

General Description

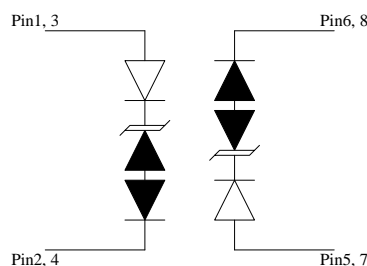
SYS12L02FAC is an ultra low-capacitance Transient Voltage Suppressor (TVS) array designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 1.0pF only, SYS12L02FAC is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ($\pm 15\text{kV}$ air, $\pm 8\text{kV}$ contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 ns), IEC 61000-4-5 (Surge) (24A, 8/20 μs), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

SYS12L02FAC is in an SOP-8 package. Each SYS12L02FAC device can protect two high-speed line pairs. The “flow-thru” design minimizes trace inductance and reduces voltage overshoot associated with ESD events. The combined features of low capacitance and high ESD robustness make SYS12L02FAC ideal for high-speed data port and high-frequency line (e.g., Gigabit Ethernet Ports) applications. The low clamping voltage of the SYS12L02FAC guarantees a minimum stress on the protected IC.

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
SYS12L02FAC	2.8V	2,500	13 Inch

Circuit Diagram



Features

- Transient protection for high-speed data lines
 - ◆ IEC 61000-4-2 (ESD) $\pm 15\text{kV}$ (Air) $\pm 8\text{kV}$ (Contact)
 - ◆ IEC 61000-4-4 (EFT) 40A (5/50 ns)
 - ◆ IEC 61000-4-5 (Surge) 24A (8/20 μs)
- Package optimized for high-speed lines
- Provides protection for two line pairs
- Low capacitance: 2.0pF @ 3.0V (Typical)
- Low leakage current: 0.1 μA @ V_{RWM} (Typical)
- Low operating and clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for $\pm 8\text{kV}$ contact discharge

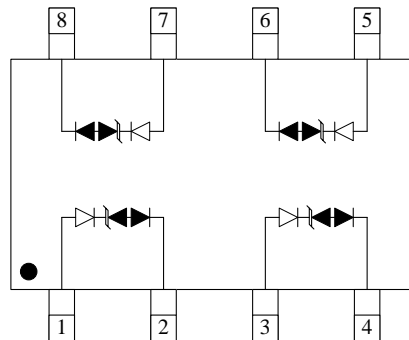
Mechanical Characteristics

- SOP-8 package
- Flammability Rating: UL 94V-0
- Marking: Part number, logo, date
- Packaging: Tape and Reel

Applications

- 10/100/1000M Ethernet Ports
- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- Cellular Phones
- Switching Systems
- Audio/Video Inputs

Pin Configuration (Top View)



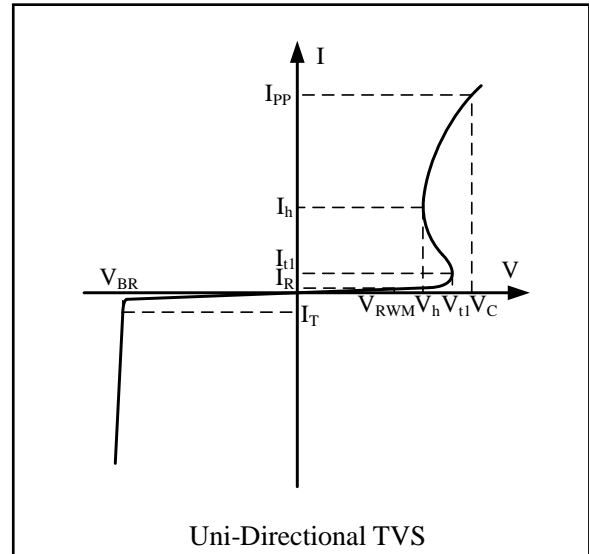
(SOP-8)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current (8/20 μ s)	60	A
P_{PK}	Peak Pulse Power (8/20 μ s)	1200	Watts
V_{ESD}	ESD per IEC 61000-4-2 (Air)	± 30	kV
	ESD per IEC 61000-4-2 (Contact)	± 30	
T_{OPT}	Operating Temperature	-55 to +125	$^{\circ}$ C
T_{STG}	Storage Temperature	-55 to +150	$^{\circ}$ C
T_{LST}	Lead Soldering Temperature	260 (10 seconds)	$^{\circ}$ C

