MARK-UP for DCR312 (also DCR333 & DCR337) plus extra dunge for DCR181 plus addetes drange 09/7/7 agreed with Betathern. ace Components Coordination

Pages 1 to 17

THERMISTORS

(THERMALLY SENSITIVE RESISTORS), NTC, いらののつ RANGE 2000 TO 199990 OHMS AT +25 °C WITH

A TEMPERATURE RANGE OF -60 to +160 °C

ESCC Detail Specification No. 4006/014

- BASED ON TYPE **ENBAGERS 3913**, GISK4D489 GLOK4D453, G2K7D411, G4K7D421

ISSUE # (Drult B) July 2005 July 2007



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ESCC Detail Specification No. 4006/014

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
184 312,833 337	Specification upissued to incorporate editorial and technical changes per DCR.

ESCC Detail Specification	PAGE 3
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No. 4006/014

1. GENERAL

1.1 <u>SCOPE</u>

2000 15000

This specification details the ratings, physical and electrical characteristics, test and inspection data for Thermistors, Thermally Sensitive Resistors, NTC, Range 2 000 to 100 000 Ohms at +25°C with a Temperature Range of -60 to +160 °C. It shall be read in conjunction with ESCC Generic Specification No. 4006, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS G2K7D411, G4K7D421.

Variants of the basic type thermistors specified herein, which are also covered by this specification, are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the thermistors specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION (FIGURE 1)

Not applicable.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the thermistors specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the thermistors specified herein is shown in Figure 3.

2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:-

- (a) ESCC Generic Specification No. 4006, Thermistors (Resistors, Thermally Sensitive).
- (b) IEC 60410, Sampling Procedures and Tables for Inspection by Attributes.
- (c) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply. In addition, the following symbols are used:-

NTC =Negative Temperature Coefficient.

R_Z =Zero Power Resistance.

