高 ESD 防护、单电源供电 RS-232 收发器

UM202EESE *SOP16*
UM202EEPE *DIP16*
UM202EEUE *TSSOP16*

描述

UM202EExE系列是低功耗单电源RS232接口。该器件由两个线路驱动器、两个线路接收器和2倍输出电荷泵电路组成。该器件符合TIA/EIA-232标准的要求，提供异步通信控制器和串行端口连接器之间的电气接口。片内电荷泵和4个小型外部电容器作为板载DC-DC转换器，允许芯片可由5V单电源供电，无需±10V电源，降低了成本和节省电路板空间。该器件的数据信号传输速率超过250kbps。驱动器的压摆率在内部设置为小于30V/μs，接收器具有内部噪声滤波功能，无需外部压摆率和滤波电容，以确保运行可靠性。驱动器输入和接收器输出兼容TTL和CMOS。UM202EExE采用16引脚DIP、SOP和TSSOP封装，可在消费级和工业级温度范围内工作。

UM202EExE 的 ESD 能够耐受±8kV 人体放电模型和±15kV IEC61000-4-2 空气间隙放电，且不会发生闩锁现象。芯片使用 4 个 0.1μF 电容，降低了系统成本并节省电路板空间。

应用

- 笔记本电脑和掌上电脑
- 电池供电设备
- 手持设备
- POS 终端

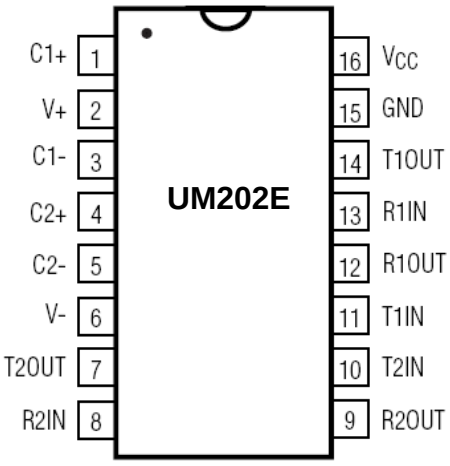
特性

- RS-232总线引脚ESD保护
  - ±8kV，人体放电模型
- 5V单电源供电
- 低功耗，I_{CC} 最大15mA
- 工作速率高达 250kbps
- 接收器具有噪声滤波功能
- 闩锁性能(Latch-up)超过200mA

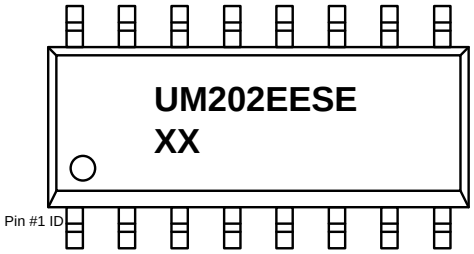
订购信息

Part Number	Temp. Range	Marking Code	Package Type	Shipping Qty
UM202EESE	-40℃ to +85℃	UM202EESE	SOP16	2500pcs/13 Inch Tape & Reel
UM202EEPE	-40℃ to +85℃	UM202EEPE	DIP16	25pcs/Tube
UM202EEUE	-40℃ to +85℃	UM202EEUE	TSSOP16	3000pcs/13 Inch Tape & Reel

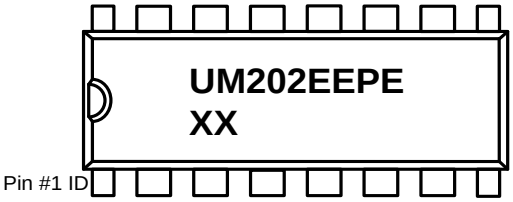
Pin Configurations **Top View**



SOP16/DIP16/TSSOP16



XX: Week Code
UM202EESE
SOP16



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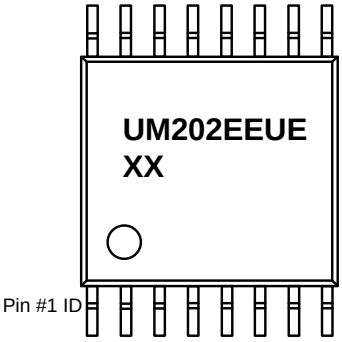
DIP16



