IEEE 802.3 DTE Power via MDI

Patch Panel/Outlet/Cable Current Considerations

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Key Messages

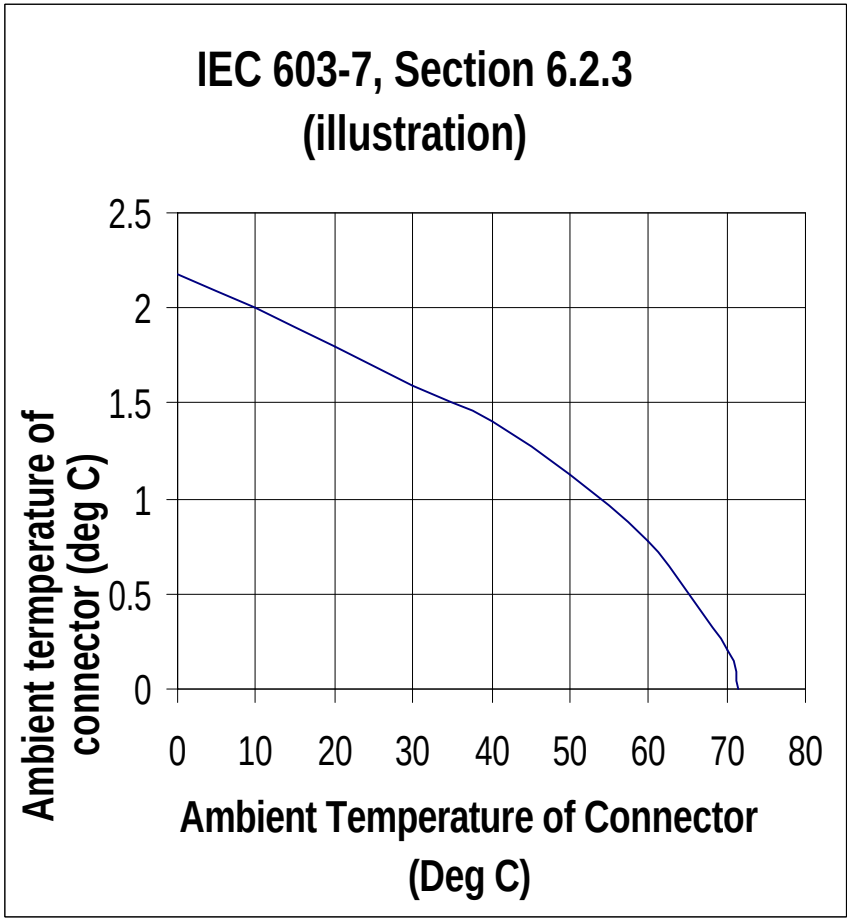
- UL safety limits suggest ~>1.0 amp continuous allowable
- CEI IEC 603-7 - Current capacity for connectors
  - Depending on target ambient range, Current can be > 1.0 A
- PCB limits
  - Dense PCB limit guideline: ~0.3 amp
  - Practical to design to up to >1.0 amp
- Mail to IEEE exploder (Kee, 2/3/2000)
  - Sought information on equipment current limits
  - No responses indicating equipment needing < 250-300ma
- FCC data on cable currents
  - Guidance on cable current at 25^{o} C ambient (and 40^{o} C rise): Safe currents: ~ 0.8 amp/conductor in 4 pr/25 pr cables
  - No guidelines on derating to higher ambients

Applicable UL Current Limits

- UL1863 Communications Circuit Accessories
  - Fault Current Test: 7.0 amperes for 5 seconds
  - Fault Current Test: 2.2 amperes for 30 minutes
- Rough practical guideline: Meeting UL 1863 would allow support a fault current of 1.3 ampere continuous, at 20^{o} C. (from designers familiar with UL standards and thermal design)

CEI IEC 603-7 - Connectors

- Addresses “Connectors for frequencies below 3 MHz for use with printed boards”
- Depending on target ambient temperature range for IEEE DTE, connector current can be >1.0 A



PCB Current Limits Guidelines

- Practical PCB design guidelines for an ***array*** of conductors
  - The following is *worst case* for many conductors on a PWB
  - Typical Land size Width 12 mils; thickness 1.4 mils; space 8 mils;
  - 0.2 amps; temp rise = 6-to-20C
  - 0.25 amps; temp rise = 13-to-30C
  - 0.3 amps; temp rise = 20-to-50C
  - 0.5 amps; temp rise = 50-to-100C

PCB Guidelines - Array of Conductors

- Assuming an ambient of 40C (104F)
  - Maximum continuous operating temperature of PCB (Epoxy Glass Laminate/copper) - ***90 degrees C*** (194 degrees F)
  - 0.2 amps: Potential operating temperature 40 + 20 = 60C (140F)
  - 0.25 amps: Potential operating temperature 40 + 30 = 70C
  - 0.30 amps: Potential operating temperature 40 + 50 = ***90C***
  - 0.5amps: Potential operating temperature 40 + 100 = 140C
  - ***~ 0.3 amps is clearly practical***

PCB Guidelines - Panels and Outlets

- Practical PCB Design Guidelines for an isolated PCB conductor in free space
  - 1.3 ampere; temperature rise above ambient = 20 degree C
  - 2 ampere; temperature rise above ambient = 45 degree C
- Panels and outlets are somewhere between an array and a conductor in free air
- Currents of **between 0.3 and >1.0** amp are practical for many existing and for new designs

Cable Ambients, Current Limits

- FCC Rules for Registration of Telephone Equipment Part 68 Subparts A-E specifies for 24 ga:
  - Assumes a 40^{o} C rise for poly-vinyl chloride insulation, in an ambient of 25^{o} C (25+40 = 65^{o} C)
  - Maximum values are to be derated for installations where ambients are > 25^{o} C
  - Maximum continuous current capacity of PVC insulated copper wire, confined: 2.1 Amperes for 25^{o} C
  - Total current in all conductors in multiple conductor cable may not exceed 20% of the sum of the individual ratings of all such conductors
  - Leads to these maximums
    - 4-pair/8Conductors: 3.36 amps in all conductors
    - 25-Pair/50Conductors: 21.0 amps in all conductors
- Unaware of data or regulations better addressing bundles of cables

Cable Ambients, Current Limits