				i. Antipitation										PAGE	9
IABLE 1(a) - TYPE VARIANTS IABLE 1(a) - TYPE VARIANTS VARUAUT BASED R.2 (3) RESISTANCE/TEMPERATURE CHARACTERISTICS (Note 2) VARUAUT 0N TYPE 0N TYPE 0N TYPE 1006 10 2000 1007 1107 1007 1107 1107 1107 1107 1107 1107 1101			いて	3			ESCC	Letall Speci Vo. 4006/014	Incation 4						
(1) (2) R2 (3) RESISTANCE/TEMPERATURE CHARACTERISTICS (Note 2) VARIANT BASED R2 (Note 1) 60°C -40°C -20°C 0°C +50°C +10°C +140°C +140°C +160° 101 G2K7D110 NOM. (g) -60°C -40°C -20°C 0°C +50°C +10°C +110°C +160° +160° 101 G2K7D110 NOM. (g) -540 254 -757 1.34 1.17 1.05 0.130 1.13 - 1.17 1.05 0.130 1.13 - 1.17 1.05 0.130 1.13 - 1.17 1.05 0.130 1.13 0.130 1.130 0.130 1.130 0.131 0.130 1.130 0.130 1.130 0.130 1.130 0.131 1.117 1.16 1.13 1.117 1.16 1.130 0.131 1.117 1.130 0.160 2.14 1.130 0.141 1.117 1.16 1.105 1.101 1.10							TABLE 1	(a) - TYPE	VARIANTS						-
(Note 1) -60°C -40°C -20°C 0°C +25°C +50°C +70°C +10°C +13°C +140°C 1 0 62X7D110 NOM. (3) -60°C -20°C 0°C +25°C +50°C +10°C +13°C +140°C 1 0 62X7D110 NOM. (3) -2.54 +7.57 1.34 1.17 1.05 0.90 1.13 1 0 0 100 43362 1.34 1.17 1.05 0.90 1.13 1 0 0 1.34 1.17 1.05 0.90 7.43 1.35 1 0 0 1.34 1.17 1.05 0.90 7.43 1.35 1 0 0 1.34 1.17 1.05 0.90 7.43 1.356.3 1 0 0 1.34 1.34 1.32 0.47.00 1.32 0.47.00 1.32 0.47.00 1.32 0.47.00 1.32 0.47.00 <td< th=""><th></th><th>(1) VARIANT</th><th>BASED ON TYPE</th><th>Rz</th><th></th><th></th><th>RE</th><th>SISTANCE/</th><th>TEMPERAT</th><th>URE CHAR</th><th>ACTERIST</th><th>ICS (Note 2</th><th>_</th><th></th><th>(4)</th></td<>		(1) VARIANT	BASED ON TYPE	Rz			RE	SISTANCE/	TEMPERAT	URE CHAR	ACTERIST	ICS (Note 2	_		(4)
101 G2K7D110 NOM. (g) 43362 14556 5650 2000.0 815.0 107.40 102.00 702 G4K7D108 NOM. (g) 2.54 1.57 1.34 1.17 1.05 0.30 1.13 02 G4K7D114 NOM. (g) 2.946 1.300 4000 1630.0 864.0 374.86 2.94.00 103 G4K7D114 NOM. (g) 2.94 1.37 1.34 1.17 1.05 0.30 7.13 - 103 G4K7D114 NOM. (g) 2.97 2.54 1.57 1.34 1.17 1.05 0.30 7.13 103 G4K7D114 NOM. (g) 2.90 2.54 1.57 1.34 1.17 1.06 7.13 2.16.00 104 G15640114 NOM. (g) 2.90 2.54 1.57 1.34 1.17 1.06 2.73 1.15 105 G100660114 NOM. (g) 1.32 1.34 1.24 1.17 1.24 1.32 105 G100660114 NOM. (g) 1.32 1.32 0.37 <				(Note 1)	-60°C	-40°C	-20°C	D.0	+25°C	+50°C	+70°C	+100°C	+125°C	+140°C	+160°C
02 C4K7D108 NOM. (2) 2.54 1.57 1.34 1.17 1.05 0.90 1.13 - 02 C4K7D108 NOM. (2) 2.54 1.57 1.34 4.17 1.05 0.90 1.13 - 103 C4K7D104 NOM. (2) 2.54 1.57 1.34 4.17 1.05 0.90 7.43 - - 103 C4K7D114 NOM. (2) 2.54 1.57 1.34 1.17 1.05 0.90 7.43 -		1 01	G2K7D110	NOM. (22)-		43362	14658	5650	2000.0	815.0	432.0	187.40	102.00		
02 G4K7D108 NOM. (2) -29346 13300 4000 1630.0 864.0 374.89 204.00 -134 -177 1.34 -177 1.05 0.90 -143 -175 -1.34 -177 1.05 0.90 -143 -1.34 -177 1.05 0.90 -143 -1.13 -1.17 1.05 0.90 -143 -1.15 -1.34 -1.17 1.05 0.90 -143 -1.15 -1.34 -1.17 1.05 0.90 -1.43 -1.15 -1.34 -1.17 1.05 0.90 -1.43 -1.15				¥0Ľ.(±%)).	06.3	2.54	1:57	1.34	1.17	1.05	0:90	1.13	,	1
IOL. (±%) IOL. (±%) 2.54 1.57 1.34 4.17 1.05 0.90 1.45 - IO3 G4K7D114 NOM.(12) - 2.90 2.54 1.57 1.34 1.17 1.05 0.90 1.45 - IO3 G4K7D114 NOM.(12) - 2.90 2.54 1.57 1.34 1.17 1.05 0.90 1.45 -		02	G4K7D108	(0) WOM	(.	,	29346	11300	4000	1630.0	-864.0	374.80	204.00		,
103 G4K7D114 NOM. (12) 86724 29316 11300 4000 1630.0 864.0 -<		5	$\Big)$	TOL. (##)	-	\.)	2.54	4:21	1.34	4:4	1.05	0.00	64.		
