DESIGN OBJECTIVES
108-101599

The product described in this document has not been fully tested to ensure conformance to the requirements outlined herein. TE Connectivity makes no representation or warranty, express or implied, that the product will comply with these requirements, Further, TE Connectivity reserves the right these requirements based on the results of additional testing and evaluation. Contact TE Connectivity Engineering for further information. If necessary, This document will become the Product Specification at successful completion of testing.

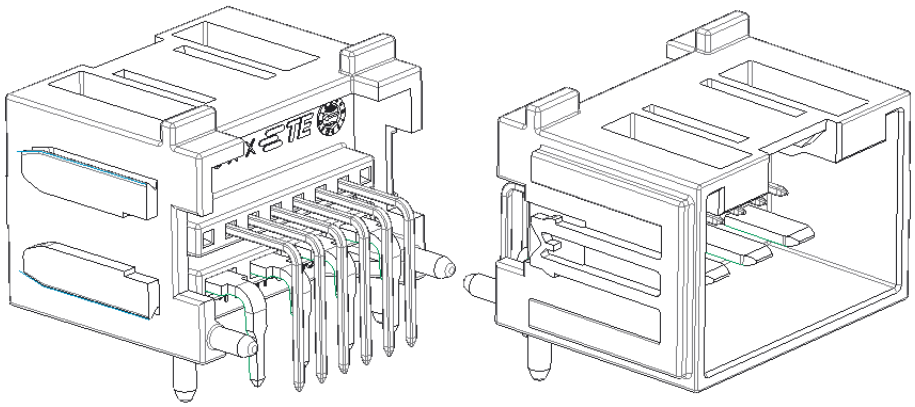
1. Scope:

1.1 Content

This specification covers the requirements for product performance, test methods and quality requirements for TE Connectivity pin header for PCB connections. The header is soldered onto the PCB.

Pin header assy: P/N:*-2311788-*, *-2321709-*
Suitable mating connector: 2322347-*

P/N	Pin Position	Type	Applicable Plug	Remarks	Terminal P/N
-2311788-	4P/10P/12P	90°	2322347-*	With 4 power pins	Signal Pin:928999-* /963715-*/1355717-*
-2321709-	4P/10P/12P	180°	2322347-*	With 4 power pins	Power Pin:1241386-* 1241388-*/1241390-*



				DR K.WEI 18JAN2017	TE Connectivity Shanghai, China		
				CHK W.WU 01DEC2017			
				APP I.YIN 05DEC2017	NO. 108-101599	REV A2	LOC ES
A2	**Change Drop Test Information**	K.W	11MAY2018				
A1	**Add Prefix of P/N Add Derating Curve of 3.5.18 Update max current of 2.5mm² wire**	K.W	08APR2018	PAGE 1 of 11	TITLE TecMCP 2.8 Series Header		
A	**Release**	K.W	18JAN2017				
LTR	REVISION RECORD	DR	DATE				

1.2 Qualification

A. When tests are performed on the subject product line, the procedures specified in USCAR-2 Revision 6 specifications shall be used. All inspections shall be performed using the applicable Inspection Plan and Product Drawing.

2. Applicable Documents:

The following documents form a part of this Specification to the extent specified herein. In the event of conflict between the requirements of this Specification and the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 Spec

A. USCAR-2 Revision 6
B. GMW3191

3. Requirements:

3.1 Design and Construction

Product shall be of the design, construction and physical dimensions specified in the Applicable product drawing.

3.2 Materials

A. Contact
-Material: 0.63 SQ Pin CuZn30
2.8 Tab Pin CuZn30
-Finish: Tin over Nickel
B. Housing
-Material: PA10T or SPS
C. Plug housing
-Material: PBT-GF10

3.3 Ratings:

Operating temperature Range : -40℃ to + 105℃

3.4 Performance and Test Descriptions

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in fig.1 All tests are performed at test condition of the USCAR-2 Revision 6 specifications unless otherwise specified.

