

PROTECTION PRODUCTS

Description

μClamp®2492SQ is specifically designed to provide secondary surge and ESD protection on CAN Bus and other 24V ports in automotive applications.

μClamp2492SQ integrates two bidirectional TVS diodes rated at 24V. ESD characteristics are highlighted by high ESD withstand voltage (+/-30kV contact / air discharge per IEC 61000-4-2) and low dynamic resistance. Each device is rated for a maximum EOS current of 5A (tp = 8/20μs). This device is qualified to AEC-Q100, Grade 1 (-40 to +125 °C) for automotive applications.

μClamp2492SQ is in a 3-pin SOT-23 package. The leads are finished with lead-free matte tin.

Features

- Transient Protection to
 - ♦ IEC 61000-4-2 (ESD) 30kV (Air), 30kV (Contact)
 - ♦ IEC 61000-4-4 (EFT) 4kV (5/50ns)
 - ♦ IEC 61000-4-5 (Lightning) 5A (8/20μs)
 - ♦ ISO-10605 (ESD) 30kV (Air), 22kV (Contact)
- Qualified to AEC-Q100, Grade 1
- Industry standard SOT-23 package
- Protects Two Data Lines
- Working Voltage: 24V
- Capacitance: 18pF Maximum
- Dynamic Resistance: 0.55 Ohms (Typ)
- Solid-State Silicon-Avalanche Technology

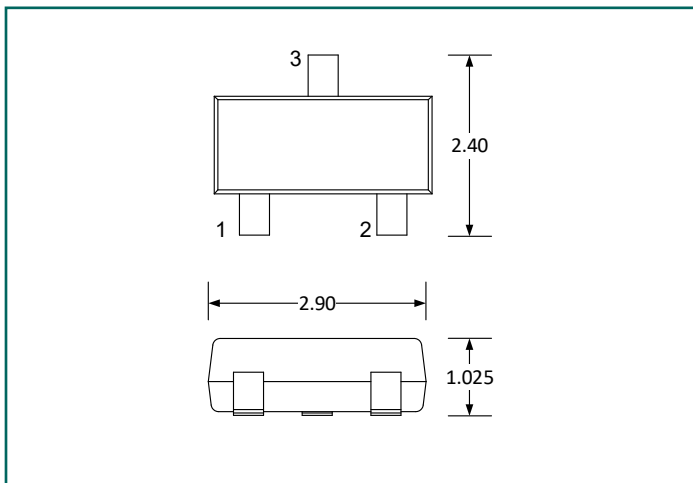
Mechanical Characteristics

- SOT-23 Package
- Pb-Free, Halogen Free, RoHS/WEEE Compliant
- Nominal Dimensions: 2.9 x 1.3 x 1.20 mm
- Lead Finish: Matte Tin
- Molding Compound Flammability Rating: UL 94V-0
- Marking : Marking Code + Date Code
- Packaging : Tape and Reel

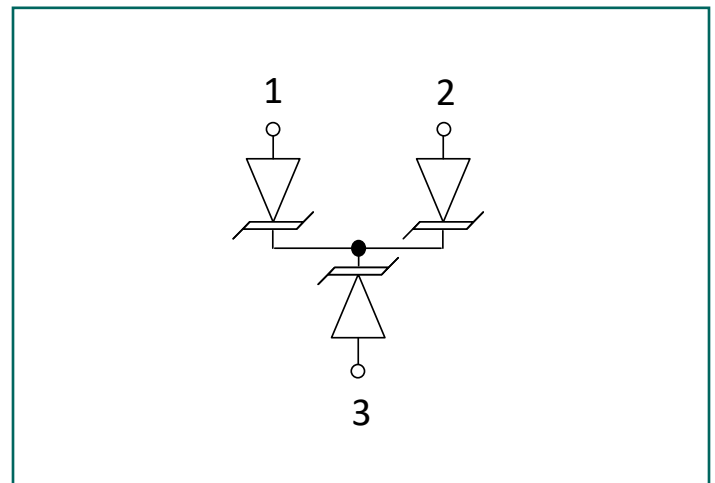
Applications

- Automotive Applications
- CAN Bus
- FlexRay Bus
- Industrial Equipment

Nominal Dimensions (mm)