Electrical Characteristics (T = 25°C)

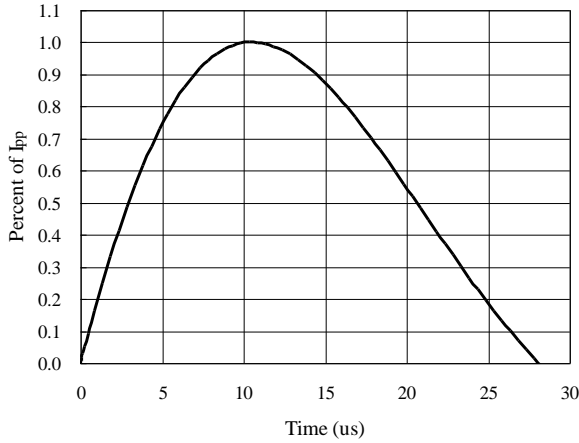
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{t1}	Trigger Voltage
I_{t1}	Trigger Current @ V_{t1}
V_h	Holding Voltage
I_h	Holding Current @ V_h
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
V_{BR}	Breakdown Voltage @ I_T
C_{ESD}	Parasitic Capacitance



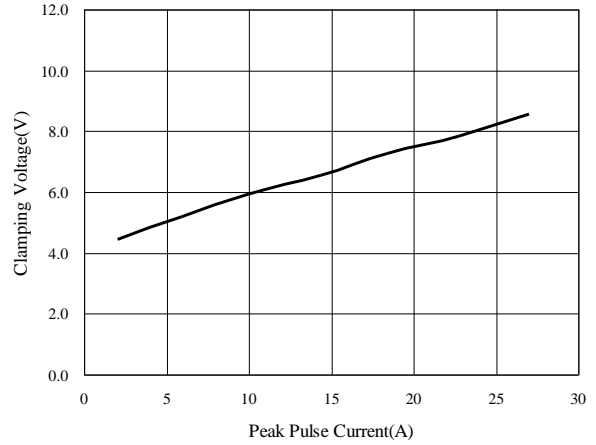
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				2.8	V
I_R	$V_{RWM} = 2.8V, T = 25^\circ C$		0.1	1.0	μA
V_{t1}	$I_{t1} = 1\mu A$	3.0	3.7	4.5	V
V_h	$I_h = 1mA$	3.0		4.0	V
V_C	$I_{PP} = 2A, t_p = 8/20\mu s$ (Each Line)			5.0	V
V_C	$I_{PP} = 10A, t_p = 8/20\mu s$ (Each Line)			8.0	V
V_C	$I_{PP} = 24A, t_p = 8/20\mu s$ (Each Line)			14.0	V
C_{ESD}	$V_R = 3.0V, f = 1MHz$ (Each Line)		2.0	3.0	pF

