SIM Card EMI Filter Array with ESD Protection

Features

- Three channels of EMI filtering, each with ESD protection
- Two additional channels of ESD-only protection
- ±10kV ESD protection (IEC 61000-4-2, contact discharge)
- ±25kV ESD protection (HBM)
- Greater than 30dB of attenuation at 1GHz
- 10-bump, 1.960mm x 1.330mm footprint Chip Scale Package (CSP)

Applications

- SIM Card slot in mobile handsets
- I/O port protection for mobile handsets, notebook computers, PDAs, etc.
- EMI filtering for data ports in cell phones, PDAs or notebook computers

Product Description

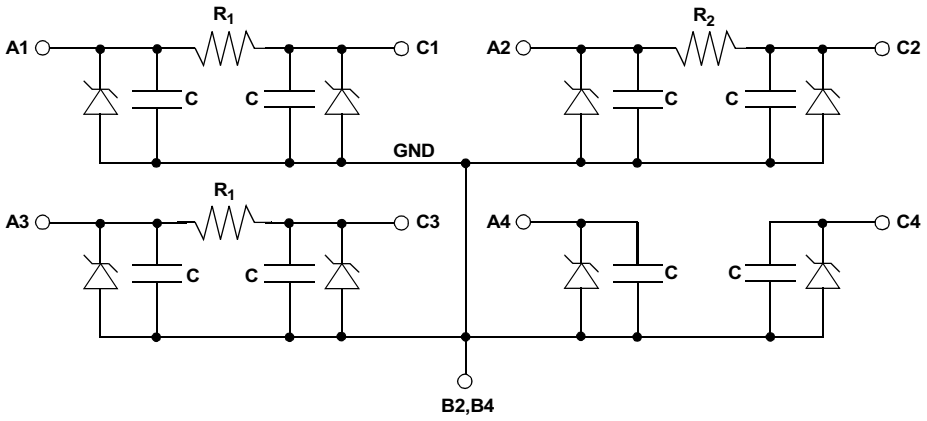
CAMD's CSPEMI400 is an EMI filter array with ESD protection, which integrates three pi filters (C-R-C) and two additional channels of ESD protection. The CSPEMI400 has component values of 20pF-47Ω-20pF, and 20pF-100Ω-20pF. The parts include avalanche-type ESD diodes on every pin, which provide a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD diodes connected to the filter ports are designed and characterized to safely dissipate ESD strikes of ±10kV, beyond the maximum requirement of the IEC 61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the pins are protected for contact discharges at greater than ±25kV.

The ESD diodes on pins A4 and C4 ports are designed and characterized to safely dissipate ESD strikes of ±10kV, well beyond the maximum requirement of the IEC 61000-4-2 international standard.

This device is particularly well suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package format and easy-to-use pin assignments. In particular, the CSPEMI400 is ideal for EMI filtering and protecting data lines from ESD for the SIM card slot in mobile handsets.

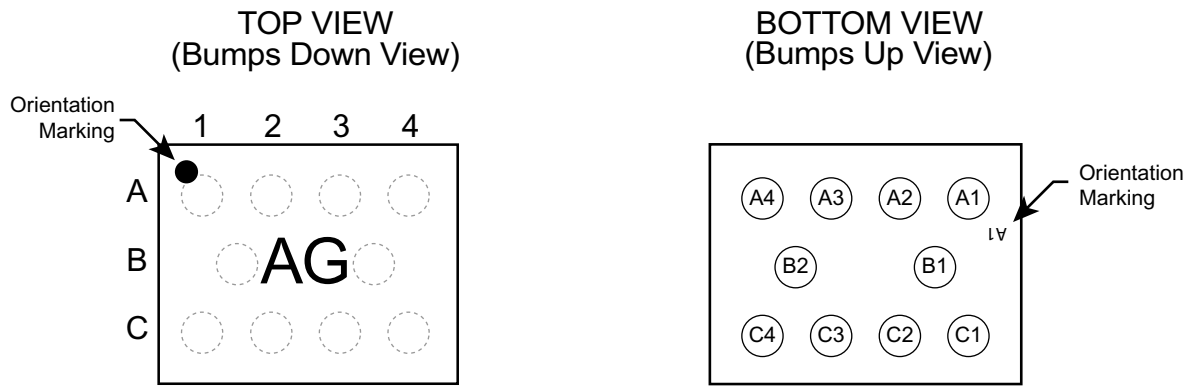
The CSPEMI400 is available in a space-saving, low-profile, chip-scale package.