Schematic



Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P _{PK}	250	W
Peak Pulse Current (tp = 8/20μs)	I _{PP}	5	A
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾ ESD per IEC 61000-4-2 (Air) ⁽¹⁾	V _{ESD}	±30 ±30	kV
ESD per ISO-10605 (Contact) ⁽²⁾ ESD per ISO-10605 (Air) ⁽²⁾	V _{ESD}	±22 ±30	kV
Operating Temperature	T _{OP}	-40 to +125	°C
Storage Temperature	T _{STG}	-55 to +150	°C

Electrical Characteristics (T=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Reverse Stand-Off Voltage	V _{RWM}	-40°C to 125°C, between any two pins			24	V	
Reverse Breakdown Voltage	V _{BR}	I _t = 10mA, Between any two pins	-40°C to 125°C	26.5	31.5	36	V
Reverse Leakage Current	I _R	V _{RWM} = 24V	T = 25°C			0.200	μA
			T = 125°C			0.350	μA
Clamping Voltage ⁽³⁾	V _C	I _{pp} = 5A, tp = 8/20μs, between any two pins		44	50	V	
ESD Clamping Voltage ⁽⁴⁾	V _C	tp = 0.2/100ns (TLP) Between any two pins	I _{pp} = 4A		34		
			I _{pp} = 16A		44		
Dynamic Resistance ^{(4), (5)}	R _{DYN}	tp = 0.2/100ns (TLP), between any two pins		0.55		Ohms	
Junction Capacitance	C _J	V _R = 0V, f = 1MHz, between any two pins		15	18	pF	

Notes:

(1): ESD Gun return path to Ground Reference Plane (GRP)

(2): ESD Gun return path to Horizontal Coupling Plane (HCP); Test conditions: a) 150pF/330pF, 330Ω b) 150pF/330pF, 2kΩ

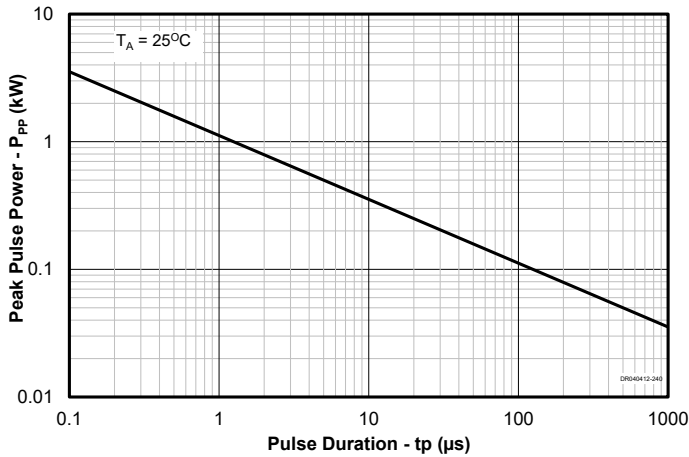
(3): Measured using a constant current source.

(4): Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t₁ = 70ns to t₂ = 90ns.

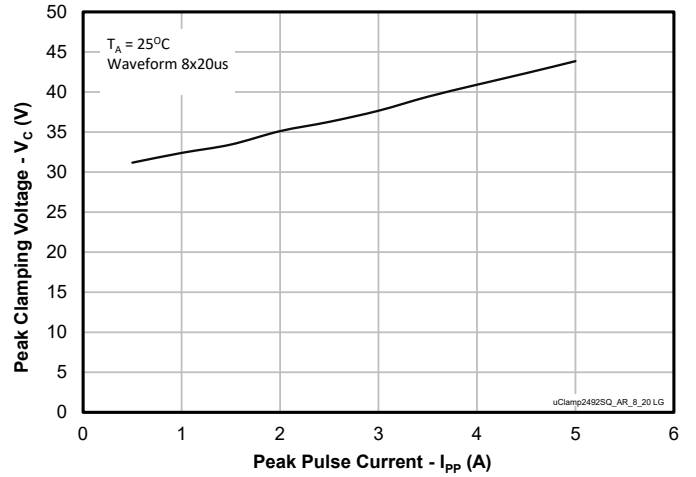
(5): Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

