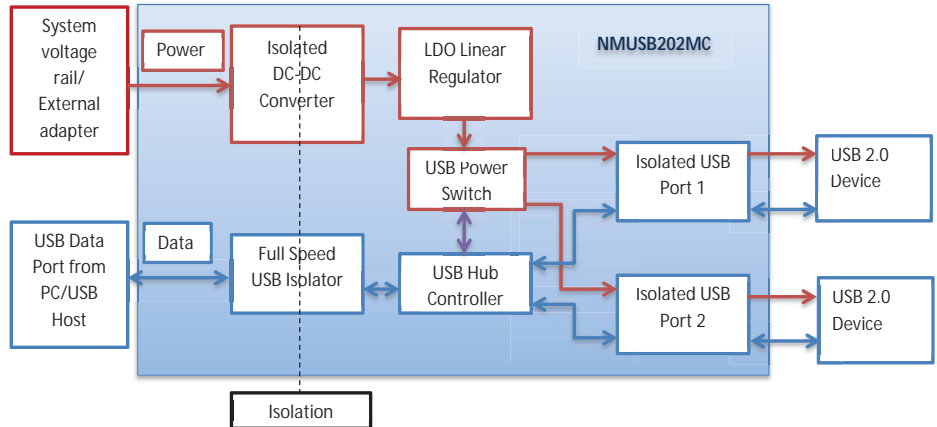


FEATURES

- Isolated dual powered USB 2.0 compliant
- Surface mount module
- One upstream port, two isolated downstream ports
- Automatic switching between low (1.5Mbps) and full speed (12Mbps)
- Full 500mA available from isolated ports
- 3kVAC isolation voltage 'Hi Pot Test'
- UL60950 recognised
- ANSI/AAMI ES60601-1 1MOPP/2MOOPs recognised
- Industrial temperature range -40°C to +85°C
- Short circuit/overload protected USB ports
- Power surge notification
- Patents pending
- 3D model available



SELECTION GUIDE

| | |
|-------------------------|-------------------|
| Order Code ¹ | NMUSB202MC |
|-------------------------|-------------------|

PRODUCT OVERVIEW

The NMUSB202MC is a surface mount module which conveniently provides dual port USB data isolation from a single upstream port with full power (500mA) available from each downstream port. Isolation provides effective breaking of ground loops and immunity to EMI in harsh environments as found in industrial and medical applications. Full speed (12Mbps) and low speed (1.5Mbps) are supported with automatic switching. Input power of 5V must be provided by an external 'adapter' or system voltage rail. The input power of 5V provided to the hub cannot be sourced from a USB connection.



For full details go to www.murata-ps.com/rohs



1. Components are supplied in tape and reel packaging, please refer to package specification section. Orderable part numbers are NMUSB202MC-R7 (23 pieces per reel), or NMUSB202MC-R13 (92 pieces per reel). All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

DC-DC CHARACTERISTICS

INPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--------------------------------|----------------------|------|------|------|---------|
| Voltage range | Continuous operation | 4.5 | 5 | 5.5 | V |
| Current (hub inactive) | 5V input | | 70 | | mA |
| Current (hub active) 0% load | 5V input | | 110 | | mA |
| Current 100% load | 5V input | | 1.3 | | A |
| Input reflected ripple current | 5V input | | 31 | | mA(rms) |

OUTPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------|---|------|------|------|-------------------|
| Downstream voltages | 5V output | 4.75 | 5 | 5.25 | V |
| Transient response | Peak deviation (0-50-0% & 50-100-50% swing) | -5 | | +3 | %V _{out} |
| | Settling time | 40 | | 400 | μs |

MODULE CHARACTERISTICS

TEMPERATURE CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--|---|------|------|------|-------|
| Operation | See derating curve | -40 | | 85 | °C |
| Storage | | -50 | | 105 | |
| Product temperature rise above ambient | 100% Load, Nom V _{IN} , Still Air (measured on transformer core) | | 31 | 37 | |

ISOLATION CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|------------------------|---------------------------|------|------|------|-------|
| Isolation test voltage | Flash tested for 1 second | 3000 | | | VAC |
| Resistance | Viso = 1kVDC | 20 | | | GΩ |