Electrical Schematic



R_1=100Ω
R_2=47Ω

PACKAGE / PINOUT DIAGRAMS



CSPEMI400
CSP Package

Note: These drawings are not to scale.

PIN DESCRIPTIONS

TYPE	PIN	DESCRIPTION
EMI Filter	A1	EMI Filter with ESD Protection for RST Signal
	C1	EMI Filter with ESD Protection for RST Signal
EMI Filter	A2	EMI Filter with ESD Protection for CLK Signal
	C2	EMI Filter with ESD Protection for CLK Signal
Device Ground	B1	Device Ground
	B2	Device Ground
EMI Filter	A3	DAT EMI Filter with ESD Protection
	C3	DAT EMI Filter with ESD Protection
ESD Channel	A4	ESD Proection Channel - V_{CC} Supply
ESD Channel	C4	ESD Proection Channel

Ordering Information

PART NUMBERING INFORMATION

Bumps	Package	Ordering Part Number[1]	Part Marking
10	CSP	CSPEMI400	AG

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	**RATING**	**UNITS**
Storage Temperature Range	-65 to +150	°C
DC Power per Resistor	100	mW
DC Package Power Rating	300	mW

STANDARD OPERATING CONDITIONS		
PARAMETER	**RATING**	**UNITS**
Operating Temperature Range	-40 to +85	°C

ELECTRICAL OPERATING CHARACTERISTICS[1]						
SYMBOL	**PARAMETER**	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
R_1	Resistance of R_1		80	100	120	Ω
R_2	Resistance of R_2		38	47	56	Ω
C	Capacitance	V_{IN} = 2.5VDC, 1MHz, 30mV ac	16	20	24	pF
$V_{STANDOFF}$	Stand-off Voltage	I = 10µA	5.5			V
I_{LEAK}	Diode Leakage Current	V_{BIAS} = 3.3V		100		µA
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	 I_{LOAD} = 10mA I_{LOAD} = -10mA	 5.6 -1.5	 6.8 -0.8	 9.0 -0.4	 V V
V_{ESD}	In-system ESD Withstand Voltage a) Human Body Model, MIL-STD-883, Method 3015 b) Contact Discharge per IEC 61000-4-2	Notes 2,4 and 5	 ±25 ±10			 kV kV
V_{CL}	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients	Notes 2,3,4 and 5			 +12 -7	 V V

Note 1: T_A=25°C unless otherwise specified.

Note 2: ESD applied to input and output pins with respect to GND, one at a time.

Note 3: Clamping voltage is measured at the opposite side of the EMI filter to the ESD pin. For example, if ESD is applied to Pin A1, then clamping voltage is measured at Pin C1.

Note 4: Unused pins are left open

Note 5: The parameters are guaranteed by design.

Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

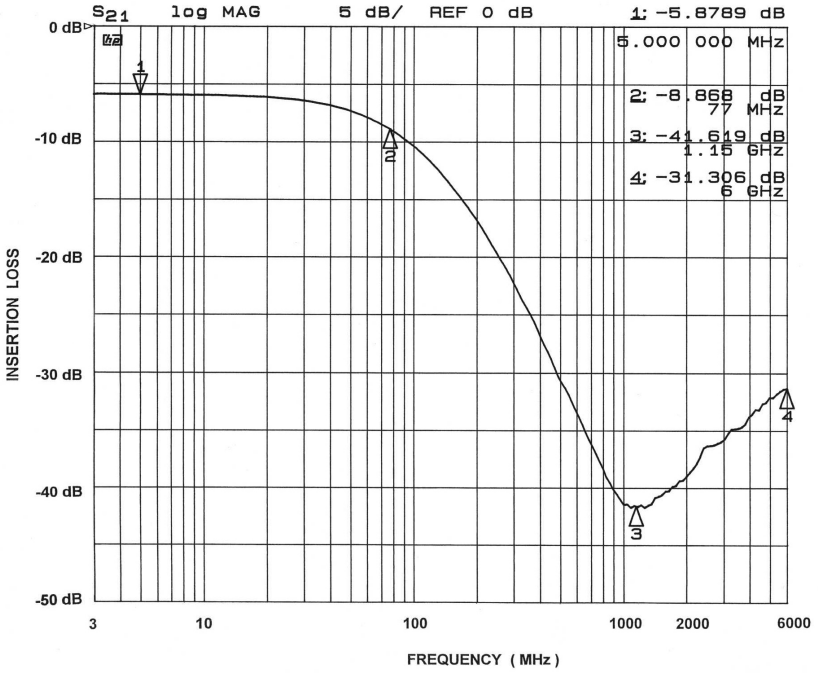


Figure 1. A1-C1 EMI Filter Performance

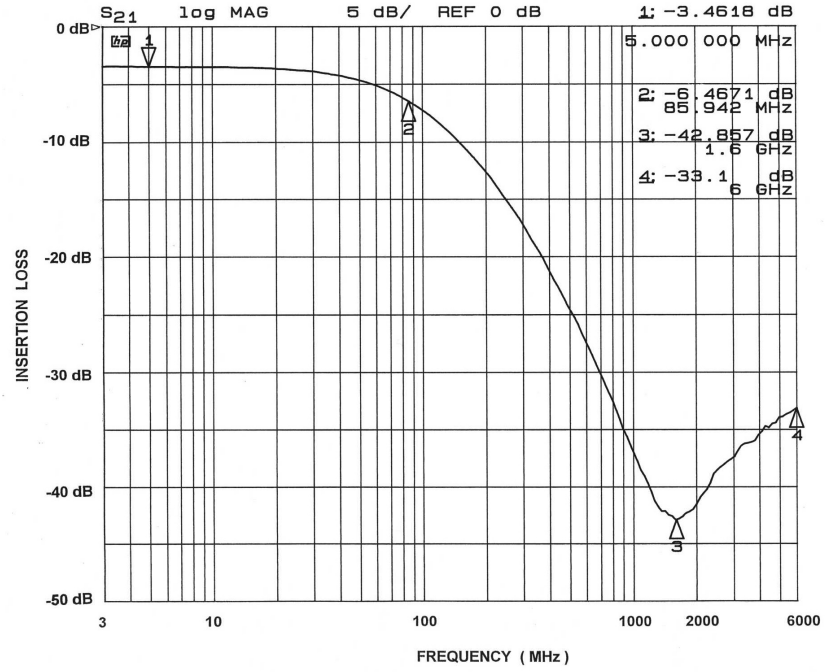


Figure 2. A2-C2 EMI Filter Performance

