

Test Report: TIDA-00465

Single Port, Power-over-Ethernet, Type 2 Auto-Mode PSE Reference Design

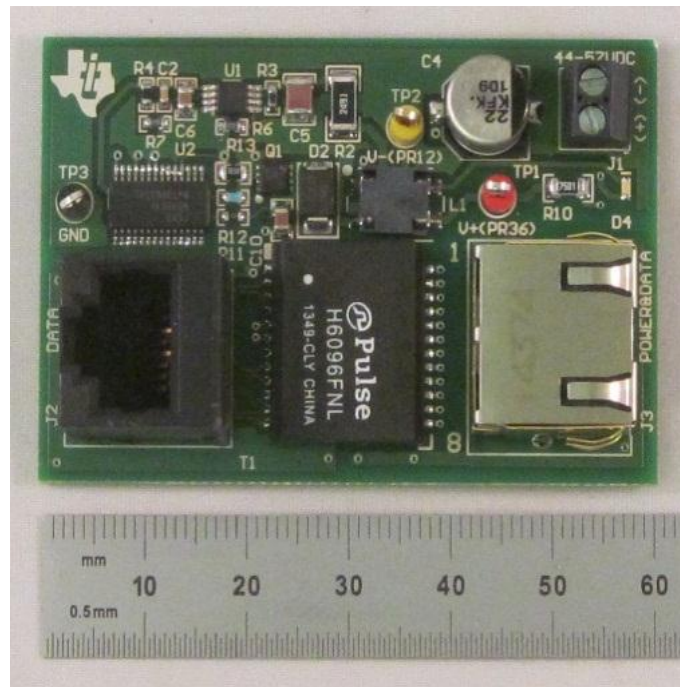


Description

The TIDA-00465 is an application using the TPS23861 as a single-port, type 2, PoE auto-mode PSE in a small form factor. Input voltage to the unit is 44 V - 57 V using any commonly available 40-W, AC-DC power supply. The design will inject power onto any Ethernet cable for PoE powered loads up to 30 W.

The circuit is placed on a 1.6" x 2.4" PCB with the key TPS23861 circuit occupying only 0.35 in².

The TIDA-00465 is derived from application design PR2207. Both numbers may appear in documentation but refer to a single common design.



