

## Systems ATE report

Model Name : 24V 65W adapter

Serial No : 00001

Test program name  
ElapsedTime : 01:30:55  
Inspector : JFCustomer :  
Environment : ATE bench  
SystemTime : 2014/04/03 12:12:33 PM

Substrate - Description	PMP9643
- BOM	A1
	25 deg ambient

## Test Notes

CH1 = Vout

CH2 = Vin AC

CH3 = Iout

Vout for efficiency measured at output connector

All output measurements are taken with 1uF and a 0.1uF MLCC across the DUT output.

## Hardware used for Tests

Chroma 8000 ATE

AC source Chroma 61513

DC source Chroma 62012

Timing/Noise Analyser Chroma 80611

Electronic load Chroma 63630-80-60, Chroma 63610-80-20

Short circuit / OVP tester Chroma 80612

DMM Agilent 34970

Power Meter Chroma 66202

Digital Oscilloscope TektronixTDS3014C

Current probe Tektronix TCP202

Current probe Tektronix AM503B Amplifier with A6303 Current probe

Differential probe Tektronix P5205 100 MHz High Voltage Differential Probe

## No Load Power Test

No Load Power					
Vin (V)	F (Hz)	Pin (W) Measured	Pin (W) Max Spec	Vout (V)(Load_1)	Pass?
115	60	0.056	0.070	24.28	PASS
230	50	0.059	0.070	24.22	PASS