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

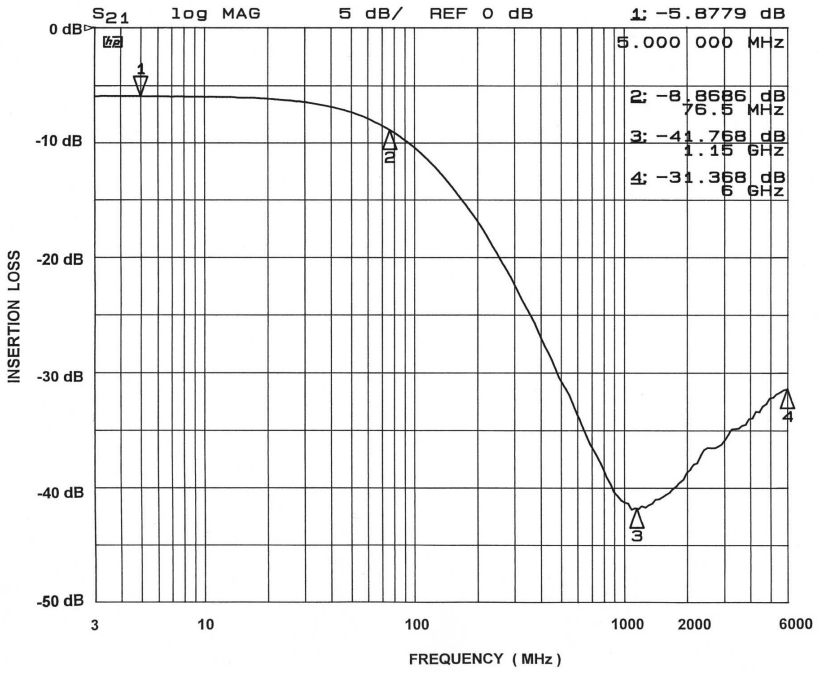


Figure 3. A3-C3 EMI Filter Performance

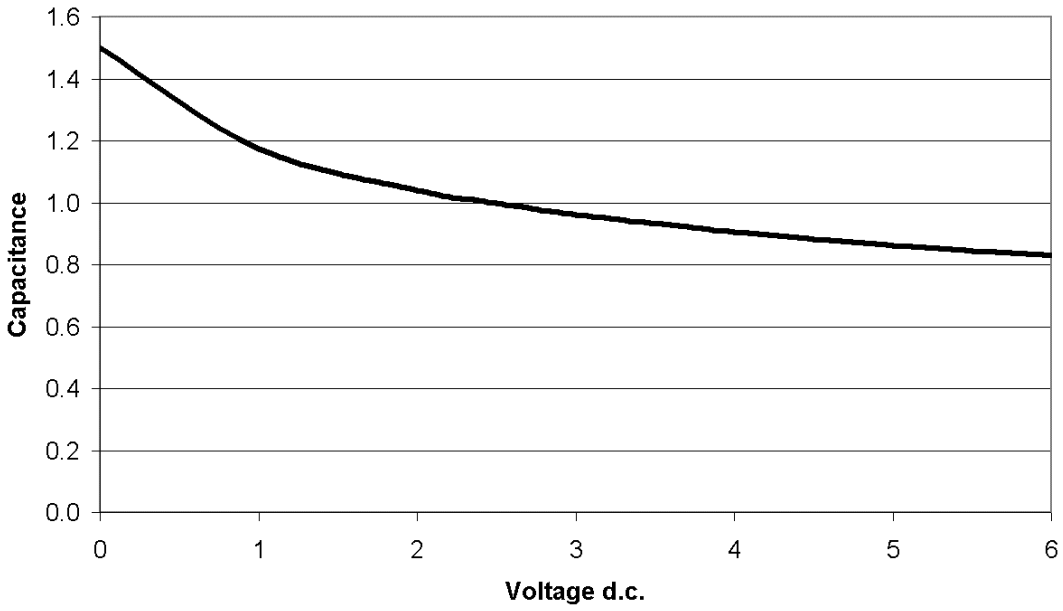
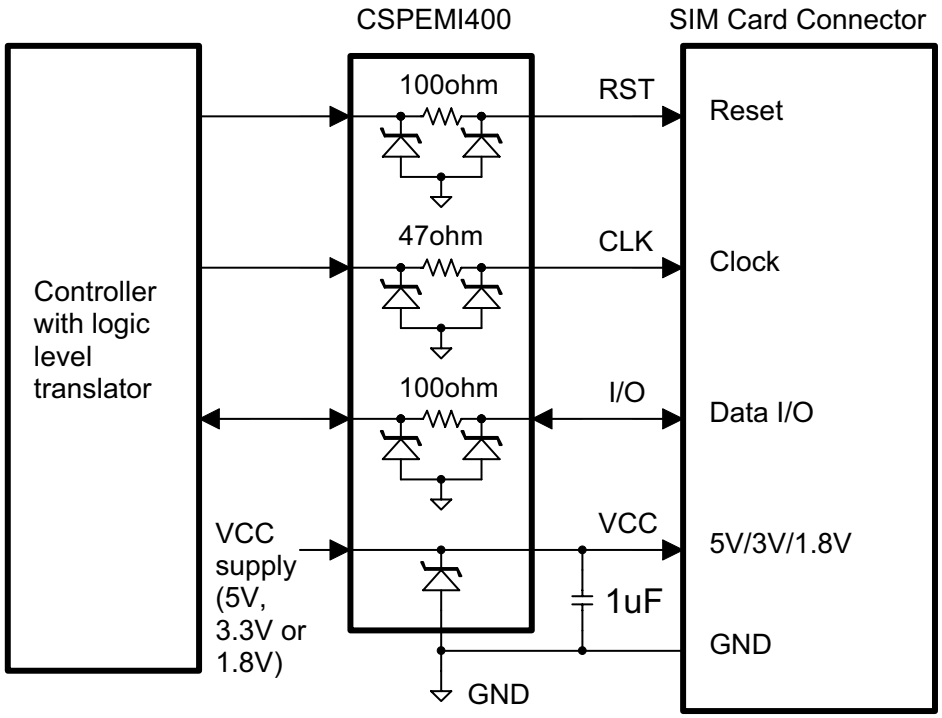


