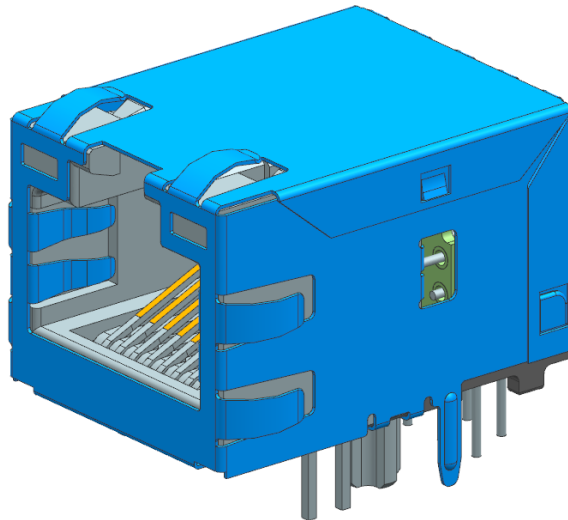
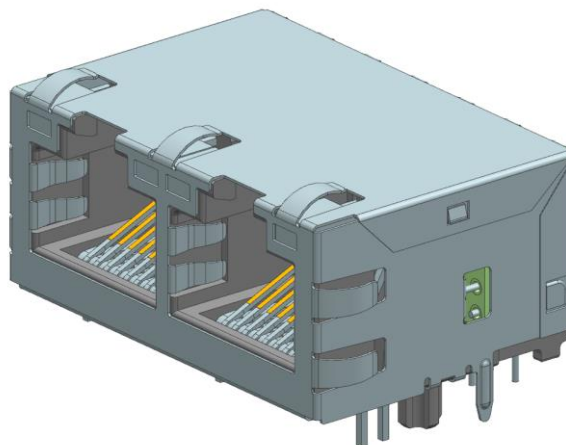


**PRODUCT SPECIFICATION
FOR
MXMag MAGNETIC JACK**



0.85" INVERTED PROFILE SINGLE PORT WITH LEDS WITH EMI SHIELD TABS
(shown as example)



0.85" INVERTED PROFILE DUAL PORT WITH LEDS WITH EMI SHIELD TABS
(shown as example)

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 1 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |



PRODUCT SPECIFICATION

1.0 SCOPE

This specification defines the functionality as well as the mechanical and electrical interfaces for the Molex Family of MXMag Magnetic Jacks.

2.0 PRODUCT DESCRIPTION

The MXMag magnetic connector offers a simple solution for integrating Ethernet magnetics and the RJ-45 connector interface into one integrated package with guaranteed signal integrity, Fast and Gigabit Ethernet, common mode termination and EMI shielding. The connector is available in 0.85" deep Inverted profile, 0.85" deep Standard profile and 1" deep profile versions. The connector includes up to two LED's per port.

3.0 PRODUCT NAME AND SERIES NUMBER

MXMag Single Port Series Connector

| Series Number | | | | |
|---------------|--------------------|---------------|---------------|-------------------|
| Tray | | Tape & Reel | | |
| 3.3mm PHY Pin | 1.8mm PHY Pin | 3.3mm PHY Pin | 1.8mm PHY Pin | Description* |
| 93461 | 93741 | 93753 | 93765 | 0.85" 4C FE STD |
| 93462 | 93742 | 93754 | 93766 | 0.85" 4C FE INV |
| 93463 | 93743 | 93755 | 93767 | 1" 4C FE INV |
| 93626 | 93744 | 93756 | 93768 | 0.85" 8C GIG STD |
| 93627 | 93745/94011 | 93757 | 93769 | 0.85" 8C GIG INV |
| 93628 | 93746 | 93758 | 93770 | 1" 8C GIG INV |
| 93634 | 93747 | 93759 | 93771 | 0.85" 6C FE STD |
| 93635 | 93748 | 93760 | 93772 | 0.85" 6C FE INV |
| 93636 | 93749 | 93761 | 93773 | 0.85" 12C GIG STD |
| 93637 | 93750 | 93762 | 93774 | 0.85" 12C GIG INV |
| 93638 | 93751 | 93763 | 93775 | 1" 6C FE INV |
| 93639 | 93752 | 93764 | 93776 | 1" 12C GIG INV |

MXMag Dual Port Series Connector

| Series Number | | | | |
|----------------|----------------|----------------|----------------|----------------|
| Tray | | Tape & Reel | | |
| 2.7 mm PHY Pin | 2.2 mm PHY Pin | 2.7 mm PHY Pin | 2.2 mm PHY Pin | Description* |
| 93824 | 93828 | 93832 | 93836 | DP 4C FE INV |
| 93825 | 93829 | 93833 | 93837 | DP 6C FE INV |
| 93826 | 93830 | 93834 | 93838 | DP 8C GIG INV |
| 93827 | 93831 | 93835 | 93839 | DP 12C GIG INV |

