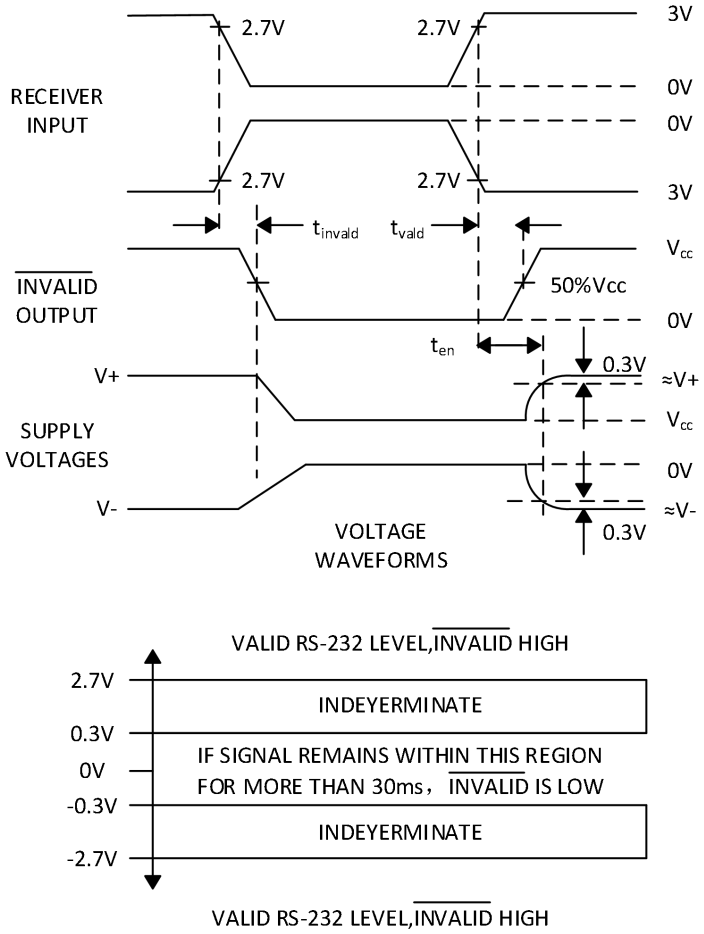
Figure 3. Receiver Propagation Delay Times



A. CL includes probe and jig capacitance
B. The pulse generator has the following characteristics: PRR = 5kbit/s, ZO = 50 Ω, 50 % duty cycle, tr ≤ 10ns, tf ≤ 10ns.
C. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
D. t_{PZL} and t_{PZH} are the same as ten.

Figure 4. Receiver Enable and Disable Times





A. CL includes probe and jig capacitance.
B. The pulse generator has the following characteristics: PRR = 5kbit/s, ZO = 50 Ω, 50 % duty cycle, tr ≤ 10ns, tf ≤ 10ns.