Typical Performance Characteristics

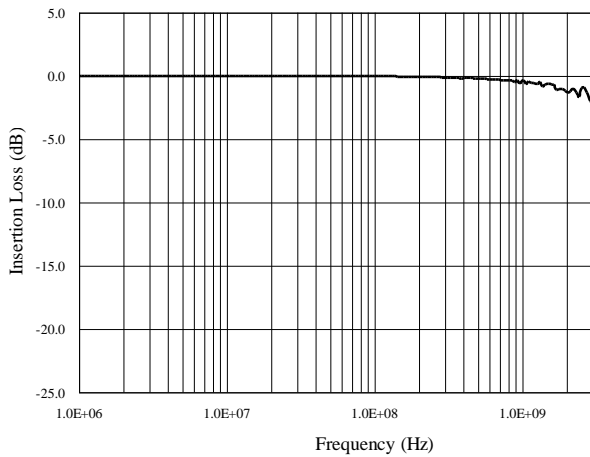
8/20 μ s Pulse Waveform



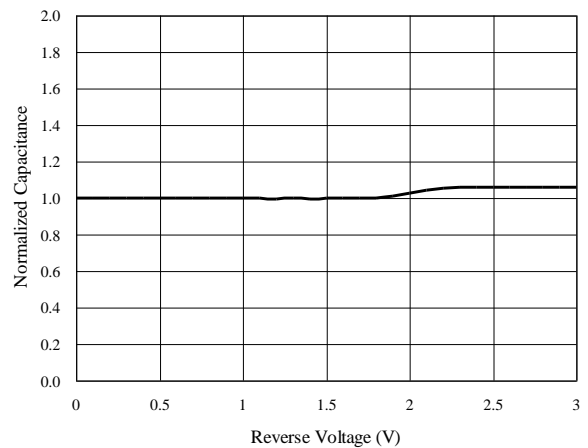
Clamping Voltage VC vs. Current Ipp



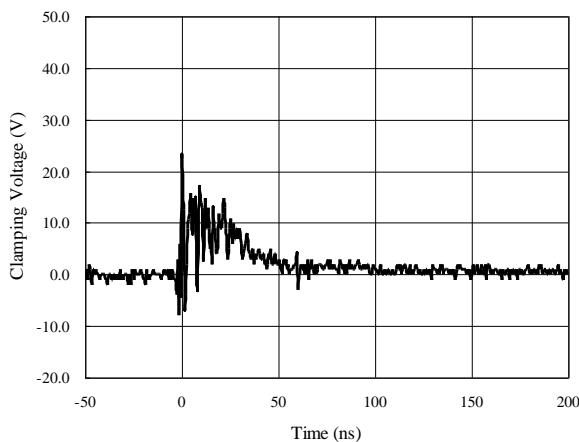
Insertion Loss S21



Normalized Capacitance vs. Voltage



**ESD Clamping of I/O to GND
(+8kV Contact per IEC 61000-4-2)**



Application Information

Electronic equipment is susceptible to damage caused by a variety of sources, including Electrostatic Discharge (ESD), Electrical Fast Transients (EFT) and Lightning strikes. The SYS12L02FAC was designed to protect the sensitive equipment from damage which may be induced by such transient events. This product can be configured in different connections to meet the requirement of common-mode and differential-mode as follows:

Four Lines Protection

The SYS12L02FAC can provide protection for four high speed data lines as depicted in figure 1:

Pin 1 is connected to Line 1

Pin 3 is connected to Line 2

Pin 5 is connected to Line 3

Pin 7 is connected to Line 4

Pin 2, 4, 6 and 8 are connected to ground

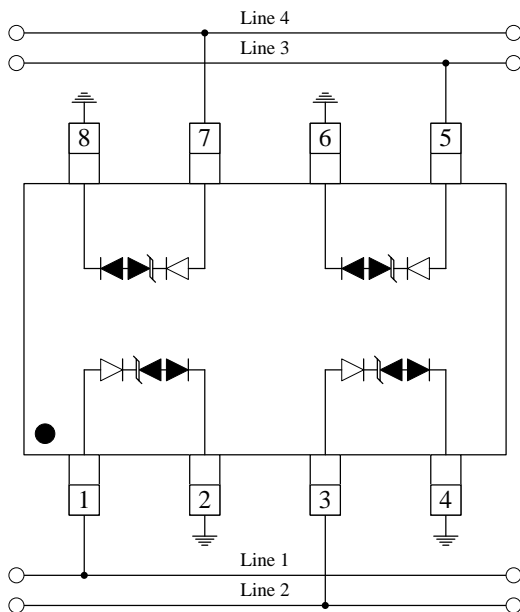


Figure 1. Four lines protection configuration

Two Lines Bidirectional Protection

The SYS12L02FAC can provide bidirectional protection for two high speed data lines as depicted in figure 2:

Pin 1 & 4 is connected to Line 1

Pin 5 & 8 is connected to Line 2

Pin 2, 3, 6 and 7 are connected to ground

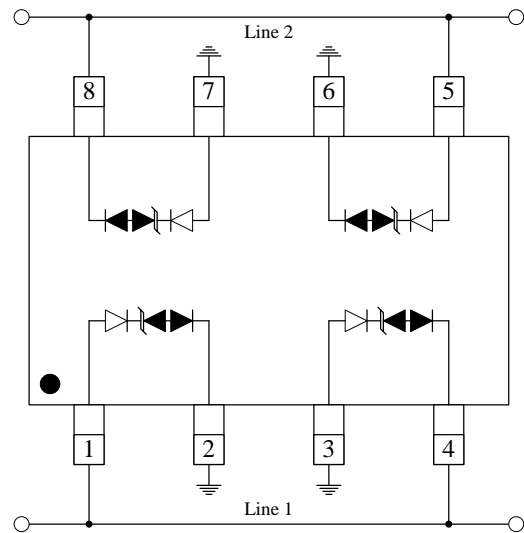


Figure 2. Two lines bidirectional protection

Two Line Pairs Differential Protection

The SYS12L02FAC can provide differential protection for two high speed data line pairs as depicted in figure 3:

Pin 1, 2, 7 and 8 are connected to Line Pair 1

Pin 3, 4, 5 and 6 are connected to Line Pair 2

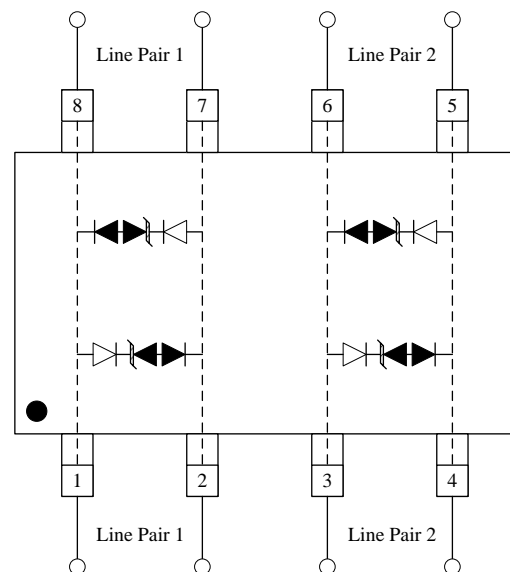
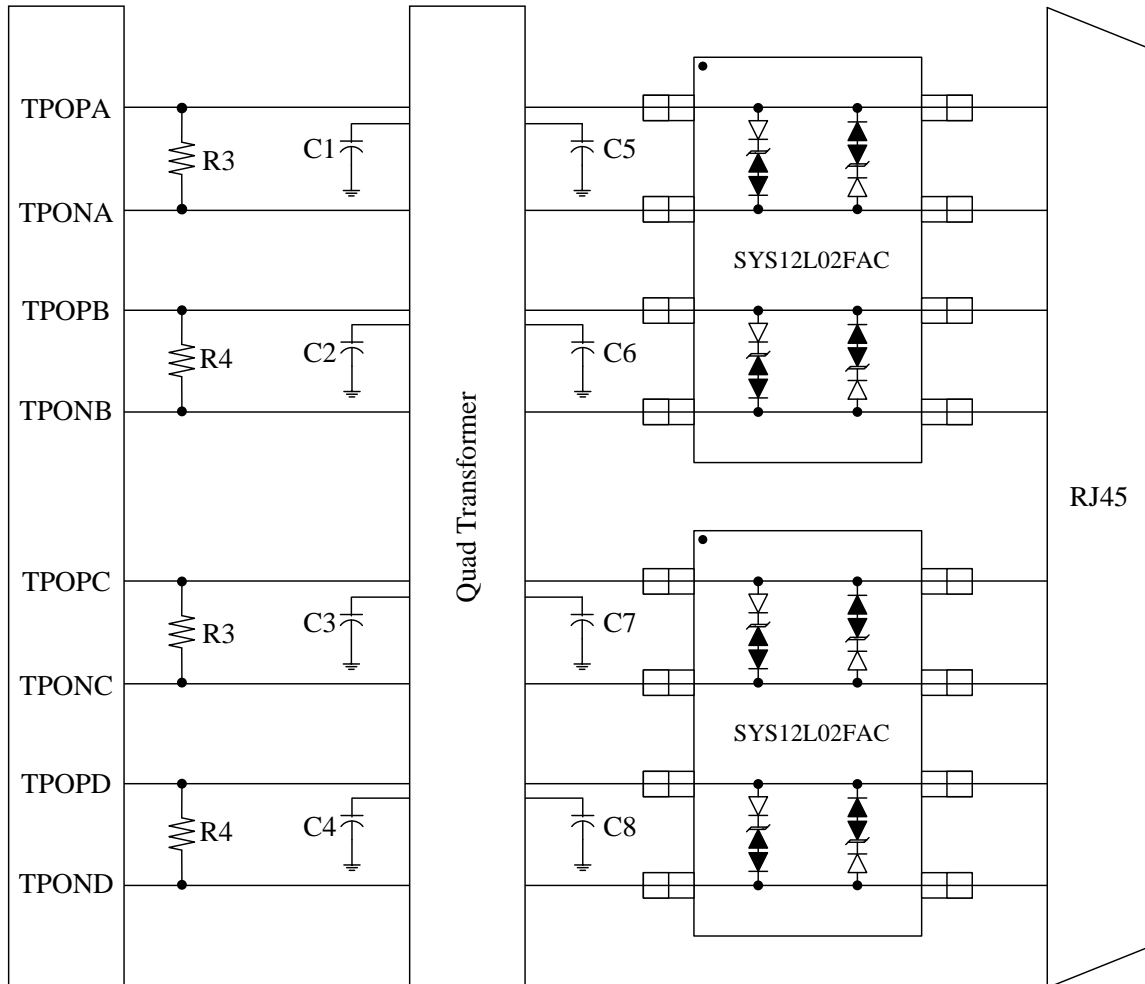