* 0.85" & 1" refer to connector depth, C = cores, FE = Fast Ethernet, GIG = Gigabit Ethernet, INV = Inverted / Tab-Up, STD = Standard / Tab-Down, DP = Dual Port

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 2 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

4.0 FEATURES

- Range of Fast & Gigabit Ethernet magnetic options
- Integrated Common Mode Termination Circuitry
- Operating Temperature range: SEE RELEVANT SALES DRAWINGS
- 2250 V DC isolation
- Integrated LED options
- Options available for Reflow or Wave soldering process

5.0 SAFETY AGENCY APPROVALS

UL File Number.....E355595

This product is designed as an SELV CIRCUIT and is considered to be powered up by a TELECOMMUNICATION CABLE OR A CABLE DISTRIBUTION SYSTEM. For any other power supply, the requirements of IEC 60950-1 must be taken into consideration.

| | | | |
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| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 3 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

6.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

Molex sales drawing

See relevant sales drawing for information on dimensions, materials, markings and product offerings.

Plating

Contact Surface:

Palladium Nickel With Gold Flash:

Post plate 0.05 μm Min Gold Flash over 1.00 μm Min Palladium Nickel in contact area, 1.90 μm Min pure Tin in tail area, both over 1.270 μm Min Nickel overall.

PHY Terminals: 1.25 μm Min Nickel.

Shield: 1.27 μm Min Nickel, solder tabs post plated with 1.27 μm Min Tin

Molex Packaging Spec

See relevant Sales Drawings

Applicable standards

IEC 60603-7

IEC 60603-7-1

TIA-1096-A

EIA-364-65

IEC 60951-1

IEEE802.3

LED Terminal Pinout

The Magnetic Jack has on-board LEDs that can be controlled directly. Each Magnetic Jack has two LED positions per port with up to two different colours (single or bicolour) per position. The bicolour LEDs are bipolar. Colour change is achieved by reversing voltage using an external switch or relay. Note that the LEDs need external current limitation and voltage adjustment according to the LED characteristics.

See LED Pin out examples below.

| | | | | |
|-------------------------|---|---|--------------------|---------------------|
| REVISION: | ECR/ECN INFORMATION: | TITLE: | | SHEET No. |
| C | <u>ECTR</u> 169633 <u>DATE:</u> 2018/01/04 | PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | | 4 of 21 |
| <u>DOCUMENT NUMBER:</u> | | <u>CREATED / REVISED BY:</u> | <u>CHECKED BY:</u> | <u>APPROVED BY:</u> |
| 934620001 PSP | | DBYRNES | SMCGREEVY | DBYRNES |

