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REQUEST for PROJECT REPORT

RFP RFI-42040-1

THORLABS

GTM46161-16V.V-USB* EMC TEST REPORT (05-12-2020)

Tests performed at 230Vac on 2 sample units of GTM46161-165.0-USB1A

SUMMARY of TEST RESULTS:

TYPE	LEVEL	DATE	SAMPLE #	RESULTS
EFT - 2KV 100KHz	±2KV	4-22-2020	SAMPLE #1	PASSED
SURGE 1KV DIFFERENTIAL MODE	±1KV	4-22-2020	SAMPLE #1	PASSED
SURGE 2KV COMMON MODE	±2KV	4-22-2020	SAMPLE #1	PASSED
ESD – CONTACT DISCHARGE	±8KV	4-29-2020	SAMPLE #1	PASSED
ESD – AIR DISCHARGE	±20KV	4-29-2020	SAMPLE #2	PASSED

TEST RESULTS DETAILS:

PRODUCT HISTORY:

5 units were received by GTUS Lab, all unsealed, taped around the housing. These power supplies were powered at its rated load 5.0V at 3.2A, using available cable approx. 2 ft long solid wire 22AWG.
2 UNITS – GTM46161-165.0-USB1A (USED FOR THESE ACTIVITIES)
2 UNITS – GTM46161-165.0-USB2A (USED FOR SURGE MARGIN TEST ACTIVITIES)
1 UNIT – GTM46161-165.0-USBC
Visual inspection done on the samples and have the same PCB structure except on the secondary due to various type of output connector used. These were sent to GT Lab for compliance testing and margin determination how far it could go.

Test conducted were as follows:

EFT TEST

Date tested: April 22, 2020
Test type: EFT TEST at 2KV

SAMPLE 1: GTM46161-165.0-USB1A

Line	Output	Freq	Burst Time	Repeat Time	Time (Sec)	
2KV Class 2	L+	100KHz	0.75mS	300mS	60	OK
	N+	100KHz	0.75mS	300mS	60	OK
	L + N+	100KHz	0.75mS	300mS	60	OK
	L-	100KHz	0.75mS	300mS	60	OK
	N-	100KHz	0.75mS	300mS	60	OK
	L- N-	100KHz	0.75mS	300mS	60	OK

Tested by: EV

Actual test profile below:

09:57:11 4/22/2020
09:57:23 Burst Generator activated!

Time	Output	Volt (kV)	Freq. (kHz)	Burst (ms)	Rep (ms)	T Eut (A)	CFG Output
09:57:24	L+	0.00	100.0	0.75	300	0.0	off
09:57:24	L+	2.00	100.0	0.75	300	0.0	off
09:58:26	N+	2.00	100.0	0.75	300	0.0	off
09:59:29	Stop						
09:59:30	L+N+	2.00	100.0	0.75	300	0.0	off
10:00:32	Stop						
10:00:33	L-	2.00	100.0	0.75	300	0.0	off
10:01:34	Stop						
10:01:35	N-	2.00	100.0	0.75	300	0.0	off
10:02:37	Stop						
10:02:38	L-N-	2.00	100.0	0.75	300	0.0	off
10:03:40	Stop						

RESULT: PASSED, NO ISSUE

SURGE TEST:

PART 1

SAMPLE 1: GTM46161-165.0-USB1A

TEST TYPE: SURGE DIFFERENTIAL MODE_0.5KV-1KV PER EN610004-5
Date: 04/22/2020
10:32:18 Surge Generator activated!

Time	Output	Us (kV)	Ph. (?)	Rep (s)	EUT (A)	Cnt max	Cnt	CFG Output
10:33:47	L+N-	0.50	0	60	0.1	4	5	off
10:34:37	L+N-	0.50	0	60	0.1	3	5	off
10:35:28	L+N-	0.50	0	60	0.1	2	5	off
10:36:18	L+N-	0.50	0	60	0.1	1	5	off
10:37:07	L+N-	0.50	0	60	0.1	0	5	off
10:37:58	L+N-	0.50	0	60	0.0	0	5	off
10:37:58	Stop Counter:0							
10:38:01	L-N+	0.50	0	60	0.1	4	5	off
10:39:01	L-N+	0.50	0	60	0.1	3	5	off
10:40:01	L-N+	0.50	0	60	0.1	2	5	off
10:41:01	L-N+	0.50	0	60	0.1	1	5	off
10:42:01	L-N+	0.50	0	60	0.1	0	5	off
10:43:02	Stop Counter:0							
10:43:06	L+N-	0.50	90	60	0.1	4	5	off
10:44:08	L+N-	0.50	90	60	0.1	3	5	off
10:45:10	L+N-	0.50	90	60	0.1	2	5	off
10:46:13	L+N-	0.50	90	60	0.1	1	5	off
10:47:15	L+N-	0.50	90	60	0.1	0	5	off
10:48:16	Stop Counter:0							