XX: Week Code
UM202EEUE
TSSOP16

Pin Descriptions

Pin No. SOP/DIP/TSSOP	Pin Name	Function
1,3	C1+, C1-	Terminals for Positive Charge Pump Capacitor
2	V+	+2V_{CC} Voltage Generated by the Charge Pump
4,5	C2+, C2-	Terminals for Negative Charge Pump Capacitor
6	V-	-2V_{CC} Voltage Generated by the Charge Pump
7,14	T_OUT	RS-232 Driver Outputs
8,13	R_IN	RS-232 Receiver Inputs
9,12	R_OUT	RS-232 Receiver Outputs
10,11	T_IN	RS-232 Driver Inputs
15	GND	Ground
16	V_{CC}	+4.5V to +5.5V Supply Voltage Input

Absolute Maximum Ratings (Note 1)

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage on V_{CC}		-0.3 to +6	V
V_+	Voltage on V_+		(V_{CC}-0.3) to +14	V
V_-	Voltage on V_-		-14 to +0.3	V
T_IN	Voltage on T_IN		-0.3 to (V_{CC}+0.3)	V
R_IN	Voltage on R_IN		±30	V
T_OUT	Voltage on T_OUT		(V_--0.3) to (V_++0.3)	V
R_OUT	Voltage on R_OUT		-0.3 to (V_{CC}+0.3)	V
	Short-Circuit Duration, T_OUT		Continuous	
P_D	Continuous Power Dissipation at T_A=70℃	SOP16	696	mW
		DIP16	842	
		TSSOP16	754.7	
T_A	Operating Temperature Range		-40 to +85	℃
T_{STG}	Storage Temperature Range		-65 to +165	℃
T_L	Maximum Lead Temperature for Soldering 10 Seconds		+300	℃

Note 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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

(V_{CC}=+5V±10%, C1- C4=0.1μF, T_A=T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A=25℃)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
DC CHARACTERISTICS							
V_{CC} Supply Current	I_{CC}	No Load, T_A=+25℃			10	15	mA
LOGIC							
Input Leakage Current		T_IN=0V to V_{CC}				±10	μA
Input Threshold Low	V_{IL}	T_IN				0.8	V
Input Threshold High	V_{IH}	T_IN		2.0			V
Output Voltage Low	V_{OL}	R_OUT; I_{OUT}=3.2mA				0.4	V
Output Voltage High	V_{OH}	R_OUT; I_{OUT}=-1.0mA		3.5	V_{CC}-0.4		V
Output Leakage Current		0V≤R_OUT≤V_{CC}			±0.05	±10	μA
EIA/TIA-232E RECEIVER INPUTS							
Input Voltage Range				-30		30	V
Input Threshold Low		T_A=+25℃, V_{CC}=5V	Normal Operation	0.8	1.2		V
Input Threshold High		T_A=+25℃, V_{CC}=5V	Normal Operation		1.7	2.4	V
Input Hysteresis		V_{CC}=5V		0.2	0.5	1.0	V
Input Resistance		T_A=+25℃, V_{CC}=5V		3	5	7	kΩ
EIA/TIA-232E TRANSMITTER OUTPUTS							
Output Voltage Swing		All Drivers Loaded with 3kΩ to Ground		±5	±9		V
Output Resistance		V_{CC}=V+=V-=0V, V_{OUT}=±2V		300			Ω
Output Short-Circuit Current		Short to V_{CC} , GND or Other TXD Pin				±70	mA
TIMING CHARACTERISTICS							
Maximum Data Rate		R_L=3kΩ to 7kΩ, C_L=50pF to 1000pF, One Transmitter Switching		250			kbps
Receiver Propagation Delay	t_{PLHR}, t_{PHLR}	C_L=150pF	All Parts, Normal Operation		0.3		μs
Transmitter Propagation Delay	t_{PLHT}, t_{PHLT}	R_L=3kΩ, C_L=2500pF, All Transmitters Loaded			1.2		μs
Transition-Region Slew Rate		T_A=+25℃, V_{CC}=5V, R_L=3kΩ to 7kΩ, C_L=50pF to 1000pF, Measured from -3V to +3V or +3V to -3V, Figure 1			20	30	V/μs
ESD PERFORMANCE TRANSMITTER OUTPUTS, RECEIVER INPUTS							
ESD-Protection Voltage		Human Body Model			±8		kV
		IEC61000-4-2, Contact Discharge			±8		
		IEC61000-4-2, Air-Gap Discharge			±15		