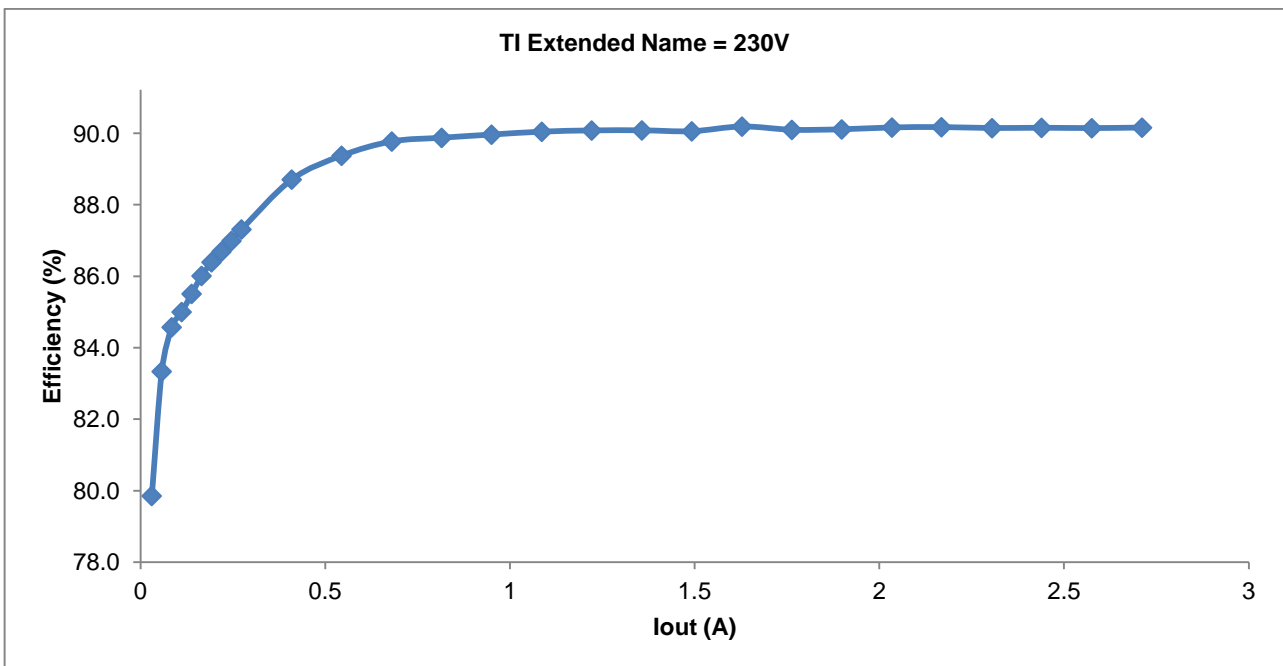
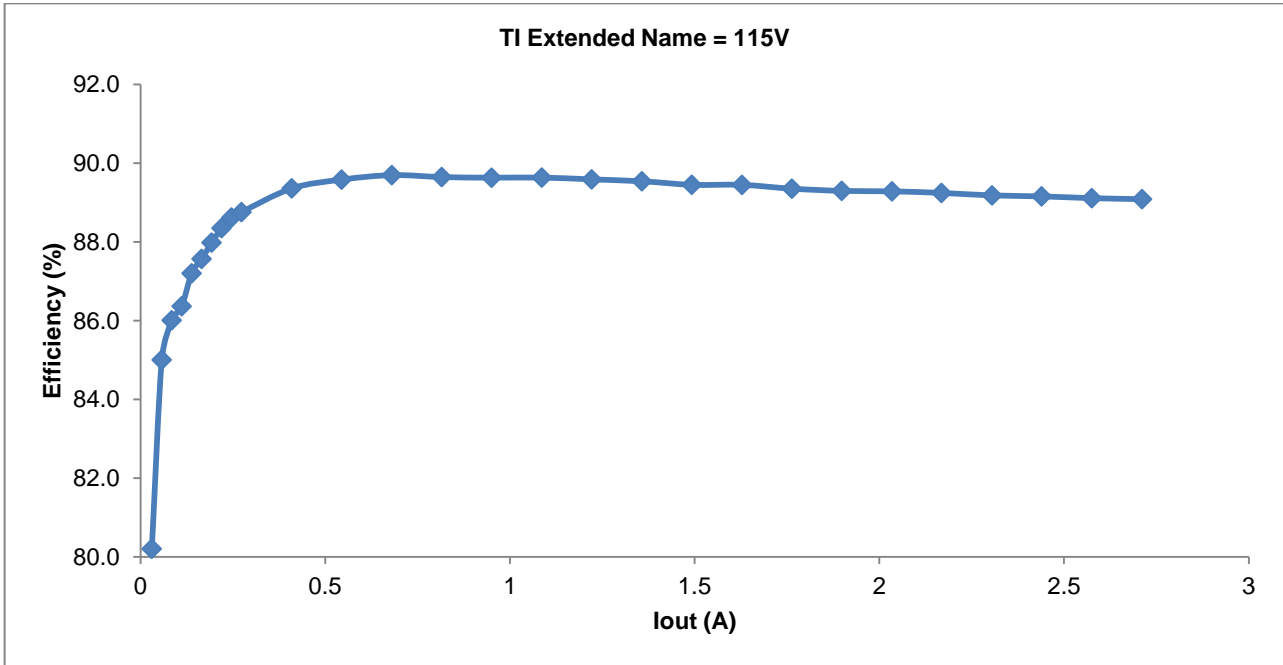
## Single Point Efficiency Tests

Power Efficiency										
Extension	Vin (V)	F (Hz)	Pin (W)	Iout (A)	Vout (V)	Pout (W)	Eff (%)	Pin Max Spec (W)	Eff (%) Min Spec	Pass?
0.25W mode	115	60	0.340	0.010	24.121	0.251	73.82	*	52	PASS
0.5W mode	115	60	0.633	0.021	24.108	0.502	79.28	*	53	PASS
1W mode	115	60	1.206	0.042	24.106	1.003	83.17	*	59	PASS
2W mode	115	60	2.355	0.083	24.114	2.006	85.21	*	65	PASS
0.25W mode	230	50	0.378	0.010	23.905	0.249	65.77	*	52	PASS
0.5W mode	230	50	0.656	0.021	23.899	0.497	75.77	*	53	PASS
1W mode	230	50	1.229	0.042	23.894	0.994	80.91	*	59	PASS
2W mode	230	50	2.370	0.083	23.900	1.989	83.90	*	65	PASS