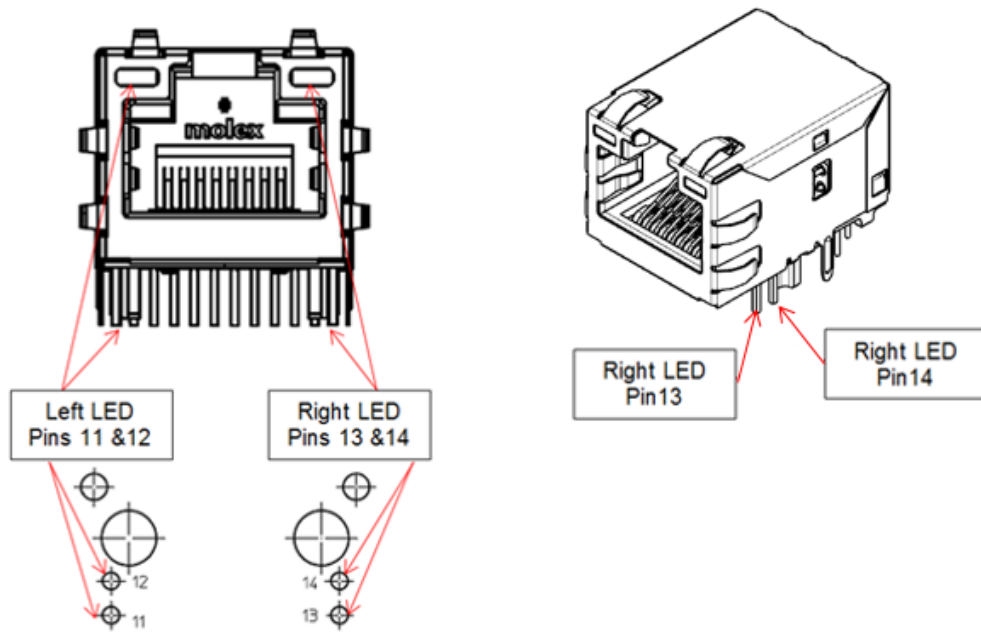


Figure 1: 0.85" Inverted Connector LED Pin-out example

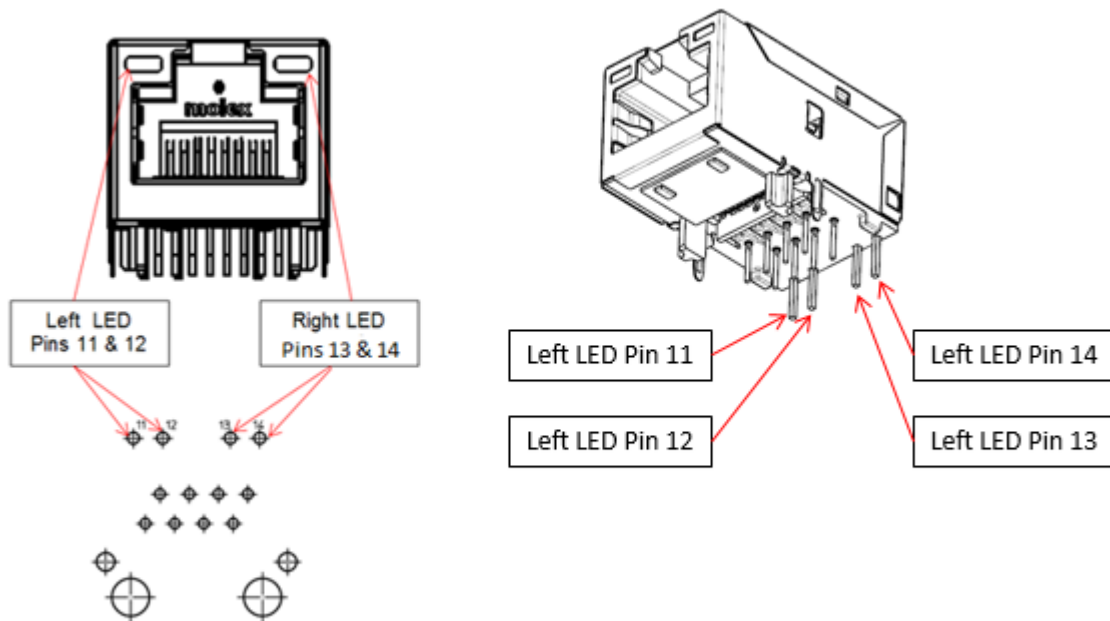


Figure 2: 1" Inverted Connector LED Pin-out example

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 5 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

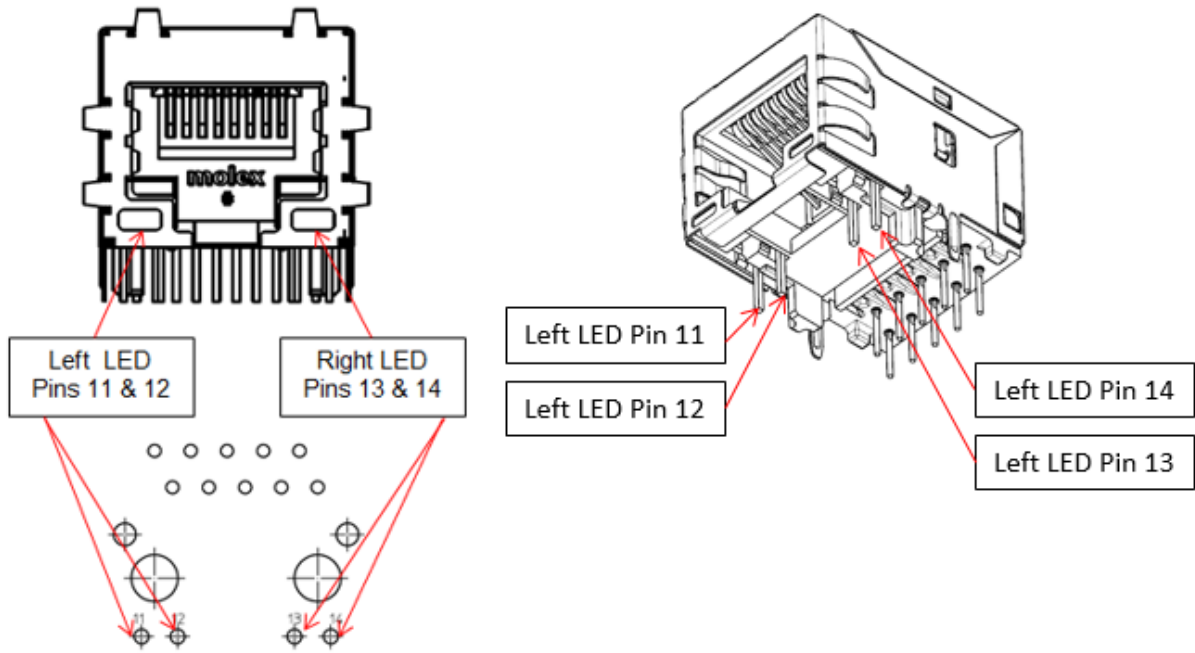


Figure 3: 0.85" Standard Connector LED Pin-out example

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 6 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

