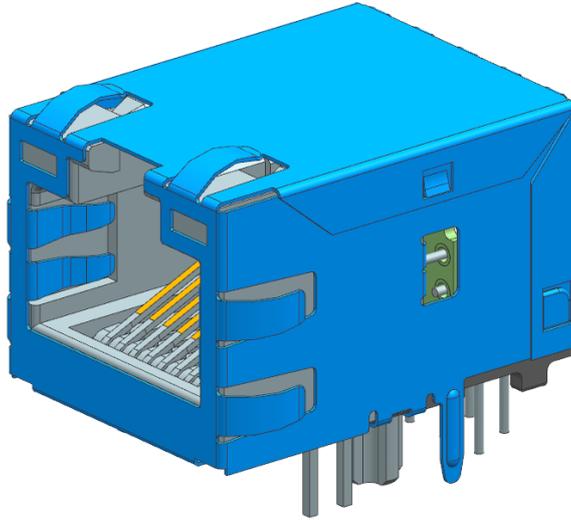
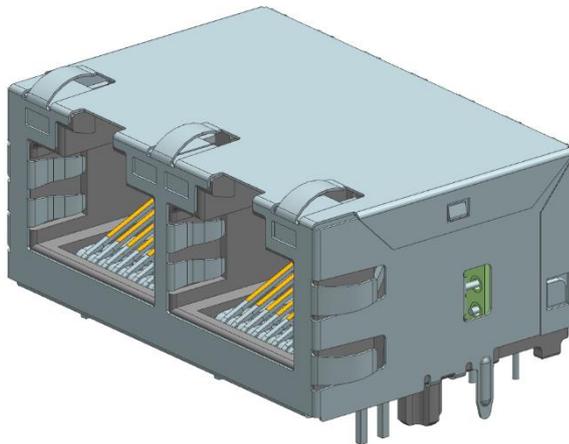


PRODUCT SPECIFICATION FOR MXMag MAGNETIC JACK



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: E	ECM INFORMATION: EC No: 602124 DATE: 2019/01/25	TITLE: MXMAG PRODUCT SPECIFICATION			SHEET No. 1 of 21
DOCUMENT NUMBER: 934620001	DOC TYPE: PS	DOC PART: P	CREATED / REVISED BY: DSHEA	CHECKED BY: DBYRNES	APPROVED BY: DBYRNES

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

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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.....E177474

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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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.

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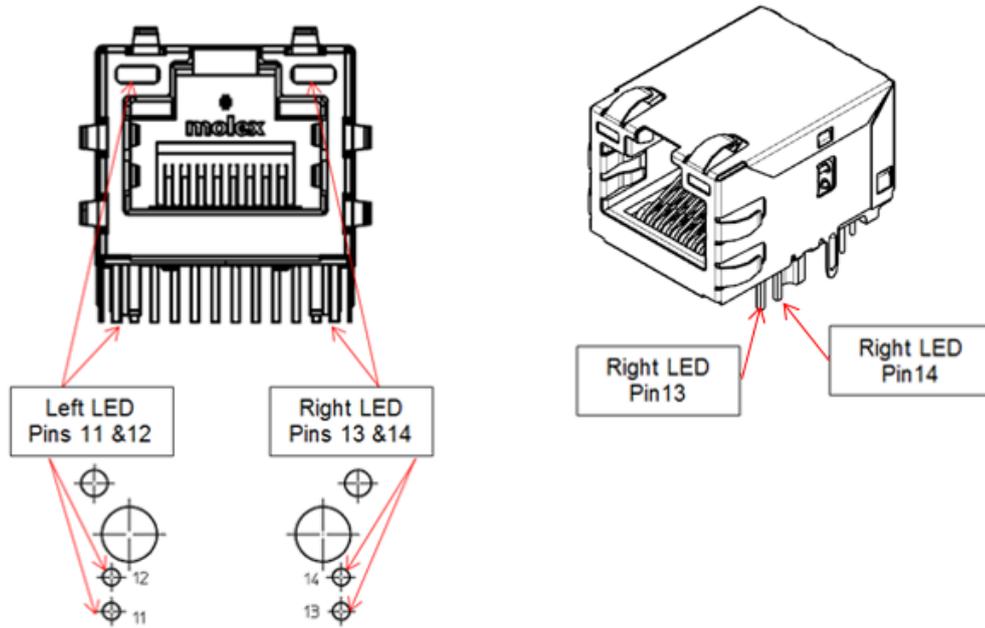