Figure 5. INVALID Propagation Delay Times and Supply Enabling Time

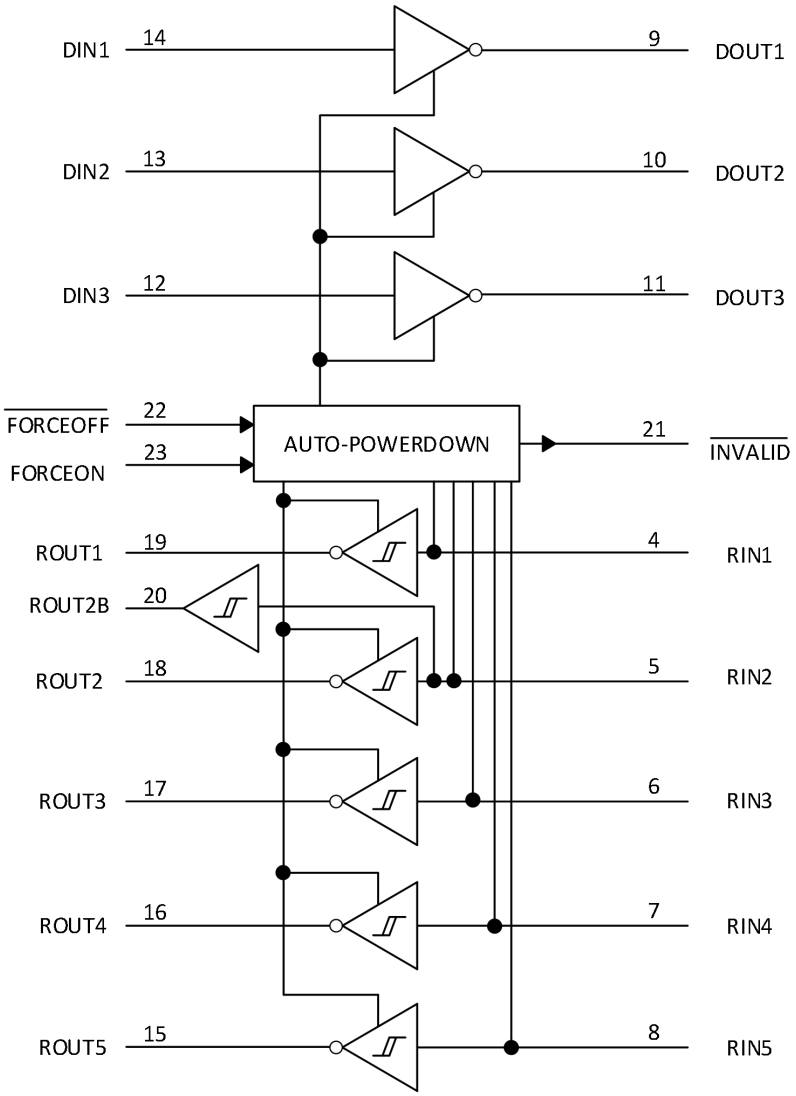
7 Detailed Description

7.1 Overview

The GM3243E device consists of three line drivers, five line receivers, and a dual charge-pump circuit with ±15kV ESD (HBM and IEC61000-4-2, Air-Gap Discharge) and ±8kV ESD (IEC61000-4-2, Contact Discharge) protection on serial-port connection pins. 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.

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. The device operates at data signaling rates up to 250kbit/s and a maximum of 30V/µs driver output slew rate.

7.2 Functional Block Diagram



7.3 Feature Description

Flexible control options for power management are available when the serial port is inactive. The auto powerdown feature functions when FORCEON is low and $\overline{\text{FORCEOFF}}$ is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If $\overline{\text{FORCEOFF}}$ is set low, both drivers and receivers (except ROUT2B) are shut off, and the supply current is reduced to 1μA. 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 $\overline{\text{FORCEOFF}}$ are high.With auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input. The $\overline{\text{INVALLD}}$ output is used to notify the user if an RS-232 signal is present at any receiver input.$\overline{\text{INVALLD}}$ is high (valid data) if any receiver input voltage is greater than 2.7 V or less than –2.7 V or has been between –0.3 V and 0.3 V for less than 30μs. $\overline{\text{INVALLD}}$ is low ($\overline{\text{INVALLD}}$ data) if all receiver input voltages are between –0.3 V and 0.3 V for more than 30μs. Refer to Figure 5 for receiver input levels.

7.4 Device Functional Modes

Table 1 through 3 show the device functional modes.

Table 1.Each Driver

INPUTS(1)				OUTPUT	DRIVER STATUS
DIN	FORCEON	$\overline{\text{FORCEOFF}}$	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	Y	H	Normal operation with auto-powerdown enabled
H	L	H	Y	L	
X	L	H	N	Z	Powered off by auto-powerdown feature

Table 2.Each Receiver

INPUTS(1)			OUTPUT	RECEIVER STATUS
RIN	FORCEON	$\overline{\text{FORCEOFF}}$	ROUT	
X	X	L	Z	Powered off
L	X	H	H	Normal operation with auto-powerdown disabled/enabled
H	X	H	L	
OPEN	X	H	H	

Table 3.Outputs ROUT2B and $\overline{\text{INVALID}}$

INPUTS(1)				OUTPUTS		OUTPUT STATUS
RIN2	FORCEON	$\overline{\text{FORCEOFF}}$	VALID RIN RS-232 LEVEL	$\overline{\text{INVALID}}$	ROUT2B	
L	X	X	Y	H	L	Always active
H	X	X	Y	H	H	
OPEN	X	X	Y	H	L	
OPEN	X	X	N	L	L	