GENERAL CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--------------------------------|--|------|------|------|--------|
| Leakage current | 250 VAC 50Hz | 1.31 | | 1.35 | μA |
| Common mode transient immunity | | 25 | | | kV/ μs |
| ESD rating | Rated on model | | 2000 | | V |
| MTTF | Calculated using MIL-HDBK-217 FN2 calculation model with nominal input voltage at full load, 25°C ambient temperature | | 600 | | kHrs |
| | Calculated using Telecordia SR-332 calculation model with nominal input voltage at full load, 25°C ambient temperature | | 3300 | | kHrs |

ABSOLUTE MAXIMUM RATINGS

| Parameter | Conditions | Value |
|--------------------------|------------------------|------------|
| Short-circuit protection | Downstream USB 5V | Continuous |
| Input voltage | Upstream USB 5V supply | 5.5V |

TECHNICAL NOTES

ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions NMUSB202MC data isolator is 100% production tested at its stated isolation voltage. This is 3kVAC for 1 second.

The NMUSB202MC series has been recognised by Underwriters Laboratory to 250 Vrms Reinforced Insulation.

REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

SAFETY APPROVAL

ANSI/AAMI ES60601-1

The NMUSB202MC is recognised to ANSI/AAMI ES60601-1 and provides 1 MOPP (Means Of Patient Protection) and 2 MOOP (Means Of Operator Protection) based upon a working voltage of 250 Vrms max, between Primary and Secondary.

UL 60950

The NMUSB202MC series has been recognised by Underwriters Laboratory (UL) to UL 60950 for reinforced insulation to a working voltage of 250Vrms.

FUSING

The NMUSB202MC series of converters are not internally fused so to meet the requirements of UL an anti-surge input line fuse should always be used with ratings as defined below.

NMUSB202MC - 2.5A (125Vdc rated)

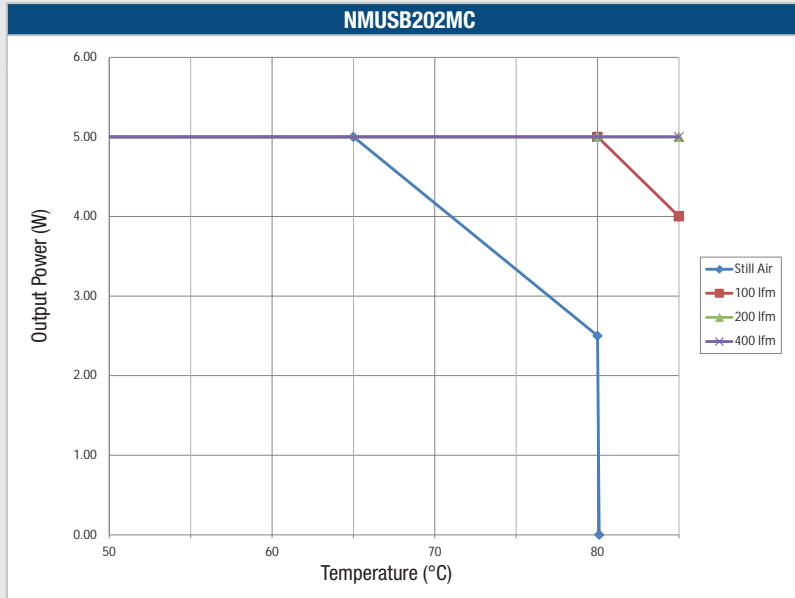
All fuses should be UL recognised and rated to at least the maximum allowable DC input voltage.

RoHS COMPLIANCE, MSL AND PSL INFORMATION

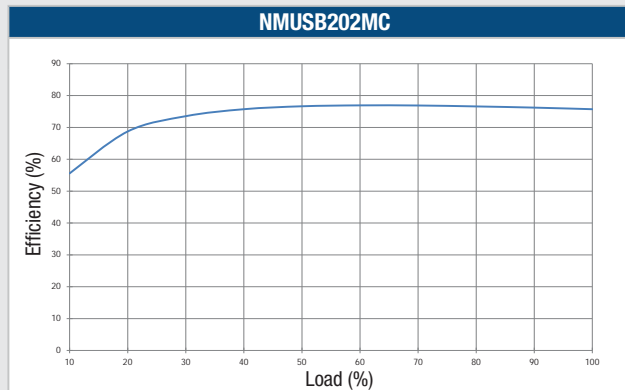


NMUSB202MC is compatible with RoHS soldering systems with a peak reflow solder temperature of 245°C as per J-STD-020D.1. Please refer to [application notes](#) for further information. The pin termination finish on this product series is Gold with Nickel Pre-plate. The series is backward compatible with Sn/Pb soldering systems. The product has a Moisture Sensitivity Level (MSL) 3.