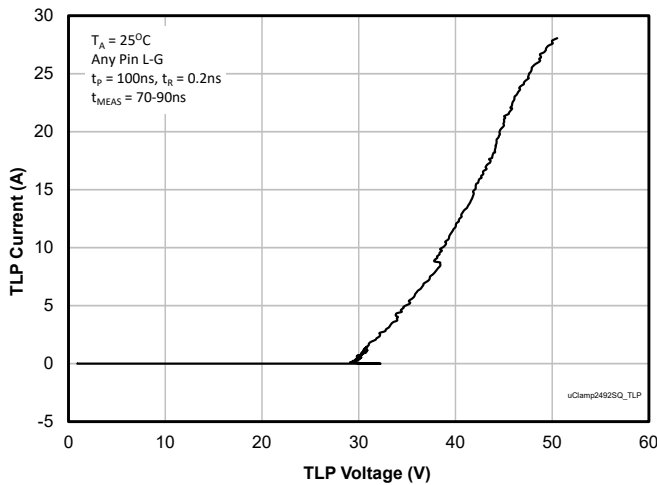
Non-Repetitive Peak Pulse Power vs. Pulse Time



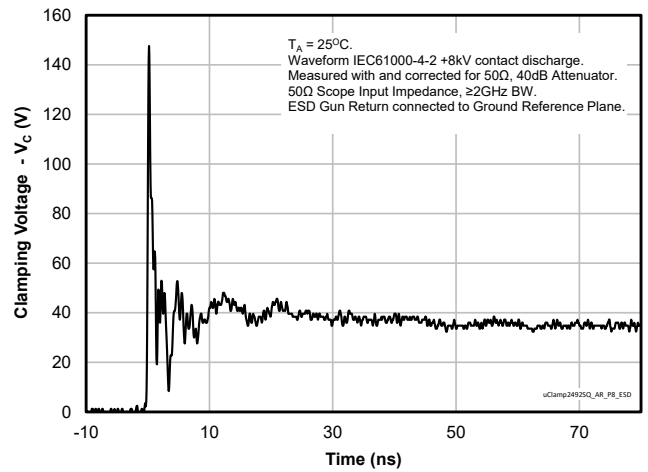
Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20\mu\text{s}$)



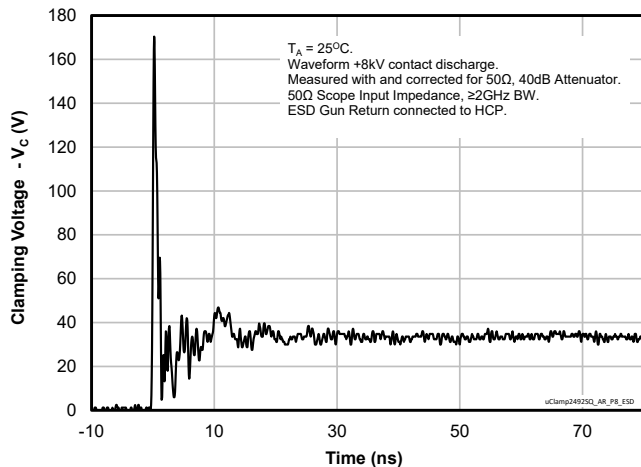
TLP IV Curve (Positive Pulse)



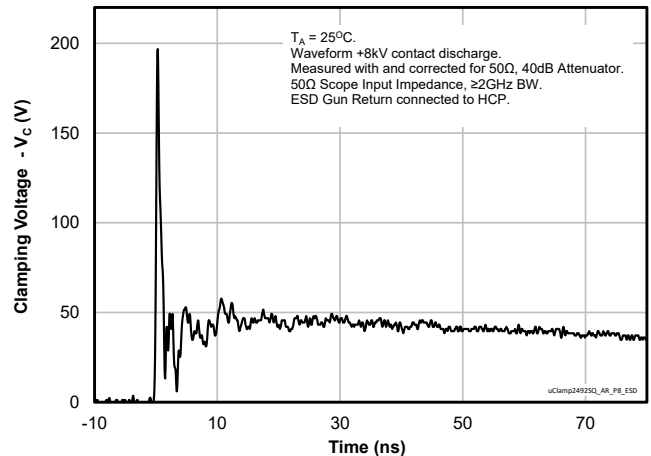
ESD Clamping (+8kV Contact per IEC 61000-4-2)



ESD Clamping (+8kV Contact per ISO-10605 150pF, 2kΩ)