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

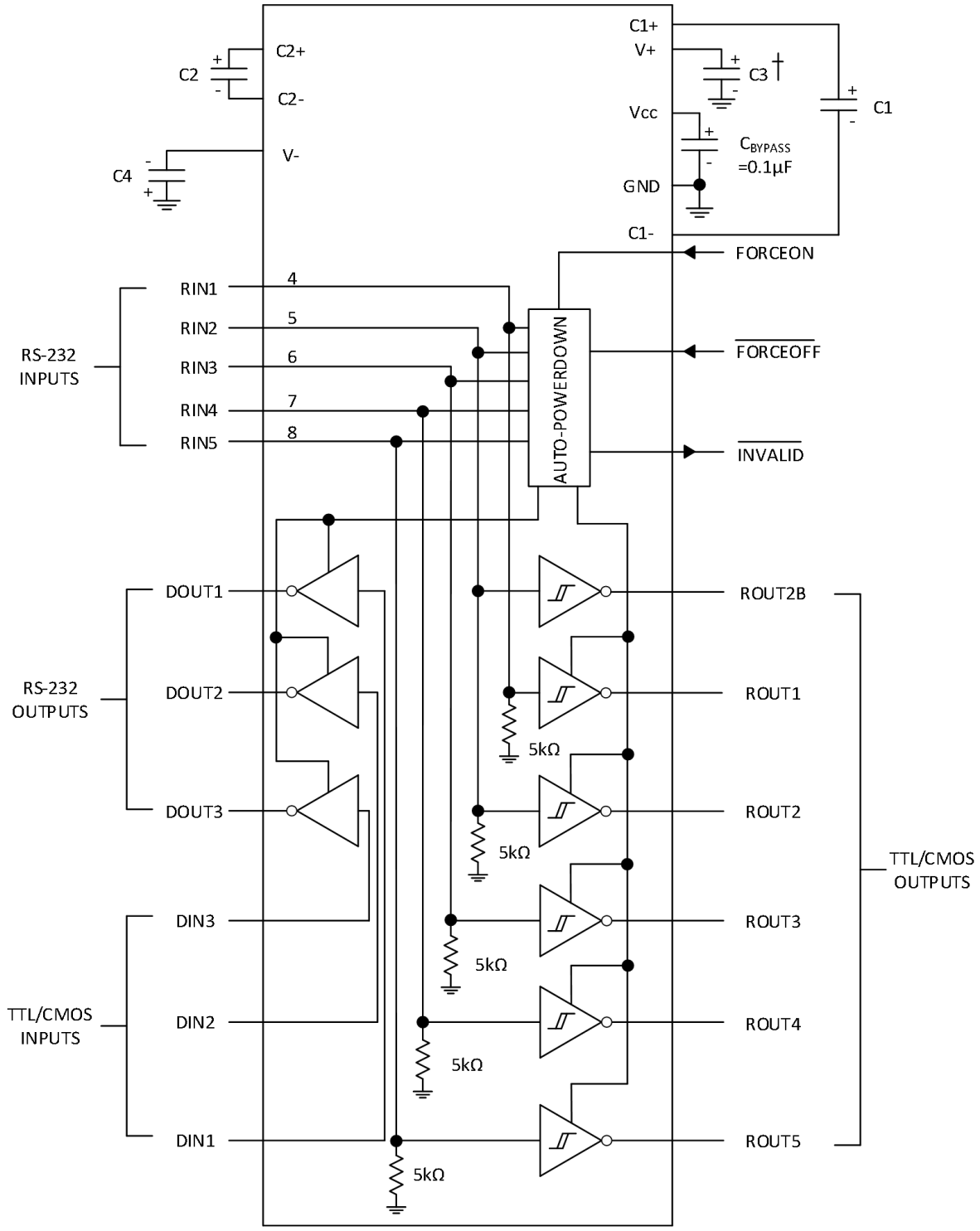
8 Applications Information

8.1 Application Information

For proper operation, add capacitors as shown in Figure 6. Pins 12 through 23 connect to UART or general purpose logic lines. RS-232 lines on Pins 4 through 11 connect to a connector or cable.

