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**CAPACITORS, CHIP, TANTALUM,  
SOLID ELECTROLYTE,  
BASED ON TYPE 1005  
ESCC Detail Specification No. 3011/001**

Issue 2	March 2013
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Document Custodian: European Space Agency – see <https://escies.org>

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DCR No.	CHANGE DESCRIPTION
772	Specification upissued to incorporate editorial changes per DCR.

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## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Chip, Tantalum, Solid Electrolyte, based on Type 1005.

It shall be read in conjunction with ESCC Generic Specification No. 3011, the requirements of which are supplemented herein.

### 1.2 RANGE OF COMPONENTS

The range of capacitors covered by this specification is scheduled 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 capacitors specified herein, are scheduled in Table 1(b).

### 1.4 PARAMETER DERATING INFORMATION

The parameter derating information applicable to the capacitors specified herein is shown in Figure 1.

### 1.5 PHYSICAL DIMENSIONS

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

### 1.6 FUNCTIONAL DIAGRAM

The functional diagram of the capacitors specified herein is shown in Figure 3.

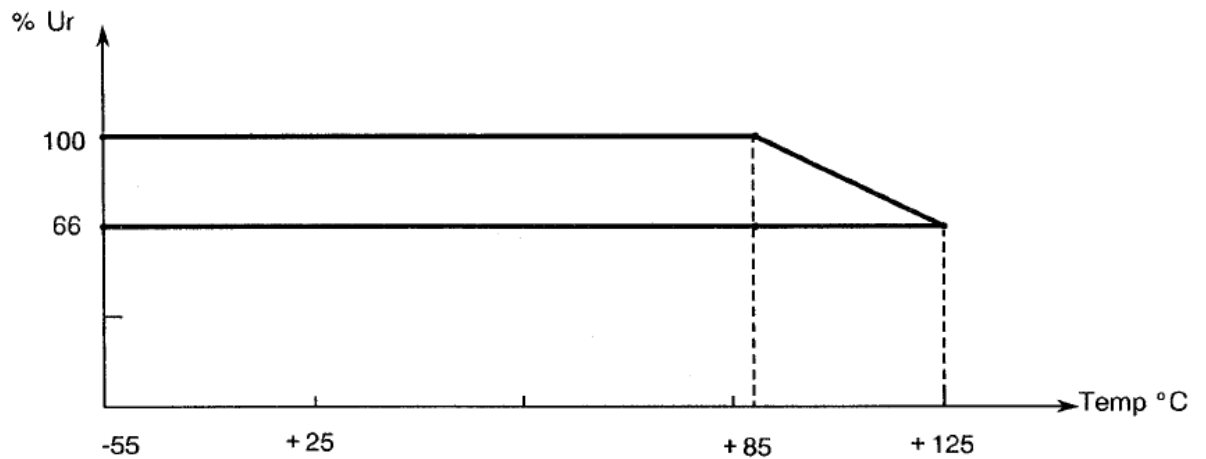
**TABLE 1(a) - RANGE OF COMPONENTS**

Capacitance Value ( $\mu\text{F}$ )	Tolerance (%)	Rated Voltage (V)
0.1		50
0.15		50
0.22		40
0.33	10	25
0.47	and	20
0.68	20	16
1		10
1.5		6.3
2.2		4

