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REPORT

ON

PROGRAMMABLE CONTROLLERS - NRAQ

HIRSCHMANN AUTOMATION AND CONTROL GMBH  
NECKARTENZLINGEN, GERMANY

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## DESCRIPTION

## PRODUCT COVERED:

USL, CNL - Listed Open Type, Programmable Controllers -

Cat. Nos. MSP, followed by 3, followed by 0 or 2, followed by dash, followed by 08, 16 or 24, followed by 04, followed by 0, followed by S, T or E, followed by C or P, may be followed by up to 16 numbers and/or letters.

Cat. Nos. MSM, followed by 20, 24, 40 or 42, followed by dash, followed by T1, M2, M4, S2, S4, L2, G2, C1, IO or 99, followed by T1, M2, M4, S2, S4, L2, G2, C1, IO or 99, followed by T1, M2, M4, S2, S4, L2, G2, C1, IO or 99, followed by S, T or E, may be followed by up to 14 numbers and/or letters.

## GENERAL:

These devices (MSP/MSM-Family) are industrial control Ethernet LAN devices for DIN-rail mounting and intended for use in industrial automation applications. The MSP devices are capable to get equipped with MSM-Family modular media modules. The system is microcomputer-based and communicates via interfaces through wire or optical ports.

These devices are intended for field wiring.

## TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

USL - Indicates investigation to United States Standard  
UL 508 17th edition (Industrial Control Equipment).

CNL - Indicates Investigated to Canadian National Standard  
C22.2 No. 142-1987.

Note: USL = United States Standards - Listed  
CNL = Canadian National Standards - Listed

## ELECTRICAL RATINGS:

## MSP MICE Switch Power Modules:

*Cat. No.	Supply Voltage, V DC (#)	Input Current, A (#)
MSP3008..C..	24-48	1.5 - 0.8
MSP3016..C..		2.0 - 1.0
MSP3024..C..		2.5 - 1.3
MSP3208..P..	PoE: 48 (45-57 min/max limits)	3.3 - 2.9
MSP3216..P..	PoE+: 54 (51-57 min/max limits)	3.5 - 3.2
MSP3224..P..	(##)	3.8 - 3.3

## Notes:

(#) - The total power consumption is made up of the power of the MSP MICE Switch Power Modules and the power of the MSM MICE Switch Media Modules.

(##) - PoE = Power Over Ethernet; PoE+ = Power Over Ethernet with increased minimum supply voltage.

Digital Input: -32..+32 V DC, 15mA  
Digital Output: 30 V DC, 1A Resistive (Relay Output)

## MSM MICE Switch Media Modules:

The MICE Switch Media Modules MSM have no separate power supply, they are supplied via the backplane of the MSP modules.

Digital Input: -32..+32 V DC, 15mA  
Digital Output (4x): Each 30 V DC, 1A Resistive (MSMx4-..IO.. only)

## ENVIRONMENTAL RATINGS:

Pollution degree:	2
Overvoltage Category:	III
Max. surrounding air temperature:	60°C

## NOMENCLATURE BREAKDOWN - MSP family (MICE Switch Power modules):

MSP	3	0	-	08	04	0	S	C	...
I	II	III	IV	V	VI	VII	VIII	IX	X-XVI

- I Product designation:  
MSP - MICE Switch Power
- II Bit rate:  
3 - 10/100 and 10/100/1000 Mbit/s ports
- III Hardware type:  
0 - Standard  
2 - Suitable for PoE/POE+ capable
- IV Dash
- V Number of 10/100 Mbit/s ports:  
08 - 8 x 10/100 Mbit/s Ethernet ports  
16 - 16 x 10/100 Mbit/s Ethernet ports  
24 - 24 x 10/100 Mbit/s Ethernet ports
- VI Number of 10/100/1000 Mbit/s ports:  
04 - 4 x 10/100/1000 Mbit/s Ethernet ports
- VII Number of 10/100/1000/10000 Mbit/s ports:  
0 - 0 x 10/100/1000/10000 Mbit/s Ethernet ports
- VIII Temperature range:  
S - Standard 0°C up to 60°C  
T - Extended -40°C up to 60°C  
E - Extended -40°C up to 60°C inclusive conformal coating
- IX Voltage range:  
Options C and P each have 2 voltage inputs for redundant voltage supply.  
C - 24-48 VDC - Only for MSP30  
P - 48 VDC nominal (PoE) or 54 VDC nominal (PoE+) - Only for MSP32
- X-XVI For information only - Up to 16 numbers and/or letters:

## Represents:

- xx - Other approvals/declarations (2 digits)  
xx - Software package (2 digits)  
xx - Customization (2 digits)  
x - Software configuration (1 digit)  
xx - Software level (2 digits)  
xxxxx - Software version (5 digits)  
xx - Maintenance

## NOMENCLATURE BREAKDOWN - MSM family (media modules):

MSM	2	0	-	T1	T1	T1	T1	S	...
I	II	III	IV	V	VI	VII	VIII	IX	X

- I Product designation:  
MSM - MICE Switch Media Module
- II Bit rate:  
2 - 10/100 Mbit/s ports  
4 - 10/100/1000 Mbit/s ports
- III Hardware type:  
0 - Standard (both MSP2x and MSP4x)  
2 - PoE or POE+ capable (only MSP4x)  
4 - IO capable (only MSP2x)
- IV Dash
- V First port configuration:  
T1 - Twisted Pair (TX) / RJ45  
M2 - Multimode FX DSC (only 100 Mbps)  
M4 - Multimode FX ST (only 100 Mbps)  
S2 - Singlemode FX DSC (only 100 Mbps)  
S4 - Singlemode FX ST (only 100 Mbps)  
L2 - Singlemode Long Haul FX DSC (only 100 Mbps)  
G2 - Singlemode Long Haul FX DSC 200km (only 100 Mbps)  
C1 - Combo Port Twisted Pair (TX) / RJ45 and Fiber Optic SFP Cage  
IO - Digital Input / Output  
99 - None
- VI Second port configuration:  
Identical options as for first port in item V.
- VII Third port configuration:  
Identical options as for first port in item V.
- VIII Fourth port configuration:  
Identical options as for first port in item V.
- IX Temperature range:  
S - Standard 0°C up to 60°C  
T - Extended -40°C up to 60°C  
E - Extended -40°C up to 60°C inclusive conformal coating
- X-XV For information only - Up to 14 numbers and/or letters:  
Represent:  
xx - Other approvals/declarations (2 digits)  
xx - Customization (2 digits)  
x - Configuration (1 digit)  
x - Software configuration (1 digit)  
xxxxx - Software version (5 digits)  
xxx - Maintenance

Combination options for the MSP MICE Switch Power Modules:

I	II+III	IV	V	VI	VII	VIII	IX	X-XVI
MSP	30	-	08, 16, 24	04	0	S	C	...
MSP	32	-	08, 16, 24	04	0	S	P	...

Number of ports and connections for the MSP MICE Switch Power Modules:

Basic Module	Total No. of MSM slots	No. of slots for 10/100 Mbits/s	No. of slots for 1000 Mbits/s	Max. No. of connectable network 10/100 Mbit/s segments	Max. No. of connectable network 10/100 Mbit/s segments
MSP30-08.. MSP32-08..	3	2	1	12	4
MSP30-16.. MSP32-16..	5	4	1	20	4
MSP30-24.. MSP32-24..	7	6	1	28	4

Combination options for the MSM MICE Switch Media Modules:

I	II+III	IV	V	VI	VII	VIII	IX	X-XV		
MSM	40	-	T1	T1	T1	T1	S	...		
MSM	42		C1	C1	C1	C1				
MSM	40		M2	T1	T1	T1				
MSM	20		S2							
MSM			M4							
MSM			S4							
MSM			L2							
MSM			G2							
MSM			M2	M2					T1	T1
MSM			S2	S2					M2	M2
MSM			M4	M4						
MSM			S4	S4						
MSM			L2	L2						
MSM			G2	G2						
MSM			M2	M2	S2	S2				
MSM			24	M4	M4	M4			M4	
MSM				S4	S4	S4			S4	
MSM				L2	L2	L2			L2	
MSM				G2	G2	G2			G2	
MSM				IO	IO	IO			IO	
MSM				IO	IO	IO			IO	

## CONSTRUCTION DETAILS:

The general design, shape and arrangement shall be as shown in the following description and in the accompanying photographs, except where variations are specifically described.

Capacitors - All capacitors are non-oil filled (other than Askarel), except where specifically described as Recognized Component capacitors.