Figure 4. Typical Diode Capacitance vs. Input Voltage (normalized to 2.5VDC)

Application Information

The CSPEMI400 provides a bidirectional filter and protector for all the signals and the power line on the SIM (subscriber identity module) card connector. SIM cards are found in all GSM cellular phones and in some other handheld devices or card readers. The ESD diodes protect the controller against possible ESD strikes that may occur when the connector pins are exposed during direct contact, or during insertion of the SIM card into the card slot. The EMI filter suppresses all high-frequency noise, preventing the unwanted EMI signals from both entering and exiting the main board. The signals that interface with the SIM card are the Reset, the Clock and the bidirectional data I/O, as shown in Figure 5.



Note: One channel of the CSPEMI400 with a zener diode is not shown on the diagram.

Figure 5. Typical Application Diagram for the SIM Card Interface

For best filter and ESD performance, both GND bumps (B1, B2) of the CSPEMI400 should be directly connected to the Ground plane. A small capacitor of about 1μF is required next to the V_{CC} pin of the SIM connector in order to improve stability of the SIM card supply rail.

For information on the assembly of the CSPEMI400 to the PCB (printed circuit board), please refer to the Chip Scale Package (CSP) Application Note AP217, or contact factory at 800-325-4966 for technical support.

Application Information (cont'd)

Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

PRINTED CIRCUIT BOARD RECOMMENDATIONS	
PARAMETER	**VALUE**
Pad Size on PCB	0.275mm Round
Pad Definition	Non-Solder Mask defined pads
Solder Mask Opening	0.325mm Round
Solder Stencil Thickness	0.152mm
Solder Stencil Aperture Opening (laser cut, 5% tapered walls)	0.330mm Round
Solder Flux Ratio	50/50 by volume
Solder Paste Type	No Clean
Pad Protective Finish	OSP (Entek Cu Plus 106A)
Tolerance — Edge To Corner Ball	±50µm
Solder Ball Side Coplanarity	±20µm
Soldering Minimum Temperature	205°C for at least 30 seconds
Soldering Maximum Temperature	240°C for at less than 2 minutes