## Efficiency vs. Load Tests

Vin(V)	Freq (Hz)	Po nom (W)	Vout nom (V)	% Power	Pin (W)	Iout	Pout	Efficiency
115	60	65	24.0	1	0.91	0.030	0.73	80.20
				2	1.61	0.057	1.37	85.00
				3	2.37	0.084	2.03	86.00
				4	3.09	0.111	2.67	86.36
				5	3.83	0.138	3.34	87.20
				6	4.54	0.165	3.97	87.56
				7	5.27	0.192	4.63	87.98
				8	5.96	0.219	5.26	88.34
				9	6.66	0.246	5.90	88.62
				10	7.36	0.273	6.53	88.75
				15	10.96	0.409	9.79	89.36
				20	14.54	0.544	13.02	89.58
				25	18.19	0.680	16.31	89.69
				30	21.82	0.815	19.56	89.64
				35	25.46	0.950	22.81	89.63
				40	29.09	1.086	26.08	89.63
				45	32.75	1.221	29.34	89.58
				50	36.40	1.357	32.59	89.54
				55	40.08	1.492	35.85	89.45
				60	43.74	1.628	39.12	89.44
65	47.44	1.763	42.39	89.35				
70	51.10	1.898	45.63	89.29				
75	54.79	2.034	48.92	89.28				
80	58.49	2.168	52.20	89.24				
85	62.24	2.305	55.50	89.18				
90	65.92	2.439	58.77	89.15				
95	69.68	2.575	62.09	89.11				
100	73.39	2.711	65.38	89.08				
230	50	65	24.0	1	0.91	0.030	0.73	79.85
				2	1.63	0.057	1.36	83.33
				3	2.39	0.084	2.02	84.57
				4	3.12	0.111	2.65	85.00
				5	3.87	0.138	3.31	85.51
				6	4.58	0.165	3.94	86.01
				7	5.32	0.192	4.60	86.39
				8	6.03	0.219	5.23	86.69
				9	6.76	0.246	5.88	86.99
				10	7.46	0.273	6.51	87.31
				15	11.01	0.409	9.77	88.70
				20	14.53	0.544	12.99	89.37
				25	18.11	0.680	16.26	89.77
				30	21.69	0.815	19.49	89.87
				35	25.29	0.950	22.75	89.96
				40	28.88	1.086	26.00	90.04
				45	32.48	1.221	29.26	90.08
				50	36.09	1.357	32.51	90.08
				55	39.71	1.492	35.76	90.05
				60	43.24	1.628	39.00	90.19
65	46.91	1.763	42.26	90.10				

				70	50.49	1.898	45.49	90.11
				75	54.08	2.034	48.76	90.16
				80	57.66	2.168	52.00	90.17
				85	61.32	2.305	55.28	90.15
				90	64.95	2.439	58.55	90.15
				95	68.59	2.575	61.83	90.14
				100	72.24	2.711	65.13	90.16