8.2 Typical Application

Three driver and five receiver channels are supported for full duplex transmission with hardware flow control. The five 5kΩ resistors are internal to the GM3243E.



†：C3 can be connected to Vcc or GND

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.

Figure 6. Typical Operating Circuit and Capacitor Values

8.2.1 Design Requirements

For this design example, use the values in Table 4.

- Vcc minimum is 3V and maximum is 5.5V.
- Maximum recommended bit rate is 250kbps.

Table 4.Vcc vs Capacitor Values

Vcc	C1	C2,C3,and C4
3.3V ± 0.3V	0.1μF	0.1μF
5V ± 0.5V	0.047μF	0.33μF
3V to 5.5V	0.1μF	0.47μF

8.2.2 Detailed Design Procedure

GM3243E has integrated charge-pump that generates positive and negative rails needed for RS-232 signal levels. Main design requirement is that charge-pump capacitor terminals must be connected with recommended capacitor values. Charge-pump rail voltages and device supply pin must be properly bypassed with ceramic capacitors.

8.2.2.1 ESD PROTECTION

GM3243E devices have standard ESD protection structures incorporated on the pins to protect against electrostatic discharges encountered during assembly and handling. In addition, the RS232 bus pins (driver outputs and receiver inputs) of these devices have an extra level of ESD protection. Advanced ESD structures were designed to successfully protect these bus pins against ESD discharge of ±15kV in all states: normal operation, shutdown, and powered down. The GM3243E devices are designed to continue functioning properly after an ESD occurrence without any latchup.
The GM3243E devices have three specified ESD limits on the driver outputs and receiver inputs, with respect to GND:

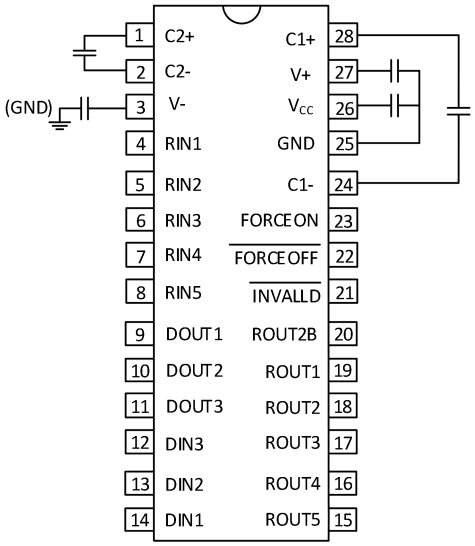
±15kV Human Body Model (HBM)
±15kV IEC61000-4-2, Air-Gap Discharge (formerly IEC1000-4-2)
±8kV IEC61000-4-2, Contact Discharge

9 Power Supply Recommendations

The Vcc voltage must be connected to the same power source used for logic device connected to DIN and ROUT pins. Vcc must be between 3V and 5.5V.

10 Layout

As shown in Layout Example, charge-pump and supply voltage capacitors must be located very close to device pins. Non-polarized ceramic capacitors are recommended. If polarized tantalum or electrolytic capacitors are used, they should be connected as per Typical Operating Circuit and Capacitor Values.