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System Connection Diagram

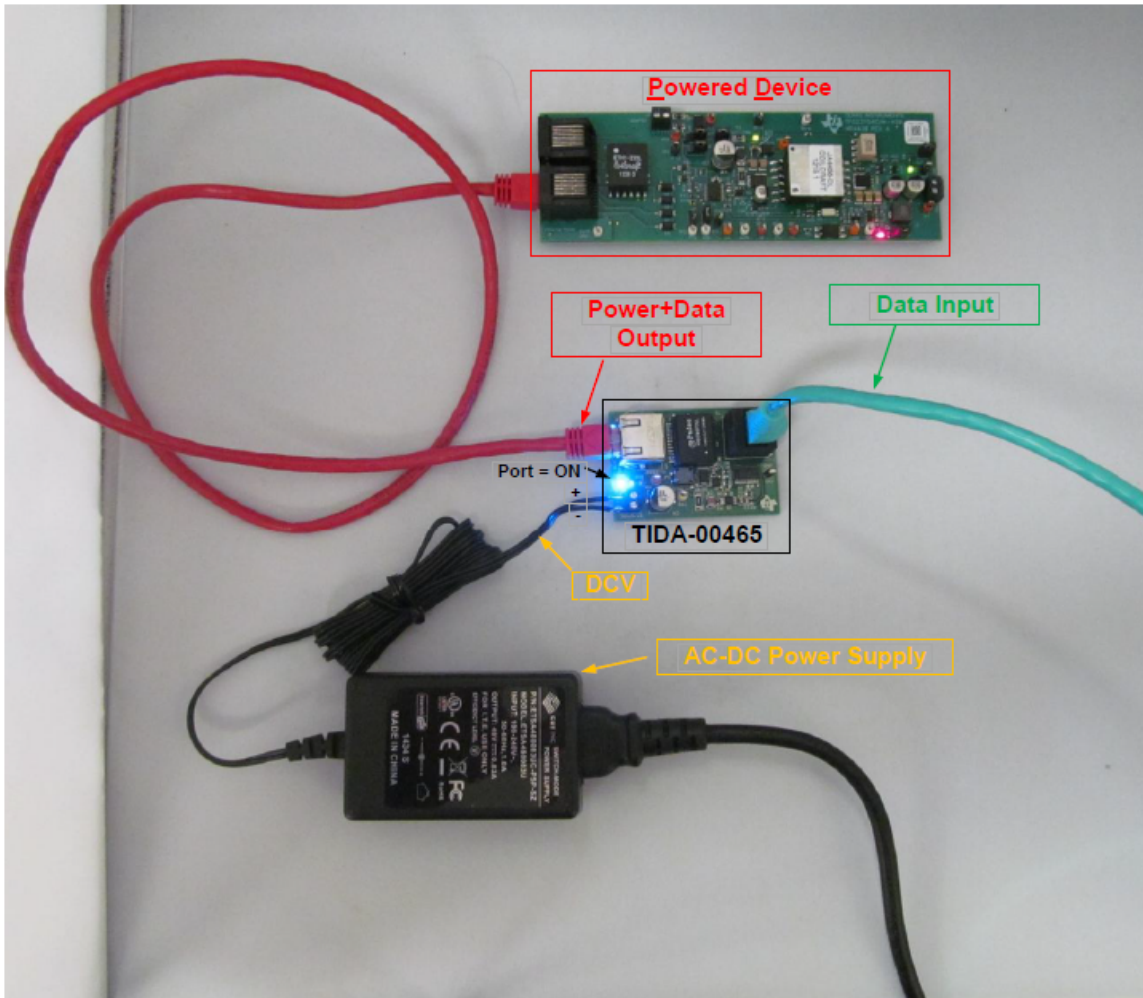


Figure 2. System Connection Diagram

Schematic

The TIDA-00465 schematic is shown in Figure 3.