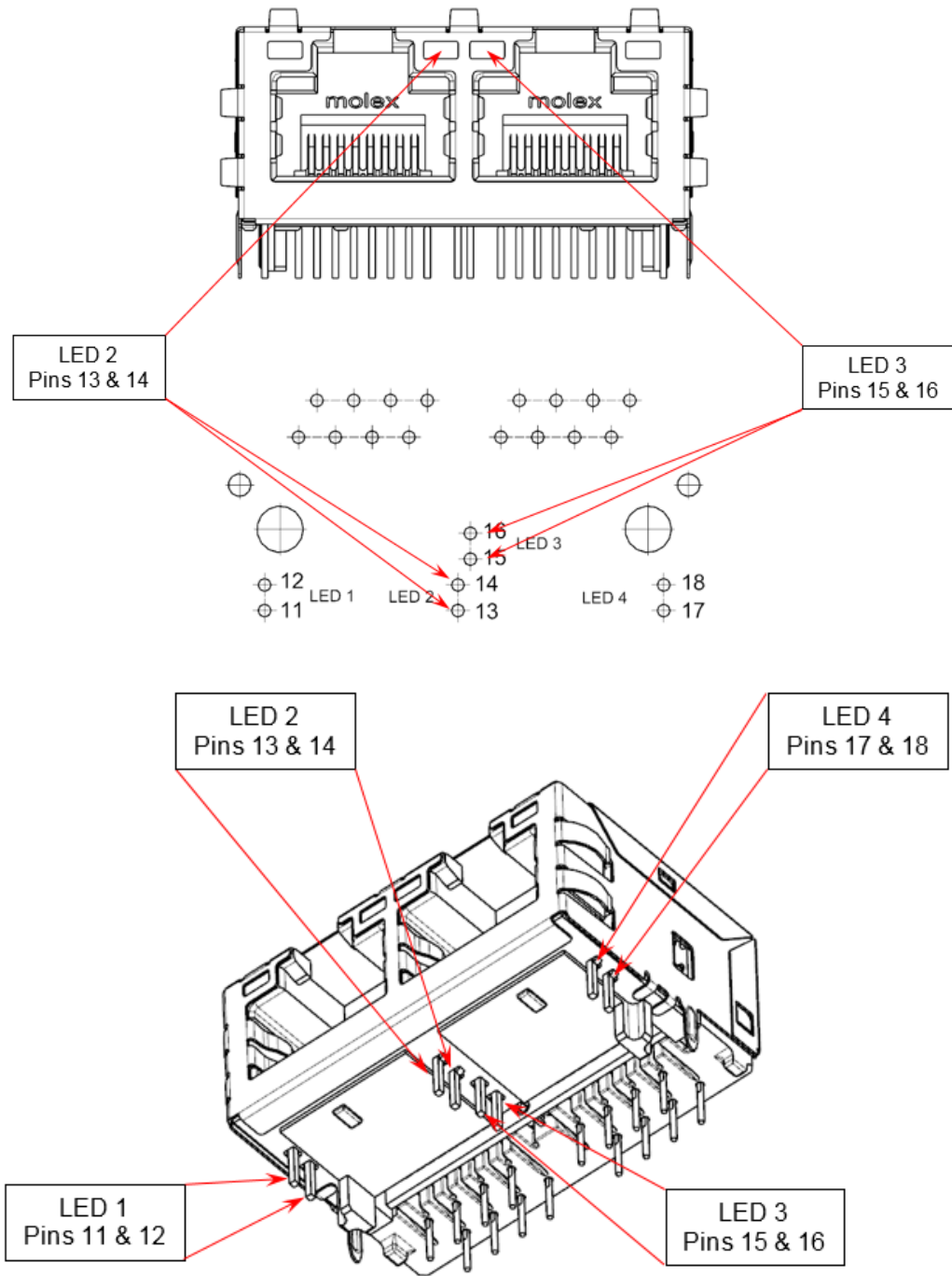


Figure 4: 0.85" Dual Port Inverted Connector LED Pin-out example

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 7 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

LED Electrical Characteristics

The following table contains the electrical characteristics for the LED and the LED terminals on the Magnetic Jack.