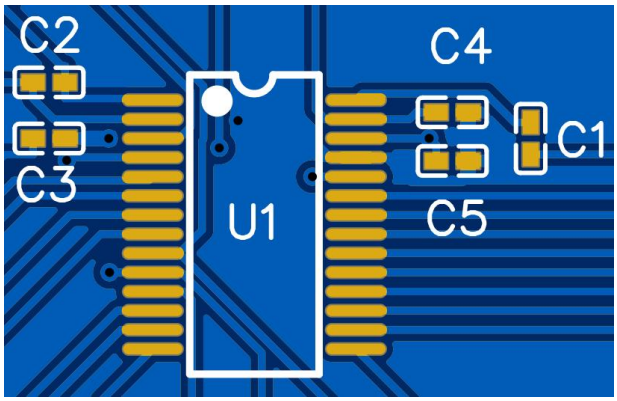
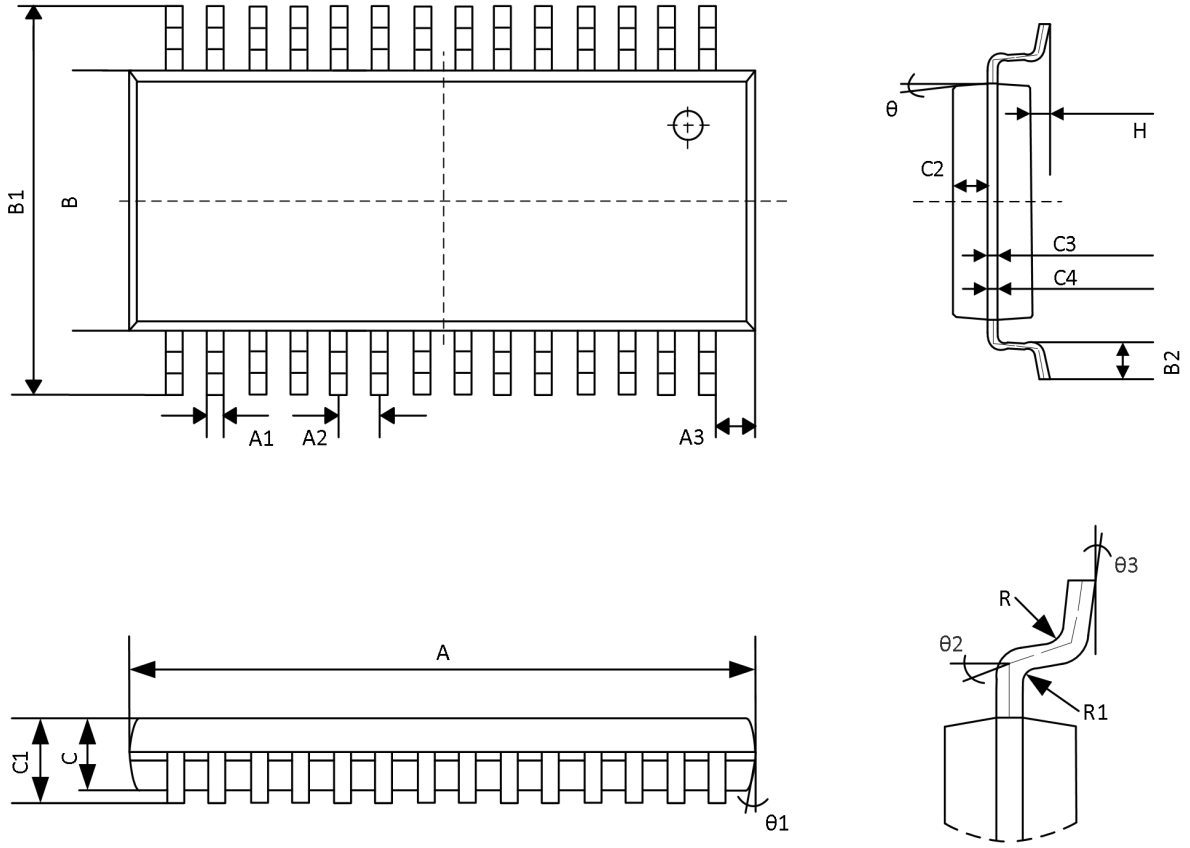