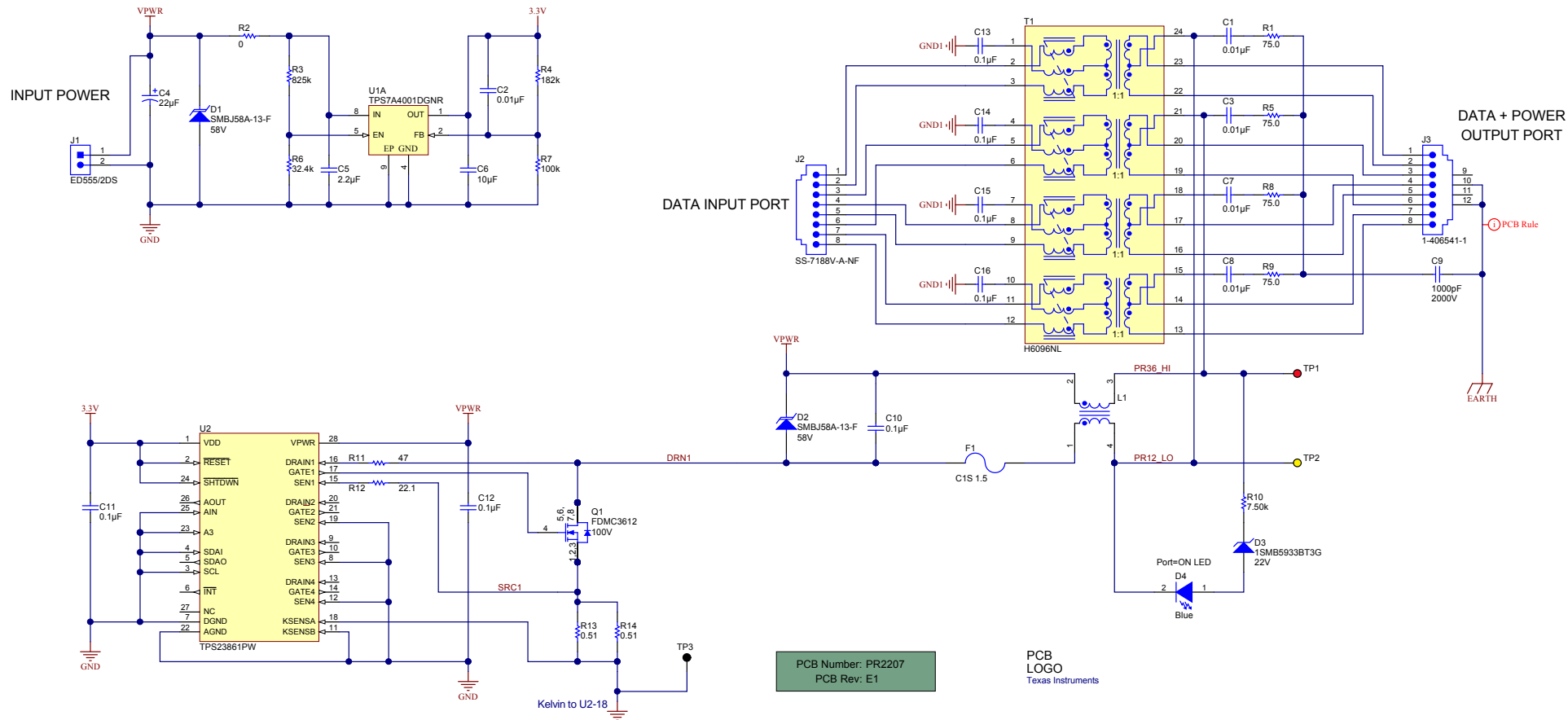


Figure 3. TIDA-00465 Schematic

Test Results

Figure 4 shows typical start up behavior for a type 2 PD. The TPS23861 automatically performs four-point detection, two-event physical classification of type 2 PDs, and inrush protected power ramp up.

