



PRODUCT SPECIFICATION

TE Connectivity Description:

DP11SMD3015NB9.5K - 11MM SMD
ROTARY ENCODER - 2176159-1

Approved on behalf of customer
Date

Parts corresponding to RoHS Compliant: 2005-Apr.-1

Approved	Checked	Prepared
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Issued Date: 2010/09/28 - Version 1

ROTATIONAL ENCODER SPECIFICATION



General

1-1 Application

This specification applies to the 11mm size rotary encoder (incremental) for microscopic current circuit used in electronic equipment.

1-2 Standard atmospheric conditions

Unless otherwise specified the standard range of atmospheric conditions for making measurements and tests is as follows.

Ambient temperature : 15°C to 35°C

Relative humidity : 25% to 85%

Air pressure : 86kpa to 106kpa

If there is any doubt the results, measurement shall be made within the follow limits

Ambient temperature : 20°C±2°C

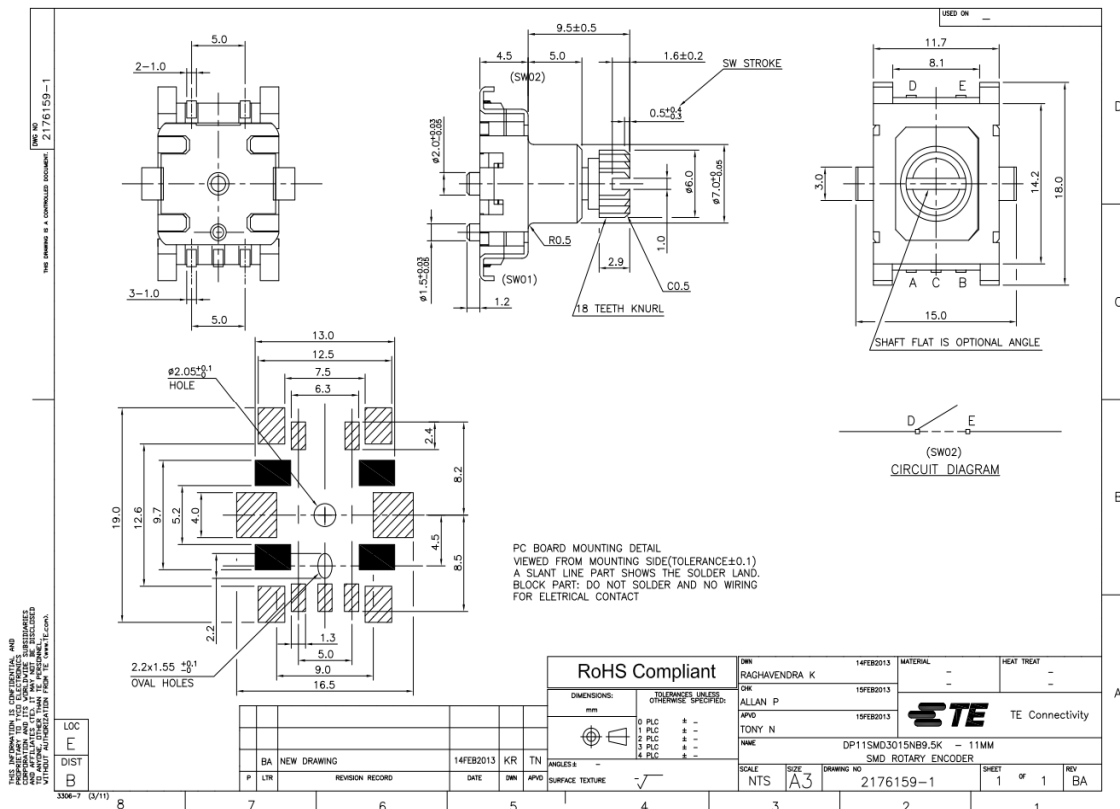
Relative humidity : 60% to 70%

Air pressure : 86kpa to 106kpa

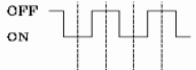

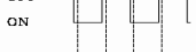
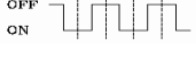
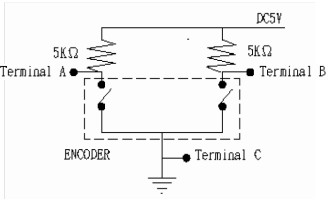
1-3 Operating temperature range : -40°C to +85°C