All LEDs are low power LEDs according to IEC 62471 /exempt group.

| Parameter | Symbol | Colour | Without 250 Ω Resistor | | With 250 Ω Resistor | | Unit | Condition |
|---------------------|-------------|--------|------------------------|-----|---------------------|-----|------|-------------|
| | | | Min | Max | Min | Max | | |
| Forward Voltage | V_f | Green | 1.8 | 2.4 | 8 | 10 | V | @If = 20 mA |
| | | Orange | 1.8 | 2.4 | 8 | 10 | | |
| | | Yellow | 1.8 | 2.4 | 8 | 10 | | |
| Dominant Wavelength | λ_D | Green | 567 | 575 | 567 | 575 | nm | |
| | | Orange | 600 | 612 | 600 | 612 | | |
| | | Yellow | 585 | 595 | 585 | 595 | | |
| Forward Current | I_f | Green | 5 | 25 | 5 | 25 | mA | N/A |
| | | Orange | 5 | 25 | 5 | 25 | | |
| | | Yellow | 5 | 25 | 5 | 25 | | |
| Luminous Intensity | I_v | Green | 5 | 10 | 5 | 10 | mcd | @If = 10 mA |
| | | Orange | 5 | 10 | 5 | 10 | | |
| | | Yellow | 5 | 10 | 5 | 10 | | |

6.1 ABSOLUTE MAXIMUM RATINGS (TABLE 1)

| Temperature Ranges | |
|---------------------------------|-----------------------------|
| Operating | SEE RELEVANT SALES DRAWINGS |
| Non-operating (No condensation) | -55°C to +85°C |
| Maximum Current | |
| Per RJ45 contact | 0.5 A |

Table 1 – Absolute Max Ratings

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 8 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |



PRODUCT SPECIFICATION

7.0 TEST SCHEDULES

The following tests specify the characteristics to be checked and the requirements to be fulfilled. This test sequence is based on IEC 60603-7 and EIA-364-1000. Where required Molex has modified testing based on the customers' requirements and changes required to accommodate custom requirements of the connector.

For a complete test sequence, a minimum of 90 specimens are needed.

Test Group EP & CZ is customised by Molex for this sequence.

All connectors in each group shall undergo the following tests as described in the sequence given.

All the test group specimens shall be subjected to the preliminary group P tests in the following sequence.

Test group P

| TEST PHASE | DESCRIPTION | TEST CONDITION | REQUIREMENT |
|------------|---|---|--|
| P1 | VISUAL INSPECTION | IEC 60512-1-1 Test 1a | There shall be no defects that would impair normal operation |
| P2 | INITIAL CONTACT RESISTANCE (LOW LEVEL) | Mated connectors: Max test voltage 20 mV DC or AC peak, test current 100 mA DC or AC peak Arrangement acc. IEC 60603-7 Section 7.3 IEC 60512-2-1 Test 2a | 5 mΩ MAXIMUM [Initial] |
| P3 | INSULATION RESISTANCE (PHY TERMINALS TO SHIELD) | Test voltage 100 V DC ± 15V Method A mated connectors IEC 60512-3-1: Test 3a | 500 MΩ Minimum |
| P4 | HI-POT (VOLTAGE PROOF / ISOLATION) | 2250 V DC for 60 seconds. (Between PHY pins + shield to RJ45 Terminals) 500 V DC (LEDs to Shield) 2250 V DC (LEDs to RJ45 Terminals) (IEC 60950-1: 2001 Sub-clause 5.2.2.) | No breakdown |

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 9 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

Test group AP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|---|--|---|
| AP 1 | INSERTION AND WITHDRAWAL FORCES | Connector locking device depressed. PER IEC 60512-13-2, Test 13b | Insertion force 30 N max, Withdrawal force 30 N max. |
| AP 2 | EFFECTIVENESS OF CONNECTOR COUPLING DEVICE. | Rate of load application 44.5 N/s Max PER IEC 60512-15-6, Test 15f | 50 N for 60s ± 5s |
| AP 3 | RAPID CHANGE OF TEMPERATURE | -40°C to 85°C Mated connectors 25 cycles t = 30 min recovery time 2 h PER IEC 60068-2-14 | |
| AP 4 | INSULATION RESISTANCE (PHY terminals to shield) | Test voltage 100V ±15 V DC method a, mated connectors IEC 60512-3-1, Test 3a, Method a. | PER P3 |
| AP 5 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| AP 6 | VOLTAGE PROOF | PER P4 | PER P4 |
| AP 7 | VISUAL EXAMINATION | PER P1 | PER P1 |
| AP 8 | CYCLIC DAMP HEAT | 21 cycles low temperature 25°C high temperature 65°C cold sub-cycle -10°C humidity 93 % Half of the samples in mated state Half of the samples in un-mated state PER IEC 60068-2-38 | |
| AP 9 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 10 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

Test group AP (continued).