Figure 1: 0.85" Inverted Connector LED Pin-out example

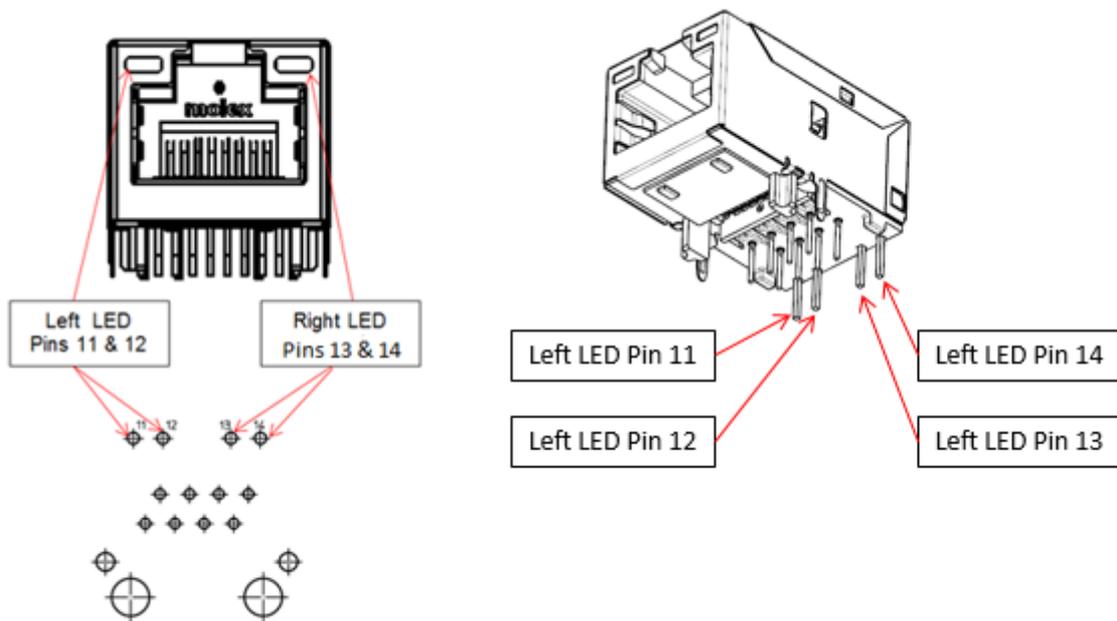


Figure 2: 1" Inverted Connector LED Pin-out example

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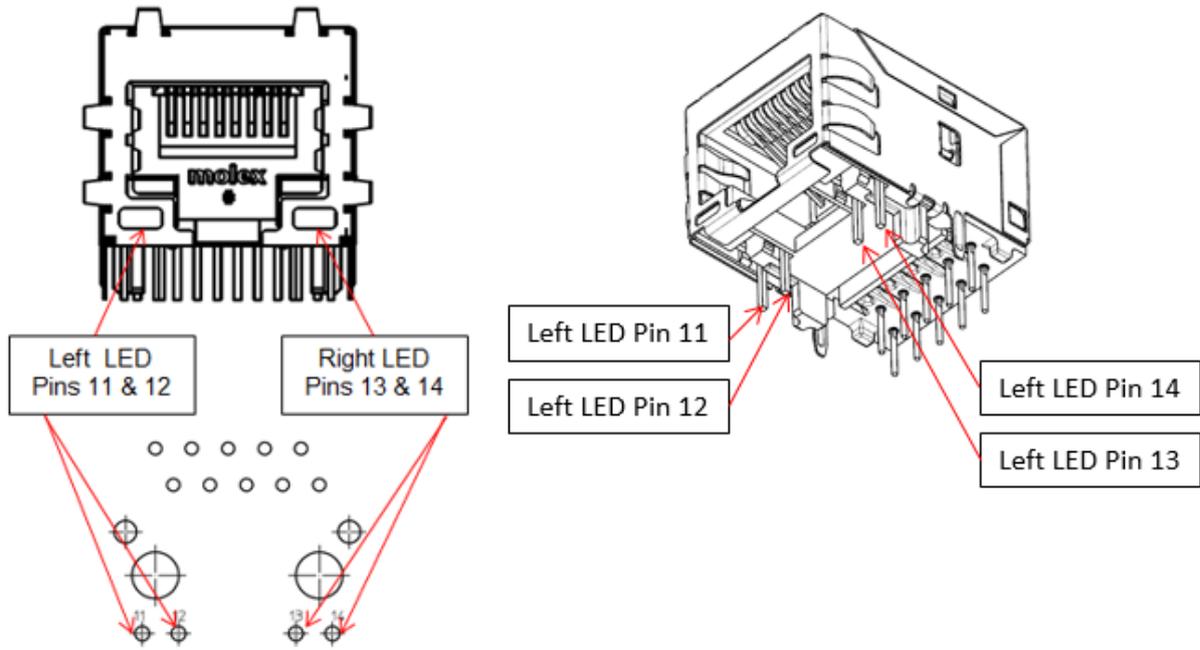