Tested by: EV

```
10:48:20 L-N+ 0.50 90 60 0.1 4 5 off
10:49:22 L-N+ 0.50 90 60 0.1 3 5 off
10:50:24 L-N+ 0.50 90 60 0.1 2 5 off
10:51:26 L-N+ 0.50 90 60 0.1 1 5 off
10:52:28 L-N+ 0.50 90 60 0.1 0 5 off
10:53:30 Stop Counter:0
10:53:33 L+N- 0.50 180 60 0.1 4 5 off
10:54:23 L+N- 0.50 180 60 0.1 3 5 off
10:55:13 L+N- 0.50 180 60 0.1 2 5 off
10:56:03 L+N- 0.50 180 60 0.1 1 5 off
10:56:53 L+N- 0.50 180 60 0.1 0 5 off
10:57:43 Stop Counter:0
10:57:47 L-N+ 0.50 180 60 0.1 4 5 off
10:58:52 L-N+ 0.50 180 60 0.1 3 5 off
10:59:57 L-N+ 0.50 180 60 0.1 2 5 off
11:01:00 L-N+ 0.50 180 60 0.1 1 5 off
11:02:05 L-N+ 0.50 180 60 0.1 0 5 off
11:03:07 Stop Counter:0
11:03:14 L+N- 0.50 270 60 0.1 4 5 off
11:04:19 L+N- 0.50 270 60 0.1 3 5 off
11:05:27 L+N- 0.50 270 60 0.1 2 5 off
11:06:33 L+N- 0.50 270 60 0.1 1 5 off
11:07:39 L+N- 0.50 270 60 0.1 0 5 off
11:08:43 Stop Counter:0
11:08:49 L-N+ 0.50 270 60 0.1 4 5 off
11:09:55 L-N+ 0.50 270 60 0.1 3 5 off
11:11:02 L-N+ 0.50 270 60 0.1 2 5 off
11:12:08 L-N+ 0.50 270 60 0.1 1 5 off
11:13:14 L-N+ 0.50 270 60 0.1 0 5 off
11:14:18 Stop Counter:0
11:14:21 L+N- 1.00 0 60 0.1 4 5 off
11:15:21 L+N- 1.00 0 60 0.1 3 5 off
11:16:21 L+N- 1.00 0 60 0.1 2 5 off
11:17:21 L+N- 1.00 0 60 0.1 1 5 off
11:18:22 L+N- 1.00 0 60 0.1 0 5 off
11:19:21 Stop Counter:0
11:19:25 L-N+ 1.00 0 60 0.1 4 5 off
11:20:24 L-N+ 1.00 0 60 0.1 3 5 off
11:21:25 L-N+ 1.00 0 60 0.1 2 5 off
11:22:25 L-N+ 1.00 0 60 0.1 1 5 off
11:23:24 L-N+ 1.00 0 60 0.1 0 5 off
11:24:26 L-N+ 1.00 0 60 0.0 0 5 off
11:24:26 Stop Counter:0
11:24:29 L+N- 1.00 90 60 0.1 4 5 off
11:25:32 L+N- 1.00 90 60 0.1 3 5 off
11:26:34 L+N- 1.00 90 60 0.1 2 5 off
11:27:36 L+N- 1.00 90 60 0.1 1 5 off
11:28:38 L+N- 1.00 90 60 0.1 0 5 off
11:29:40 L+N- 1.00 90 60 0.0 0 5 off
11:29:40 Stop Counter:0
11:29:44 L-N+ 1.00 90 60 0.1 4 5 off
11:30:46 L-N+ 1.00 90 60 0.1 3 5 off
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Tested by: EV