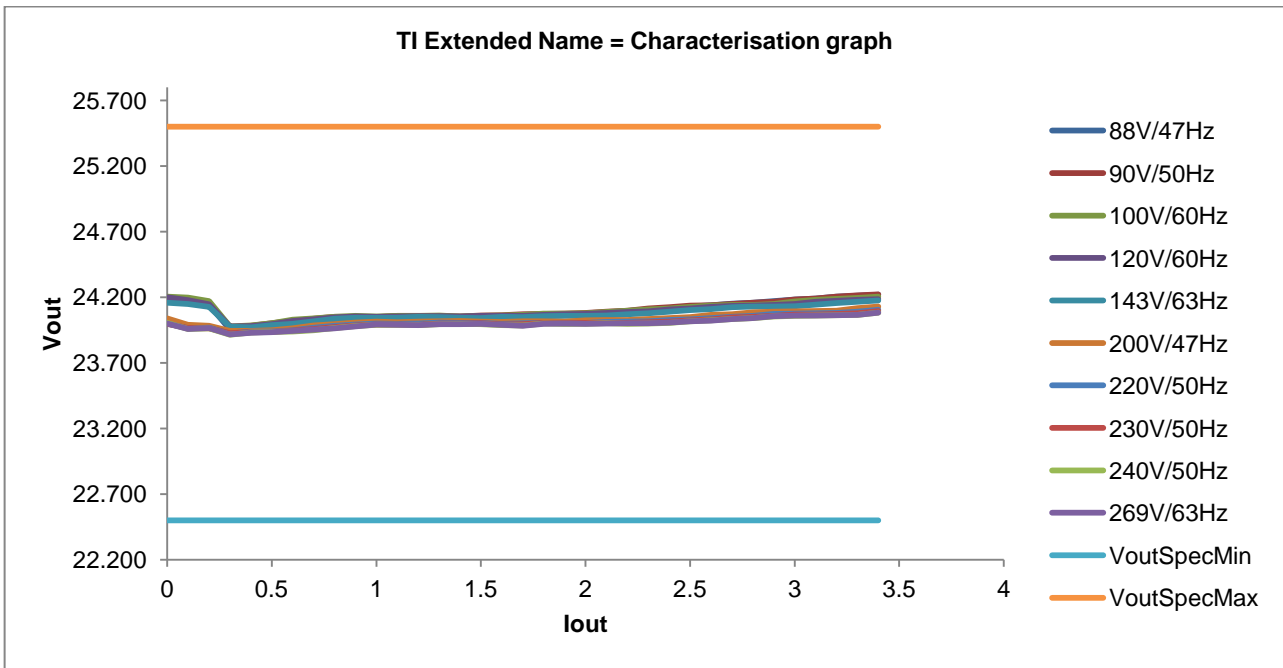


## Average Efficiency Tests

Vin (V)	Freq (Hz)	Eff @ 10% load	Average of 25%, 50%, 75%, 100%				Average %
			25% load	50% load	75% load	100% load	
115	60	88.75	89.69	89.54	89.28	89.08	89.40
230	50	87.31	89.77	90.08	90.16	90.16	90.04

Data for Characterisation Plot										
All lines	88V/47 Hz	90V/50 Hz	100V/60 Hz	120V/60 Hz	143V/63 Hz	200V/47 Hz	220V/50 Hz	230V/50 Hz	240V/50 Hz	269V/63 Hz
Io set	Vo	Vo	Vo	Vo	Vo	Vo	Vo	Vo	Vo	Vo
0.000	24.179	24.198	24.205	24.199	24.158	24.039	24.000	23.996	24.005	24.000
0.100	24.165	24.185	24.197	24.177	24.148	23.989	23.963	23.964	23.958	23.959
0.200	24.143	24.159	24.170	24.145	24.126	23.983	23.968	23.962	23.962	23.965
0.300	23.952	23.969	23.977	23.977	23.974	23.944	23.923	23.925	23.914	23.916
0.400	23.964	23.982	23.984	23.981	23.970	23.944	23.938	23.933	23.931	23.929
0.500	23.985	24.002	24.001	23.995	23.987	23.949	23.938	23.936	23.935	23.934
0.600	23.999	24.019	24.028	24.019	23.998	23.963	23.947	23.945	23.939	23.943
0.700	24.021	24.037	24.039	24.032	24.016	23.984	23.968	23.957	23.949	23.952
0.800	24.034	24.050	24.051	24.046	24.035	23.994	23.983	23.972	23.966	23.963
0.900	24.035	24.051	24.058	24.054	24.044	24.007	23.991	23.984	23.979	23.978
1.000	24.031	24.047	24.052	24.050	24.044	24.013	23.999	23.993	23.990	23.993
1.100	24.040	24.057	24.058	24.054	24.044	24.010	23.998	23.993	23.990	23.990
1.200	24.044	24.058	24.059	24.056	24.051	24.013	23.999	23.990	23.986	23.986
1.300	24.042	24.056	24.060	24.056	24.047	24.017	24.007	24.000	23.995	23.995
1.400	24.042	24.053	24.054	24.052	24.044	24.019	24.005	23.999	23.996	23.995
1.500	24.051	24.061	24.059	24.057	24.040	24.013	24.003	24.001	23.995	23.996
1.600	24.049	24.063	24.060	24.058	24.051	24.011	23.998	23.993	23.988	23.989
1.700	24.057	24.070	24.066	24.058	24.049	24.017	24.001	23.994	23.984	23.983
1.800	24.057	24.072	24.074	24.066	24.056	24.016	24.005	24.003	23.999	23.997
1.900	24.062	24.074	24.074	24.069	24.059	24.015	24.000	24.001	23.998	23.999
2.000	24.070	24.079	24.077	24.073	24.058	24.023	24.004	24.004	23.998	23.997
2.100	24.084	24.090	24.087	24.080	24.060	24.027	24.011	24.004	24.002	24.000
2.200	24.095	24.097	24.096	24.087	24.069	24.027	24.014	24.003	23.998	24.001
2.300	24.106	24.113	24.107	24.093	24.078	24.033	24.017	24.008	24.000	24.001