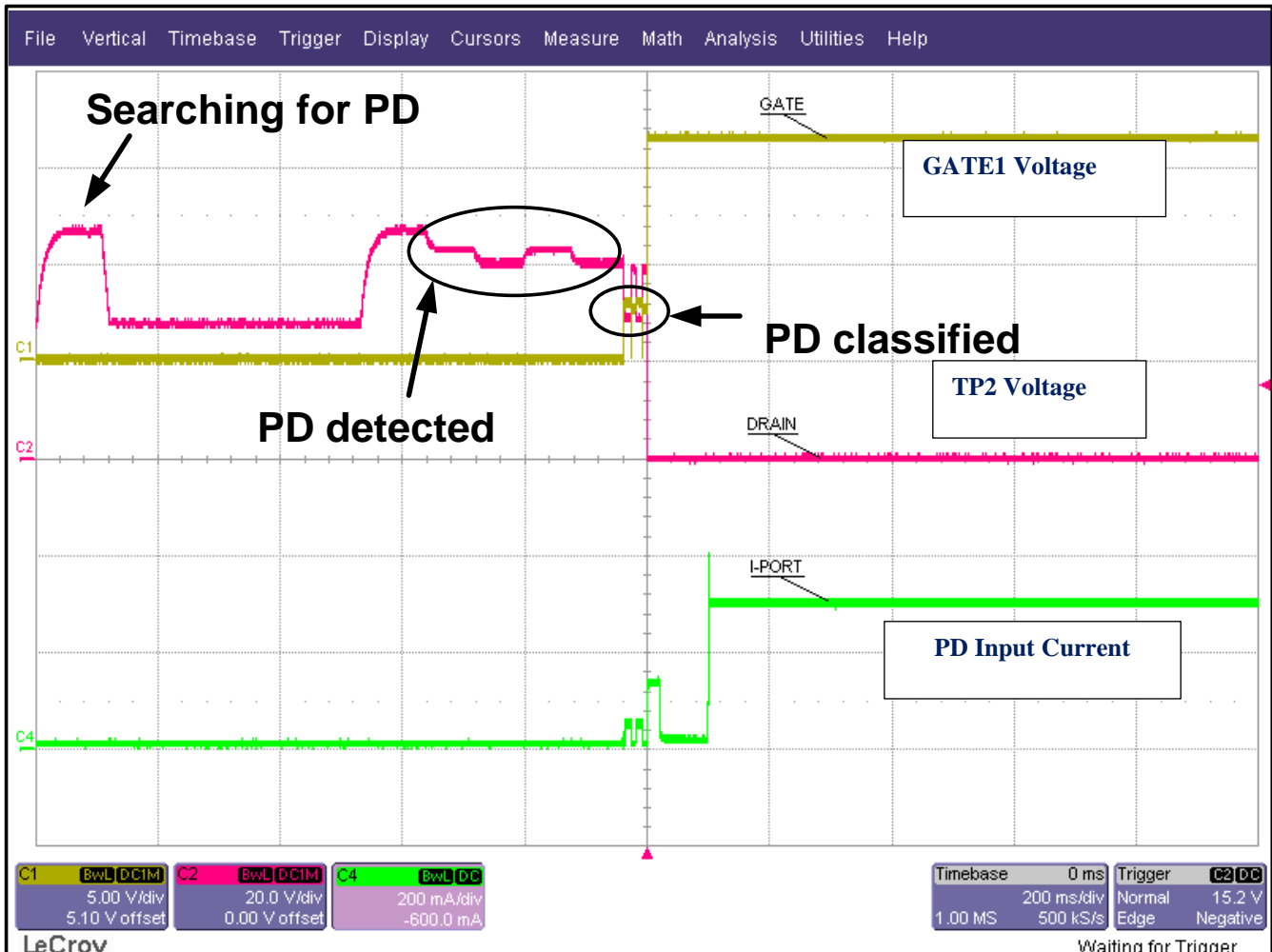


Figure 4. Start Up Type 2 PD Load

Table 1 documents the IEEE 802.3at conformance test results using the Sifos Technologies PSA-3000 test suite for a 30W PSE. Table 2 documents the IEEE 802.3at conformance test results using the Sifos Technologies PSA-3000 test suite for a 15.4W PSE.