Tolerances - Unless specified otherwise, all indicated dimensions are nominal.

Corrosion Protection - All parts not made from aluminum are of corrosion resistant material or are plated or painted as corrosion protection. All main housing parts are made from aluminum and do not require any further corrosion protection.

Printed Wiring Boards - R/C (ZPMV2/8), rated min. V-2, min. 105°C, suitable for direct support of uninsulated live parts in accordance with UL 796 (CTI min. 3 or better), unless specified otherwise. Refer to Recognized Component Directory for solder temperature and dwell time limits.

Grounding terminals - The pressure wire connectors intended for connection of a field-installed equipment grounding conductor shall be plainly identified such as being marked "G", "GR", "GRD", "Ground", "Grounding" or similar designation or with a grounding symbol (IEC 417, symbol 5019).

Mechanical Assembly - Housing parts and component mounting assemblies are reliably secured by plated steel screws.

Lithium batteries - Not included.

Conformal coatings - Printed wiring boards may be optionally coated with R/C (QMJU2/8) coatings, minimum thickness not specified.

UL Spacings - The spacings other than those required for field wiring terminal blocks have been evaluated according to the UL Standard UL 840 "Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment".

Spacings are not specified for circuitries located in low-voltage areas, other than between the low voltage circuit and primary circuits.

The following spacings have to be met when evaluating according to UL840:

Clearances - Minimum acceptable clearances according to UL 840, table 8.1:

Table I:

Phase-to-ground rated system voltage, Overvoltage Category III	Clearance, mm Pollution degree 2
100V	0.5

Creepages - Minimum acceptable creepage distances according to UL 840, table 9.1, other than on printed wiring boards:

Table II:

Operating voltage in Volts ac, dc or rms	Clearance, mm Pollution degree 2, Material Group IIIa,b
63	1.25

Creepage on PWB - Minimum acceptable creepage distances on printed wiring boards according to UL 840, table 9.2:

Table III:

Operating voltage in Volts ac, dc or rms	Clearance, mm Pollution degree 2
63	0.063



CSA Spacings - The spacings other than those required for field wiring terminal blocks have been evaluated according to the CSA 22.2 No. 142.

The following spacings have to be met:

Clearances and creepage - Minimum acceptable distances according to CSA 22.2 No. 142, table 3, item 2, other than on printed wiring boards:

Table IV:

Voltage range, V	Clearance, mm	Creepage, mm
31-150	1.2	1.2

Creepage on PWB - Minimum acceptable creepage distances on printed wiring boards according to CSA 22.2 No. 142, table 4:

Table V:

Volts ac rms or dc	Clearance, mm Pollution degree 2
50	0.85
100	1.0

UL and CSA spacings at field wiring terminals - Clearances and creepages at field wiring terminals are evaluated according to UL 508, Section 36, Table 36.1 column B, and CSA 22.2 No. 142, Table 3, item 2. The required distances are as follows:

Table VI:

Potential involved in Volts rms ac or dc	Clearance, mm	Creepage, mm
UL - 51-150	1.6	3.2
CSA - 31-150	3.2	3.2

Markings - The markings shall be applied as indicated.

Permanency of Marking - Any marking that is required to be permanent and located on the housing shall be molded, die-stamped, paint-stenciled, stamped or etched metal that is permanently secured, or indelibly stamped lettering on a pressure-sensitive label secured by adhesive.

The following markings are required to be permanently located on the enclosure and shall be visible when the devices are mounted singularly. These markings may be on the side of the device, and are not required to be visible when the device is mounted next to other devices:

1. Manufacturer's name.
2. Electrical rating(s) as shown under RATINGS. An output device having more than one rating (i.e. amperes and HP) shall have at least one rating marked on the device. Additional ratings may be marked either on the device or on a stuffer sheet referenced on the device and provided in each smallest shipping container.
3. Catalog number.

The following markings are shipped separately with the device:

1. Max. Surrounding air temperature rating as indicated under RATINGS.
2. Temperature rating of field installed conductors ("Use 75°C conductors only"). (NOTE: This marking is not required when intended for connection to control circuit conductors only.)
3. Wiring terminals shall be marked to indicate the proper connections for the power supply, load, control circuit, and the like, or a wiring diagram coded to the terminal marking shall be provided.
4. "Use Copper Conductors only".
5. The terminal tightening torque of lbs-in (Nm) shall be marked on the device or in the instruction manual.
6. "For use in Pollution Degree 2 Environment only" or equivalent.