Figure 3. Two line pairs differential protection

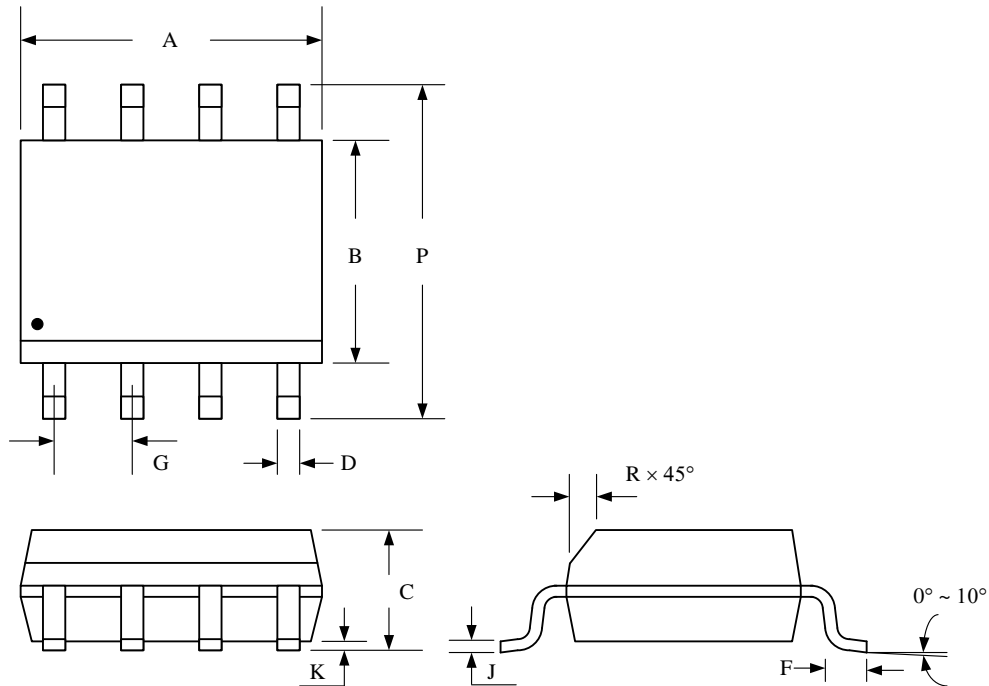
Application Information



Schematic Diagram for Gigabit Ethernet ESD/ Surge Protection

Package Outline

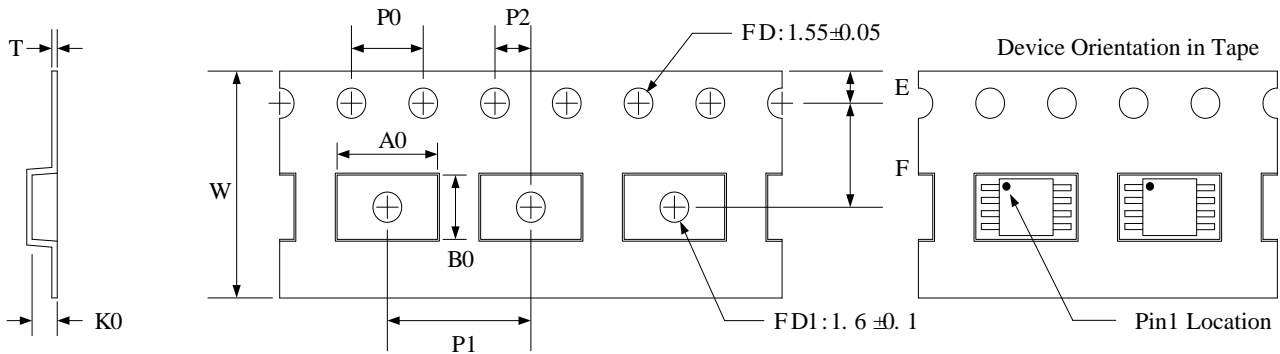
- SOP-8 package



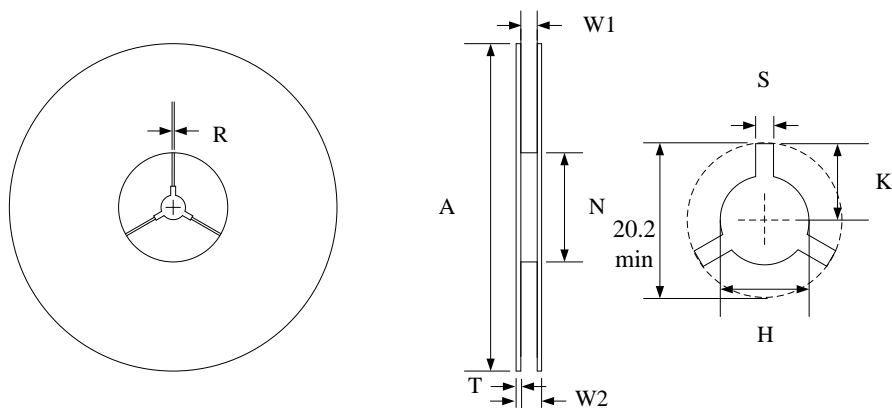
Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions (mm)		Dimensions (Inches)	
	Minimum	Maximum	Minimum	Maximum
A	4.800	5.000	0.189	0.196
B	3.800	4.000	0.150	0.157
C	1.520	1.750	0.060	0.068
D	0.330	0.510	0.013	0.020
F	0.400	1.270	0.016	0.050
G	1.27 BSC		0.05 BSC	
J	0.190	0.250	0.007	0.010
K	0.100	0.224	0.004	0.009
P	5.800	6.200	0.229	0.244
R	0.250	0.500	0.010	0.019

Tape and Reel Specification

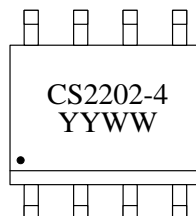


Symbol	W	A0	B0	K0	E	F	P1	P0	P2	T
Dimensions (mm)	12.00 ± 0.3	6.40 ± 0.1	5.2 ± 0.1	2.10 ± 0.1	1.75 ± 0.1	5.50 ± 0.1	8.00 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	0.3 ± 0.05



Symbol	Reel Size	A	N	W2	W1	H	T	S	K	R
Dimensions (mm)	$\Phi 330$	330.0 ± 2.0	100.0 ± 2.0	18.4 max	$12.4 + 2.0 - 0.0$	$13.0 + 0.5 - 0.2$	2.0 ± 0.2	1.5 min	10.1 min	2.5 min

Marking Codes



Note:

- (1) "CS2202-4" is the part number, fixed.
- (2) "YYWW" is date code. "YY" is year (2013 is "13"); while "WW" is the assembly week in a year.