Interference Tol. (±%) 2.90 2.54 1.57 1.34 1.17 1.06 2.905 2.47.00 Interference Tol. (±%) - 2.90 2.54 1.57 1.34 1.17 1.06 2.93.0 447.00 Interference Tol. (±%) - - - 44235 1.56.0 584.0 2985.0 1.12 1.12 1.12 1.12 1.12 1.12 1.13 1.15 1.15 1.15 1.17 1.24 1.12 0.97 7.23 1.15 1.15 1.15 1.17 1.24 1.12 0.97 7.23 1.15 1.15 1.17 1.24 1.12 0.97 7.23 1.15 1.15 1.15 1.16 1.12 0.97 7.23 1.156.3 1.156.3 1.156.3 1.16 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.132 1.101 1.132 1.102 1.132 1.102 1.102 1.102 1.102 1.102 1.02 0.03 1.02 0.03 </td <th>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</th> <td>103</td> <td>G4K7D114</td> <td>NOM. (Ω)</td> <td></td> <td></td> <td>29316</td> <td>11300</td> <td>4000</td> <td>1630.0</td> <td>864.0</td> <td>• (</td> <td>-</td> <td>•</td> <td>'</td>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	103	G4K7D114	NOM. (Ω)			29316	11300	4000	1630.0	864.0	• (-	•	'
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	24			TOL. (±%)		2.90	-2.54	1.57	1.34	1.17	1.06	Ζ,	\.).	
TOL. ($\pm\%$) TOL. ($\pm\%$) TOL. ($\pm\%$) TOL. ($\pm\%$) T.52 T.72 T.73 T.15 G100/k6D116 NOM-(x 1) TOL. ($\pm\%$) TOL. ($\pm\%$) TOL. ($\pm\%$) T.62 T.62 T.14 T.23 T.15 G100/k6D116 NOM-(x 1) T342000 371300 T20100 444200 5955 3009-0 1.11 1.141 1.32 G15K4D393 MOM-(x 1) 1342000 371300 120100 44420 150000 5855 3009-0 1276 1.02 <th>></th> <td>1 04</td> <td>G15K4B112</td> <td>NDM-(52)</td> <td>-</td> <td></td> <td></td> <td>44235</td> <td>15060</td> <td>5840-</td> <td>-2985.0</td> <td>1226.0</td> <td>639.0</td> <td>447.00</td> <td>287.70</td>	>	1 04	G15K4B112	NDM-(52)	-			44235	15060	5840-	-2985.0	1226.0	639.0	447.00	287.70
G100K6D116 NOM-(£1) - - - 000000 - 55(4 2642.4 1756.3 POL (1%) - - - - - - - 1.11 1.41 1.32 OTSK4D393 MOM-(£1) 1342000 371300 120100 44420 15040 5855 30090 1256.0 659.8 465.50 OTOL. (1%) 10.342000 371300 120100 44420 15000 5855 3009.0 1.02 <th1.02< th=""> 1.02 <th1.02< th=""></th1.02<></th1.02<>				TOL. (±%)).		1.62	1.41	1.24	1.12	0.97	1.23	1.15	1.06
TOL. (±%) TOL. (±%) 1.342000 371300 120100 44420 15000 5855 30090 12750 659.8 465.50 OT5K4D393 MOM. (1) 1342000 371300 120100 44420 15000 5855 30090 12750 659.8 465.50 OT5K4D393 MOM. (1) 1342000 371300 120100 44420 15000 5855 30090 12700 102 1.02		1 95	G100K6D116	NOM- (E)	-	$\left(\right)$	/	-	00000	(,	- 5 5ζ4	2642.4	1756.3	1059.0
CartSk4D393 Motern (1) 1342000 371300 120100 371300 120100 544200 5555 3009.0 12010 1.01 1.02<			\ \	_TŐL. (±%))	/)'),			1.1	1.41	1.32	1.21
V VrOL. ($\frac{1}{4}\%$) PDate [$\frac{5}{6}$ 3K 235 1.26 1.01 1.03 1.04 1.01 1.02		1 %	Q15K4D393	(U) HOM	1342000	\$71300	7120109-	44420	15000	5855	3009-0	1256.0	659.8	465-50	302.40
G15K4D489 P MOM. (1) 1342000 371300 120100 44420 15000 5855 3009.0 1250.0 659.8 465.50 N TOL. (±%) 10.5% 6.3% 3.35 1.5% 1.01 1.01 2.5% 3.5% R Image: Second Secon		フレ	\mathbf{b}	1901. (1987)	there	6.35	Q.35	V 386 V	1.01	- 1.03 L	1.05	1.0	1.02	1.02 U	X
$R_{\Sigma}^{(1)}$ TOL. (±%) 10.24 6.34 3.35 1.34 1.01 1.03 1.05 1.01 2.24 3.26 3.46 rest purposes, when zero power is dissipated and the ambient temperature is held as specified, the value is referred to as R_{Z} (Zero Power Resistance).		08	L N	P 140101. (22)	1342000	371300	120100	4420	15000	5855	3009.0	1250.0	659.8	465.50	302.40
 NOTES NOTES A Substrate the substrate of the substra			/	TOL. (±%)	10.06	6.3	3.35	1,040	1.01	1.03	1.05	1.01	2.26	3.56	4.8
	ſ	NOTES 1. For te	R <mark>5</mark> est purposes, whe	en zero power i	s dissipated	and the amb	vient temper	ature is held	as specifie	d, the value	is referred t	o as R _Z (Ze	ro Pawer R	esistance).	