Detailed Description

The UM202EExE consists of three sections: charge-pump voltage converters, drivers, and receivers. These E versions provide extra protection against ESD. They survive ±8kV discharges to the RS-232 inputs and outputs, tested using the Human Body Model. When tested according to IEC61000-4-2, they survive ±8kV contact-discharges and ±15kV air-gap discharges. The rugged E versions are intended for use in harsh environments or applications where the RS-232 connection is frequently changed. The UM202EExE devices have internal charge pump voltage converters which allow them to operate from a single +5V supply. The charge pumps will operate with polarized or non-polarized capacitors ranging from 0.1 to 10μF and will generate the ±9V needed to generate the RS-232 output levels.

RS-232 Drivers

The drivers are inverting transmitters, which accept TTL or CMOS inputs and output RS-232 signals with an inverted sense relative to the input logic levels. Typically the RS-232 output voltage swing is ±9V. Even under worst case loading conditions of 3kΩ and 2500pF, the output is guaranteed to be ±5V, which is consistent with the RS-232 standard specifications. The transmitter outputs are protected against infinite short-circuits to ground without degradation in reliability. The instantaneous slew rate of the transmitter output is internally limited to a maximum of 30V/μs in order to meet the RS-232 standard. The smooth transition of the loaded output from V_{OL} to V_{OH} clearly meets the monotonicity requirements of the RS-232 standard.

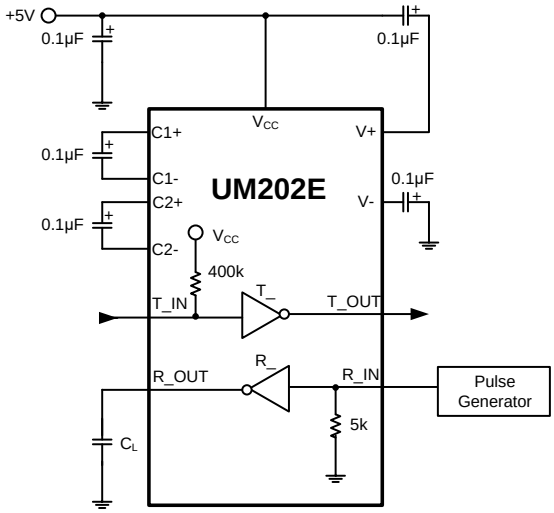
RS-232 Receivers

The receivers convert RS-232 input signals to inverted TTL signals. The input thresholds are 0.8V minimum and 2.4V maximum, again well within the 3V RS-232 requirements. The receiver inputs are also protected against voltage up to 30V. A 5kΩ pull down resistor to ground will commit the output of the receiver to a high state when the pin is float. In actual system applications, it is quite possible for signals to be applied to the receiver inputs before power is applied the receiver circuitry. This occurs, for example, when a PC user attempts to print, only to realize the printer wasn't turned on. In this case an RS-232 signal from the PC will appear on the receiver input at the printer. When the printer power is turned on, the receiver will operate normally. All of these enhanced devices are fully protected.

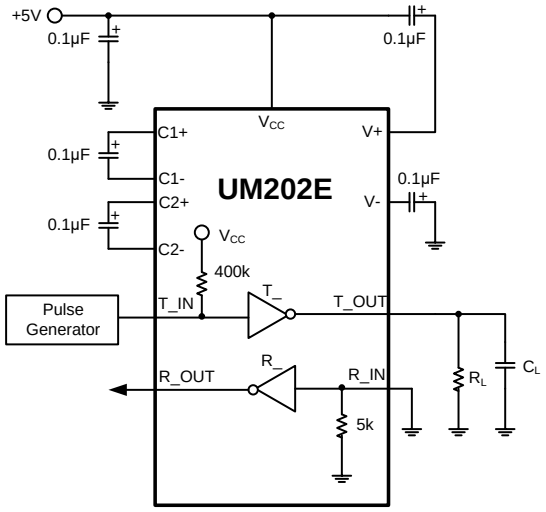
ESD Protection

UM202EExE 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 input) of these devices have an extra level of ESD protection. Advanced ESD structures were designed to successfully protect these pins against ESD discharge of ±8kV Human Body Model when powered down or up.