Table 1. IEEE 802.3at Conformance Report; 30-W PSE

PSA TEST RESULTS		February 9 2015 9:55 AM		Sifos Technologies		802.3at Conformance Report			
Port Count..... 1		Loop Count..... 10		PSE Tested: PortBang Type-2		Test Mode: 30 Watt PHY		Sifos Interop Index*: 100%	
				Error Log: C:/Users/Public/Sifos/PSA1200/Results/PortBang/psa_error_log.txt		version 4.0.77		report version 4.0.13	
Chassis ID: 158.218.10.73	PSA-3000 Ports		Min	Max	Average	Low Limit	P/F	High Limit	P/F
TestLoop: 1	1-1	UNITS							
Test: det v									
Open Circuit Det Voc=	19.85	volts	19.85	19.85	19.85	2.8	Pass	30	Pass
Peak Det Vvalid=	7.09	volts	7.09	7.09	7.09	3.8	Pass	10	Pass
Min Det Vvalid=	4.56	volts	4.56	4.56	4.56	2.8	Pass	9	Pass
Det Volt Step dVtest=	2.53	volts	2.53	2.53	2.53	1	Pass	7.2	Pass
Detection Slew=	0	V/usec	0	0	0	0	Pass	0.1	Pass
Good Sig Det Pulse=	3	edges	3	3	3	1	Pass	9	Pass
Backoff Voltage=	0.3	volts	0.3	0.3	0.3	0	Pass	2.8	Pass
Non 802 Step V=	0	volts	0	0	0	0	Pass	0.1	Pass
High Sig MaxV=	10.99	volts	10.99	10.99	10.99	3.8	Pass	11	Pass
Non 802 Discr ?=	0	****	0	0	0	0	Pass	0	Pass
Detect Strategy=	0	****	0	0	0	0	Pass	2	Pass
Test: det i									
Init Current Isc=	0.18	mA	0.18	0.18	0.18	0	Pass	5	Pass
Det Current Isc=	0.21	mA	0.21	0.21	0.21	0	Pass	5	Pass
Test: det range									
Rgood Max=	28	Kohm	28	28	28	26	Pass	32	Pass
Rgood Min=	17	Kohm	17	17	17	16	Pass	19	Pass
Rmid det=	28	Kohm	28	28	28	26	Pass	33	Pass
Cgood Max=	0.1	uF	0.1	0.1	0.1	0	Pass	10	Pass
Rbad Cbad Stat=	0	****	0	0	0	0	Pass	0	Pass
Test: det time									
Backoff Time Tdbo=	86	msec	86	86	86	-1	Pass	1500	Pass
Eff Backoff Tdbo eff=	86	msec	86	86	86	-1	Pass	1500	Pass
Backoff Type=	0	****	0	0	0	0	Pass	0	Pass
Detection Time Tdet=	313	msec	313	313	313	5	Pass	500	Pass
Total Det Time=	316	msec	316	316	316	5	Pass	1000	Pass
Test: det rsource									
Output Impedance Zout=	450	KOhm	450	450	450	45	Pass	2000	Pass
Test: class v									
Class Voltage Vclass=	18.6	volts	18.6	18.6	18.6	15.5	Pass	20.5	Pass
Vclass Min=	18.6	volts	18.6	18.6	18.6	15.5	Pass	20.5	Pass
Mark Voltage Vmark=	8.4	volts	8.4	8.4	8.4	7	Pass	10	Pass
Mark Voltage Min=	8.4	volts	8.4	8.4	8.4	7	Pass	10	Pass
Test: class time									
Event Count=	2	****	2	2	2	2	Pass	3	Pass
Event1 Tcle1=	11.3	msec	11.3	11.3	11.3	6	Pass	30	Pass
Event2 Tcle2=	10.9	msec	10.9	10.9	10.9	6	Pass	30	Pass
Mark Tme1=	7.4	msec	7.4	7.4	7.4	6	Pass	12	Pass
Mark Tme2=	9	msec	9	9	9	6	Pass	376	Pass
Test: class err									
Class lim=	75	mA	75	75	75	51	Pass	100	Pass
Vport CL lim=	14.7	V	14.7	14.7	14.7	0	Pass	20.5	Pass
Vport CL err 1=	18.6	V	18.6	18.6	18.6	0	Pass	20.5	Pass
Mark lim=	6	mA	6	6	6	5	Pass	100	Pass
Vport CL err 2=	3	V	3	3	3	0	Pass	20.5	Pass
Treset=	92	msec	92	92	92	15	Pass	10000	Pass