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|---|--|---|
| AP 10 | INSERTION AND WITHDRAWAL FORCES | PER AP1 | PER AP1 |
| AP 11 | EFFECTIVENESS OF CONNECTOR COUPLING DEVICE. | Rate of load application 44.5 N/s Max PER IEC 60512-15-6, Test 15f | 50 N for 60s ± 5s |
| AP 12 | VISUAL EXAMINATION | PER P1 | PER P1 |
| AP 13 | SOLDERABILITY | Solder Bath 245°C ± 5°C Immersion Time 5.0 ± 0.5s PER SMES-152 | Solder area will have a minimum of 95% solder coverage. |
| AP 14 | RESISTANCE TO SOLDERING HEAT | For recommended Reflow Profile (See Section 8.0) | Appearance: No Damage. |
| AP 15 | VOLTAGE PROOF | PER P4 | PER P4 |

| | | | |
|--|---|--|---------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 11 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY |
| | | APPROVED BY: DBYRNES | |

Test group BP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|---|--|--|
| BP 1 | LOCKING DEVICE MECHANICAL OPERATIONS. | 5,000 operations | After the specified number of operations, the specimens shall show no visual indication of fatigue or stress cracking of the locking device. |
| BP 2 | HI-POT (VOLTAGE PROOF / ISOLATION) | PER P4 | No breakdown |
| BP 3 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| BP 4 | DURABILITY | EIA-364-09 (perform the rated number of unplug/plug cycles. retention features, such as latches, should not be deactivated.) 2,500 cycles | no evidence of physical damage |
| BP 5 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| BP 6 | HI-POT (VOLTAGE PROOF / ISOLATION) | PER P4 | No breakdown |

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 12 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

Test group CP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|--|--|-----------------------------------|
| CP 1 | VIBRATION | <p>$f = 10 \text{ Hz to } 500 \text{ Hz}$, Amplitude: 0.35 mm Accel 50m/s² 10 sweeps / axis (3axis) Time 2 hours/axis measurement points per section 7.0</p> <p>(For arrangement, See IEC 60603-7, 7.3)</p> <p>PER IEC 60512-6-4, Test 6d</p> | Discontinuities 0.1µs maximum. |
| CP 2 | <p>CONTACT RESISTANCE</p> <p>No disturbance of the free connector to fixed connector electrical connections, between vibration test and contact resistance measurement</p> | PER P2 | 10 mΩ maximum change from initial |
| CP 3 | INSULATION RESISTANCE (PHY terminals to shield) | PER P3 | PER P3 |
| CP 4 | VISUAL EXAMINATION | PER P1 | PER P1 |

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 13 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

Test group DP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|---|--|---|
| DP 1 | ELECTRICAL LOAD AND TEMPERATURE | 500 h 70°C Recovery period 2 h PER IEC 60512-9-2, Test 9b | 1.6 A shield contacts 5 connectors, no current 5 connectors |
| | | | 0.5 A per RJ45 contact. |
| DP 2 | INSULATION RESISTANCE (PHY terminals to shield) | PER P3 | PER P3 |
| DP 3 | VOLTAGE PROOF | PER P4 | PER P4 |
| DP 4 | VISUAL EXAMINATION | PER P1 | PER P1 |
| DP 5 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| DP 6 | N/A | | |
| DP 7 | GAUGING CONTINUITY | All signal contacts and screen/specimens PER IEC 60603-7-3, Annex A | 0.1 μs maximum |

| | | | |
|--|---|--|---------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 14 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY |
| | | APPROVED BY: DBYRNES | |

Test Group EP

| TEST PHASE | TITLE | TEST CONDITION | |
|------------|---------------------|--------------------------------|---|
| EP 1 | Insertion loss (dB) | Mated Connectors | See Relevant Sales Drawings for Part specific Transmission Values |
| EP 2 | Return loss (dB) | Mated Connectors | |
| EP 3 | NEXT loss (dB) | Mated connectors, pair to pair | |
| EP 4 | CMR (dB) | Mated Connectors | |
| EP 5 | OCL (µH min) | Wire Side | |

Test group FP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS | |
|------------|---|--|--|--|
| FP 1 | SURGE TEST Test no. ITU_T K.20:2000 | Mated connectors, Table 2a /2b, Basic test level Tests 2.1.1a, 2.1.1b, 2.1.3, 2.2.1a | Test 2.1 & 2.2: Acceptance criteria A per ITU-T K.44, clause 9 | |
| FP 2 | INSULATION RESISTANCE (PHY terminals to shield) | PER P3 | PER P3 | |
| FP 3 | VISUAL EXAMINATION | PER P1 | PER P1 | |

| | | | |
|--|--|--|---------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 15 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY |
| | | APPROVED BY: DBYRNES | |

Test Group GP

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|--------------------------------|--|--|
| GP1 | HIGH TEMPERATURE (DRY HEAT) | 336 h 70°C Recovery period 2 h PER IEC 60068-2-2, Test Bb | Mated 10 mΩ maximum change from initial |
| GP2 | CYCLIC DAMP HEAT | 21 cycles low temperature 25°C high temperature 65°C cold subcycle -10°C humidity 93 % Half of the samples in mated state Half of the samples in unmated state PER IEC 60068-2-38 | 10 mΩ maximum change from initial |