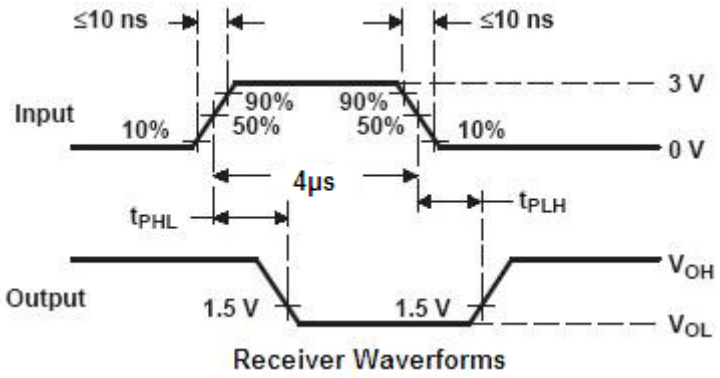
Test Circuits



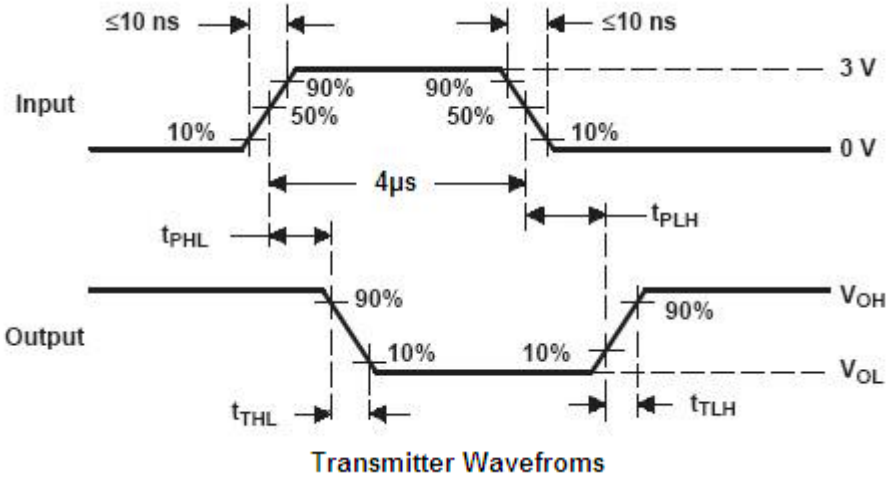
Receiver Test Circuit



Transmitter Test Circuit



Receiver Waverforms



Transmitter Wavefroms

Figure 1

Typical Operating Circuits

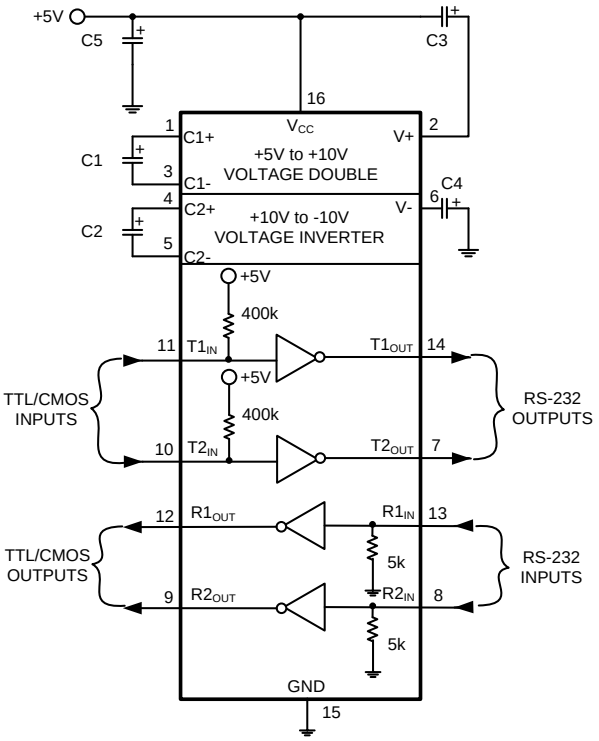


Figure 2

Applications Information

Capacitor Selection

The capacitor type used for C1–C4 is not critical for proper operation. The UM202EExE, require 0.1μF capacitors, although in all cases capacitors up to 10μF can be used without harm. Ceramic dielectrics are suggested for the 0.1μF capacitors. When using the minimum recommended capacitor values, make sure the capacitance value does not degrade excessively as the operating temperature varies. If in doubt, use capacitors with a larger (e.g., 2x) nominal value. The capacitors' effective series resistance (ESR), which usually rises at low temperatures, influences the amount of ripple on V_+ and V-. Use larger capacitors (up to 10μF) to reduce the output impedance at V_+ and V-. Bypass V_{CC} to ground with at least 0.1μF capacitor. In applications sensitive to power-supply noise generated by the charge pumps, decouple V_{CC} to ground with a capacitor the same size as (or larger than) the charge pump capacitors (C1–C4).

V+ and V- as Power Supplies