Figure 3: 0.85" Standard Connector LED Pin-out example

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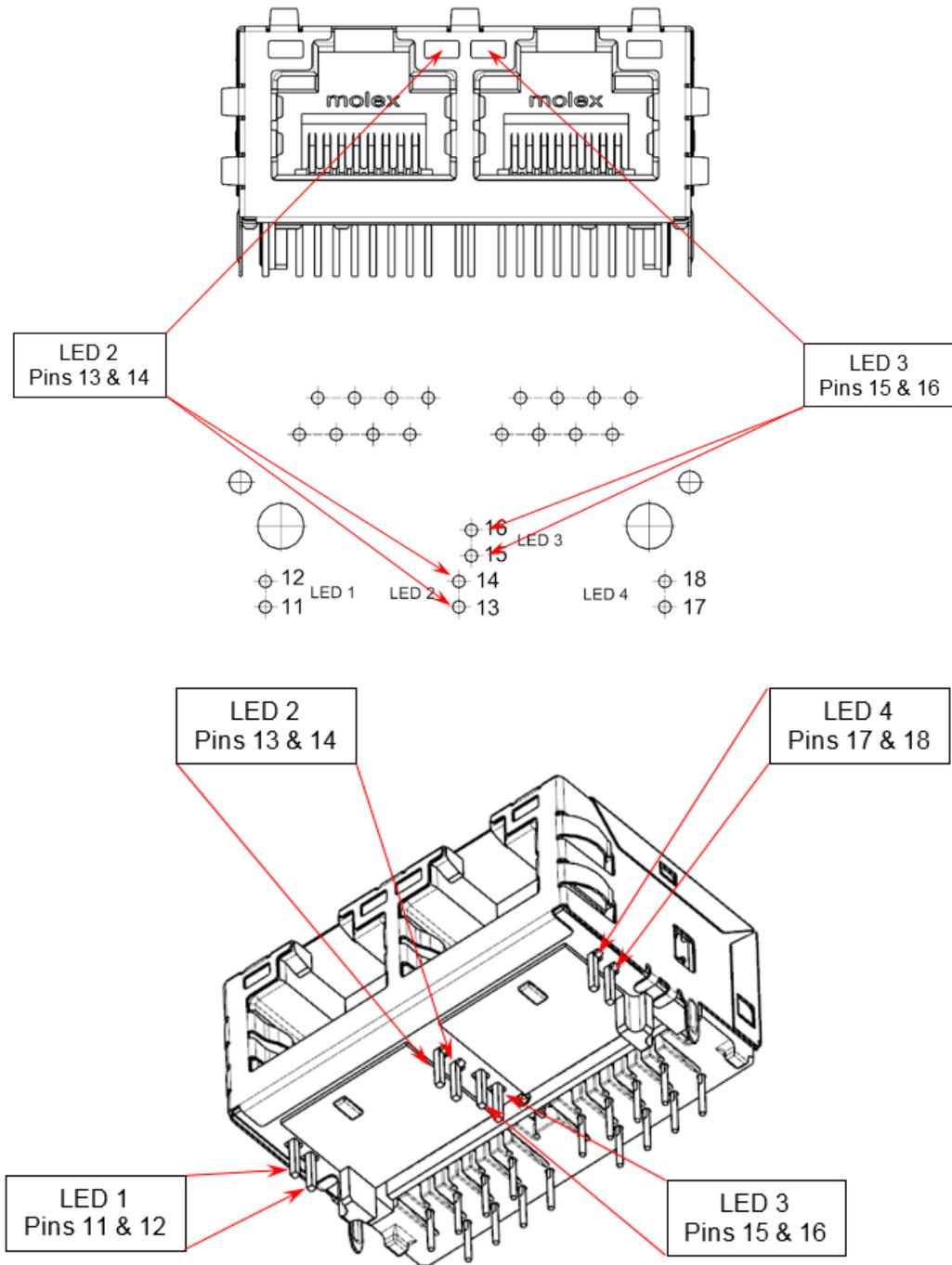