The following marking shall be on or adjacent to the component referred to.

1. A pressure wire connector intended for connection of a field-installed equipment grounding conductor shall be green-colored or plainly identified, such as being marked "G", "GR", "GRD", "GND", "GRND", "Ground", "Grounding", or the like. The symbol found in IEC Publication 417, Symbol 5019, may also be used.

Installation Instructions - Shall be provided and include a wiring diagram.

Model MSP32-08040TP..  
MSP MICE Switch Power Module

Fig. 1-22

General - Figure 1-22 show various views of the complete mounted and disassembled model MSP32-08040TP.. with printed wiring board top and bottom sides, and with the printed wiring boards removed from their respective housing and cooling parts. Unless indicated otherwise, these figures represent all MSP MICE Switch Power Modules.

Housing parts and external connection means not soldered to PWB:

1. Housing (sides) - Two provided, used as housing and cooling plates for the MSP power supply hardware boards (standard and PoE/POE+ capable), made from die-cast aluminum [AlSi9Cu3(Fe)]. Overall dimensions 133 x 32.8 x 119.7 mm, outside powder-coated, each fixed by screws to item 3. See Illustration 1 for detailed further dimensions.
2. Housing (front, top, bottom) - Stamped and formed, made from one single aluminum sheet, 1 mm thick, overall dimensions 117 x 133 x 55.8 mm, provided with vent openings 11 x 2.4 mm on top and bottom, fixed by 8 screws to item 1. See Illustration 2 for further dimensions.
3. Backplane housing, cover plate - Made from aluminum, 2.0 mm thick, fixed by min. 16 screws to item 4, provided as follows for the MSP MICE Switch Power Modules:

Module	Overall dimensions	No. and size of openings for backplane connectors	Ill. No.
MSP3xx08..	133 x 4.8 x 236,4 mm	1x 17.1 x 39.0 mm 1x 17.1 x 12.5 mm 3x 17.1 x 64.0 mm	3
MSP3xx16..	133 x 4.8 x 313,6 mm	1x 17.1 x 39.0 mm 1x 17.1 x 12.5 mm 5x 17.1 x 64.0 mm	4
MSP3xx24..	133 x 4.8 x 390,8 mm	1x 17.1 x 39.0 mm 1x 17.1 x 12.5 mm 7x 17.1 x 64.0 mm	5

4. Backplane housing, bottom (heat sink) - Made from die-cast aluminum, provided with two DIN-Rail mounting foots (see item 10), provided as follows for the MSP MICE Switch Power Modules:

Module	Overall dimensions	No. of slots for MSM modules	Ill. No.
MSP3xx08..	133 x 4.8 x 236.6 mm	3	6
MSP3xx16..	133 x 4.8 x 313.8 mm	5	7
MSP3xx24..	133 x 4.8 x 391.0 mm	7	8

Housing parts and external connection means not soldered to PWB (cont'd):

5. Mounting brackets - Made of sheet steel, used to mount the MSM MICE Switch Media Modules to the backplane, screwed to item 4, provided as follows for the MSP MICE Switch Power Modules:

Module	Lower bracket, overall dimensions	No. of mounting screws	Ill. No.
MSP3xx08..	115.2 x 15 x 1 mm	3	9
MSP3xx16..	192.4 x 15 x 1 mm	4	10
MSP3xx24..	269.6 x 15 x 1 mm	5	11

Module	Upper bracket, overall dimensions	No. of mounting screws	Ill. No.
MSP3xx08..	115.2 x 23.3 x 0.5 mm	3	12
MSP3xx16..	192.4 x 23.3 x 0.5 mm	4	13
MSP3xx24..	269.6 x 23.3 x 0.5 mm	5	14