A small amount of power can be drawn from V_+ and V-, although this will reduce both driver output swing and noise margins. Increasing the value of the charge-pump capacitors (up to 10μF) helps maintain performance when power is drawn from V_+ or V-.

Driving Multiple Receivers

Each transmitter is designed to drive a single receiver. Transmitters can be paralleled to drive multiple receivers.

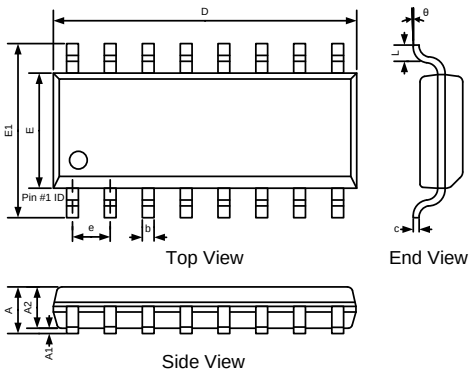
High Data Rates

These transceivers maintain the RS-232 ±5.0V minimum driver output voltages at data rates of over 250 kbps.

Package Information

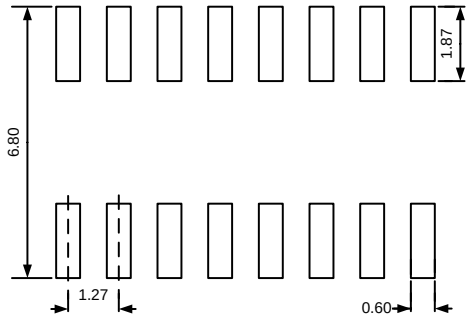
UM202EESE SOP16

Outline Drawing



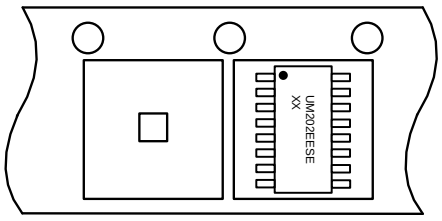
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.35	1.60	1.75	0.053	0.063	0.069
A1	0.10	-	0.25	0.004	-	0.010
A2	1.25	1.45	1.65	0.049	0.057	0.065
b	0.33	-	0.51	0.013	-	0.020
c	0.17	-	0.25	0.007	-	0.010
D	9.80	10.00	10.20	0.386	0.394	0.402
E	3.80	3.90	4.00	0.150	0.154	0.157
E1	5.80	6.00	6.20	0.228	0.236	0.244
e	1.27BSC			0.050BSC		
L	0.40	-	1.27	0.016	-	0.050
θ	0 °	-	8 °	0 °	-	8 °

Land Pattern



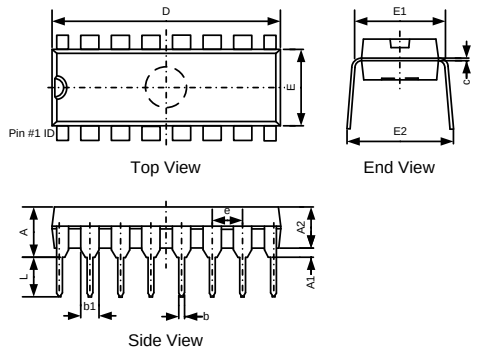
NOTES:
1. Compound dimension: 10.00×3.90.
2. Unit: mm.
3. General tolerance ±0.05mm unless otherwise specified.
4. The layout is just for reference.