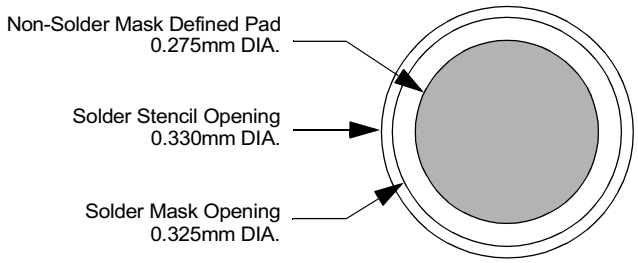


Figure 6. Recommended Non-Solder Mask Defined Pad Illustration

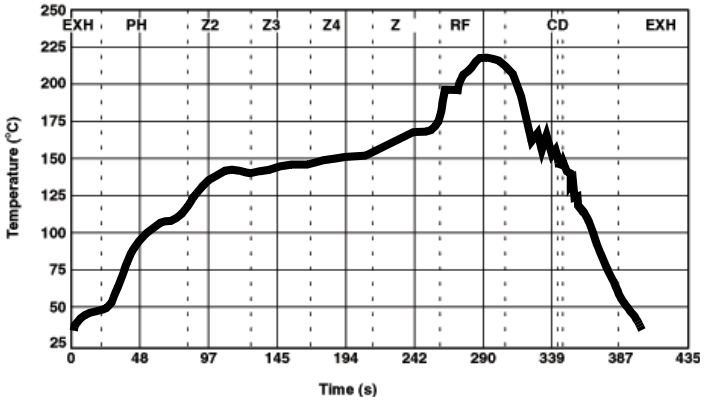


Figure 7. Solder Reflow Profile

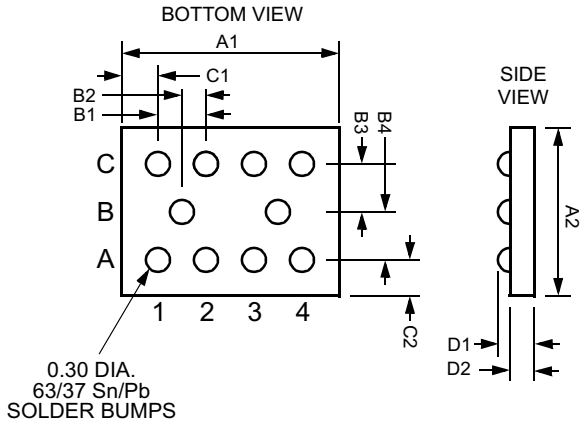
Mechanical Details

CSP Mechanical Specifications

CSPEMI400 devices are packaged in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CSP packaging, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS						
Package	Custom CSP					
Bumps	10					
Dim	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A1	1.915	1.960	2.005	0.0754	0.0772	0.0789
A2	1.285	1.330	1.375	0.0506	0.0524	0.0541
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100
B3	0.430	0.435	0.440	0.0169	0.0171	0.0173
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173
C1	0.180	0.230	0.280	0.0071	0.0091	0.0110
C2	0.180	0.230	0.280	0.0071	0.091	0.0110
D1	0.561	0.605	0.649	0.0221	0.0238	0.0255
D2	0.355	0.380	0.405	0.0140	0.0150	0.0159
# per tape and reel	3500 pieces					
Controlling dimension: millimeters						

Mechanical Package Diagrams



Package Dimensions for CSPEMI400 Chip Scale Package

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X K_0	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P_0	P_1
CSPEMI400	1.96 X 1.33 X 0.6	2.08 X 1.45 X 0.7	8mm	178mm (7")	3500	4mm	4mm

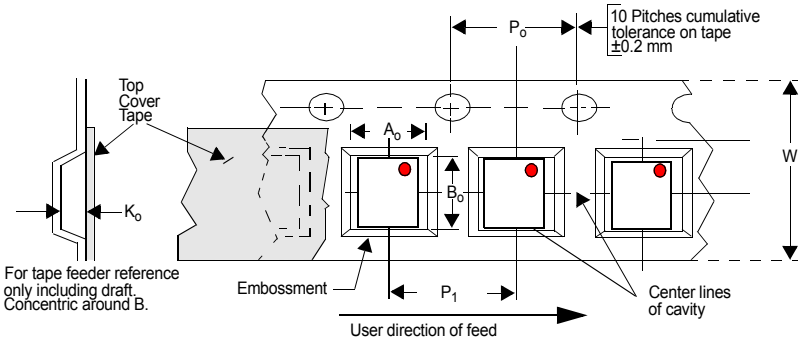


Figure 8. Tape and Reel Mechanical Data