Figure 11. Example Layout

PACKAGE DIMENSION

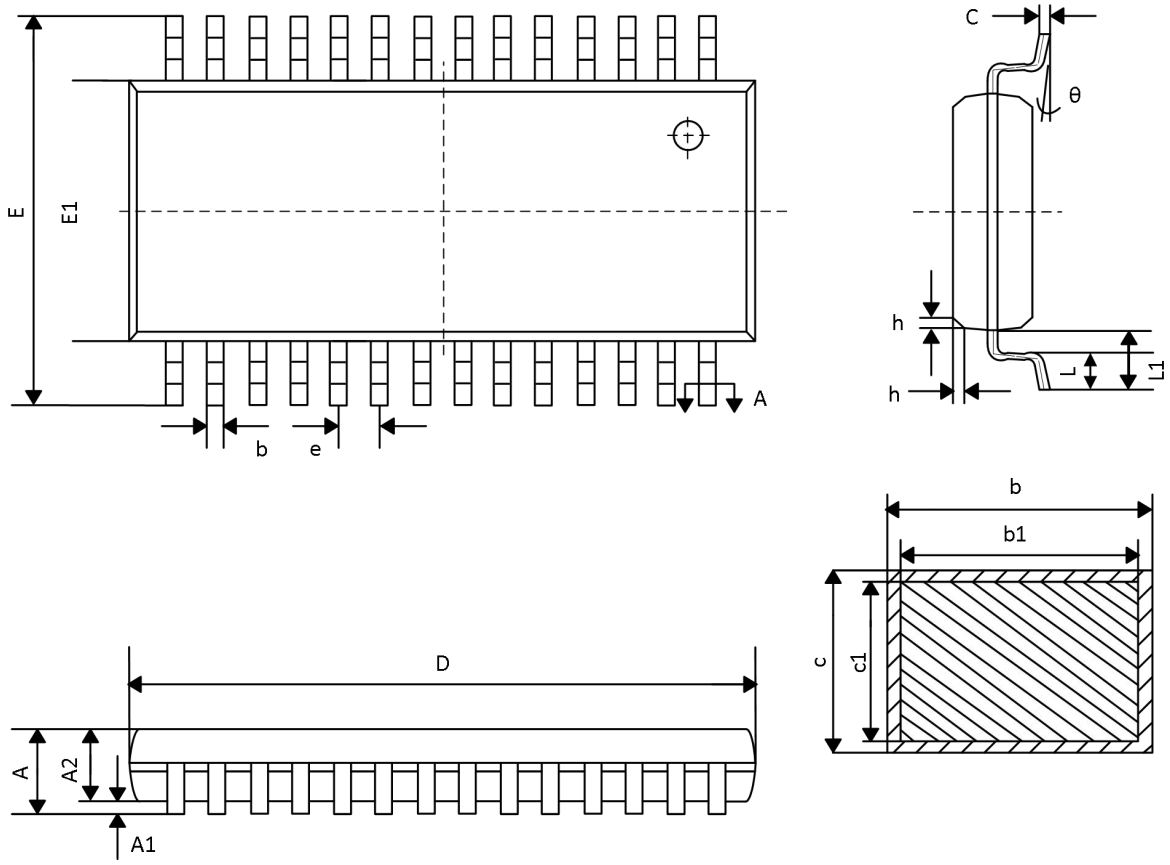
SSOP28



DIMENSION / SYMBOLS	MIN (mm)	MAX (mm)	DIMENSION / SYMBOLS	MIN (mm)	MAX (mm)
A	10.15	10.25	C3	0.152	
A1	0.30TYP		C4	0.172	
A2	0.65 TYP		H	0.05	0.15
A3	0.725TYP		θ	12° TYP4	
B	5.25	5.35	θ1	12° TYP4	
B1	7.65	7.95	θ2	10° TYP4	
B2	0.60	0.80	θ3	0° ~ 8°	
C	1.65	1.85	R	0.20 TYP	
C1	1.75	1.95	R1	0.15 TYP	
C2	0.799				