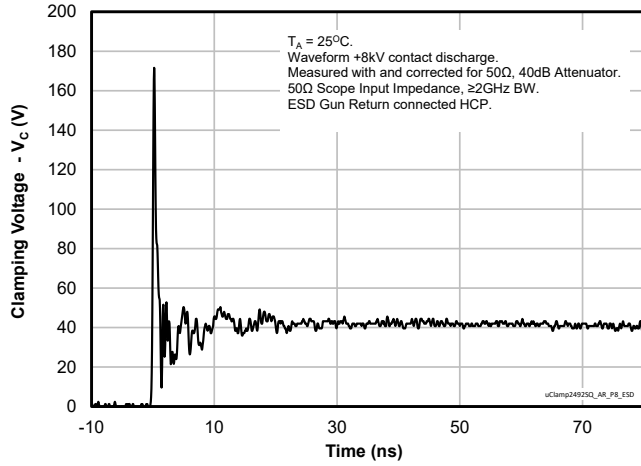


ESD Clamping (+8kV Contact per ISO-10605 150pF, 330Ω)

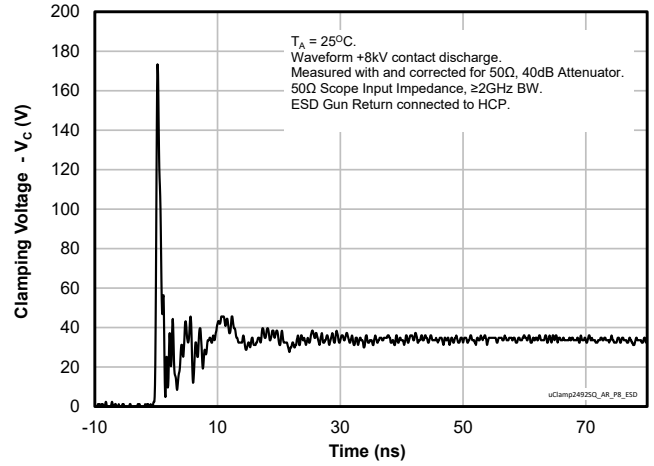


Typical Characteristics

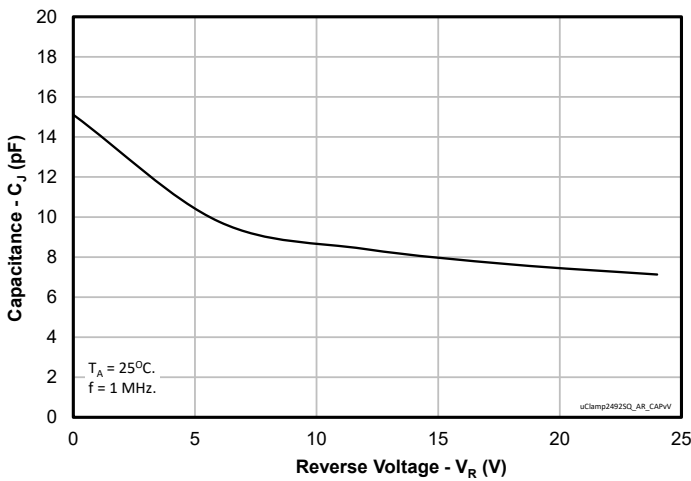
ESD Clamping (+8kV Contact per ISO-10605 330pF, 330Ω)



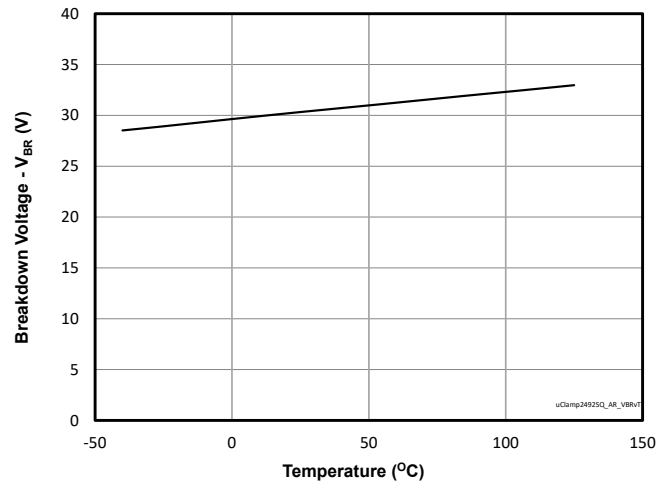
ESD Clamping (+8kV Contact per ISO-10605 330pF, 2kΩ)