**TABLE 1(b) - MAXIMUM RATINGS**

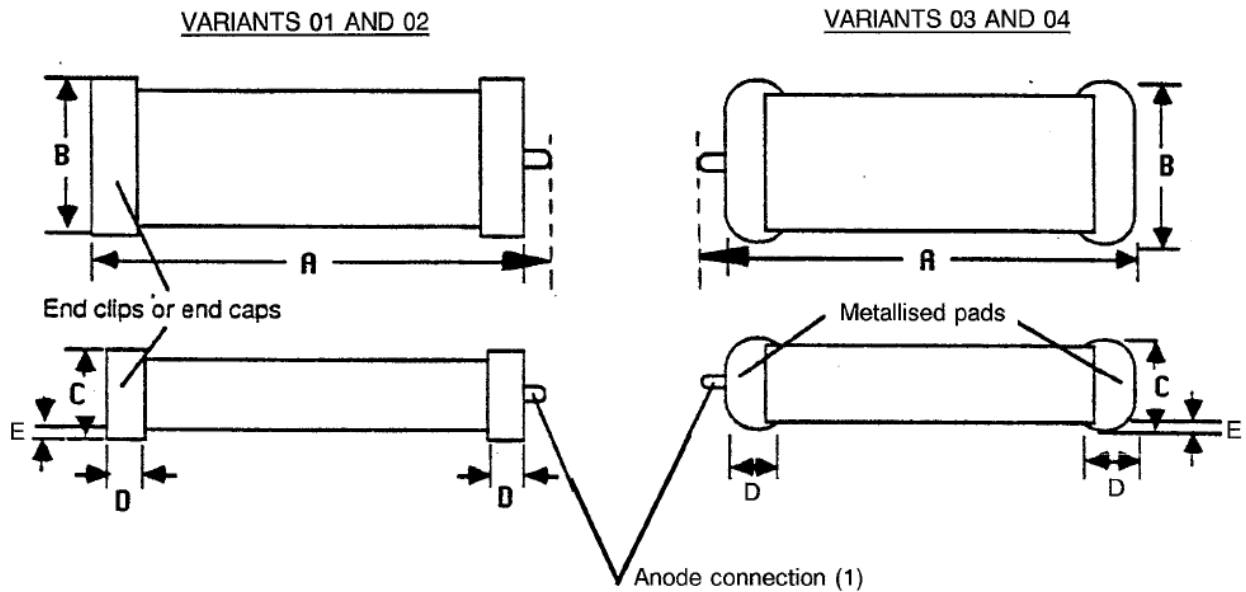
No.	Characteristics	Symbol	Maximum Ratings		Units	Remarks
			Min	Max		
1	Rated Voltage	$U_R$	See Table 1(a)		Vdc	
2	Surge Voltage	$U_S$	-	$1.3U_R$	Vdc	
3	Operating Temperature Range	$T_{op}$	-55	+125	°C	
4	Storage Temperature Range	$T_{stg}$	-55	+125	°C	
5	Soldering Temperature	$T_{sol}$	-	+260	°C	Soldering time: ≤ 10 seconds

**FIGURE 1 - PARAMETER DERATING INFORMATION**



**VOLTAGE VERSUS TEMPERATURE**

**FIGURE 2 - PHYSICAL DIMENSIONS**

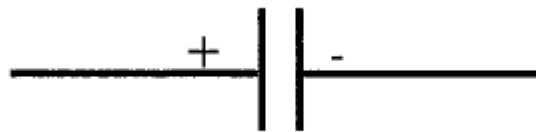


	Dimensions (mm)									
	A		B		C		D		E	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Variants 01 & 02	2.1	2.9	0.9	1.7	0.9	1.7	0.5	1	-	0.15
Variants 03 & 04	2.1	3.3	0.9	2.1	0.9	2.1	0.5	1	-	0.35

**NOTES**

- The anode terminal shall be identified by the riser wire connection, which extends from the case size by 0.4mm max.

**FIGURE 3 - FUNCTIONAL DIAGRAM**



**2 APPLICABLE DOCUMENTS**

The following document forms part of this specification and shall be read in conjunction with it:

- ESCC Generic Specification No. 3011 for Capacitors, Chip, Tantalum, Solid Electrolyte.

**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.



## 4 REQUIREMENTS

### 4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein are stated in this specification and ESCC Generic Specification No. 3011. 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

The following deviations from ESCC Generic Specification No. 3011 shall apply:

#### 4.2.1 Deviations from Special In-process Controls

Not applicable.

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

None.

#### 4.2.3 Deviations from Burn-in Tests (Chart III)

None.

#### 4.2.4 Deviations from Qualification, Environmental and Endurance Tests (Chart IV)

None.

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

None.

### 4.3 MECHANICAL REQUIREMENTS

#### 4.3.1 Dimension Check

The dimensions of the capacitors specified herein shall be verified in accordance with the requirements set out in Para 9.3 of ESCC Generic Specification No. 3011 and shall conform to those shown in Figure 2 of this specification.

#### 4.3.2 Weight

The maximum weight of the capacitors specified herein shall be 0.03 grammes.

#### 4.3.3 Adhesion

The requirements for adhesion are specified in Para 9.3 of ESCC Generic Specification No. 3011.