```
11:31:49 L-N+ 1.00 90 60 0.1 2 5 off
11:32:51 L-N+ 1.00 90 60 0.1 1 5 off
11:33:53 L-N+ 1.00 90 60 0.1 0 5 off
11:34:54 Stop Counter:0
11:34:59 L+N- 1.00 180 60 0.1 4 5 off
11:36:03 L+N- 1.00 180 60 0.1 3 5 off
11:37:08 L+N- 1.00 180 60 0.1 2 5 off
11:38:12 L+N- 1.00 180 60 0.1 1 5 off
11:39:16 L+N- 1.00 180 60 0.1 0 5 off
11:40:19 Stop Counter:0
11:40:22 L-N+ 1.00 180 60 0.1 4 5 off
11:41:12 L-N+ 1.00 180 60 0.1 3 5 off
11:42:02 L-N+ 1.00 180 60 0.1 2 5 off
11:42:52 L-N+ 1.00 180 60 0.1 1 5 off
11:43:42 L-N+ 1.00 180 60 0.1 0 5 off
11:44:33 L-N+ 1.00 180 60 0.0 0 5 off
11:44:33 Stop Counter:0
11:44:39 L+N- 1.00 270 60 0.1 4 5 off
11:45:46 L+N- 1.00 270 60 0.1 3 5 off
11:46:52 L+N- 1.00 270 60 0.1 2 5 off
11:47:59 L+N- 1.00 270 60 0.1 1 5 off
11:49:05 L+N- 1.00 270 60 0.1 0 5 off
11:50:09 L+N- 1.00 270 60 0.0 0 5 off
11:50:09 Stop Counter:0
11:50:15 L-N+ 1.00 270 60 0.1 4 5 off
11:51:21 L-N+ 1.00 270 60 0.1 3 5 off
11:52:28 L-N+ 1.00 270 60 0.1 2 5 off
11:53:35 L-N+ 1.00 270 60 0.1 1 5 off
11:54:41 L-N+ 1.00 270 60 0.1 0 5 off
11:55:44 Stop Counter:0
RESULT: PASSED 1KV DIFFERENTIAL MODE SURGE TEST.

PART 2:
SAMPLE 1: GTM46161-165.0-USB1A
TEST TYPE: SURGE COMMON MODE_1KV-2KV PER EN610004-5
13:40:18  Surge Generator activated!
Time     Output  Us   Ph. Rep  EUT  Cnt max Cnt CFG Output
            (kV) (?) (s)  (A)
13:42:17 Stop Counter:0
13:42:21 L+PE- 1.00 90 60 0.0 4 5 off
13:43:23 L+PE- 1.00 90 60 0.0 3 5 off
13:44:25 L+PE- 1.00 90 60 0.0 2 5 off
13:45:27 L+PE- 1.00 90 60 0.0 1 5 off
13:46:30 L+PE- 1.00 90 60 0.0 0 5 off
13:47:31 Stop Counter:0
13:47:35 L-PE+ 1.00 90 60 0.0 4 5 off
13:48:37 L-PE+ 1.00 90 60 0.0 3 5 off
13:49:39 L-PE+ 1.00 90 60 0.0 2 5 off
13:50:41 L-PE+ 1.00 90 60 0.0 1 5 off
13:51:43 L-PE+ 1.00 90 60 0.0 0 5 off
13:52:45 Stop Counter:0
```

Tested by: EV