PACKAGE DIMENSION

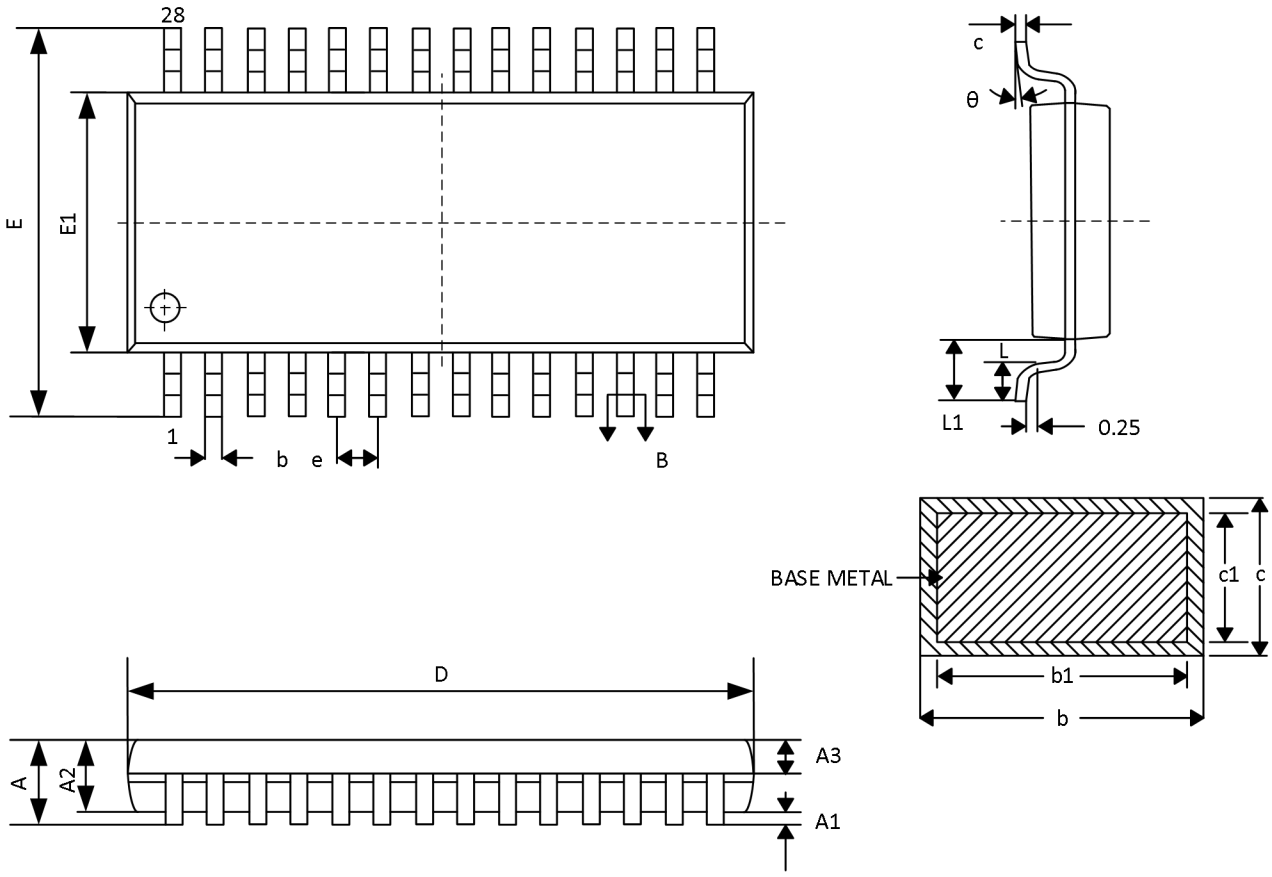
SOP28



DIMENSION / SYMBOLS	MILLIMETER		
	MIN	NOM	MAX
A	-	-	2.65
A1	0.10	-	0.30
A2	2.13	2.23	2.33
b	0.38	-	0.48
b1	0.36	0.41	0.46
c	0.24	-	0.30
c1	0.24	0.25	0.27
D	17.90	18.00	18.10
E	10.10	10.30	10.50
E1	7.40	7.50	7.60
e		1.27BSC	
h	0.25	-	0.75
L	0.60	0.80	1.00
L1		1.40REF	
θ	0°	-	8°

PACKAGE DIMENSION

TSSOP28



DIMENSION / SYMBOLS	MILLIMETER		
	MIN	NOM	MAX
A	-	-	1.20
A1	0.05	-	0.15
A2	0.80	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	-	0.28
b1	0.19	0.22	0.25
c	0.13	-	0.17
c1	0.12	0.13	0.14
D	9.60	9.70	9.80
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00REF		
θ	0	-	8°

Order Information

Order number	Package	Marking information	Operation Temperature Range	MSL Grade	Ship, Quantity	Green
GM3243ESA	SOP28	GM3243ESA	-40 to 85°C	3	T&R,1000	Rohs
GM3243ETA	TSSOP28	GM3243ETA	-40 to 85°C	3	T&R,2000	Rohs
GM3243EBA	SSOP28	GM3243EBA	-40 to 85°C	3	T&R,2000	Rohs