### 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 capacitors 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 Terminations

The capacitors shall be terminated in accordance with the requirements of ESCC Basic Specification No. 23500, as follows:

- (a) Variant 01:  
With clips or end caps Type 'E' with Type '2' finish.
- (b) Variant 02:  
With clips or end caps Type 'E' with Type '3' finish.
- (c) Variant 03:  
With pads of Silver Loaded Epoxy Resin with Type '2' finish.
- (d) Variant 04:  
With pads of Silver Loaded Epoxy Resin with Type '3' finish.

#### 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 subparagraphs. These components being too small to accommodate the marking as specified hereafter, the marking information in full shall accompany each component in its primary package. Such marking shall comprise:

- (a) The ESCC Component Number.
- (b) Electrical Characteristics and Ratings.
- (c) Traceability Information.

##### 4.5.2 The ESCC Component Number

The ESCC component number shall be constituted and marked as follows:

Example: 301100101B

- Detail Specification Number: 3011001
- Type Variant (as applicable, see Para 4.4.1): 01
- Testing Level (B or C, as appropriate): B

#### 4.5.3 Electrical Characteristics and Ratings

The electrical characteristics and ratings to be marked in the following order of precedence are:

- (a) Numerical value.
- (b) Tolerance.
- (c) Rated voltage.

The information shall be constituted and marked as follows:

Example: 155KG

- Capacitance value (1.5 $\mu$ F): 155
- Tolerance ( $\pm 10\%$ ): K
- Rated voltage (25V): G

##### 4.5.3.1 *Capacitances*

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads.

Numerical Value (%)	Code
XX10 <sup>4</sup>	XX4
XX10 <sup>5</sup>	XX5
XX10 <sup>6</sup>	XX6

##### 4.5.3.2 *Tolerances*

The tolerance on numerical values shall be indicated by the letter code specified hereafter.

Tolerance (%)	Code Letter
$\pm 10$	K
$\pm 20$	M

##### 4.5.3.3 *Rated Voltage*

The rated voltage shall be indicated by the code letters specified hereafter.

Rated Voltage (V)	Code Letter
50	K
40	J
25	G
20	F
16	E
10	D
6.3	A
4	M

4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESCC Basic Specification No. 21700.

- (a) Manufacturing date code.
- (b) Manufacturer's name.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C.

4.6.2 Electrical Measurements at High and Low Temperatures (Table 3)

The parameters to be measured at high and low temperatures are scheduled in Table 3.

4.6.3 Circuit for Electrical Measurements

Not applicable.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**

No.	Characteristics	Symbol	ESCC 3011 Test Method	Test Conditions	Limits		Unit	Remarks
					Min.	Max.		
1	Capacitance	$C_n$	Para. 9.4.1.1	$V_T \leq 0.5V_{rms}$ $V_P = 2.1$ to $2.5V$ $f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$	$C_n$ -10 -20	$C_n$ +10 +20	$\mu F$ % %	See Table 1(a)
2	DC Leakage Current	$I_L$	Para. 9.4.1.2	$V_T = U_R \pm 2\%$ Series Resistor = $1k\Omega$	-	(Note 1)	$\mu A$	
3	Dissipation Factor	DF	Para. 9.4.1.3	$f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$	-	6	%	

**NOTES**

1.  $0.01C \times U_R$  or 1, whichever is the greater.

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

No.	Characteristics	Symbol	ESCC 3011 Test Method	Test Conditions (Note 1)	Limits		Unit	Remarks
					Min.	Max.		
1	Capacitance	$C_n$	Para. 9.4.1.1	$V_T \leq 0.5V_{rms}$ $V_P = 2.1$ to $2.5V$ $f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$  $-55^\circ C, +85^\circ C$ $+125^\circ C$	$C_n$	$C_n$	$\mu F$	See Table 1(a)
2	DC Leakage Current	$I_L$	Para. 9.4.1.2	$V_T = U_R \pm 2\%$ Series Resistor $= 1k\Omega$  $+85^\circ C$ $+125^\circ C$	-	(Note 2) (Note 3)	$\mu A$	
3	Dissipation Factor	DF	Para. 9.4.1.3	$f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$ $-55^\circ C, +85^\circ C,$ $+125^\circ C$	-	8	%	

**NOTES**

1. Inspection Level II, Single Sampling, AQL 2.5% for each capacitance value. Each capacitance value shall be considered as constituting a complete lot.
2.  $0.1C \times U_R$  or 10, whichever is the greater.
3.  $0.12C \times U_R$  or 12, whichever is the greater.