TEMPERATURE DERATING GRAPH



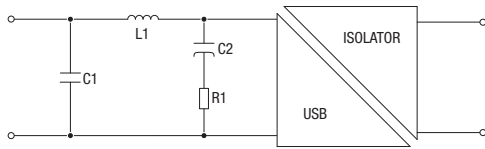
EFFICIENCY GRAPH



EMC FILTERING AND SPECTRA

FILTERING

The following filter circuit and filter table shows the input filters typically required to meet EN55022 Quasi-Peak Curve A or B.



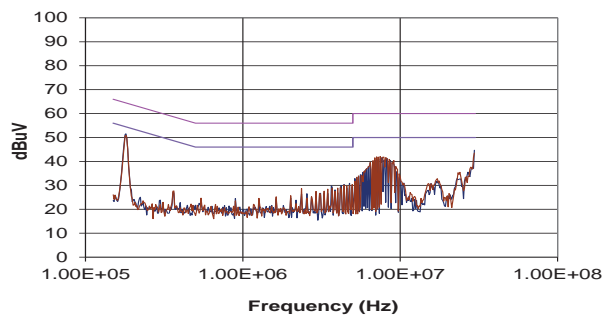
C1 Ceramic capacitor

C2 Electrolytic capacitor

TO MEET CURVE B

| Part Number | C1 | L1 | C2 | R1 |
|-------------|------------|------------|-------------|--------------|
| NMUSB202MC | 10 μ F | 10 μ H | 470 μ F | 0.5 Ω |

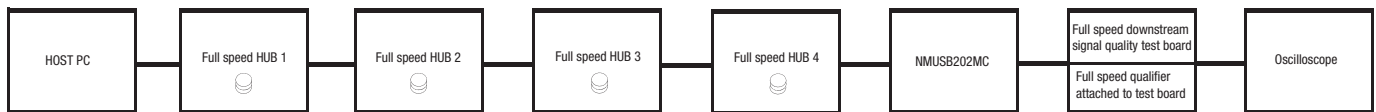
NMUSB202MC



APPLICATION NOTES

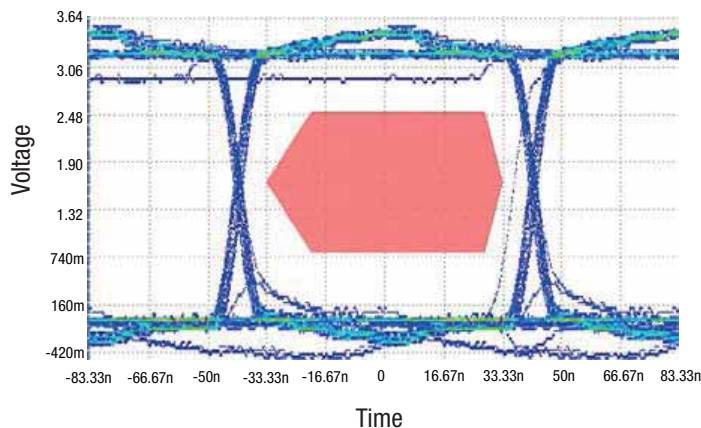
NMUSB202MC is equivalent to one USB hub for dynamic characteristics, verified by the setup in the figure below for worst case USB specification of 5 cascaded hubs. The host PC counts as one hub.