6. Protection caps - Used for transportation purposes to protect unused slots, made from any R/C (QMFZ2/8) polymeric material, rated min. HB, up to three, five or seven provided for MSP3xx08.., MSP3xx16.. or MSP3xx24.. respectively.
7. Terminal blocks (4-pole plugs) - Two provided, used for redundant power supply input and 1 digital output (signaling only) per terminal block, R/C (XCFR2/8) type 313511XX with XX=04 (4-pole), manufactured by METZ CONNECT USA INC (E121004), rated 300V, 10A, UG D, 105°C, 4.5 lb-in (0.5 Nm), suitable for field wiring, to AWG 28-12 conductors.
8. Terminal block (4-pole plug) - Used for digital input, R/C (XCFR2/8) type 313791XX with XX=04 (4-pole), manufactured by METZ CONNECT USA INC (E121004), rated 300V, 8A, UG C, 105°C, 3 lb-in (0.34 Nm), suitable for field wiring, to AWG 28-16 conductors.
9. Hex spacer bolts - Five provided for MICE Power Supply Board, 4 provided for the MICE PoE Power Supply Board (not provided for MSP30..). Each bolt measures 5.5 mm by 19 mm overall length, 13 mm effective spacer distance.
10. DIN-Rail Mounting foots - Two provided die-cast aluminum, see Illustration 23.

## MICE Power Supply Board:

General - This board is fixed with 5 screws to the housing. A fixed distance to the housing is maintained by 1 spacer bolt per screw, see item 9 above.

1. Terminal block (4-pole header) (CO102) - R/C (XCFR2/8) type MSTBO2.5/4-GR-5.08, manufactured by PHOENIX CONTACT GMBH & CO KG (E60425), rated 300V, 10A, UG D, 105°C.
2. Terminal block (4-pole header) (CO101) - R/C (XCFR2/8) type MSTBO2.5/4-GL-5.08, manufactured by PHOENIX CONTACT GMBH & CO KG (E60425), rated 300V, 10A, UG D, 105°C.
3. Terminal block (4-pole header) (CO601) - R/C (XCFR2/8) type 313921XX with XX=04 (4-pole), manufactured by METZ CONNECT USA INC (E121004), rated 300V, 8A, UG D, 105°C.
4. RJ45 / USB port connector (CO301) - Any manufacturer, for signaling only.
5. Connector (CO501) - Any R/C (ECBT2/8) 55-pole male PWB connector, various manufacturers, located in limited voltage signaling circuit.
6. Connector (CO103) - R/C (ECBT2/8) 3-pole male connector, Series "ERmet", type "Power Module", rated 250V, 10A, 130°C, located in limited voltage circuit.
7. PWB connector (CO201) - R/C (ECBT2/8) 10-pole female PWB connector, manufactured by Samtec, type SSM-105-L-DV-BE-TR-M, rated 3.5A, 450V, 125°C.
8. DC EMI Capacitors (C201..C203) - Rated 47 nF, minimum 60V dc.
9. Varistors (RV201, RV203..RV206) - Rated min. 60V dc.
10. Varistor (RV207) - R/C (VZCA2), CSA Certified (Class 2221-01, File 241538), Cat. No. SIOVS07K60, manufactured by EPCOS (ZHUHAI FTZ) CO LTD (E321126), rated 60V, prefix "SIOV" is optional for both UL and CSA.
11. Varistor (RV208) - R/C (VZCA2), CSA Certified (Class 2221-01, File 241538), Cat. No. SIOVS10K680, manufactured by EPCOS (ZHUHAI FTZ) CO LTD (E321126), rated 680V, prefix "SIOV" is optional for both UL and CSA.
12. Double Schottky-diode (D201) - Type STTH2003CG, rated 10A, 300V, T<sub>j</sub> 175°C, manufactured by ST Microelectronics. Heat transfer paste is provided between the diode case and the housing.  
  
Alternate - Any manufacturer and type, rated min. 60V 10A, T<sub>j</sub> 175°C.
13. SMD Fuse (F201) - R/C (JDYX2/8) Cat. No. 452 or 454, rated 7A, 60Vdc, 50A IR, manufactured by LITTELFUSE INC (E10480).  
  
Alternate - Any R/C (JDYX2/8) supplemental fuse, rated min. 7A, min. 60Vdc, min. 50A IR.