**4.7 SELECTIVE LEVEL TESTING**

**4.7.1 Parameter Drift Value**

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3^\circ C$ .

The parameter drift value ( $\Delta$ ) applicable to the parameter 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. 3011. The conditions for burn-in shall be as specified in Table 5 of this specification.

Upon completion of burn-in, a recovery period of  $24 \pm 2$  hours is necessary before performance of the end measurements.

**4.7.3 Electrical Circuit for Burn-in**

Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

No	Characteristics	Symbol	Test Method And Condition	Limits	Unit
1	Capacitance Change	$\Delta C/C$	ESCC No. 3011 Paras. 9.4.2 & 9.4.1.1	$\pm 5$	%
2	DC Leakage Change	$\Delta I_L/I_L$	ESCC No. 3011 Para 9.4.1.2	(1) +200% of initial value measured or +(25% + 0.05 $\mu$ A) of limit value, whichever is smaller	%

**NOTES**

1. Leakage currents  $\leq 0.1\mu$ A are considered as a 0.1 $\mu$ A value.

**FIGURE 4 - TEST CIRCUIT**

(Not applicable)

**TABLE 5 - CONDITIONS FOR BURN-IN**

No	Characteristics	Symbol	Limits	Unit
1	Ambient Temperature	$T_{amb}$	+125	$^{\circ}$ C
2	Test Voltage	$V_T$	0.66 $U_R$	V
3	Duration	t	168	Hours

**FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN**

(Not applicable)

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental testing shall be those specified in Table 6.

Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3$   $^{\circ}$ C.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance tests shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3$   $^{\circ}$ C.

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)

The requirements for operating life test are specified in Section 9 of ESCC Generic Specification No. 3011. The conditions for operating life test shall be as specified in Table 7 of this specification.

4.8.5 Electrical Circuit for Operating Life Test

Not applicable.

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

No.	ESCC Generic Spec. No. 3011		Measurements And Inspections		Symbol	Limits		Unit
	Environmental And Endurance Tests (1)	Test Method And Conditions	Identification	Conditions		Min.	Max.	
01	Visual Inspection	Para. 9.1	Visual Inspection	ESCC 20400	-	-	-	-
02	Mounting on Substrates	Para. 9.2	<b>Final Measurements</b> Capacitance DC Leakage Current Dissipation Factor Visual Examination	Table 2, Item 1 Table 2, Item 2 Table 2, Item 3 Good Tinning	C I <sub>L</sub> DF -	Table 2, Item 1 (2) Table 2, Item 2 Table 2, Item 3 -	-	-
03	Adhesion	Para. 9.5	<b>Final Examination</b> Visual Examination Capacitance	no damage or loosening from substrate Table 2, Item 1	- C	- Table 2, Item 1	-	-
04	Solderability	Para. 9.6	Visual Examination	no damage	-	-	-	-
05	Rapid Change of Temperature	Para. 9.7	<b>Initial Measurements</b> Capacitance <b>Final Measurements</b> Visual Examination Capacitance Change DC Leakage Current Dissipation Factor	Table 2, Item 1 or value recorded in 02 After 4 hours minimum recovery No corrosion, mechanical damage or obliteration of marking Table 2, Item 1 Table 2, Item 2 Table 2, Item 3	C   ΔC/C I <sub>L</sub> DF	Table 2, Item 1  - -5 Table 2, Item 2 Table 2, Item 3	-	%
06	Vibration	Para. 9.8	<b>Intermediate Measurements</b> Electrical Measurements <b>Final Examination</b> Visual Examination	During last cycle Intermittent operation, intermittent contact, arcing, open or shorts No damage	- -	- -	-	-
07	Shock or Bump	Para. 9.9	<b>Final Examination</b> Visual Examination	No damage	-	-	-	-