| Equipment | Use |
|--|-----------------------------|
| Tektronix DPO5034B Scope | Signal Qualification |
| Scope Firmware 7.2.0 Build 4 | |
| TekExpress USB2 1.0.0.65 | |
| Framework version 3.0.1.51 | |
| Tektronix TPP0500 500MHZ 300V CATII 3.9pF probes | |
| Thurlby PL320 | Power Supply for NMUSB202MC |
| HP Elite Desk 800G F6X32ET~ABU | Remote From |
| HP Compaq DC5800 | Remote Into |
| Keithley 2000 DMM | Vin Measurement |
| Keithley 2000 DMM | Iin Measurement |
| Pro Signal PS11116 5M Certified USB cables | USB Cabling |
| Newlink USB 4-Port Hubs | USB Hubs |
| Integral "Splash Black" USB flash drive (8GB) | Full Speed Qualifier |
| HP 672652-001 | Mouse for Port 1 |
| Logitech 810-003656 | Mouse for Port 2 |
| TektronixUSB test fixture TDSUSBF | Test Fixture |



Typical Eye Diagram:

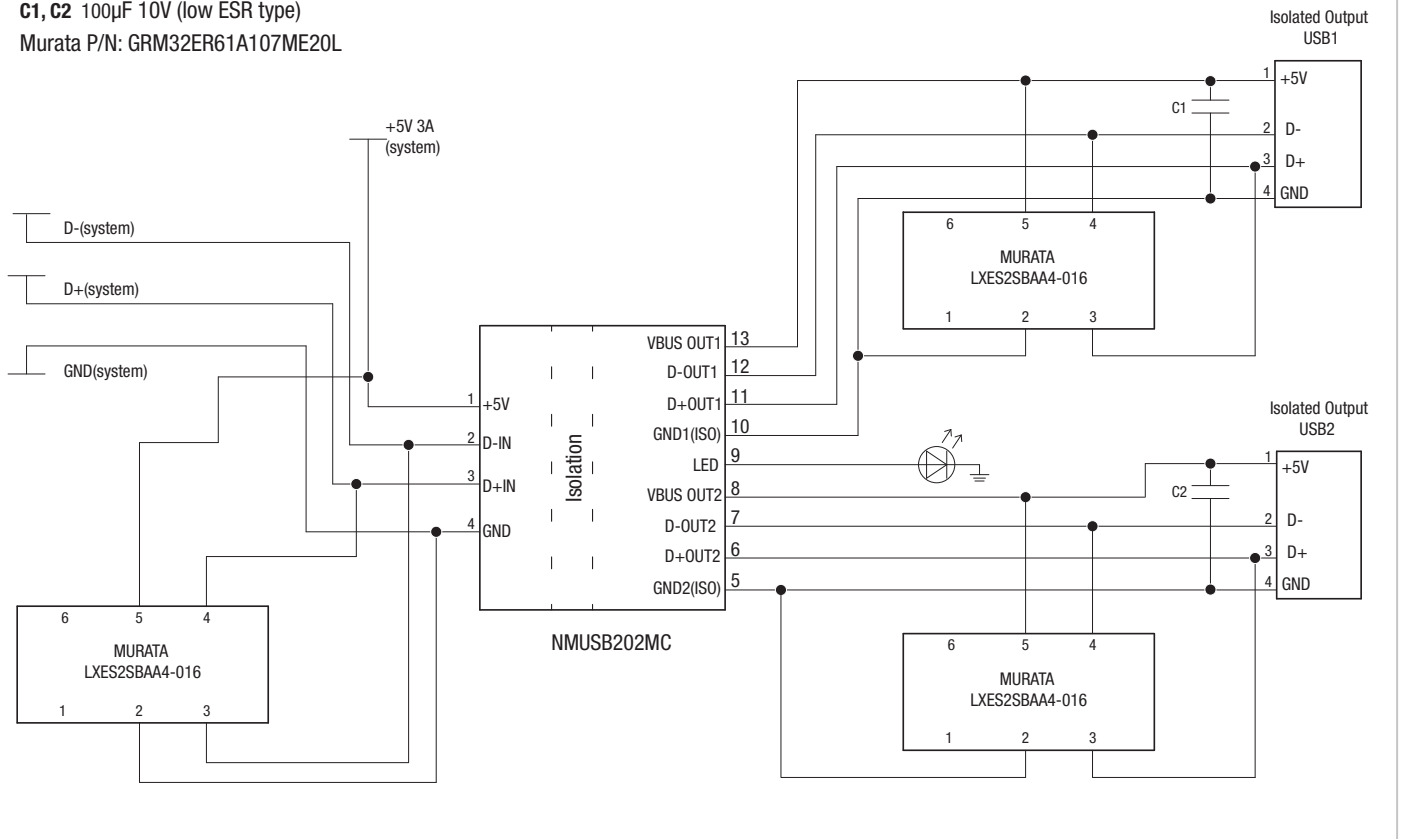
The 'eye' diagram is an indication of adequate data quality after the worst case of five cascaded USB hubs.