Figure 4: 0.85'' Dual Port Inverted Connector LED Pin-out example

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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	@ $I_f = 20$ 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	@ $I_f = 10$ 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

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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

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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

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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 60 s ± 5 s
AP 12	VISUAL EXAMINATION	PER P1	PER P1
AP 13	SOLDERABILITY	Solder Bath 245 °C ± 3 °C Immersion Time 3.0 s ± 0.3 s PER IEC 60068-2-20 Test Ta Method 1	Solder area will have a minimum of 95% solder coverage.
AP 14	RESISTANCE TO SOLDERING HEAT	For wave solder connectors: Temperature: 260 °C ± 3 °C Immersion Time: 10 s ± 1 s PER IEC 60068-2-20 Test Tb Method 1 For recommended Reflow Profile (See Section 8.0)	Appearance: No Damage.
AP 15	VOLTAGE PROOF	PER P4	PER P4

REVISION: E	ECM INFORMATION: EC No: 602124 DATE: 2019/01/25	TITLE: MXMAG PRODUCT SPECIFICATION	SHEET No. 11 of 21
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PRODUCT SPECIFICATION

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

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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 0.1 μ s 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 m Ω maximum change from initial
CP 3	INSULATION RESISTANCE (PHY terminals to shield)	PER P3	PER P3
CP 4	VISUAL EXAMINATION	PER P1	PER P1

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PRODUCT SPECIFICATION

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

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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	

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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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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	1.0 MECHANICAL OPERATIONS 2.0	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, ½ 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

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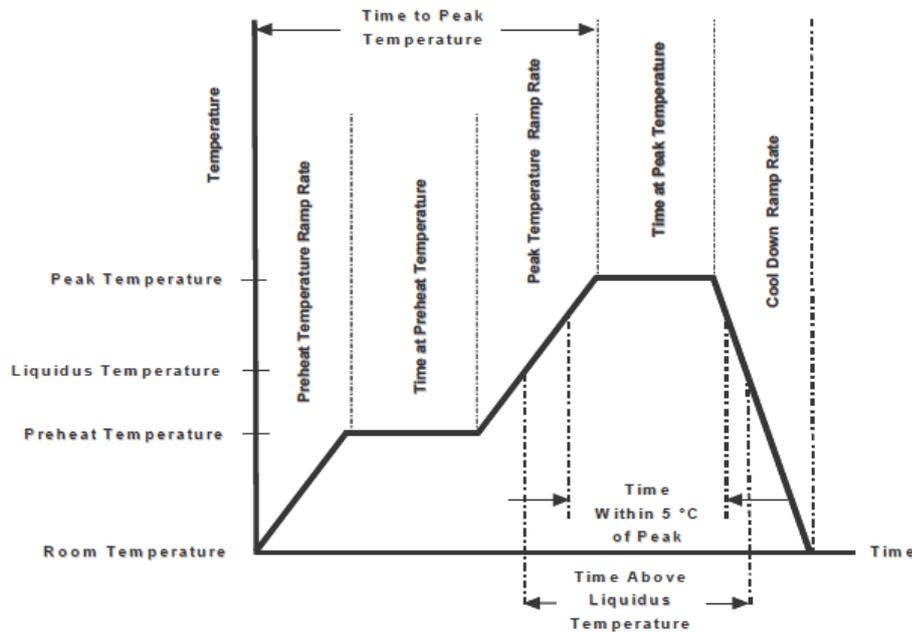
8.0 SOLDERING CONDITIONS.

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 2 – Reflow simulation.



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

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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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<small>TEMPLATE FILENAME: PRODUCT_SPEC[SIZE_A4](V.3).DOC</small>						

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 2-2-: 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

REVISION: E	ECM INFORMATION: EC No: 602124 DATE: 2019/01/25	TITLE: MXMAG PRODUCT SPECIFICATION	SHEET No. 20 of 21		
DOCUMENT NUMBER: 934620001	DOC TYPE: PS	DOC PART: P	CREATED / REVISED BY: DSHEA	CHECKED BY: DBYRNES	APPROVED BY: DBYRNES



PRODUCT SPECIFICATION

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 3 – 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
D	Updated UL File Number	DShea	606445	02-Oct-2018
E	Updated Sections AP13 and AP14	DShea	602124	19-Dec-2018

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