## MICE Power Supply Board (cont'd):

14. SMD MOSFET (Q202) - Type SUM90P10-19L, rated 100V, 9.9 A,  $T_j$  175°C, manufactured by Vishay.
15. Common mode choke (TR201) - Type WE-CMB HC, part No. 7448225007, rated 2 x 0.7 mH, 5A (@70°C), 250V, overall dimensions 13 x 16.6 x 20.0 mm, constructed as follows:
  - A. Base - R/C (QMFZ2/8) "LONGLITE" type T375J, manufactured by CHANG CHUN PLASTICS CO LTD (E59481), min. thickness 2.2 mm, color BK or BN (rated V-0, HWI 0, HAI 0, CTI 3, RTI elec 150°C).
  - B. Core - Ferrit core, measures 14.5 mm OD, 9.5 mm width, 3.3 mm thick (dimensions incl. core insulation).
  - C. Core coating - R/C (QMFZ2) Epoxy Potting Compound, type 506A/B, manufactured by GUANGZHOU CITY PO-TE COMPOUND MATERIAL CO LTD (E343922), 0.6 mm thick (all colors, RTI elec 90°C, generic).
  - D. Magnet Wire - R/C (OBMW2) magnet wire, MW80-C (155°C), type UEFN/U, 0.70 mm dia, manufactured by PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD (E201757).
  - E. Spacer - R/C (QMFZ2/8) "Ultramid" type A3X2G5, manufactured by BASF CORP (E36632), min. thickness 2.0 mm, 10 x 7 mm (rated V-0, HWI 0, HAI 0, CTI 0, 19kV/mm, RTI elec 120°C).
  - F. Glue - R/C (QMFZ2/8) Epoxy Molding Compound, type CKE-660, manufactured by CHINA KYOTOKU ENTERPRISE CO LTD (E221448), min. thickness 0.8 mm, color GY (rated V-2, RTI elec/str 130°C generic). Used to fix the spacer in item E.
16. Common mode choke (TR202) - Type WE-CMBH, part No. 744834407, rated 2 x 7 mH, 3.5A (@70°C), 250V, overall dimensions 20.2 x 28.0 x 32.5 mm, constructed as follows:
  - A. Base - R/C (QMFZ2/8) "Ultramid" type A3X2G5, manufactured by BASF CORP (E36632), min. thickness 1.35 mm, 10 x 7 mm, color NC or BK (rated V-0, HWI 0, HAI 0, CTI 0, 19kV/mm, RTI elec 120°C).
  - B. Core - Ferrit core, measures 22.4 mm OD, 13 mm width, 4.4 mm thick (dimensions incl. core insulation).
  - C. Core coating - R/C (QMFZ2) Epoxy Casting Compound, type A-010A, manufactured by NEWRIXU ELECTRONIC MATERIAL COMPANY CO LTD (E257126), 0.6 mm thick (color GN, RTI elec 90°C, generic).
  - D. Magnet Wire - R/C (OBMW2) magnet wire, MW82C (180°C) or MW79C (155°C), type UEF1/U, 0.70 mm dia, manufactured by PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD (E201757).

## MICE Power Supply Board (cont'd):

17. Electrolytic capacitors (C226, C227) - Type KY, Part No. EKY-101ELL331MM20S, rated 330uF, 100V, 105°C, manufactured by Nippon.  
  
Alternate - Same ratings as above, type 150 RMI, Part No. MAL2150 90183E3, manufactured by Vishay.
18. DC/DC linear voltage regulator IC (IC202) - Type TPS7A4001 DGN, rated 100V, T 125°C, peak output current internally limited, manufactured by Texas Instruments.
19. Resistors (R216, R240) - Rated min. 22 Ohm, 0.25W.
20. Resistors (R214, R215) - Rated min. 2.7K Ohm, 0.25W.
21. Transistor (Q203) - Type UFZT653TA, rated 100V, 2A, T 150°C, manufactured by Diodes Inc. (Zeta).
22. Resistor (R217) - Rated min. 1 Ohm, 0.25W.
23. Inverting switching regulator IC (IC204) - Type MC33063A, rated 40V, 1.5A, T<sub>A</sub> 85°C, manufactured by Texas Instruments or On Semiconductor.
24. Electrolytic capacitor (C241, C227) - Rated min. 47uF, min. 50V.
25. Electrolytic capacitors (C245, C246) - Type EEUFClH821, rated 820uF, 50V, 105°C, manufactured by Panasonic.  
  