```
13:52:50 L+PE- 1.00 180 60 0.0 4 5 off
13:53:55 L+PE- 1.00 180 60 0.0 3 5 off
13:54:59 L+PE- 1.00 180 60 0.0 2 5 off
13:56:03 L+PE- 1.00 180 60 0.0 1 5 off
13:57:08 L+PE- 1.00 180 60 0.0 0 5 off
13:58:10 Stop Counter:0
13:58:15 L-PE+ 1.00 180 60 0.0 4 5 off
13:59:20 L-PE+ 1.00 180 60 0.0 3 5 off
14:00:24 L-PE+ 1.00 180 60 0.0 2 5 off
14:01:28 L-PE+ 1.00 180 60 0.0 1 5 off
14:02:33 L-PE+ 1.00 180 60 0.0 0 5 off
14:03:35 Stop Counter:0
14:03:41 L+PE- 1.00 270 60 0.0 4 5 off
14:04:48 L+PE- 1.00 270 60 0.0 3 5 off
14:05:54 L+PE- 1.00 270 60 0.0 2 5 off
14:07:00 L+PE- 1.00 270 60 0.0 1 5 off
14:08:07 L+PE- 1.00 270 60 0.0 0 5 off
14:09:11 Stop Counter:0
14:09:17 L-PE+ 1.00 270 60 0.0 4 5 off
14:10:22 L-PE+ 1.00 270 60 0.0 3 5 off
14:11:30 L-PE+ 1.00 270 60 0.0 2 5 off
14:12:36 L-PE+ 1.00 270 60 0.0 1 5 off
14:13:43 L-PE+ 1.00 270 60 0.0 0 5 off
14:14:46 Stop Counter:0
14:14:49 PE-N+ 1.00 0 60 0.0 4 5 off
14:15:49 PE-N+ 1.00 0 60 0.0 3 5 off
14:16:49 PE-N+ 1.00 0 60 0.0 2 5 off
14:17:49 PE-N+ 1.00 0 60 0.0 1 5 off
14:18:49 PE-N+ 1.00 0 60 0.0 0 5 off
14:19:49 Stop Counter:0
14:19:52 PE+N- 1.00 0 60 0.0 4 5 off
14:20:53 PE+N- 1.00 0 60 0.0 3 5 off
14:21:52 PE+N- 1.00 0 60 0.0 2 5 off
14:22:52 PE+N- 1.00 0 60 0.0 1 5 off
14:23:53 PE+N- 1.00 0 60 0.0 0 5 off
14:24:53 Stop Counter:0
14:24:56 PE-N+ 1.00 90 60 0.0 4 5 off
14:25:58 PE-N+ 1.00 90 60 0.0 3 5 off
14:27:00 PE-N+ 1.00 90 60 0.0 2 5 off
14:28:03 PE-N+ 1.00 90 60 0.0 1 5 off
14:29:05 PE-N+ 1.00 90 60 0.0 0 5 off
14:30:06 Stop Counter:0
14:30:10 PE+N- 1.00 90 60 0.0 4 5 off
14:31:12 PE+N- 1.00 90 60 0.0 3 5 off
14:32:14 PE+N- 1.00 90 60 0.0 2 5 off
14:33:16 PE+N- 1.00 90 60 0.0 1 5 off
14:34:19 PE+N- 1.00 90 60 0.0 0 5 off
14:35:20 Stop Counter:0
14:35:25 PE-N+ 1.00 180 60 0.0 4 5 off
14:36:29 PE-N+ 1.00 180 60 0.0 3 5 off
14:37:34 PE-N+ 1.00 180 60 0.0 2 5 off
14:38:38 PE-N+ 1.00 180 60 0.0 1 5 off
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Tested by: EV