Table 1. IEEE 802.3at Conformance Report; 30-W PSE, Cont'd

Test: pwrup_time										
Pwr-On Rise Time Trise=	88	usec	88	88	88	88	15	Pass	50000	Pass
Power-On Time Tpon=	35.2	msec	35.2	35.2	35.2	35.2	0	Pass	400	Pass
Test: pwrup_inrush										
Init Iinrush=	421.13	mA	421.13	421.13	421.13	421.13	400	Pass	450	Pass
Max Iinrush c4=	421	mA	421	421	421	421	400	Pass	450	Pass
Min Iinrush=	420.75	mA	420.75	420.75	420.75	420.75	400	Pass	450	Pass
Tinrush=	60.7	msec	60.7	60.7	60.7	60.7	50	Pass	75	Pass
Inrush 45m=	51.9	Volts	51.9	51.9	51.9	51.9	50	Pass	57	Pass
Inrush Voltage=	30.6	Volts	30.6	30.6	30.6	30.6	30	Pass	57	Pass
Max Init Inrush=	421	mA	421	421	421	421	0	Pass	2000	Pass
Inrush Strategy=	0	****	0	0	0	0	0	Pass	0	Pass
Test: pwr_on_v										
Vport min 2=	51	V	51	51	51	51	50	Pass	57	Pass
Vport max 2=	52	V	52	52	52	52	50	Pass	57	Pass
Vport ripple 2=	2	mVpp	2	2	2	2	0	Pass	500	Pass
Vport noise 2=	21	mVpp	21	21	21	21	0	Pass	200	Pass
Vtrans min 2=	51	V	51	51	51	51	50	Pass	57	Pass
Vtrans max 2=	52.1	V	52.1	52.1	52.1	52.1	50	Pass	57	Pass
Test: pwr_on_pwr_cap										
Pcon c4=	31.4	watts	31.4	31.4	31.4	31.4	30	Pass	38.9	Pass
Icon c4=	614	mA	614	614	614	614	526.3	Pass	683	Pass
Type-2 Enable=	1	****	1	1	1	1	1	Pass	1	Pass
Test: pwr_on_maxi										
Ilim Peak=	98.3	mA	98.3	98.3	98.3	98.3	0	Pass	1750	Pass
Ilim Min 2=	685.5	mA	685.5	685.5	685.5	685.5	683	Pass	1750	Pass
Tlim 2=	61.3	msec	61.3	61.3	61.3	61.3	10	Pass	75	Pass
Vlim 2=	50.8	V	50.8	50.8	50.8	50.8	50	Pass	57	Pass
Ilim Max 2=	859.5	mA	859.5	859.5	859.5	859.5	0	Pass	1750	Pass
Ilim Low V Tol 2=	60.2	msec	60.2	60.2	60.2	60.2	10	Pass	9999	Pass
Ktran lo 2=	101.5	%	101.5	101.5	101.5	101.5	92.4	Pass	115	Pass
Test: pwr_on_overld										
%Ipeak 2=	125	%	125	125	125	125	0	Pass	125	Pass
Vport Ipeak 2=	50.8	V	50.8	50.8	50.8	50.8	50	Pass	57	Pass
Vport 5%DC 2=	50.9	V	50.9	50.9	50.9	50.9	50	Pass	57	Pass
Test: mps_dc_valid										
Min Valid Time Tmps=	50	msec	50	50	50	50	1	Pass	60	Pass
Duty Cycle tol=	1	****	1	1	1	1	1	Pass	1	Pass
Test: mps_dc_pwr_dn										
Min Valid I hold=	5	mA	5	5	5	5	5	Pass	10	Pass
Time-to-Shutdown Tmpdo=	364	msec	364	364	364	364	300	Pass	400	Pass
Max Voltage Vopen_max=	19.9	volts	19.9	19.9	19.9	19.9	-1	Pass	30	Pass
Test: pwr_dn_overld										
Icut 2=	641	mA	641	641	641	641	-1	Pass	683	Pass
Tcut 2=	63.5	msec	63.5	63.5	63.5	63.5	10	Pass	9999	Pass
Isoft 2=	-1	mA	-1	-1	-1	-1	-1	Pass	683	Pass
Tsoft 2=	-1	msec	-1	-1	-1	-1	-1	Pass	2000	Pass
Test: pwr_dn_time										
Turn-Off Time Toff=	15.5	mSec	15.5	15.5	15.5	15.5	0	Pass	500	Pass
Output Cap Cout=	0.0643	uF	0.0643	0.0643	0.0643	0.0643	-1	Pass	0.52	Pass
Output Load Rp=	116.8	Kohm	116.8	116.8	116.8	116.8	45	Pass	50000	Pass
Test: pwr_dn_v										
Avg Idle Voff=	0.1	VDC	0.1	0.1	0.1	0.1	0	Pass	2.8	Pass
Error Delay Ted=	1406.3	msec	1406.3	1406.3	1406.3	1406.3	750	Pass	10000	Pass
Peak Error Delay Ved=	0.8	VDC	0.8	0.8	0.8	0.8	0	Pass	20.5	Pass