3.5 Requirements and Procedures Summary

MECHANICAL TEST			
3.5.1	Visual Examination	The specimen under test must not show any evidence of deterioration, cracks, deformities, etc. that could affect function.	**USCAR-2 Revision 6 Section 5.1.8** Visually, Dimensionally and Functionally inspected per applicable inspection plan.
3.5.2	Terminal insertion force	Insertion force<=30N	**USCAR-2 Revision 6 Section 5.4.1** Insert the terminal straight into the connector at a uniform rate not to exceed 50mm per minute. Upon reaching the forward stop, continue applying force until failure point of the forward stop is reached.
3.5.3	Terminal retention force	1st lock>=30N 1st lock+2nd lock>=60N(after Moisture Conditioning) 1st lock+2nd lock>=50N(after Temp/Humidity and HTE)	**USCAR-2 Revision 6 Section 5.4.1** Pull the terminal straight back from connector. Increase the pullout force at a uniform rate not to exceed 50mm/min, until pullout occurs.
3.5.4	2nd lock open and close force	Pre-set to lock 60N Min. Lock to pre-set 10~60N	**USCAR-2 Revision 6 Section 5.4.5** Engage each component to be tested, with its retaining mechanism in place, at a rate not exceed 50mm/min With the component fully installed and properly fixtured, disengage the component at a rate not exceed 50mm/min.
3.5.5	Connector-to-Connector mating Force	Mating force <=75N	**USCAR-2 Revision 6 Section 5.4.2** Connectors to be mated together by applying a measured force at speed 50 mm/min to slide fully seated and locked at the first time.
3.5.6	Connector-to-Connector Unmating Force with Lock Disengaged	Unmating force <=75N	**USCAR-2 Revision 6 Section 5.4.2** Connectors with primary lock to be unmated by applying a measured force at speed 50 mm/min to slide out at the first time.
3.5.7	Connector-to-Connector Unmating Force with Lock Engaged	Unmating force >=110N	**USCAR-2 Revision 6 Section 5.4.2** Connectors with primary lock fully engaged by applying a measured force at speed 50 mm/min to slide out at the first time.

3.5.8	Polarization Feature Effectiveness	The connection system must withstand a specified mis-mating force without damage to the connector and no electrical contact shall be made between the male/female terminals.	**USCAR-2 Revision 6 Section 5.4.4** Attempt to engage the connector halves at a rate not to exceed 50mm/min. until a force of 3X the maximum value of a properly mated connector is applied. Hold force for 3 seconds.
3.5.9	Pin Push-Out Force	The minimum force required is signal pin:15N; power pin:50N	**USCAR-2 Revision 6 Section 5.7.1** Moisture condition samples at 95-98% relative humidity at 40℃ for 6hours Apply an axial load to the front and back of the Contact Operation speed: 50mm/min
3.5.10	Connector Cycling	Re-mate connectors in preparation for future test sequences or follow directions in the respective procedure to follow	**USCAR-2 Revision 6 Section 5.1.7** Completely mate and un-mate each connector pair 10 times
3.5.11	Connector Integration drop test	Prepare three assemblies, and every assembly is assembled by four commodity headers, drop every assemblies at a time once onto a horizontal concrete surface from a height of at least 1 meter. Only judge the “lego” structure	**USCAR-2 Revision 6 Section 5.4.8** Fall surface: concrete Drop height: 1.0 m
3.5.12	Lego structure bending resistance	The bending force to destroy “Lego” is Min50N	Two single headers integration(A+B), fix A, Measure the force required to destroy the “Lego” (the point of application of force on the centre of B) Then fix B, measure A (Integration B+A) (5 integrations for A+B, 5 integrations for B+A)Measure sketch map shown as Fig 3
3.5.13	Lego structure mating force	The mating force of lego is max 75N	Fix A single header, measure the force to mating B lego in A until the lock engage Then fix B measure A The measure sketch map shown as Fig 4
ELECTRICAL TEST			
3.5.14	Dry Circuit Resistance	Dry Circuit Resistance Signal pin: Max20mΩ Power pin: Max 5 mΩ	**USCAR-2 Revision 6 Section 5.3.1** Measure and record the resistance across 150mm of conductor to be use for this test.
3.5.15	Voltage Drop	Voltage Drop <=50mV	**USCAR-2 Revision 6 Section 5.3.2** Measure and record the millivolt drop across 150mm of the conductor size and insulation type to be used during the test.
3.5.16	Insulation Resistance	Insulation resistance>=100MΩ	**USCAR-2 Revision 6 Section 5.5.1** Test condition: U=500V (DC)

