

# PCA, mDOM-Mainboard-Connector, Molex 1053141208, Breakdown Voltage, +

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## **MOLEX Connector 1053141208, PCB Footprint**



- □ Pad size 2.1mm x 1.6mm
- □ Pad to pad clearance > 0.9mm





### **MOLEX Nano-Fit Connector, Features**



The smallest, fully-isolated headers in the market Deliver up to 69% PCB space savings

Optional TPA (Terminal Position Assurance) retainer Ensures terminals are fully seated in the housing to reduce terminal back-out Retains terminals if main retention feature fails

Positive-lock housing with anti-snag design Ensures mated connector assemblies will not accidentally disengage Provides an audible click while mating Protects latch from damage due to wire snags

Terminal interface with four points of contact Offers redundant, secondary current paths for long-term performance and reliability

SMT version enables use of multi-layer boards by eliminating the need for through holes Opens up real estate on space-constricted PCBs

Potentially reduces costs by enabling use of smaller PCBs with fewer drilled holes

Terminals and headers available in gold and tin plating Delivers different cost options while meeting performance need

#### Multiple mechanical keying and color-coded options

Allow same-circuit, multiple-connector use with virtually no chance of cross mating Color coding provides visual indication of the proper mating connector — enabling faster assembly

Ultra-low mate force terminal Reduces operator fatigue and improves assembly compliance for high-circuit applications

#### Fully isolated terminals

Protect against potential damage of the header and receptacle terminals during handling and mating

Retention tang and contact rib Maintains stable contact

SMT headers provide short electrical paths Deliver superior signal integrity performance





CRIMP TERMINALS

### **MOLEX Nano-Fit Connector, Spec.**



#### VOLTAGE \* 4.1

250 Volts AC(RMS)/DC. \* This connector voltage rating meets the connector level provided by the safety agency.

#### 4.2 APPLICABLE WIRES

Maximum Insulation	Stranded copper 26 AWG: 1.27 mm MAXIMUM
Diameter and Applicable	Stranded copper 24 AWG: 1.27 mm MAXIMUM
Wire Gauges	Stranded copper 22 AWG: 1.57 mm MAXIMUM
	Stranded copper 20 AWG: 1.57 mm MAXIMUM

Wire to Board Current Rating (Amp Max.) (As tested with tinned copper wire and gold 15u" plated terminals)														
Connector fully loaded with all circuits powered														
AWG	Ckt Size(Single row)						Ckt Size(Dual row)							
Wire Size	2	3	4	5	6	7	8	4	6	8	10	12	14	16
20	8.00	*7.75	*7.50	*7.25	*7.00	*6.75	6.50	7.50	*7.17	*6.83	*6.50	*6.17	*5.83	5.50
22	6.50	*6.17	*5.83	*5.50	*5.17	*4.83	4.50	5.50	*5.25	*5.00	*4.75	*4.50	*4.25	4.00
24	6.00	*5.75	*5.50	*5.25	*5.00	*4.75	4.50	5.50	*5.17	*4.83	*4.50	*4.17	*3.83	3.50
26	5.00	*4.75	*4.50	*4.25	*4.00	*3.75	3.50	4.00	*3.83	*3.67	*3.50	*3.33	*3.17	3.00

### **MOLEX Nano-Fit Connector, Spec. Cont.**



### 4.4 TEMPERATURE

Operating temperature (including T-rise from applied current) is rated -40°C to 105°C for tin) or 115°C (for gold) Field temperatures and field life: Tested per EIA-364-1000.01 to meet field temperature of 65°C for 10 years life per table-8.

### 4.5 DURABILITY

Tin plated: 25 cycles\* Gold plated: 50 cycles\*

\* When tested in accordance with EIA-364-1000.01 test method (see Sec. 7.0 of this specification). Durability per EIA-364-09

### 5.0 QUALIFICATION.

Laboratory conditions and sample selection are in accordance with EIA-364-1000.01.

□ Link to specs and literature

### **IPC-2221A, Electrical Conductor Spacing**



- Copied from IPC-2221A (May 2003)
- Molex PCB footprint, pad to pad clearance: 0.9mm
- Max. voltage between pads / traces is 72V
- Connector pads on top side will be fully polymer coated
- Solder pads on bottom side will get conformal coating after soldering
- Note "any elevation" means the minimum of the Paschen's curve