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14:39:42 PE-N+ 1.00 180 60 0.0 0 5 off
14:40:45 Stop Counter:0
14:40:49 PE+N- 1.00 180 60 0.0 4 5 off
14:41:54 PE+N- 1.00 180 60 0.0 3 5 off
14:42:58 PE+N- 1.00 180 60 0.0 2 5 off
14:44:02 PE+N- 1.00 180 60 0.0 1 5 off
14:45:07 PE+N- 1.00 180 60 0.0 0 5 off
14:46:09 Stop Counter:0
14:46:12 PE-N+ 1.00 270 60 0.0 4 5 off
14:47:02 PE-N+ 1.00 270 60 0.0 3 5 off
14:47:52 PE-N+ 1.00 270 60 0.0 2 5 off
14:48:42 PE-N+ 1.00 270 60 0.0 1 5 off
14:49:33 PE-N+ 1.00 270 60 0.0 0 5 off
14:50:23 Stop Counter:0
14:50:30 PE+N- 1.00 270 60 0.0 4 5 off
14:51:35 PE+N- 1.00 270 60 0.0 3 5 off
14:52:42 PE+N- 1.00 270 60 0.0 2 5 off
14:53:48 PE+N- 1.00 270 60 0.0 1 5 off
14:54:55 PE+N- 1.00 270 60 0.0 0 5 off
14:55:59 Stop Counter:0
14:56:02 L+PE- 2.00 0 60 0.0 4 5 off
14:57:02 L+PE- 2.00 0 60 0.0 3 5 off
14:58:02 L+PE- 2.00 0 60 0.0 2 5 off
14:59:01 L+PE- 2.00 0 60 0.0 1 5 off
15:00:02 L+PE- 2.00 0 60 0.0 0 5 off
15:01:02 Stop Counter:0
15:01:05 L-PE+ 2.00 0 60 0.0 4 5 off
15:02:05 L-PE+ 2.00 0 60 0.0 3 5 off
15:03:05 L-PE+ 2.00 0 60 0.0 2 5 off
15:04:05 L-PE+ 2.00 0 60 0.0 1 5 off
15:05:06 L-PE+ 2.00 0 60 0.0 0 5 off
15:06:06 Stop Counter:0
15:06:10 L+PE- 2.00 90 60 0.0 4 5 off
15:07:12 L+PE- 2.00 90 60 0.0 3 5 off
15:08:14 L+PE- 2.00 90 60 0.0 2 5 off
15:09:17 L+PE- 2.00 90 60 0.0 1 5 off
15:10:19 L+PE- 2.00 90 60 0.0 0 5 off
15:11:20 Stop Counter:0
15:11:24 L-PE+ 2.00 90 60 0.0 4 5 off
15:12:26 L-PE+ 2.00 90 60 0.0 3 5 off
15:13:28 L-PE+ 2.00 90 60 0.0 2 5 off
15:14:30 L-PE+ 2.00 90 60 0.0 1 5 off
15:15:32 L-PE+ 2.00 90 60 0.0 0 5 off
15:16:35 Stop Counter:0
15:16:39 L+PE- 2.00 180 60 0.0 4 5 off
15:17:44 L+PE- 2.00 180 60 0.0 3 5 off
15:18:48 L+PE- 2.00 180 60 0.0 2 5 off
15:19:52 L+PE- 2.00 180 60 0.0 1 5 off
15:20:57 L+PE- 2.00 180 60 0.0 0 5 off
15:21:59 Stop Counter:0
15:22:04 L-PE+ 2.00 180 60 0.0 4 5 off
15:23:08 L-PE+ 2.00 180 60 0.0 3 5 off
```

Tested by: EV

```
15:24:12 L-PE+ 2.00 180 60 0.0 2 5 off
15:25:17 L-PE+ 2.00 180 60 0.0 1 5 off
15:26:22 L-PE+ 2.00 180 60 0.0 0 5 off
15:27:24 Stop Counter:0
15:27:30 L+PE- 2.00 270 60 0.0 4 5 off
15:28:37 L+PE- 2.00 270 60 0.0 3 5 off
15:29:43 L+PE- 2.00 270 60 0.0 2 5 off
15:30:49 L+PE- 2.00 270 60 0.0 1 5 off
15:31:56 L+PE- 2.00 270 60 0.0 0 5 off
15:33:00 Stop Counter:0
15:33:06 L-PE+ 2.00 270 60 0.0 4 5 off
15:34:12 L-PE+ 2.00 270 60 0.0 3 5 off
15:35:19 L-PE+ 2.00 270 60 0.0 2 5 off
15:36:25 L-PE+ 2.00 270 60 0.0 1 5 off
15:37:32 L-PE+ 2.00 270 60 0.0 0 5 off
15:38:35 Stop Counter:0
15:38:38 PE-N+ 2.00 0 60 0.0 4 5 off
15:39:38 PE-N+ 2.00 0 60 0.0 3 5 off
15:40:37 PE-N+ 2.00 0 60 0.0 2 5 off
15:41:38 PE-N+ 2.00 0 60 0.0 1 5 off
15:42:37 PE-N+ 2.00 0 60 0.0 0 5 off
15:43:38 Stop Counter:0
15:43:41 PE+N- 2.00 0 60 0.0 4 5 off
15:44:41 PE+N- 2.00 0 60 0.0 3 5 off
15:45:41 PE+N- 2.00 0 60 0.0 2 5 off
15:46:41 PE+N- 2.00 0 60 0.0 1 5 off
15:47:41 PE+N- 2.00 0 60 0.0 0 5 off
15:48:41 Stop Counter:0
15:48:44 PE-N+ 2.00 90 60 0.0 4 5 off
15:49:34 PE-N+ 2.00 90 60 0.0 3 5 off
15:50:25 PE-N+ 2.00 90 60 0.0 2 5 off
15:51:15 PE-N+ 2.00 90 60 0.0 1 5 off
15:52:04 PE-N+ 2.00 90 60 0.0 0 5 off
15:52:54 Stop Counter:0
15:52:58 PE+N- 2.00 90 60 0.0 4 5 off
15:54:00 PE+N- 2.00 90 60 0.0 3 5 off
15:55:02 PE+N- 2.00 90 60 0.0 2 5 off
15:56:04 PE+N- 2.00 90 60 0.0 1 5 off
15:57:07 PE+N- 2.00 90 60 0.0 0 5 off
15:58:08 Stop Counter:0
15:58:13 PE-N+ 2.00 180 60 0.0 4 5 off
15:59:18 PE-N+ 2.00 180 60 0.0 3 5 off
16:00:21 PE-N+ 2.00 180 60 0.0 2 5 off
16:01:26 PE-N+ 2.00 180 60 0.0 1 5 off
16:02:30 PE-N+ 2.00 180 60 0.0 0 5 off
16:03:33 Stop Counter:0
16:03:36 PE+N- 2.00 180 60 0.0 4 5 off
16:04:26 PE+N- 2.00 180 60 0.0 3 5 off
16:05:16 PE+N- 2.00 180 60 0.0 2 5 off
16:06:06 PE+N- 2.00 180 60 0.0 1 5 off
16:06:56 PE+N- 2.00 180 60 0.0 0 5 off
16:07:46 Stop Counter:0
```

Tested by: EV