APPLICATION NOTES (Continued)

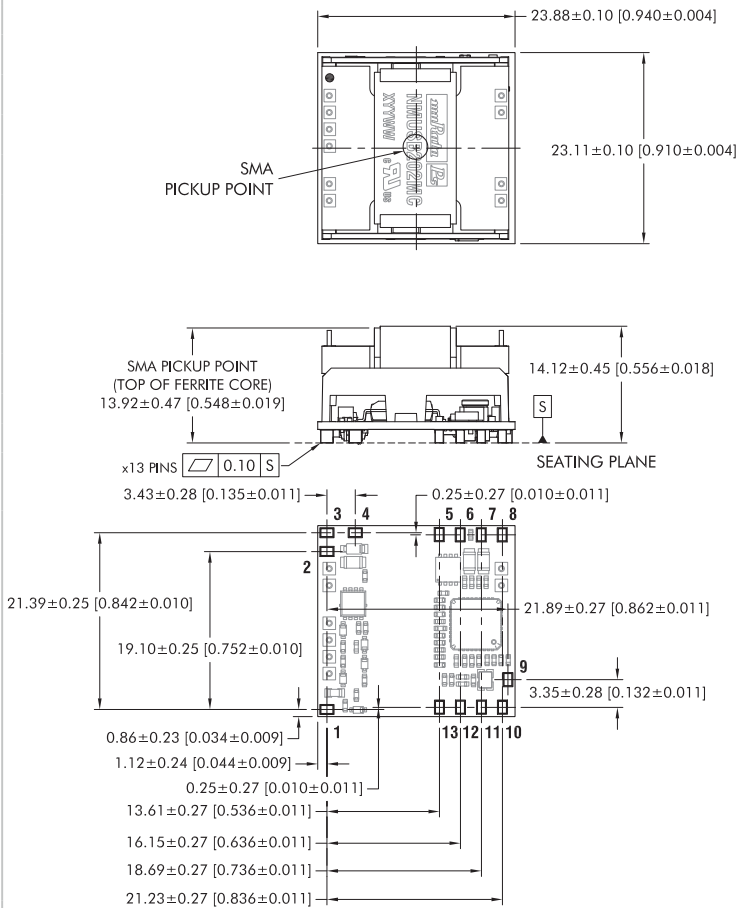
Typical Implementation:

C1, C2 100µF 10V (low ESR type)
Murata P/N: GRM32ER61A107ME20L



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



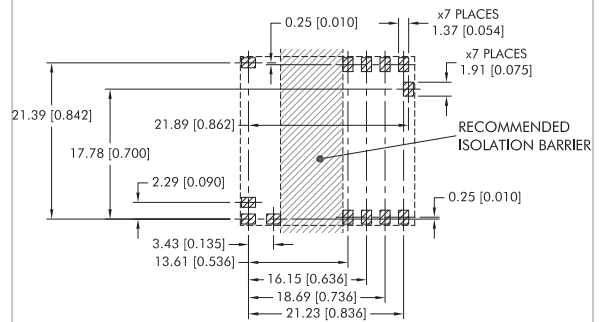
All dimensions in mm (inches), Controlling dimensions is mm.