3.5.17	Dielectric strength	No creeping discharge or flashover shall occur	**GMW3191 Section 4.3.6** 1000V at 50Hz or 60 Hz or 1600V DC for at least 1min
3.5.18	Current Capability Test	Current 5A, Increase temperature 55℃ max wire range 0.75mm^2 and measure 4 pin for signal pin (Measured by applying all 8 signal pins with series circuit, no applying current on power pins) Current 16A max, Increase temperature 55℃ max wire range 2.5mm^2 and measure 4 pin for power pin together (Derating Curve of Power pins is shown as Fig.8 Measured by applying all 4 power pins with series circuit, no applying current on signal pins)	1) Measure and record the voltage drop, using the expected Maximum Current Capability of TUT. 2) Test the sample terminal pairs at 23℃±5℃. Slowly increase the power supply output until it is providing no greater than 50% of the expected Maximum Current Capability of the TUT. 3) Wait at least 15 minutes, record the ambient temperature, the temperature of each terminal pair interface, the millivolt drop across each terminal pair. 4) Increase the current by no more than 10% of the expected Maximum Current Capability and repeat 3).
ENVIRONMENT TEST			
3.5.19	Vibration/Mechanical Shock	There must be no instance in which the resistance of any terminal air exceeds 7.0 Ω for more than 1 microsecond for circuit continuity monitoring. 3.5.14 Dry Circuit Resistance 3.5.15 Voltage Drop	**USCAR-2 Revision 6 Section 5.4.6** Vibration class V1(see the Fig.5)
3.5.20	Temperature/Humidity Cycling	3.5.14 Dry Circuit Resistance 3.5.15 Voltage Drop 3.5.16 Insulation resistance	**USCAR-2 Revision 6 Section 5.6.2** Temperature: -40℃~105℃ Cycles: 40 cycles(see the Fig.6)
3.5.21	High Temperature Exposure	3.5.14 Dry Circuit Resistance 3.5.15 Voltage Drop	**USCAR-2 Revision 6 Section 5.6.3** Place the samples in the chamber, set to 105℃, and leave the samples in the chamber for 1008 hours.
3.5.22	Thermal Shock	There must be no instance in which the resistance of any terminal air exceeds 7.0 Ω for more than 1 microsecond for circuit continuity monitoring. 3.5.14 Dry Circuit Resistance 3.5.15Voltage Drop	**USCAR-2 Revision 6 Section 5.6.1** -40°C/30min, +105°C/30min. Make this one cycle. Repeat 100 cycles.
3.5.23	Reflow soldering pretreatment	After reflow soldering, the plastic housing should not blister, melt or occur any discoloration. Meet all test items follow sequences	Reflow soldering simulation (the reflow temperature curve shown as Fig.7 max temperature:260℃)

Fig .1

3.6 Product Qualification Test and Sequence

Test or Examination		Test Group									
		1	2	3	4	5	6	7	8	9	10
3.5.1	Visual Examination	1,3,6	1,3,6	1,3,6	1,3,5	1,3,5	1,3,9	1,3,9	1,3,11	1,3,9	1,3,5
3.5.2	Terminal insertion force										
3.5.3	Terminal retention force										
3.5.4	2nd lock open and close force										
3.5.5	Connector-to-Connector mating Force		4	4							
3.5.6	Connector-to-Connector Unmating Force with Lock Disengaged		5								
3.5.7	Connector-to-Connector Unmating Force with Lock Engaged			5							
3.5.8	Polarization Feature Effectiveness				4						
3.5.9	Pin Push-Out Force					4					
3.5.10	Connector Cycling	4					4	4	4	4	
3.5.11	Connector integration drop test										4
3.5.12	Lego structure bending resistance										
3.5.13	Lego structure mating force										
3.5.14	Dry Circuit Resistance						5,7	5,7	5,7	5,7	
3.5.15	Voltage Drop						8	8	8	8	
3.5.16	Insulation Resistance								9		
3.5.17	Dielectric strength								10		
3.5.18	Current Capability test	5									
3.5.19	Vibration/Mechanical Shock						6				
3.5.20	Temperature/Humidity Cycling								6		
3.5.21	High Temperature Exposure									6	
3.5.22	Thermal Shock							6			
3.5.23	Reflow soldering pretreatment	2	2	2	2	2	2	2	2	2	2
Sample Size		5	5	5	5	4	8	8	8	8	9