Table 2. IEEE 802.3at Conformance Report; 15.4-W PSE

PSA TEST RESULTS		February 9 2015 7:55 AM		Sifos Technologies		802.3at Conformance Report				
Port Count..... 1		Loop Count..... 10		PSE Tested: PortBang Type-1		Test Mode: 15.4 Watt		Sifos Interop Index*: 100%		version 4.0.77 report version 4.0.13
Chassis ID: 158.218.10.73		PSA-3000 Ports		Min	Max	Average	Low Limit	P/F	High Limit	P/F
TestLoop: 1		1-1	UNITS							
Test: det v										
Open Circuit Det Voc=	19.85	volts	19.85	19.85	19.85	2.8	Pass	30	Pass	
Peak Det Vvalid=	7.1	volts	7.1	7.1	7.1	3.8	Pass	10	Pass	
Min Det Vvalid=	4.55	volts	4.55	4.55	4.55	2.8	Pass	9	Pass	
Det Volt Step dVtest=	2.55	volts	2.55	2.55	2.55	1	Pass	7.2	Pass	
Detection Slew=	0	V/usec	0	0	0	0	Pass	0.1	Pass	
Good Sig Det Pulse=	3	edges	3	3	3	1	Pass	9	Pass	
Backoff Voltage=	0.3	volts	0.3	0.3	0.3	0	Pass	9	Pass	
Non 802 Step V=	0	volts	0	0	0	0	Pass	0.1	Pass	
High Sig MaxV=	10.99	volts	10.99	10.99	10.99	3.8	Pass	11	Pass	
Non 802 Discr ?=	0	****	0	0	0	0	Pass	0	Pass	
Detect Strategy=	0	****	0	0	0	0	Pass	2	Pass	
Test: det i										
Init Current Isc=	0.18	mA	0.18	0.18	0.18	0	Pass	5	Pass	
Det Current Isc=	0.2	mA	0.2	0.2	0.2	0	Pass	5	Pass	
Test: det_range										
Rgood Max=	28	Kohm	28	28	28	26	Pass	32	Pass	
Rgood Min=	17	Kohm	17	17	17	16	Pass	19	Pass	
Rmid det=	28	Kohm	28	28	28	26	Pass	33	Pass	
Cgood Max=	0.1	uF	0.1	0.1	0.1	0	Pass	10	Pass	
Rbad Cbad Stat=	0	****	0	0	0	0	Pass	0	Pass	
Test: det_time										
Backoff Time Tdbo=	86	msec	86	86	86	-1	Pass	1500	Pass	
Eff Backoff Tdbo_eff=	86	msec	86	86	86	-1	Pass	1500	Pass	
Backoff Type=	0	****	0	0	0	0	Pass	0	Pass	
Detection Time Tdet=	313	msec	313	313	313	5	Pass	500	Pass	
Total Det Time=	316	msec	316	316	316	5	Pass	1000	Pass	
Test: det_resource										
Output Impedance Zout=	450	KOhm	450	450	450	45	Pass	2000	Pass	
Test: class v										
Class Voltage Vclass=	18.9	volts	18.9	18.9	18.9	15.5	Pass	20.5	Pass	
Vclass Min=	18.7	volts	18.7	18.7	18.7	15.5	Pass	20.5	Pass	
Test: class_time										
Event Count=	1	****	1	1	1	0	Pass	3	Pass	
Class Time Tpdcc=	11.3	msec	11.3	11.3	11.3	6	Pass	75	Pass	
Test: class_err										
Class lim=	75	mA	75	75	75	51	Pass	100	Pass	
Vport CL lim=	14.9	V	14.9	14.9	14.9	0	Pass	57	Pass	
Vport CL err l=	18.5	V	18.5	18.5	18.5	0	Pass	57	Pass	
Test: pwrup_time										
Pwr-On Rise Time Trise=	40	usec	40	40	40	15	Pass	50000	Pass	
Power-On Time Tpon=	11.7	msec	11.7	11.7	11.7	0	Pass	400	Pass	
Test: pwrup_inrush										
Init Inrush=	423	mA	423	423	423	400	Pass	450	Pass	
Max Inrush c0=	421.63	mA	421.63	421.63	421.63	400	Pass	450	Pass	
Min Inrush=	420.88	mA	420.88	420.88	420.88	400	Pass	450	Pass	
Tinrush=	60	msec	60	60	60	50	Pass	75	Pass	
Inrush 45m=	51.9	Volts	51.9	51.9	51.9	44	Pass	57	Pass	
Inrush Voltage=	30.6	Volts	30.6	30.6	30.6	30	Pass	57	Pass	
Max Init Inrush=	616.3	mA	616.3	616.3	616.3	0	Pass	2000	Pass	
Inrush Strategy=	0	****	0	0	0	0	Pass	0	Pass	