No.	ESCC Generic Spec. No. 3011		Measurements And Inspections		Symbol	Limits		Unit		
	Environmental And Endurance Tests (1)	Test Method And Conditions	Identification	Conditions		Min.	Max.			
08	Climatic Sequence  Dry Heat	Para. 9.10	<b>Initial Measurements</b> Capacitance	Value recorded in 02	C	Table 2, Item 1				
		Para. 9.10.2	<b>Intermediate Measurements</b> Capacitance Change DC Leakage Current	At High Temperature  Table 3, item 1 Table 3, Item 2	$\Delta C/C$ $I_L$	Table 3, item 1 Table 3, Item 2				
	Cold Test	Para. 9.10.4	<b>Intermediate Measurements</b> Capacitance Change	At Low Temperature  Table 3, item 1	$\Delta C/C$	Table 3, item 1				
		Para. 9.10.6	<b>Final Measurements</b> Capacitance Change Visual Inspection Capacitance Change DC Leakage Current Dissipation Factor	Recovery period 1 to 24 hours Gen. 3011, Para. 9.10.7  Table 2, item 1 Table 2, item 2 Table 2, Item 3	- $\Delta C/C$ $I_L$ DF	- -10 Table 2, Item 2 -	- +10 Note 3			
	09	Damp Heat, Steady State	Para. 9.11 During 56 days	<b>Initial Measurements</b> Capacitance	Value recorded in 02	C	Table 2, item 1			
				<b>Final Measurements</b> Visual Examination	Recovery Period 6 to 24 ± 2 hours  No damage	-	-		-	-
				Capacitance Change	Table 2, item 1	$\Delta C/C$	-10		+10	%
				DC Leakage Current	Table 2, item 2	$I_L$	Table 2, Item 2			
Dissipation Factor				Table 2, Item 3	DF	-	Note 3			
10	High and Low Temperature Stability	Para. 9.12	Capacitance Change	Table 3, Item 1	$\Delta C/C$	Table 3, Item 1				
			DC Leakage Current at all but Step 2	Table 3, item 2	$I_L$	Table 3, Item 2				
			Dissipation Factor	Table 3, Item 3	DF	Table 3, Item 3				
11	Surge Voltage	Para. 9.13	Final Measurements	After temperature stabilisation						
			Capacitance	Table 2, item 1	C	Table 2, item 1				
			DC Leakage Current	Table 2, item 2	$I_L$	Table 2, Item 2				
			Dissipation Factor	Table 2, Item 3	DF	Table 2, Item 3				



No.	ESCC Generic Spec. No. 3011		Measurements And Inspections		Symbol	Limits		Unit
	Environmental And Endurance Tests (1)	Test Method And Conditions	Identification	Conditions		Min.	Max.	
12	Operating Life	Para. 9.15	<b>Initial Measurements</b> Capacitance DC Leakage Current Dissipation Factor <b>Intermediate Measurements</b> DC Leakage Current <b>Final Measurements</b> Capacitance Change DC Leakage Current Dissipation Factor Visual Examination	Value recorded in 02 Table 2, item 2 Table 2, Item 3 at 250 and 1000 hours At High Temperature Table 3, Item 2 At 1000 and 2000 hours and after 24 hours recovery Table 2, Item 1 Table 2, Item 2 At +25 °C At +85 °C At +125 °C Table 2, Item 3 No damage	C $I_L$ DF  $I_L$  $\Delta C/C$  $I_L$  DF -	Table 2, item 1 Table 2, Item 2 Table 2, Item 3  Table 3, Item 2  -5   +5  Table 2, Item 2 Table 3, Item 2 Table 3, Item 2 Table 2, item 3 -   -	%    %    -	
13	Permanence of Marking	Para. 9.17	<b>Final Examination</b> Visual Examination	ESCC No. 24800	-	-	-	-

**NOTES**

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. Value to be recorded.
3. 1.2 x value specified in Table 2 Item 3.

**TABLE 7 - CONDITIONS FOR OPERATING LIFE**

No	Characteristics	Symbol	Condition	Unit
1	Ambient Temperature	$T_{amb}$	+85 +125	°C
2	Test Voltage	$U_R$	Rated Voltage (1) Derated Voltage	Vdc

**NOTES**

1. The test voltage shall be the rated voltage (see Table 1(a)) for +85 °C ambient temperature and the derated voltage (see Figure 1) for +125 °C ambient temperature.