Test or Examination		Test Group													
		11	12	13											
3.5.1	Visual Examination	1,4	1,3	1											
3.5.2	Terminal insertion force	2													
3.5.3	Terminal retention force	3													
3.5.4	2nd lock open and close force		2												
3.5.5	Connector-to-Connector mating Force														
3.5.6	Connector-to-Connector Unmating Force with Lock Disengaged														
3.5.7	Connector-to-Connector Unmating Force with Lock Engaged														
3.5.8	Polarization Feature Effectiveness														
3.5.9	Pin Push-Out Force														
3.5.10	Connector Cycling														
3.5.11	Connector integration drop test														
3.5.12	Lego structure bending resistance			3											
3.5.13	Lego structure mating force			2											
3.5.14	Dry Circuit Resistance														
3.5.15	Voltage Drop														
3.5.16	Insulation Resistance														
3.5.17	Dielectric strength														
3.5.18	Current Capability test														
3.5.19	Vibration/Mechanical Shock														
3.5.20	Temperature/Humidity Cycling														
3.5.21	High Temperature Exposure														
3.5.22	Thermal Shock														
3.5.23	Reflow soldering pretreatment														
Sample Size		10	10	5											

Fig. 2

4. QUALIFICATION TEST

4.1 Sample selection

Samples shall be prepared in accordance with applicable specification.

4.2 Test sequence

Qualification test shall be conducted as sequence specified in Fig. 2

4.3 Requalification test

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall co-ordinate requalification testing, consisting of all or part of original testing sequence as determined by developments, product, quality and reliability engineering.

4.4 Acceptance

Acceptance is based on verification that product meets requirements of Fig 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify product. When product failure occurs, Corrective action shall be taken and sample resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

4.5 Quality conformance inspection

Applicable TE quality inspection plan will specify sampling acceptable quality level to be used. Dimensional and functional requirements shall be accordance with applicable product drawings and this specification.