Table 2. IEEE 802.3at Conformance Report; 15.4-W PSE, Cont'd

Test: pwrn_v									
Vport min 1=	51.5	V	51.5	51.5	51.5	50	Pass	57	Pass
Vport max 1=	52	V	52	52	52	50	Pass	57	Pass
Vport ripple 1=	2	mVpp	2	2	2	0	Pass	500	Pass
Vport noise 1=	14	mVpp	14	14	14	0	Pass	200	Pass
Vtrans min 1=	51.5	V	51.5	51.5	51.5	50	Pass	57	Pass
Vtrans max 1=	52.1	V	52.1	52.1	52.1	50	Pass	57	Pass
Test: pwrn_pwracap									
Pcon c0=	18.2	watts	18.2	18.2	18.2	15.4	Pass	22.7	Pass
Icon c0=	353	mA	353	353	353	270.2	Pass	399	Pass
Pcon c1=	17.6	watts	17.6	17.6	17.6	4	Pass	22.7	Pass
Icon c1=	341	mA	341	341	341	70.1	Pass	399	Pass
Pcon c2=	17.6	watts	17.6	17.6	17.6	7	Pass	22.7	Pass
Icon c2=	341	mA	341	341	341	122.8	Pass	399	Pass
Pcon c3=	18.2	watts	18.2	18.2	18.2	15.4	Pass	22.7	Pass
Icon c3=	353	mA	353	353	353	270.2	Pass	399	Pass
Test: pwrn_maxi									
Ilim Peak=	97.8	mA	97.8	97.8	97.8	0	Pass	1750	Pass
Ilim Min 1=	401.5	mA	401.5	401.5	401.5	400	Pass	1750	Pass
Tlim 1=	62.1	msec	62.1	62.1	62.1	50	Pass	9999	Pass
Vlim 1=	51.3	V	51.3	51.3	51.3	50	Pass	57	Pass
Ilim Max 1=	98.8	mA	98.8	98.8	98.8	0	Pass	1750	Pass
Ilim Low V Tol 1=	59.4	msec	59.4	59.4	59.4	50	Pass	9999	Pass
Ktran lo 1=	102.6	%	102.6	102.6	102.6	92.4	Pass	115	Pass
Test: pwrn_overld									
%Ipeak 1=	125	%	125	125	125	100	Pass	125	Pass
Vport Ipeak 1=	51.5	V	51.5	51.5	51.5	50	Pass	57	Pass
Vport 5%DC 1=	51.5	V	51.5	51.5	51.5	50	Pass	57	Pass
Test: mps_dc_valid									
Min Valid Time Tmps=	50	msec	50	50	50	1	Pass	60	Pass
Duty Cycle tol=	1	****	1	1	1	1	Pass	1	Pass
Test: mps_dc_pwrn									
Min Valid I hold=	5	mA	5	5	5	5	Pass	10	Pass
Time-to-Shutdown Tmpdo=	365	msec	365	365	365	300	Pass	400	Pass
Max Voltage Vopen max=	19.9	volts	19.9	19.9	19.9	-1	Pass	30	Pass
Test: pwrn_overld									
Icut 1=	373.3	mA	373.3	373.3	373.3	-1	Pass	683	Pass
Tcut 1=	62.6	msec	62.6	62.6	62.6	50	Pass	9999	Pass
Isoft 1=	-1	mA	-1	-1	-1	-1	Pass	683	Pass
Tsoft 1=	-1	msec	-1	-1	-1	-1	Pass	2000	Pass
Test: pwrn_time									
Turn-Off Time Toff=	16.5	mSec	16.5	16.5	16.5	0	Pass	500	Pass
Output Cap Cout=	0.0708	uF	0.0708	0.0708	0.0708	-1	Pass	0.52	Pass
Output Load Rp=	111.7	Kohm	111.7	111.7	111.7	45	Pass	50000	Pass
Test: pwrn_v									
Avg Idle Voff=	0.1	VDC	0.1	0.1	0.1	0	Pass	2.8	Pass
Error Delay Ted=	1390.6	msec	1390.6	1390.6	1390.6	750	Pass	10000	Pass
Peak Error Delay Ved=	0.4	VDC	0.4	0.4	0.4	0	Pass	20.5	Pass

Related Documentation

1. Texas Instruments, *TPS23861 IEEE 802.3at Quad Port Power-over-Ethernet PSE Controller Data Sheet*

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