Voltage	Minimum Spacing										
Conductors		Bare	Board	Assembly							
(DC of AC Peaks)	B1	B2	B3	B4	A5	A6	A7				
0-15	0.05 mm	0.1 mm	0.1 mm	0.05 mm	0.13 mm	0.13 mm	0.13 mm				
	[0.00197 in]	[0.0039 in]	[0.0039 in]	[0.00197 in]	[0.00512 in]	[0.00512 in]	[0.00512 in]				
16-30	0.05 mm	0.1 mm	0.1 mm	0.05 mm	0.13 mm	0.25 mm	0.13 mm				
	[0.00197 in]	[0.0039 in]	[0.0039 in]	[0.00197 in]	[0.00512 in]	[0.00984 in]	[0.00512 in]				
31-50	0.1 mm	0.6 mm	0.6 mm	0.13 mm	0.13 mm	0.4 mm	0.13 mm				
	[0.0039 in]	[0.024 in]	[0.024 in]	[0.00512 in]	[0.00512 in]	[0.016 in]	[0.00512 in]				
51-100	0.1 mm	0.6 mm	1.5 mm	0.13 mm	0.13 mm	0.5 mm	0.13 mm				
	[0.0039 in]	[0.024 in]	[0.0591 in]	[0.00512 in]	[0.00512 in]	[0.020 in]	[0.00512 in]				
101-150	0.2 mm	0.6 mm	3.2 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm				
	[0.0079 in]	[0.024 in]	[0.126 in]	[0.016 in]	[0.016 in]	[0.031 in]	[0.016 in]				
151-170	0.2 mm	1.25 mm	3.2 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm				
	[0.0079 in]	[0.0492 in]	[0.126 in]	[0.016 in]	[0.016 in]	[0.031 in]	[0.016 in]				
171-250	0.2 mm	1.25 mm	6.4 mm	0.4 mm	0.4 mm	0.8 mm	0.4 mm				
	[0.0079 in]	[0.0492 in]	[0.252 in]	[0.016 in]	[0.016 in]	[0.031 in]	[0.016 in]				
251-300	0.2 mm	1.25 mm	12.5 mm	0.4 mm	0.4 mm	0.8 mm	0.8 mm				
	[0.0079 in]	[0.0492 in]	[0.4921 in]	[0.016 in]	[0.016 in]	[0.031 in]	[0.031 in]				
301-500	0.25 mm	2.5 mm	12.5 mm	0.8 mm	0.8 mm	1.5 mm	0.8 mm				
	[0.00984 in]	[0.0984 in]	[0.4921 in]	[0.031 in]	[0.031 in]	[0.0591 in]	[0.031 in]				
> 500 See para. 6.3 for calc.	0.0025 mm /volt	0.005 mm /volt	0.025 mm /volt	0.00305 mm /volt	0.00305 mm /volt	0.00305 mm /volt	0.00305 mm /volt				

B1 - Internal Conductors

B2 - External Conductors, uncoated, sea level to 3050 m [10,007 feet]

B3 - External Conductors, uncoated, over 3050 m [10,007 feet]

B4 - External Conductors, with permanent polymer coating (any elevation)

A5 - External Conductors, with conformal coating over assembly (any elevation)

A6 - External Component lead/termination, uncoated, sea level to 3050 m [10,007 feet]

A7 - External Component lead termination, with conformal coating (any elevation)

### **Reasons to stay with the Molex connector**



- □ Enough clearance available, creepage not expected
- □ The mDOM will be floaded with Nitrogen (less hygroscopic than air)
- □ Redundant terminal construction (4 points of contact)
- □ The typical pad to pad voltage will be between 30V to 40V, not exceed 72V
- □ High peak current of 6A (when switching / hot plugging, short cable, lab conditions)
- □ Typical amount of plugging cycles will be 2
  - □ Mainboard test and mDOM assembly
- □ Mechanically more robust, higher contact pressure
- □ Well tested and documented, see the product spec
- □ Easier handling (esp. unplugging)

## Backup



## **Assembly Test at DESY**

Molex cable connector









### Breakdown Voltage according to Paschen's Law



- □ Might not be directly applicable, but could be used for interpolation
- □ Two flat parallel copper electrodes in air, seperated by 1 inch
- □ ~42kV @ 25.4mm
- > ~1500V @ 0.9mm



### **Breakdown Voltage calculated, for 500mbar**



- □ According to this formular:
- □ @ 0.9mm -> 2930V
- □ Applicable?
  - Lt is not a uniform field

For air at atmospheric pressure for uniform fields, the breakdown voltage in kV (expressed as  $V_B/kV$ ) is

$$V_B/kV = 24.4\rho d + 6.53\sqrt{\rho d}$$
, (12)

where d is in cm (for 0.01 cm  $\leq d \leq 20$  cm), and

$$\rho = \frac{p}{1013mbar} \frac{293K}{T/^{\circ}C + 273K},$$
(13)

which has been gained from averaging several experimental results, Allen (2000) [14]. It has accuracy within 1 percent. Further factors influencing the breakdown voltage include gap distance, pressure, electrode geometry (radius of curvature), electrode material, and contaminations, such as humidity, dust. These factors are discussed next.