5. APPENDIX

5.1 Lego bending resistance measure sketch map

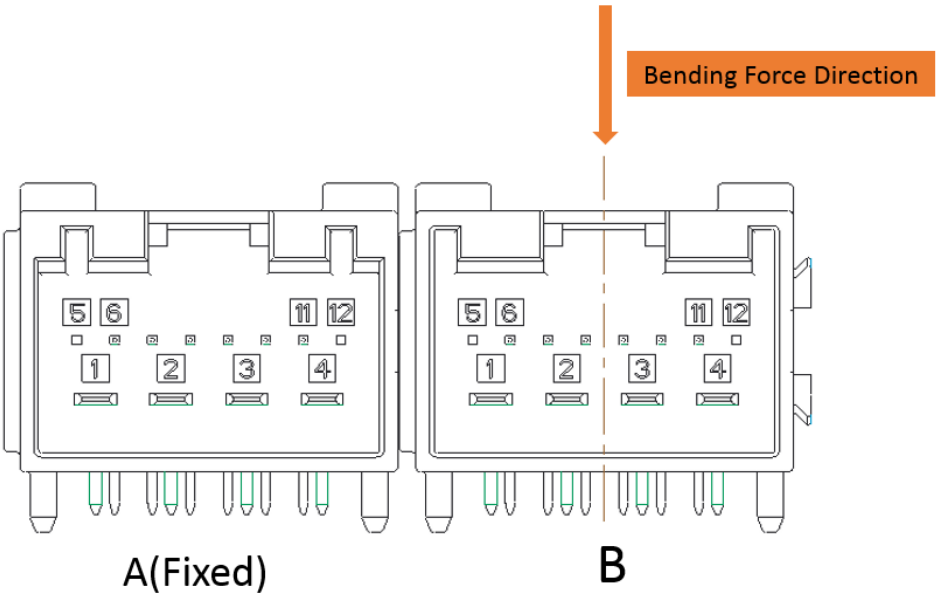


Fig 3. Lego bending resistance measure sketch map

5.2 Lego mating sketch map

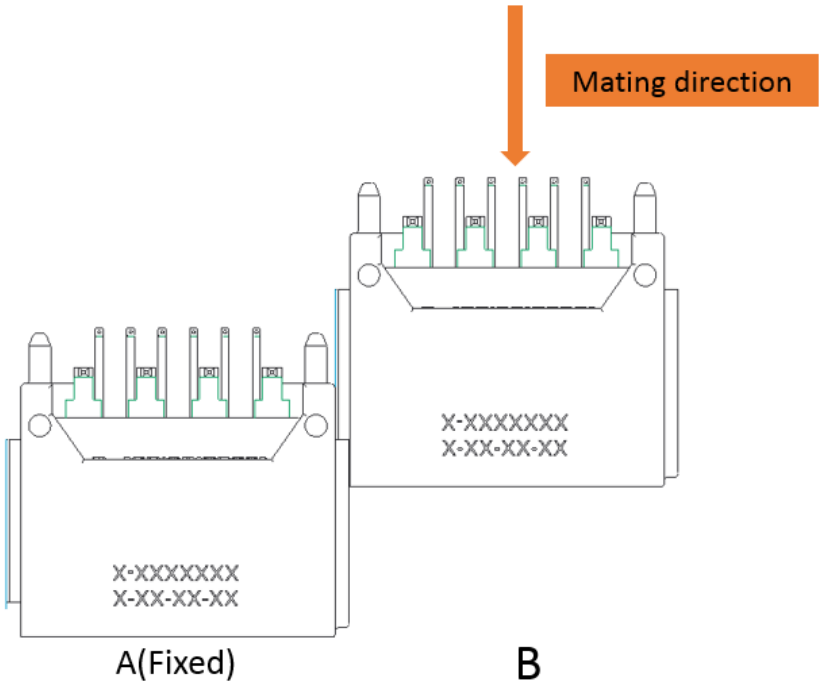


Fig 4. Lego mating sketch map

5.4 Vibration class graphs

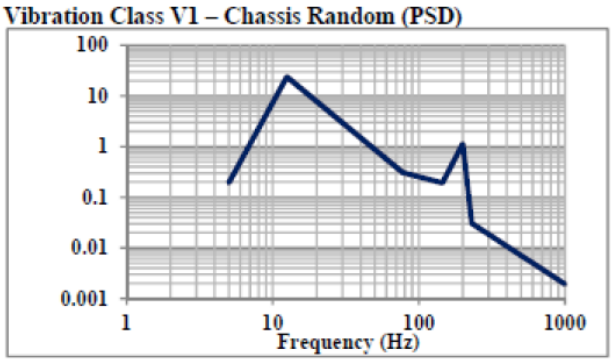
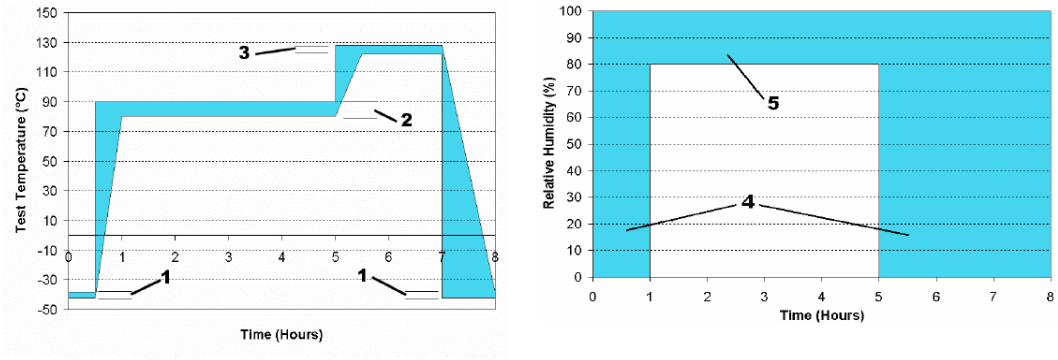


Fig 5. The vibration class V1 graphs

5.5 Temperature/humidity cycling schedule



Key: 1 (-40)°C 2 (80 – 90)°C 3 Test temperature per Table 5.1.4.1 (Class 3 shown for illustration only)
4 Relative Humidity, uncontrolled. Do not vent chamber at hour 5. 5 (80 – 100)% Relative Humidity