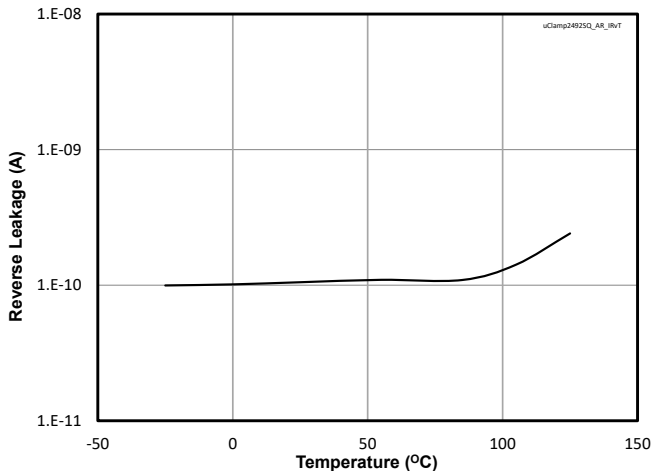
Capacitance vs. Reverse Voltage



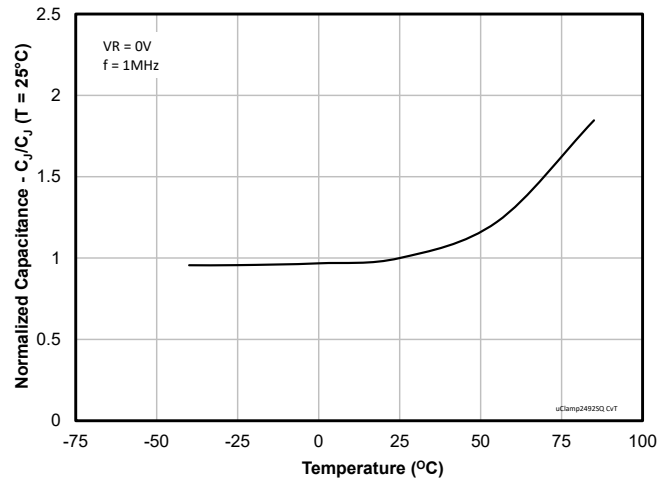
Breakdown Voltage vs. Temperature



Leakage Current vs Temperature



Normalized Capacitance vs. Temperature



Application Information

CAN Bus Protection

CAN bus connections are subject to harsh transient and noise conditions of an automobile environment. The CAN physical layer specification requires a certain level of noise and transient protection. However, due to the harsh environment in which they operate, it is prudent to add additional external protection in the form of low pass filters and TVS diodes. Low pass filtering and noise protection is achieved with some combination of RC networks and (optional) common mode chokes. Once added to the system, these components are also subject to transient ESD and EOS events.

μ Clamp2492SQ is a 2-Line TVS diodes specifically designed for protection of CAN circuits. It has an operating (working) voltage of 24V with a minimum breakdown voltage of 26.5V. This means it will not

turn on in case of an indefinite short between the automotive battery and the signal lines. It provides ESD protection to +/-25kV contact discharge (per IEC 61000-4-2) and EOS protection to 5A for an 8/20 μ s pulse. Typical junction capacitance is only 15pF .

A typical implementation is shown in Figure 1. The TVS is located such that it protects the filter components as well as the CAN transceiver. μ Clamp2492SQ should be placed as close to the connector as possible.