1-4 Storage temperature range :-40°C to +85°C

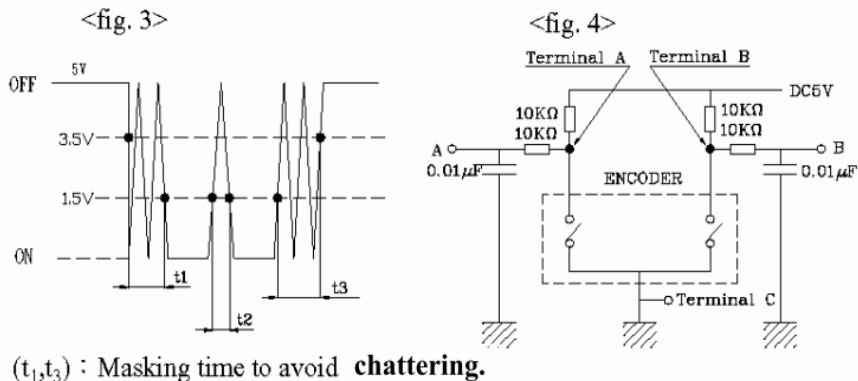
1-5 Construction and dimensions Refer to attached drawing



Electrical Characteristics

NO.	item	conditions	specifications	
2-1	output signal format		2. Phase-different signals (Signal A. & signal B) Details shown in <fig.1 > (The broken line shows detent position of with - detent type.)	
		Shaft rotational direction	Signal	Output constant speed : 360°
		C. W.	A (Terminal A-C)	
			B (Terminal B-C)	
		C. C. W.	A (Terminal A-C)	
			B (Terminal B-C)	
2-2	Resolution	Number of pulses in 360° rotation .	15 pulses / 360° for each phase (2click 1 pulse)	
2-3	Switching characteristics	Measurement shall be made under the condition as follows. (1). Shaft rotational speed : 360° /S (2). Test circuit : < fig. 2 > . 		
2-4	Sliding noise	Details shown in <fig.3> Specified by the signal's passage time from 3.5V to 1.5V or from 1.5V to 3.5V of each switching position (code OFF→ON or ON→OFF) . Note : To avoid chattering(t1 , t3), please consider masking time and adding C/R filters on your circuit for pulse count design, as show in <fig. 4> .	t1 , t3 ≤2ms	

NO.	item	conditions	specifications
		(2) Bounce Details shown in <fig.3>.Specified by the time of voltage change exceed 1.5V in code - ON area. When the bounce has code - ON time less than 1ms between chatterings (t ₁ or t ₃), the voltage change shall be regarded as a part of chattering. When the code - ON time between 2 bounces is less than 1ms, they are regarded as 1 linked bounce.	$t_2 \leq 2\text{ms}$
		(3) Sliding noise The voltage change in code-OFF area	3.5V MIN.



Code - OFF area : The area which the voltage is 3.5V or more.
 Code - ON area : The area which the voltage is 1.5 V or less.

2-5		Measurement shall be made under the condition which the shaft is rotated in 360° / S(constant speed). <p style="text-align: center;">Rotational direction</p>	$\Delta T \geq 4 \text{ msec}$
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Note : * The test is conducted with equipment at constant speed: 360°/S according to Spec.
 Item 2-4 & 2-5, and the test result could be different from the result by manual test.
 * In order to prove the interoperability between the firmware and the encoder,
 please test the part in real condition

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NO.	item	conditions	specifications
2-6	Insulation resistance	Measurement shall be made under the condition which a voltage of 250V D.C is applied between individual terminals and bushing.	Between individual terminals and bushing . 100MΩ MIN.
2-7	Dielectric strength	A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and bushing (Leak current : 1mA)	Without damage to parts arcing or breakdown.
2-8	Rating		D.C. 5V 10 mA

Mechanical characteristics

3-1	Total rotational angle		360° (Endless)												
3-2	Detent torque		100±70gf.cm												
3-3	Number and position		(30 detents) (step angle:12° ±3°)												
3-4	Push - pull strength of shaft	Push and pull static load of 10Kgf shall be applied to the shaft in the axial direction for 10sec.(After installing)	Without damage or excessive play in shaft. No excessive abnormality in rotational feeling.												
3-5	Shaft wobble	A momentary load of 500gf.cm shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	<table border="0"> <tr> <td>Bushing wobble length</td> <td>(mm)</td> <td>(mmp-p less)</td> </tr> <tr> <td></td> <td>3.5</td> <td>1.4xL/30mm</td> </tr> <tr> <td></td> <td>5</td> <td>1.1xL/30mm</td> </tr> <tr> <td></td> <td>7</td> <td>0.7xL/30mm</td> </tr> </table> <p>L: Measurement point from mounting surface of bushing.</p>	Bushing wobble length	(mm)	(mmp-p less)		3.5	1.4xL/30mm		5	1.1xL/30mm		7	0.7xL/30mm
Bushing wobble length	(mm)	(mmp-p less)													
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3-6	Rotation play at the click position	Mesurement with jig for rotational angle .	5° MAX.												