Weight: 11 g

PIN CONNECTIONS

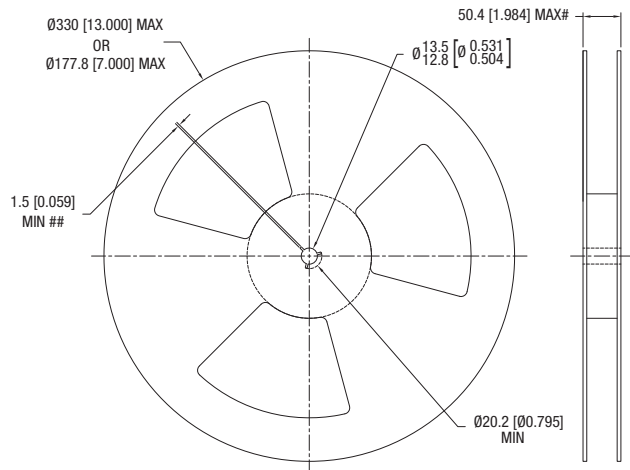
| Pin | Function |
|-----|-------------------|
| 1 | +5V (UPSTREAM) |
| 2 | D-IN |
| 3 | D+IN |
| 4 | GND (UPSTREAM) |
| 5 | GND2 (DOWNSTREAM) |
| 6 | D+OUT2 |
| 7 | D-OUT2 |
| 8 | VBUS OUT2 |
| 9 | LED PIN |
| 10 | GND1 (DOWNSTREAM) |
| 11 | D+OUT1 |
| 12 | D-OUT1 |
| 13 | VBUS OUT1 |

RECOMMENDED FOOTPRINT DETAILS



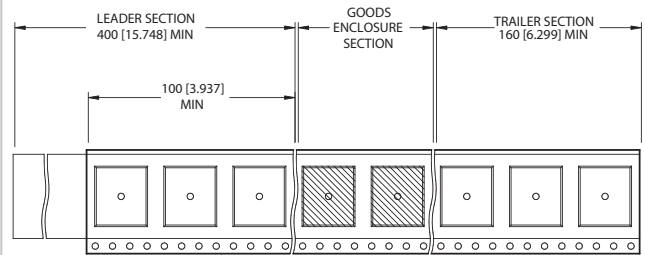
TAPE & REEL SPECIFICATIONS

REEL OUTLINE DIMENSIONS



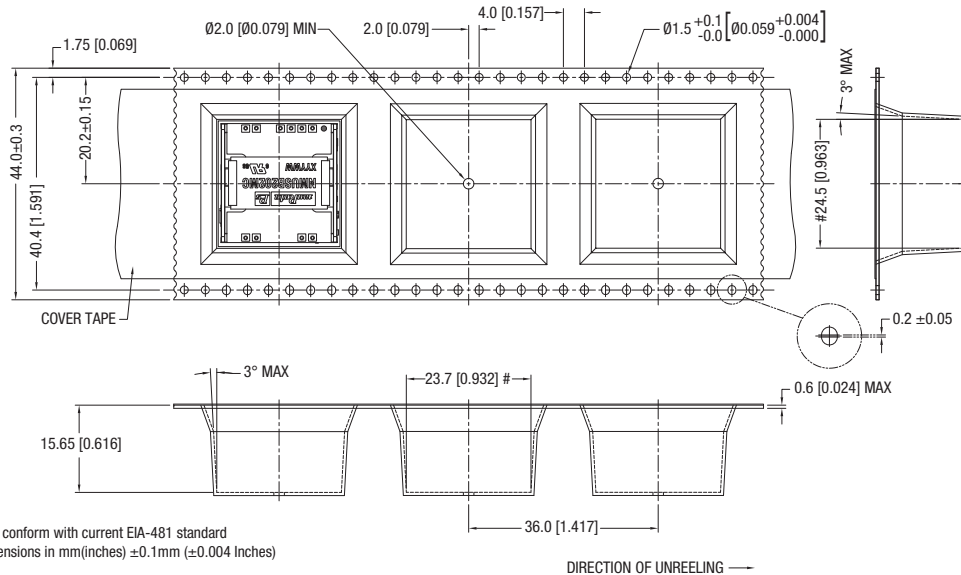
Tape & Reel specifications shall conform with current EIA-481 standard
 Unless otherwise stated all dimensions in mm(inches)
 Controlling dimension is mm
 # Measured at hub
 ## Six equi-spaced slots on 180mm/7" reel

REEL PACKAGING DETAILS



Carrier tape pockets shown are illustrative only - Refer to carrier tape diagram for actual pocket details.
 Reel Quantity: 7" - 23 or 13" - 92

TAPE OUTLINE DIMENSIONS



Tape & Reel specifications shall conform with current EIA-481 standard
 Unless otherwise stated all dimensions in mm(inches) ±0.1mm (±0.004 Inches)
 Controlling dimension is mm
 Components shall be orientated within the carrier tape as indicated
 # Measured on a plane 0.3mm above the bottom pocket

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