```
16:07:53 PE-N+ 2.00 270 60 0.0 4 5 off
16:08:59 PE-N+ 2.00 270 60 0.0 3 5 off
16:10:05 PE-N+ 2.00 270 60 0.0 2 5 off
16:11:11 PE-N+ 2.00 270 60 0.0 1 5 off
16:12:18 PE-N+ 2.00 270 60 0.0 0 5 off
16:13:22 Stop Counter:0
16:13:28 PE+N- 2.00 270 60 0.0 4 5 off
16:14:34 PE+N- 2.00 270 60 0.0 3 5 off
16:15:41 PE+N- 2.00 270 60 0.0 2 5 off
16:16:47 PE+N- 2.00 270 60 0.0 1 5 off
16:17:54 PE+N- 2.00 270 60 0.0 0 5 off
16:18:57 Stop Counter:0
```

RESULT: PASSED 2KV COMMON MODE SURGE TEST- NO ISSUE.

Note: On 4-29-2020, 1.5KV DM surge test was applied and right on the first pulse L+N-, the UUT got damaged with no recovery. Failure analysis conducted showed the bridge diode AC pins shorted blowing the fuse F1.

ESD - Electrostatic Discharge:
Date tested: April 29, 2020
SAMPLE 1 & 2: GTM46161-165.0-USB1A
Test type: Electrostatic Discharge

Discharge type	Discharge Level/Polarity	Tested location	Number of discharges	Results
Contact Discharge	±8KV	O/P COM CONNECTOR	x5	PASSED
		LED LENS	x5	PASSED
		HOUSING EXCEPT SEAM	x5	PASSED
Air Discharge	±10KV	O/P COM CONNECTOR	x5	PASSED
		LED LENS	x5	PASSED
		HOUSING EXCEPT SEAM	x5	PASSED
	±12KV	O/P COM CONNECTOR	x5	PASSED
		LED LENS	x5	PASSED
		HOUSING EXCEPT SEAM	x5	PASSED
	±15KV	O/P COM CONNECTOR	x5	PASSED
		LED LENS	x5	PASSED
		HOUSING EXCEPT SEAM	x5	PASSED
	±20KV SAMPLE #2	O/P COM CONNECTOR	x5	PASSED
		LED LENS	x5	PASSED
		HOUSING EXCEPT SEAM	x5	PASSED

NOTE: Housing seam was not tested since sample units were not production sealed.

Tested by: EV