Test group AZ

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|--------------------------------|---|-----------------------------------|
| AZ1 | HIGH TEMPERATURE (DRY HEAT) | Mate connectors; expose to: 96 hours at 85°C ± 2°C PER IEC 60068-2-2, Test 9b | Use Molex plug 500602-0819 |
| AZ 2 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |

| | | | |
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| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 16 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |



PRODUCT SPECIFICATION

Test group CZ (Use Molex Plug 500602-0819)

| TEST PHASE | TITLE | SEVERITY | REQUIREMENTS |
|------------|---|--|-----------------------------------|
| CZ 1 | CONTACT RESISTANCE | PER P2 | 5 mΩ maximum change from initial |
| CZ 2 | MECHANICAL OPERATIONS | Mate/un-mate connectors 20 cycles, at a maximum rate of 10mm/s maximum. Rest 1s (when mated and when unmated) Locking device inoperative. | No Evidence Of Physical Damage. |
| CZ 3 | TEMPERATURE LIFE PER EIA-364-17, METHOD A (TEMPERATURE AND DURATION PER EIA-364-1000, TABLE 9, 60°C FOR 10YEARS). | Mate Connectors 105°C for 72 hours | Use Molex plug 500602-0819 |
| CZ 4 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| CZ 5 | FLOWING MIXED GAS CORROSION PER EIA 364-65 CLASS IIA | 1/2 samples mated for 336 hours, 1/2 samples unmated for 240 hours, then mated for final 96 hours. (do not place unmated plugs in chamber). | |
| CZ 6 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| CZ 7 | THERMAL DISTURBANCE | Mate Connectors 10 cycles of 15°C ± 3°C to 85°C ± 3°C/ dwell 30 minutes at each temp | |
| CZ 8 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| CZ 9 | RESEATING | Manually unplug/plug the connector or socket. perform 3 such cycles. | No evidence of physical damage |
| CZ 10 | CONTACT RESISTANCE | PER P2 | 10 mΩ maximum change from initial |
| CZ 11 | VISUAL EXAMINATION | PER P1 | PER P1 |

| | | | |
|---------------------------------------|--|---|-----------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 17 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

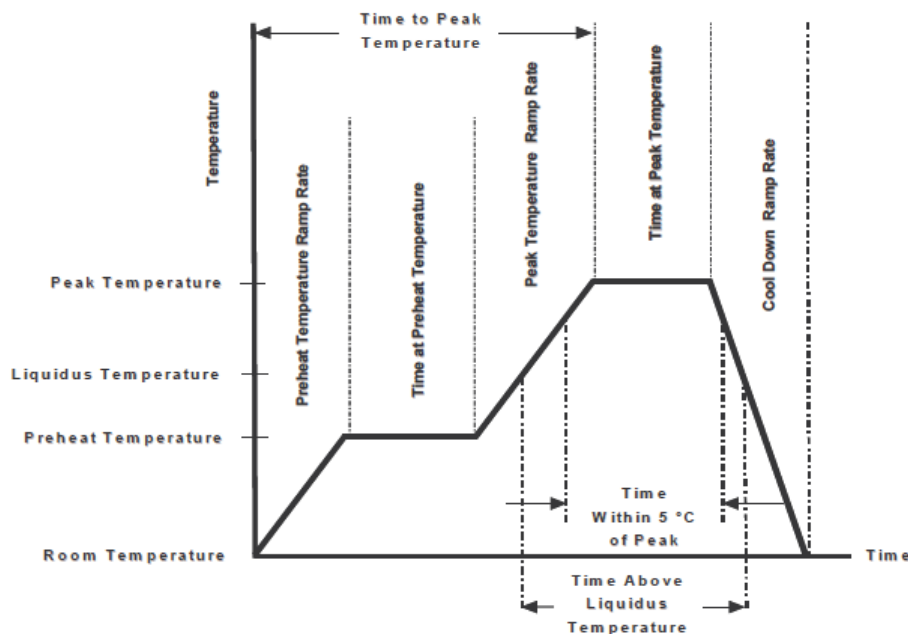
8.0 SOLDERING CONDITIONS.

Recommended

REFLOW SOLDERING SIMULATION PEAK PROFILE REFLOW AT 260 °C

| DESCRIPTION | REQUIREMENT |
|-----------------------------|--------------------------------|
| Solder Type | None |
| Solder Flux Type | None |
| Paste Flux Type | None |
| Average Ramp Rate | 3 °C/second maximum |
| Preheat Temperature | 150 °C minimum; 200 °C maximum |
| Preheat Time | 60 to 180 seconds |
| Ramp to Peak | 3 °C/second maximum |
| Time over Liquidus (217 °C) | 60 to 150 seconds |
| Peak Temperature | 260 °C +0/-5 °C |
| Time within 5 °C of peak | 20 to 40 seconds |
| Ramp – Cool Down | 6 °C/second maximum |
| Time 25 °C to Peak | 8 minutes maximum |

Table 1 – Reflow simulation.