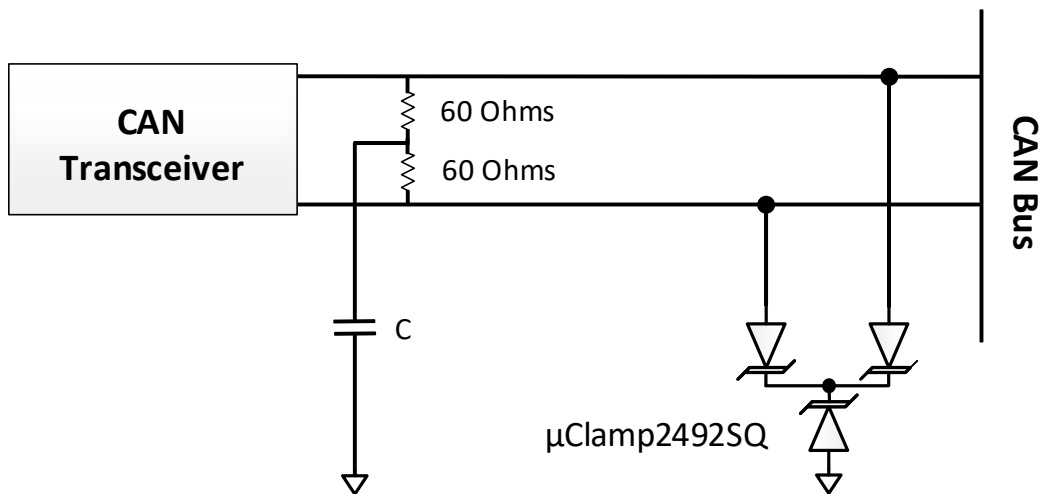
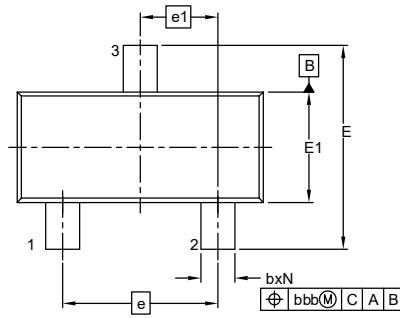
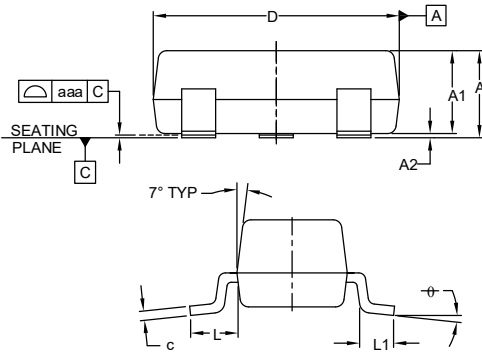


Figure 1 - CAN Bus Protection Circuit

Outline Drawing - SOT-23



DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.903	1.025	1.100
A1	0.890	0.975	1.000
A2	0.013	0.05	0.100
b	0.37	0.40	0.51
c	0.085	0.110	0.150
D	2.80	2.90	3.00
E1	1.20	1.30	1.40
E	2.30	2.40	2.50
e	1.83 BSC		
e1	0.915 BSC		
L	0.40	0.45	0.61
L1	0.25	0.40	0.55
ϕ	0°	-	8°
aaa	0.10		
bbb	0.20		

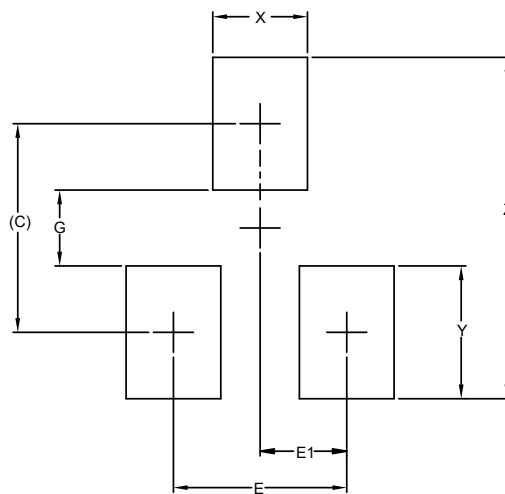


SIDE VIEW

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

Land Pattern - SOT-23

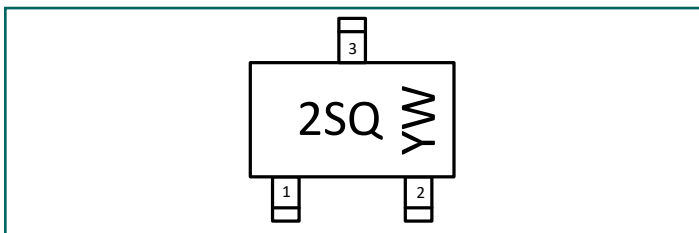


DIMENSIONS	
DIM	MILLIMETERS
C	(2.20)
G	0.80
E1	0.915
E	1.83
X	1.00
Y	1.40
Z	3.60

NOTES:

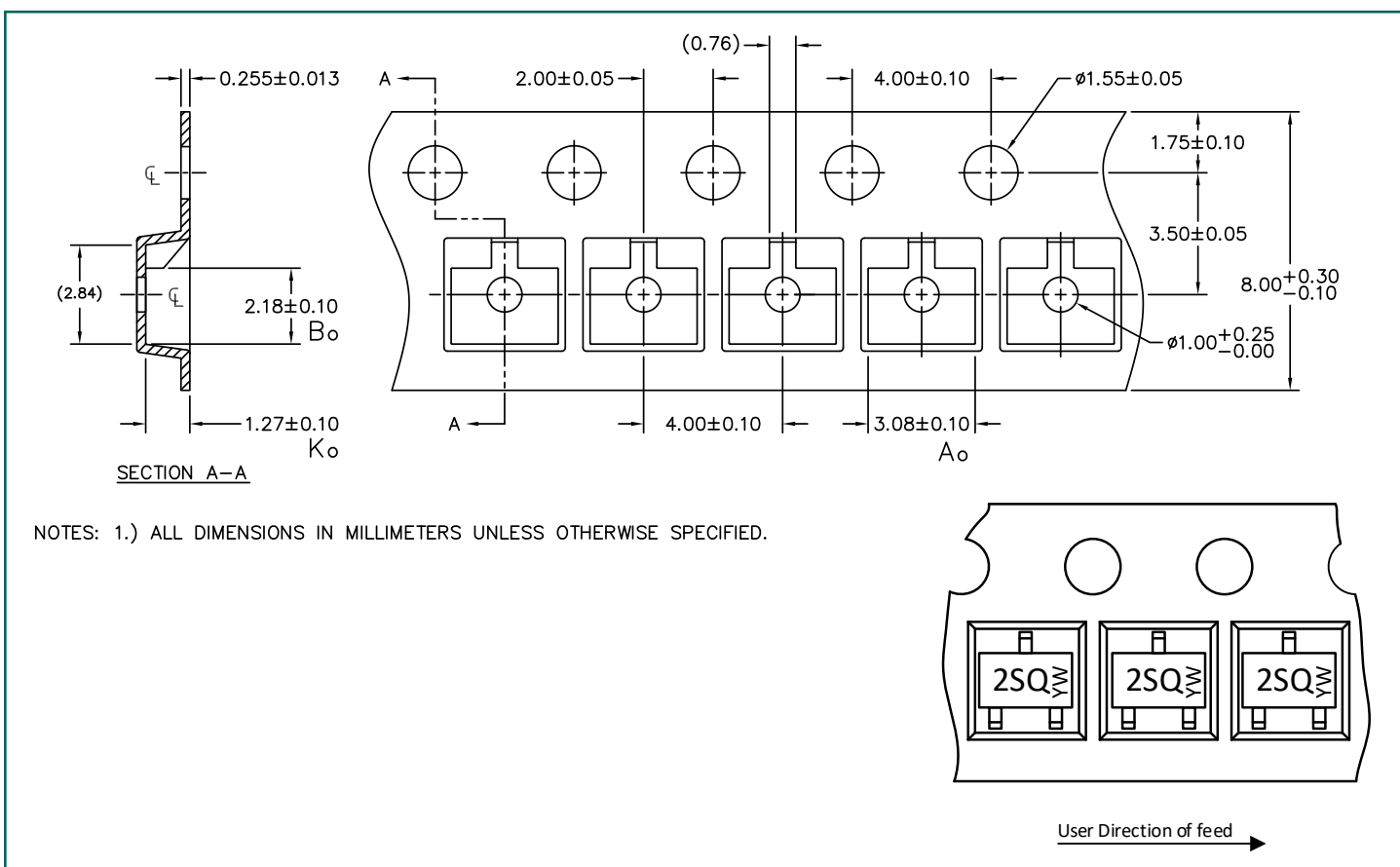
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code



Notes: YW = Date Code

Tape and Reel Specification - Plastic Tape, 4mm Pitch



Ordering Information

Part Number	Qty per Reel	Reel Size	Carrier Tape	Pitch
μClamp24925QTCT	3000	7 Inch	Plastic	4mm
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