Alternate - Same ratings as above, any type and manufacturer.
26. DC/DC converter (IC201) - R/C (QQGQ2/8) model UWE-5/15-Q48NB-C, rated input 18.75Vdc, output 5Vdc, 15A, manufactured by MURATA POWER SOLUTIONS INC (E151252). Heat transfer paste is provided between the DC/DC converter heat sink and the insulation foil, item 27.
27. Foil - R/C (QMFZ2/8) type "Tgard 500", manufactured by LAIRD TECHNOLOGIES (E180840), RTI elec/str 150°C, provided between the DC/DC converter heat sink and the housing, minimum thickness 0.23 mm, 30 mm width by 80 mm length. (Used for heat transfer purposes only, not for insulation or electrical barrier.)
28. SMD Fuse (F202) - R/C (JDYX2/8) Cat. No. 451 or 453, rated 15A, 65Vdc, 50A IR, manufactured by LITTELFUSE INC (E10480).  
  
Alternate - Any R/C (JDYX2/8) supplemental fuse, rated min. 15A, min. 40Vdc, min. 50A IR.

## MICE Power Supply Board (cont'd):

29. Relays (K301, K302) - R/C (NRNT2/8) Cat. No. V23079-G2008-B301, rated 125Vdc/0.5A GP, 30Vdc/2A resistive, T<sub>A</sub> 85°C, manufactured by TE CONNECTIVITY SOLUTIONS GMBH (E111441).  
  
Alternate - R/C (NRNT2/8) Cat. No. TX2SS-3V-Z, rated 30Vdc/2A resistive, 110Vdc/0.3A resistive, manufactured by PANASONIC CORPORATION (E43149).
30. Resistors (R401..R404) - Rated min. 10k Ohm, 0.25W.
31. Resistors (R401..R404) - Rated min. 30k Ohm, 63mW.
32. Optocouplers (IC401, IC501, IC502, IC601, IC603) - R/C (FPQU2/8) Cat. No. PC3H7 (prefix PC is optional), rated 2500V isolation voltage, max. operating temperature 110°, manufactured by SHARP CORP ELECTRONIC COMPONENTS AND DEVICES DIV (E64380).
33. SMD suppressor diodes (D601, D606) - Rated min. 30V, 5W.



## PoE/PoE+ Board:

General - This board is provided for MSP32.. models only. The board is fixed with 4 screws to the housing. A fixed distance to the housing is maintained by 1 spacer bolt per screw, see item 9 above for description of housing parts and external connection means.

1. PWB connector (CO101) - R/C (ECBT2.E111594), CSA Certified (6233-01/090871\_0\_000) 10-pole male PWB connector, manufactured by SAMTEC, type DW-05-14-G-D-710, rated 3A, 250V, 120°C.

Alternate - Any R/C (ECBT2/8) 10 pole male PWB connector, same ratings as above.

2. DC EMI Capacitors (C201..C203) - Same as for MICE Power Supply Board, item 8.
3. Varistors (RV201, RV203, RV205) - Same as for MICE Power Supply Board, item 9.
4. Double Schottky-diode (D201) - Same as for MICE Power Supply Board, item 12.
5. SMD Fuse (F201) - Same as for MICE Power Supply Board, item 13.
6. SMD MOSFET (Q202) - Same as for MICE Power Supply Board, item 14. Heat transfer paste is provided between the MOSFET case and the housing.
7. Common mode choke (TR201) - Same as for MICE Power Supply Board, item 15.
8. Common mode choke (TR202) - Same as for MICE Power Supply Board, item 16.
9. Electrolytic capacitors (C226, C227, 231, 237, 238) - Type AX, rated 47uF, 100V, 105°C, manufactured by Suncon (Sanyo).

Alternate - Same ratings as above, type RVI, manufactured by Vishay-BC Components.

10. Fuses (F202..F204) - R/C (JDYX2/8) Cat. No. 451 or 453, rated 3.5A, 125Vdc, manufactured by LITTELFUSE INC (E10480).

Alternate - Any R/C (JDYX2/8) supplemental fuse, same ratings as above.

11. Resistors (R301, R302, R319, R320) - Rated min. 10k Ohm, 0.25W.
12. Resistors (R303, R326) - Rated min. 100k Ohm, 63mW.
13. Optocouplers (IC302..IC304) - Same as for MICE Power Supply Board, item 33.
14. Connector (CO102) - Same as for MICE Power Supply Board, item 6.

## Backplane board:

General - This board is supplied limited voltage (5V) and supplies the MICE Switch Media Modules (MSMs) via the multi-pole backplane connectors. This board is housed in aluminum housing parts as described in item 3 and 4, housing parts and external connection means.