-

Add new variants Og, 10, 11 * abbached

DOCUMENT CHANGE REQUEST

CONTINUATION SHEET FOR BOX []

Change request No.)

Page 2 of [3]

CHANGE:

Toble

Page 6 Table 1(a) Add variants 09, 10 and 11 to Table, giving resistance values and appropriate resistance tolerances at temperatures - 60; - 40; -20; 0; +25; +50; +70; +100; +125; degrees C. The insertion is as follows:

/ARIANT	BASED ON	Rz		RESI	STANCE	TEMPERA							_
	TYPE		-60 °C	-40 °C	-20 °C	0°C	+25°C	+50°C	+70°C	+100°C	+125°C	+140°C	+160°C
09	G10K4D453	ΠΟΜ (Ω)	847284	239768	78930	29490	10000	3893	1990	817.2	426.0]
		TOL (+%)	7 🗶	32	2.6	2.8	28	1.7	1.6	3 🕱	3.5		
10	G2K7D411		<u> </u>	43362	14658	5650	2000.0	815.0	432.0	187.40	102.00		
		TOL (+%)		2.9	2.54	1.57	1.34	1.17	1.05	0.9	1.13		
11	G4K7D421	ΝΟΜ (Ω)		86724	29316	11300	4000	1630.0	864.0	374.80	204.00		
	7	TOL (<u>+</u> %]		2.96	2.54	1.57	1.34	1.17	1.05	0.9	1.13		

JUSTIFICATION:

New variant 09 has been developed from old customer specifications to meet demand and is a 10,000 ohm device. Construction is "similar" to the newly qualified variant 08; with the improved glass tubing, the 26 AWG wire and the assembly as described in the current PID/Iss. 7. There are two changes, in the physical-dimensions, from that of Variant 08 – dimensions A and C – which are documented in this DCR.

Variants 18 is electrically similar to variant 01. The differences are that construction is similar to the newly qualified variant 08; with the improved glass tubing, the 26 AWG wire and the assembly as described in the current PID lss. 7.

Variant 11 is electrically similar over the combined temperature range of variants 02 and 03. The differences, from Variants 02 and 03, are that construction is similar to the newly qualified variant 08; with the improved glass tubing, the 26 AWG wire and the assembly as described in the current PID iss. 7.

CHANGE:

Page 7 Table 1(b) Change Note 3 <u>from</u> " -40° C for Variants 01 to 05 and -60° C for Variant 06 and 08 to the Maximum Operating Temperature specified in Column 4 of Table 1(a)" <u>to</u> " -40° C for Variants 01, 02, 03, 04, 05, 10 and 11 and -60° C for Variants 06, 08 and 09 to the Maximum Operating Temperature specified in Column 4 of Table 1(a)"

JUSTIFICATION:/

Includes new Variants 09,10 and 11

CHANGE:

Change Table of Figure 2 from

SYMBØL	MILLIMETRES							
. / [VARIANT	S 01 - 05	VARIAN	VT 06,08				
	MIN	MAX	MIN	MAX				
/A	280.00	330.00	356.00	406.00				
/ B	6.10	6.60	6.10	6.60				
/ C	- /	2.80		2.40				
7 D	-/	9.80		9.80				
T E	Ø.33	0.48	0.33	0.48				
F	/ -	50.00	-	50.00				
G	50.00	80.00	50.00	80.00				



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PAGE

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Power Dissipation	PD	243	mW	Note 1
2	Operating Temperature Range	Top	Note 2	°C	
3	Storage Temperature Range	T _{stg}	Note 3	°C	
4	Soldering Temperature	T _{sol}	+245	°C	Note 4

NOTES

- 1. Never to be exceeded in the temperature measurement mode. The thermistors specified herein shall not be used in the self-heat mode.
- 2. See Column 4 of Table 1(a).