NOTE MXMag can only be used in a **NO-WASH** soldering process due to magnetics used.

| | | | |
|--|---|--|--------------------------------|
| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 18 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

9.0 PACKAGING

Parts shall be packaged to protect against damage during handling, transit and storage.
See relevant Packaging specifications.

10.0 ESD PROTECTION

To avoid damage by an electrostatic discharge while installing the connector, ESD packaging has been used. For more details see relevant Packaging specifications.

11.0 GAUGES AND FIXTURES

Arrangement for contact resistance test:
Arrangement acc. IEC60603-7 section 7.2

Arrangement for vibration test:
Arrangement acc. IEC60603-7 section 7.3

12.0 QUALITY ASSURANCE PROVISIONS

The applicable Molex Inspection plan specifies the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with applicable product drawings and this specification.

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| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 19 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |

13.0 APPENDIX B

The norms and standards cited in the following sections are applicable.

| Standard | Test | Description |
|----------------|------|---|
| IEC 60068-2-14 | | Environmental testing – Part 2-14: Tests – Test N: Change of Temperature |
| IEC 60068-2-20 | | Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads |
| IEC 60068-2-38 | | Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test |
| IEC 60068-2-60 | | Environmental testing - Part 2: Tests - Test Ke: Flowing mixed gas corrosion test |
| IEC 60068-2-78 | | Environmental testing - Part 2-78: Tests; Test Cab: Damp heat, steady state |
| IEC 60512-2-1 | 2a | Part 2-1: Electrical continuity and contact resistance tests; Test 2a: Contact resistance - Millivolt level method |
| IEC 60512-3-1 | 3a | Part 3-1: Insulation tests; Test 3a: Insulation resistance |
| IEC 60512-6 | 12a | Part 6: Climatic tests and soldering tests: Test 12a: Solderability, wetting, solder bath method. |
| IEC 60512-6-3 | 6c | Part 6-3: Dynamic stress tests; Test 6c: Shock |
| IEC 60512-6-4 | 6d | Connectors for electronic equipment - Tests and measurements - Part 6-4: Dynamic stress tests - Test 6d: Vibration (sinusoidal) |
| IEC 60512-9-1 | 9a | Part 9-1: Endurance tests - Test 9a: Mechanical operation |
| IEC 60512-9-2 | 9b | Connectors for electronic equipment - Tests and measurements - Part 9-2: Endurance tests - Test 9b: Electrical load and temperature |
| IEC 60512-13-2 | 13b | Part 13-2: Mechanical operation tests - Test 13b: Insertion and withdrawal force |
| IEC 60512-15-6 | 15f | Connectors for electronic equipment – Tests and measurements Part 15 - : Connector tests (mechanical) – Test 15f: Effectiveness of connector coupling devices |
| IEC 60603-7 | | Connectors for electronic equipment - Part 7: Detail specification for 8-way, unshielded, free and fixed connectors |
| IEC 60603-7-1 | | Connectors for electronic equipment - Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors |
| IEC 60950-1 | | Information technology equipment – Safety – Part 1: General Requirements |
| IEEE 802.3 | | Standard for Ethernet |

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| REVISION: | ECR/ECN INFORMATION: | TITLE: | SHEET No. |
| C | ECTR 169633 DATE: 2018/01/04 | PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | 20 of 21 |
| DOCUMENT NUMBER: | CREATED / REVISED BY: | CHECKED BY: | APPROVED BY: |
| 934620001 PSP | DBYRNES | SMCGREEVY | DBYRNES |

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| TIA 1096 A | | Connector requirements for connection of Terminal Equipment to the telephone network |
| EIA-364-65 | | Mixed Flowing test procedure for electrical connectors contacts and sockets. |
| EIA-364-17 | | Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors and Sockets |
| EIA-364-1000 | | Environmental Test Methodology For Assessing The Performance Of Electrical Connectors And Sockets |
| | | |
| | | |

Table 2 – Standards Index.

Released Revision Control

| Revision | Change | Person Responsible | ECN No: | Date: |
|----------|---|--------------------|---------|-------------|
| 2 | Release post screen testing | D.Byrnes | | |
| B | Product Testing | D.Byrnes | 109228 | 03-Oct-2016 |
| C | Edited Section AP13 Solderability and added Dual Port | DShea | 169633 | 04-Oct-2017 |
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| REVISION: C | ECR/ECN INFORMATION: ECTR 169633 DATE: 2018/01/04 | TITLE: PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK | SHEET No. 21 of 21 |
| DOCUMENT NUMBER: 934620001 PSP | CREATED / REVISED BY: DBYRNES | CHECKED BY: SMCGREEVY | APPROVED BY: DBYRNES |