1. PWB connectors - R/C (ECBT2/8) multi-pole connectors, three different types provided:

Connector type 1: 55-pole female PWB connector, various manufacturers.  
Connector type 2: 110-pole female PWB connector, various manufacturers.  
Connector type 3: 3-pole male connector, Series "ERmet", type "Power Module", rated 250V, 10A, 130°C.

Module	Connector Type	No. of connectors
MSP3xx08..	1	1
	2	3
	3	5
MSP3xx16..	1	1
	2	5
	3	7
MSP3xx24..	1	1
	2	7
	3	9

## MSM MICE Switch Media Modules

Fig. 23-31

## Overview of Figures:

Fig. No.	MSM Module
23	Overview
24	MSM20-M2M2T1T1..
25	MSM20-M2M2M2M2..
26	MSM20-M4M4T1T1..
27	MSM20-S2S2S2S2..
28	MSM24-IOIOIOIO..
29	MSM40-T1T1T1T1..
30	MSM40-C1C1C1C1..
31	MSM42-T1T1T1T1..

General - Figure 23-31 show various MSM MICE Switch Media Modules. These figures represent all MSM MICE Switch Media Modules. All MSM MICE Switch Media Modules are supplied by Limited Voltage via the MSP backplanes. Unless specified otherwise, the following items are applicable for all MSM MICE Switch Media Modules.

1. Main housing - Overall dimensions 111.7 x 107.4 x 38.2 mm, R/C (QMFZ2/8) material, rated min. HB, min. RTI str 85°C. See Illustration 15.
2. Back housing part - Overall dimensions 132.6 x 38.2 x 7.2 mm, R/C (QMFZ2/8) material, rated min. HB, min. RTI str 85°C. See Illustration 16.
3. Bottom housing part - Made from aluminum, 1.9 mm thick, overall dimensions 115.3 x 34.1 mm, fixed by one or more screws as applicable for the various models, provided as follows for the MSM MICE Switch Media Modules:

Module	Ill. No.
MSM20-M2M2T1T1..	17
MSM20-M2M2M2M2..	18
MSM20-M4M4T1T1..	17
MSM20-S2S2S2S2..	18
MSM20-S4T1T1T1..	19
MSM24-IOIOIOIO..	20
MSM40-T1T1T1T1..	21
MSM40-C1C1C1C1..	22

4. Mounting spring - Made steel, one provided.
5. PWB connector - R/C (ECBT2/8) 110-pole female PWB connector, various manufacturers.
6. Connector - Provided for MSM42.. only. Same as for MICE Power Supply Board, item 6.

Model MSM24-IOIOIOIO..

Fig. 32

General - Figure 32 shows the printed wiring boards of the I/O capable model MSM24-IOIOIOIO.., provided with 4 digital inputs and 4 digital outputs.

1. Terminal blocks (plugs) - R/C (XCFR2/8) type 313511XX, one provided with XX=04 (4-pole), one with XX=08 (8-pole), one with XX=12 (12-pole), manufactured by METZ CONNECT USA INC (E121004), rated 300V, 10A, UG D, 105°C, 4.5 lb-in (0.5 Nm), suitable for field wiring, to AWG 28-12 conductors.
2. Terminal block (header) (CO804, CO801, CO802)- R/C (XCFR2/8) type 313921XX, one provided with XX=02 (2-pole), one with XX=08 (8-pole), one with XX=12 (12-pole), manufactured by METZ CONNECT USA INC (E121004), rated 300V, 8A, UG D, 105°C.
3. Relays (K210, K220, K230, K240) - Four provided, same as for MICE Power Supply Board, item 29.
4. SMD suppressor diodes (D501, D506, D511, D516) - Rated min. 30V, 5W.
5. Optocouplers (IC404, IC501..504) - R/C (FPQU2/8) Cat. No. PC3H7 (prefix PC is optional), rated 2500V isolation voltage, max. operating temperature 110°, manufactured by SHARP CORP ELECTRONIC COMPONENTS AND DEVICES DIV (E64380).
6. DC/DC converter (IC406) - R/C (QQGQ2/8) model PKR 2221A SI, rated input 18..36Vdc, output 2x 12Vdc, 0.62A, 15W, manufactured by ERICSSON AB (E210157).