08,09

- 3. -40°C for Variants 01-to 05 and -60°C for Variants 06 and 09 to the Maximum Operating Temperature specified in Column 4 of Table 1(a)
- 4. Duration 10 seconds maximum at a distance of not less than 10mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



FIGURE 2 - PHYSICAL DIMENSIONS



		MILLIM	ETRES						
SYMBOL	VARIANT	5 10,11	VARIANT	08	VARIANT 09				
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX			
А	280,499	330	356	406	500	550			
В	6.10	6.6	6.1	6.6 £	6.1	6.6			
С	-	2.80	-	2.48	-	2.8			
D		9.8	-	9.8 ¢	-	9.8			
Е	0.33	0.48	0.33	0.48	0.33	0.48			
F	-	50,00	-	50 /21 2	-	50			
G	50 /99	80	50,00	80,00	50	80			
	~~~~								
	-								

#### NOTES

1. The least shall not be bent, or the means of fastening them cause bending in any direction from the place of column, the thermister fastening disc within a distance of 16mm from the centre of the thermistor.

1. Within dimension D (housing/crimp) no part of the housing or leads shall protocode below the mounting plane by more than 0.13mm. FIGURE 3-FUNCTIONAL DIAGRAM





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#### 4. REQUIREMENTS

#### 4.1 GENERAL

The complete requirements for procurement of the thermistors specified herein are stated in this specification and ESCC Generic Specification No. 4006 for Thermistors (Resistors, Thermally Sensitive). Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

#### 4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

#### 4.2.2 Deviations from Final Production Tests (Chart II)

(a) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.

#### 4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

None.

#### 1.2.4 Deviations from Qualification Tests (Chart IV)

- (a) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.
- (b) Para. 9.3.1.2, Dissipation Constant: Not applicable.
- (c) Para. 9.15, Short Time Overload: Not applicable.
- (d) Para. 9.17, High Temperature Storage: Not applicable.

#### 4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Thermal Shock: Test Condition 'C' except that the maximum temperature shall be the maximum operating temperature specified in Column 4 of Table 1(a) of this Specification.

#### 4.3 MECHANICAL REQUIREMENTS

#### 4.3.1 **Dimension Check**

The dimensions of the thermistors specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESCC Generic Specification No. 4006 and they shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight

> The maximum weight of the thermistors specified herein shall/be 4d grammes, with the exception of Variant \$ \$6000 08, whose maximum weight shall be 2.3 grammes.



#### 4.3.3 <u>Terminal Strength</u>

The requirements for terminal strength testing are specified in Para. 9.13 of ESCC Generic Specification No. 4006. The test conditions shall be as follows:-

Applied Force: 4.45 (+1.1 -0)N. Duration: 5 seconds.

#### 4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the thermistors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

#### 4.4.1 Case

The housing shall be aluminium filled with a black epoxy encapsulant.

#### 4.4.2 Lead Material and Finish

03

The lead material shall be in accordance with ESCC Detail Specification No. 3901/012 Variant # with the exception of Variants 06- and 08, which shall be in accordance with ESCC Detail Specification No. 3901/012 Variant 03. One lead shall carry an identification sleeve which shall carry all part marking specified in Para. 4.5.

#### 4.5 MARKING

#### 4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

- (a) The ESA Symbol, for qualified components only.
- (b) The ESCC Component Number.
- (c) Traceability Information.

Detail Constituation Mumber

#### 4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:



Detail Specification Number	
Type Variant (see Table 1(a))	

Testing Level (B or C, as applicable) -

#### 4.5.3 <u>Traceability Information</u>

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.



#### 4.6 ELECTRICAL MEASUREMENTS

#### 4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at T_{amb}=+25±0.01 °C.

#### 4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The temperature tolerance shall be ±0.01 °C.

# 4.6.3 <u>Circuits for Electrical Measurements (Figure 4)</u>

Not applicable.