Fig 6. Temperature/humidity cycling schedule

5.6 Reflow temperature

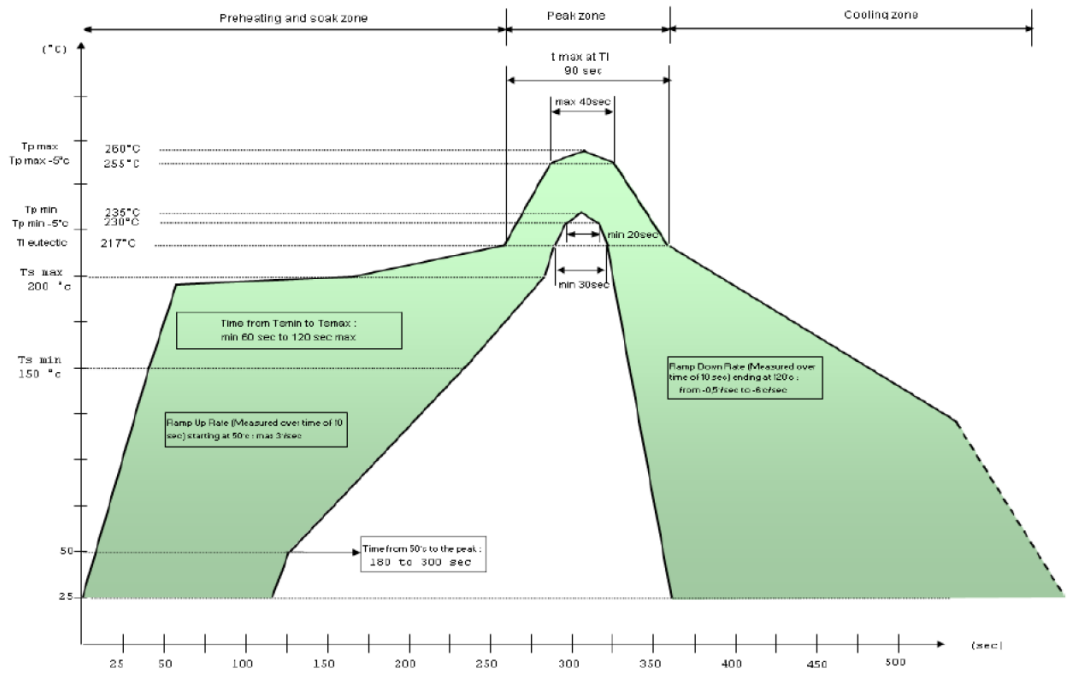


Fig 7. Reflow Temperature curve

5.7 Derating Curve of 4 Power Pin together

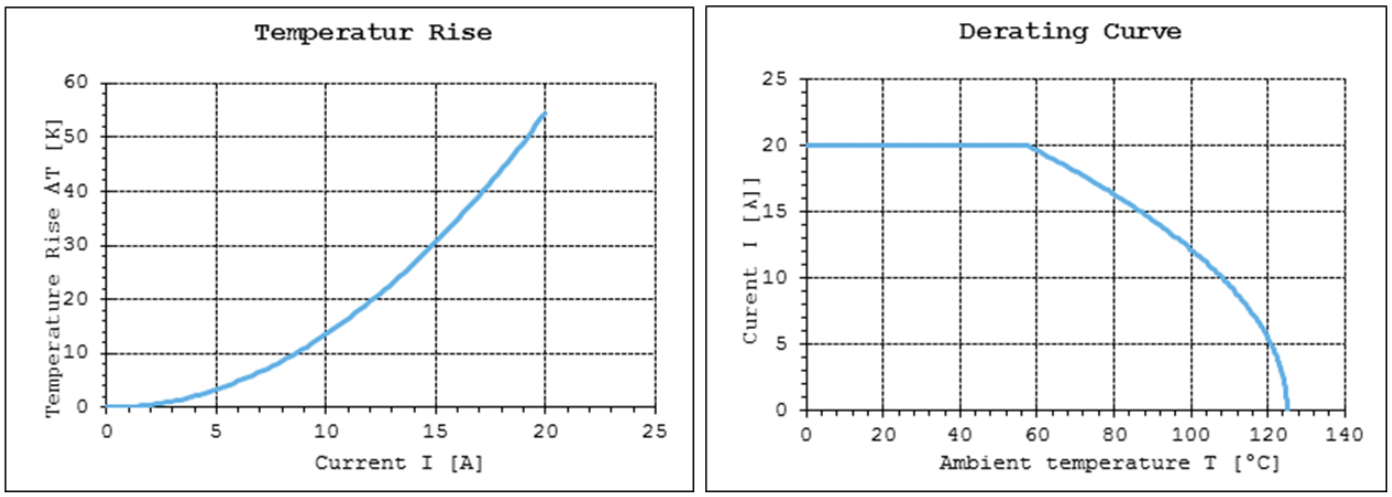


Fig 8. Power Pins Derating Curve