Tape and Reel Orientation



UM202EEPE DIP16

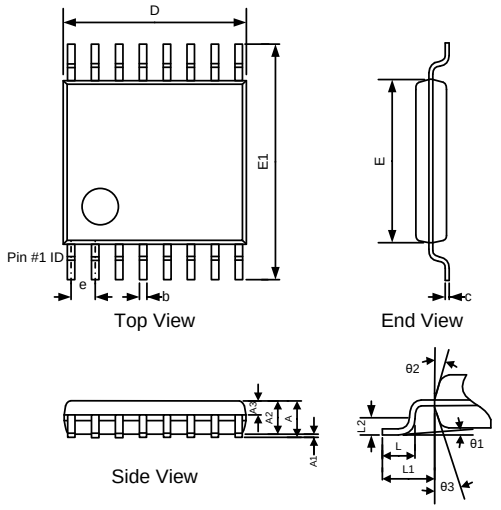
Outline Drawing



DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	3.71	4.01	4.31	0.146	0.158	0.170
A1	0.51	-	-	0.020	-	-
A2	3.20	3.40	3.60	0.126	0.134	0.142
b	0.38	0.48	0.57	0.015	0.019	0.022
b1	1.52BSC			0.060BSC		
c	0.20	0.28	0.36	0.008	0.011	0.014
D	18.80	19.00	19.20	0.740	0.748	0.756
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	7.32	7.62	7.92	0.288	0.300	0.312
E2	8.40	8.70	9.00	0.331	0.343	0.354
e	2.54BSC			0.100BSC		
L	3.00	3.30	3.60	0.118	0.130	0.142

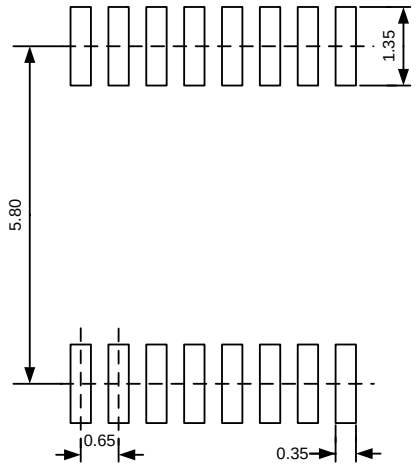
UM202EEUE TSSOP16

Outline Drawing



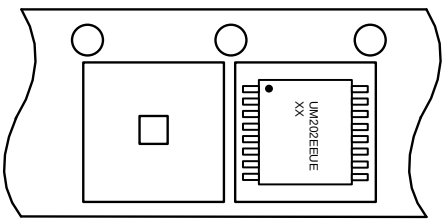
Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	-	-	1.20	-	-	0.047
A1	0.05	-	0.15	0.002	-	0.006
A2	0.80	-	1.05	0.031	-	0.041
A3	0.34	0.44	0.54	0.013	0.017	0.021
b	0.19	-	0.30	0.007	-	0.012
c	0.09	-	0.20	0.004	-	0.008
D	4.86	4.96	5.10	0.191	0.195	0.201
E	4.30	4.40	4.50	0.169	0.173	0.177
E1	6.20	6.40	6.60	0.244	0.252	0.260
e	0.65BSC			0.026BSC		
L	0.45	0.60	0.75	0.018	0.024	0.030
L1	1.00REF			0.039REF		
L2	0.25BSC			0.010BSC		
θ1	0 °	-	8 °	0 °	-	8 °
θ2	10 °	12 °	14 °	10 °	12 °	14 °
θ3	10 °	12 °	14 °	10 °	12 °	14 °