#### 4.7 BURN-IN TESTS

#### 4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at  $T_{amb}$ =+25±0.01°C. The parameter drift values ( $\Delta$ ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

#### 4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESCC Generic Specification No. 4006. The conditions for burn-in shall be as specified in Table 5 of this specification.

#### 4.7.3 Electrical Circuits for Burn-in (Figure 5)



## TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - DC PARAMETERS

No.	CHARACTERISTICS	SYMBOL	ESCC 4006	LIM		
NO.	CHARACTERISTICS	STMBOL	TEST METHOD AND CONDITIONS	MIN.	MAX.	UNIT
1	Zero Power Resistance	Rz	Para. 9.3.1.1	Not	te 1	Ω
2	Insulation Resistance	Pr RI	Para. 9.3.1.4 T _{amb} =+25 ±1°C Note 2	100	-	MΩ
³ C	Thermal Time Constant Variants <del>01 05</del> <b>つ名, iつ, i i</b> Variant <b>g かみ</b> 08	КН	Para. 9.3.1.3 T _{amb} =+25±1°C In Still Air Note 3	-	40 25	SØC.

## NOTES

1. See Column 4 of Table 1(a) for resistance values.

2. If more than 20 devices have to be measured, the test shall be performed on a sample basis in accordance with Level II, Single Sampling Plan for Normal Inspection, AQL=1.0 of IEC 60410.

3. Test to be performed on 10 samples during Chart II only.

## TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	ESCC 4006 TEST METHOD	LIMITS		UNIT
10.	CHARACTERISTICS	STMBOL	AND CONDITIONS	MIN.	MAX.	
1	Zero Power Resistance	Rz	Para. 9.3.1.1 At each specified temperature, over operating range	No	te 1	Ω

## NOTES

1. See Column 4 of Table 1(a) for resistance values.

## FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS



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No.	CHARACTERISTICS	SYMBOL	METHODS AND TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
1	Zero Power Resistance Change	$\frac{\Delta R_Z}{R_Z}$	As per Table 2	±0.2	%

## TABLE 4 - PARAMETER DRIFT VALUES

#### TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T _{amb}	Note 1 Note 2	°C
2	Power Dissipation	P _D	(24)	mW

#### NOTES

Maximum Operating Temperature specified in Column 4 of Table 1(a).
 The Temperature Tolerance = (+0 -3) °C.

#### FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN AND OPERATING LIFE TESTS



#### 4.8 <u>ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC</u> SPECIFICATION No. 4006)

#### 4.8.1 <u>Measurements and Inspections on Completion of Environmental Tests</u>

The parameters to be measured and inspections to be performed on completion of environmental tests are scheduled in Table 2. Unless otherwise stated, the measurements shall be performed at  $T_{amb}$ =+25±0.01 °C.

#### 4.8.2 <u>Measurements and Inspections at Intermediate Points during Endurance Tests</u>

The parameters to be measured and inspections to be performed at intermediate points during endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at  $T_{amb}$ =+25±0.01 °C.

#### 4.8.3 <u>Measurements and Inspections on Completion of Endurance Tests</u>

The parameters to be measured and inspections to be performed on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at  $T_{amb}$ =+25±0.01 °C.

#### 4.8.4 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 4006. The conditions for operating life testing shall be as specified in Table 5 for the burn-in test.

## 4.8.5 Electrical Circuits for Operating Life Tests



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#### TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

	ESCC GENERIC SI	PEC. No. 4006	MEASUREMENTS	AND INSPECTIONS		LIM	IITS	
No.	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS	SYMBOL	MIN.	MAX.	UNIT
01	Thermal Shock	Para. 9.2 (2)	-			-	-	-
02	Thermal Time Constant	Para. 9.3.1.3 In Still Air	Initial Measurements Zero Power Resistance Final Measurements Thermal Time Constant	Para, 9.3.1.3(c) Para, 9.3.1.3(f)	R _Z KH		Values Item 3	Ω
03	External Visual Inspection	Para, 9.5	ESCC 20500	-	-	-	-	-
04	Shock (Specified Pulse)	Para. 9.7	Initial Measurements Zero Power Resistance During Shock Intermittent Contact	Table 2 Item 1 No Open or Short	R _z	Table 2	ltern 1	_
			After Shock Zero Power Resistance Change Visual Examination	Circuiting Table 2 Item 1 No evidence of damage	∆R _Z /R _Z	-2.0	+2	%