3-7	Notice for mounting	<p>Hold the bushing use front panel or light pipe. Because this switch not has thread, If don't hold the bushing, the switch maybe become intermittent or rough mounting after soldering by knob stopper force.</p>	<p style="text-align: center;">FRONT PANEL OR LIGHT PIPE</p>
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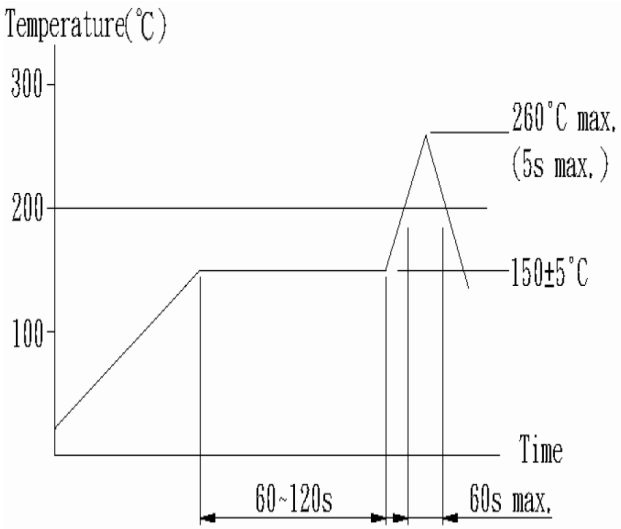
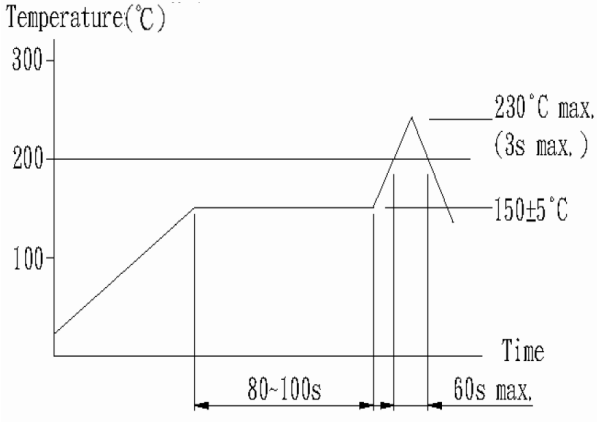
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Endurance characteristics

NO.	item	conditions	specifications
4-1	Rotational life	The shaft of encoder shall be rotated to 15,000 cycles at a speed of 500 cycles per hour without electrical load, after which measurement shall be mad (1 cycle : rotate 360° C.C.W. rotate 360° C.W.)	Detent torque : Relative to the previously Specified +10 value. % -30 Sliding noise : $t_1, t_2, t_3 \leq 3\text{ms}$ Except above items , specifications in clause 2.1~8 and 3.1~6 shall be satisfied.

Soldering condition

NO.	item	conditions	specifications
5-1	Re-flow soldering	<p>Precaution in use :</p> <p>1.1 Load on terminals during soldering : Note that if the load is applied to the terminals during soldering they might suffer deformation and defects in electrical performance.</p> <p>1.2 Use of water-soluble soldering flux shall be avoided because it may cause erosion of the part.</p> <p>1.3 Condition of re-flow soldering shall be confirmed with actual production conditions.</p> <p>1.4 Example of re-flow soldering condition (reference)</p> <p>a-1. Heating method : re-flow soldering with infrared heater. (only once)</p> <p>a-2. Temperature measurement : Thermocouple $\Phi 0.1\sim 0.2$ CA(K) or CC(T) at soldering portion</p> <p>a-3. Temperature profile :</p>  <p>b-1. Heating method: re-flow soldering with hot air.(only once)</p> <p>b-2. Temperature measurement: Thermocouple $\Phi 0.1\sim 0.2$ CA(K) or CC(T) at soldering portion.</p> <p>b-3. Temperature profile:</p> <p>b-3. Temperature profile:</p> 	

PUSH MOMENTARY SWITCH SPECIFICATION



NO.	item	conditions	specifications
6-1	Contact resistance	Measured by the Electric Current DC voltage drop method	100 mΩ MAX.
6-2	Chattering	Switch is operated at the rate of 1 cycle 1 sec. The 1 cycle shall be OFF - ON - OFF.	Less than 10 msec .
6-3	Insulation resistance	Measurement shall be made under the condition which a voltage of 250V D.C.is applied between individual terminals and bushing.	Between individual terminals and bushing 100MΩ MIN .
6-4	Dielectric strength	A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and bushing. (Leak current : 1mA)	Without damage to parts arcing or breakdown.
6-5	Switch rating (Resistor load)		D.C.5V 10mA

(Switch mechanical characteristics)

7-1	Contact arrangement		S.P.S.T (PUSH ON)
7-2	Switching stroke		+0.4 0.5 mm -0.3
7-3	Switch strength		350±100gf.

(Switch mechanical characteristics)

NO.	item	conditions	specifications
8-1	Operating life	The shaft of switch shall be 20,000 times without electrical load, after which measurements shall be made	Switch contact resistance : 200mΩ MAX . Switch strength : Relative to the +10 previously specified value % -30 Except above items specifications in clause 6.1~4 and7.1~3 shall be satisfied.

ROHS COMPLIANCE