Land Pattern

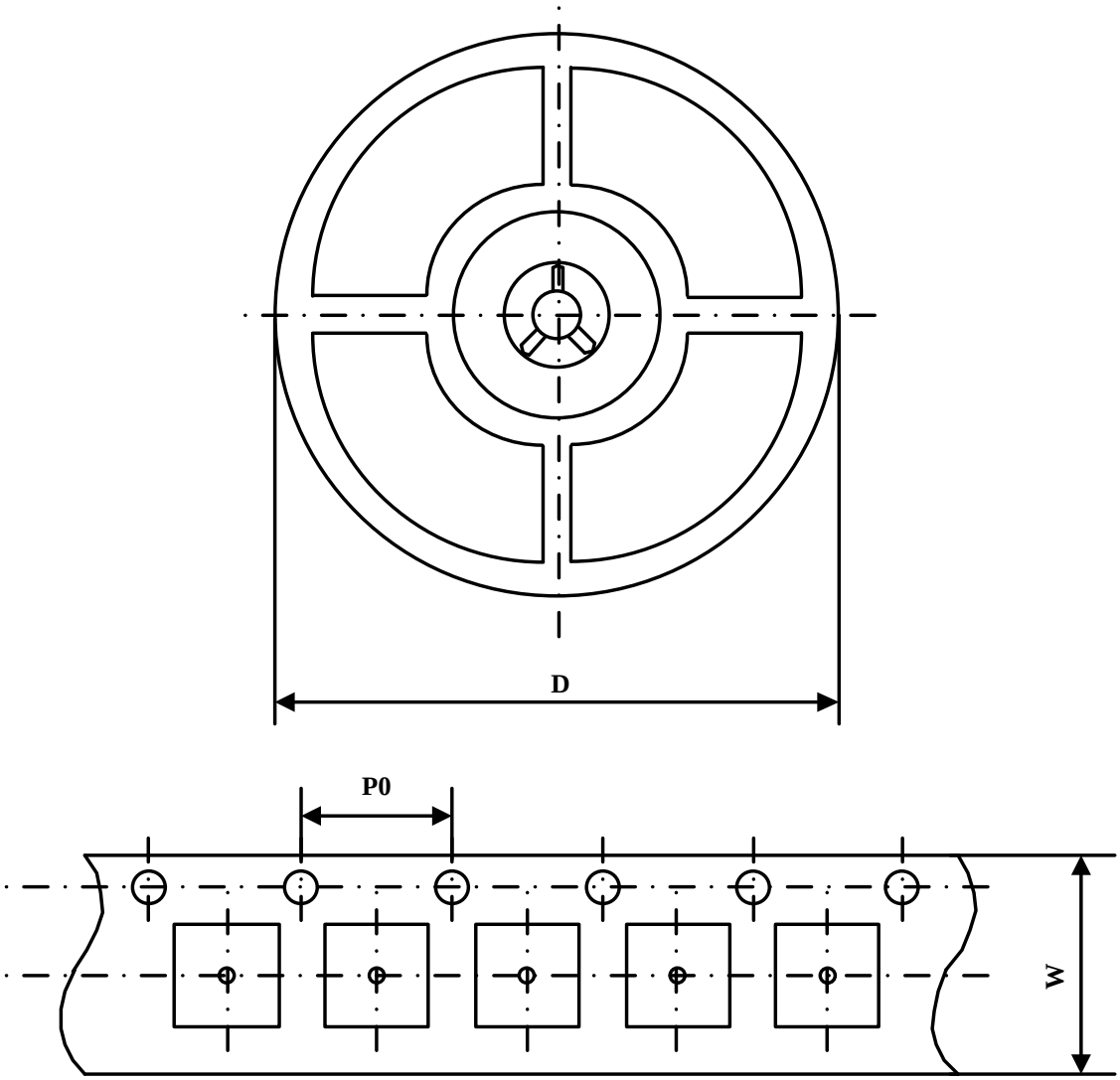


NOTES:
1. Compound dimension: 4.96×4.40.
2. Unit: mm.
3. General tolerance ±0.05mm unless otherwise specified.
4. The layout is just for reference.

Tape and Reel Orientation



Packing Information



Part Number	Package Type	Carrier Width(W)	Pitch(P0)	Reel Size(D)
UM202EESE	SOP16	16 mm	4 mm	330 mm
UM202EEUE	TSSOP16	16 mm	4 mm	330 mm

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