05	Vibration	Para. 9.8	Initial Measurements Zero Power Resistance During Vibration Intermittent Contact	Table 2 Item 1 No Open or Short Circuiting	R _Z	Table 2	ttern 1	_
			After Vibration Zero Power Resistance Change Visual Examination	Table 2 item 1	∆R ₂ /R _z	-2 <b>\$</b>	+2. <b>g</b>	%
06	Immersion	Para. 9.9	Visual Examination	No evidence of damage	-	-	-	-
07	Dielectric Withstanding Voltage	Para. 9.10	During Test Visual Examination After Test	No evidence of breakdown or flashover	-			-
			Visual Examination	No evidence of damage, arcing or breakdown	-	-	-	-
08	Resistance to Soldering Heat	Para. 9.11	After Test Zero Power Resistance Visual Examination	After a recovery period of 24±4 hrs Table 2 Item 1 No evidence of damage	R _z	Table 2	Item 1	-
09	Moisture Resistance	Para. 9.12	Initial Measurements Zero Power Resistance Final Measurements	Within 24 hrs of removal from 1.5 to 3.5 hr conditioning			2 Item 1	
			Zero Power Resistance Change		∆R _Z /R _Z 0_	-24	+2.0	%
L.			Insulation Resistance	Table 2 Item 2	R _{1,91}	100	-	MΩ

## NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.

2. Thermal Shock Test Method and conditions shall use the deviation of this specification as applicable.



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#### TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)

	ESCC GENERIC S	PEC. No. 4006	MEASUREMENTS	AND INSPECTIONS		LIM	ITS	
No.	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS	SYMBOL	MIN.	MAX.	UNIT
10	Terminal Strength	Para. 9.13	Initial Measurements Zero Power Resistance Final Measurements Zero Power Resistance		R _z ΔR _z /R _z	Table 2	2 Item 1 +2. <b>4</b>	%
			Change Visual Examination	No evidence of damage	-	-	-	-
11	Operating Life	Para. 9.14	Initial Measurements Zero Power Resistance Intermediate	Table 2 Item 1	Rz	Table 2	itern 1	
			Measurements Zero Power Resistance Change	Table 2 Item 1	∆R _z /R _z	-1#	+1	%
			Insulation Resistance	Table 2 item 2	k₁ 🗙	100	-	MΩ
			Zero Power Resistance Change	Table 2 Item 1	$\Delta R_{z}/R_{z}$	-1歳	+1 🌶	%
			Insulation Resistance	Table 2 Item 2	R _{I PR}	100	-	мΩ
12	Low Temperature Storage	Para. 9.16	Initial Measurements Zero Power Resistance Final Measurements	Table 2 Item 1	Rz	Table 2	2 Item 1	
			Zero Power Resistance Change		$\Delta R_{Z}/R_{Z}$	-2.	+2	%
			Visual Examination	No evidence of damage	-	-	•	<u> </u>
13	Solderability	Para. 9.18	-	-		-	-	<u> </u>
14	Permanence of Marking	Para. 9.20	ESCC 24800	-	-	-	-	-

**NOTES** 1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.





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# APPENDIX 'A'

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# AGREED DEVIATIONS FOR BETATHERM (IRELAND)

ITEMS AFFECTED	Variants, 08,09,10,11
Para. 4.2.2 Deviations from Final Production Tests	Para. 9.2 Thermal Shock For <del>Variant 08</del> to Testing Level B, Parameter Drift Value Measurements in accordance with Para. 9.3.2 (and Para. 4.7.1 of the Detail Specification) shall
Manam 08 to Jesting beyet B any)	be performed immediately before and after Thermal Shock.
Para. 4.2.3 Deviations from Burn-in and Electrical Measurements	Variants 01.09, 10,11 Para. 7.4/7 A.1 Check for Lot Failure / Lot Failure During 100% Testing For <del>Variant 08</del> to Testing Level B, all Parameter Drift or Limit Failures during Parameter Drift Value Measurements performed after Thermal Shock during Final Production Tests shall be included in the Check for Lot Failure Percent
(Klanear 08 to Testing LevenB Ionly)	Defective Allowable calculation. This Percent Defective shall be referenced against the quantity of components submitted to Burn-in and Electrical Measurements plus any Parameter Drift or Limit failures during Parameter Drift Value Measurements performed after
~	Thermal Shock. Jariants 08,09, 10,11
Para. 4.2.5 Deviations from Lot Acceptance Tests	Para. 9.14.2 Operating Life during Lot Acceptance Testing For <del>Variant 00,</del> amend (f), Data Points, to be as follows:
Wantan Osleniy	Measurements at intermediate and end points in accordance with Table 6 of the Detail Specification at 0, 250, 500, 750 and $1000 \pm 48$ hours.
	Para. 9.6 Radiographic Inspection
	Inspection shall be with a single view such that
	the component's mounting plane is seated on
	the X-ray film holder.

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