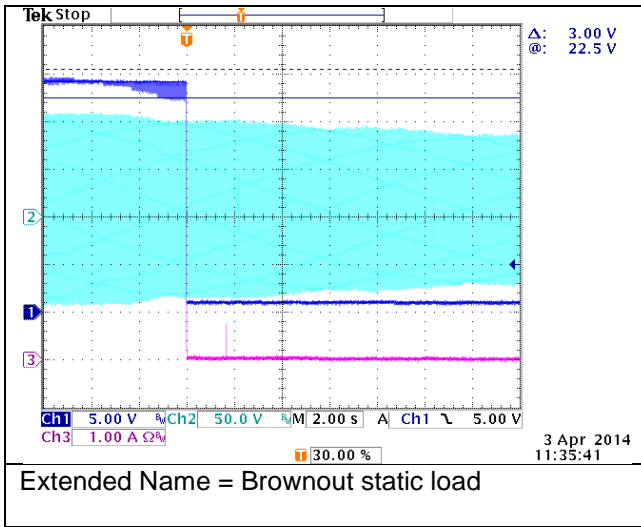
2.4 00	24.115	24.123	24.113	24.106	24.089	24.041	24.027	24.015	24.005	24.006
2.5 00	24.129	24.136	24.127	24.114	24.102	24.048	24.031	24.023	24.017	24.017
2.6 00	24.139	24.139	24.137	24.127	24.108	24.064	24.041	24.032	24.024	24.022
2.7 00	24.151	24.148	24.141	24.134	24.124	24.069	24.050	24.045	24.034	24.034
2.8 00	24.159	24.157	24.141	24.136	24.128	24.085	24.058	24.051	24.041	24.041
2.9 00	24.171	24.165	24.147	24.140	24.128	24.090	24.072	24.059	24.053	24.056
3.0 00	24.182	24.182	24.168	24.148	24.130	24.091	24.075	24.067	24.058	24.060
3.1 00	24.190	24.190	24.179	24.165	24.142	24.094	24.078	24.068	24.060	24.060
3.2 00	24.205	24.205	24.186	24.172	24.156	24.096	24.080	24.073	24.063	24.062
3.3 00	24.211	24.213	24.195	24.179	24.164	24.116	24.090	24.078	24.066	24.064
3.4 00	24.220	24.221	24.203	24.184	24.175	24.128	24.104	24.094	24.083	24.082



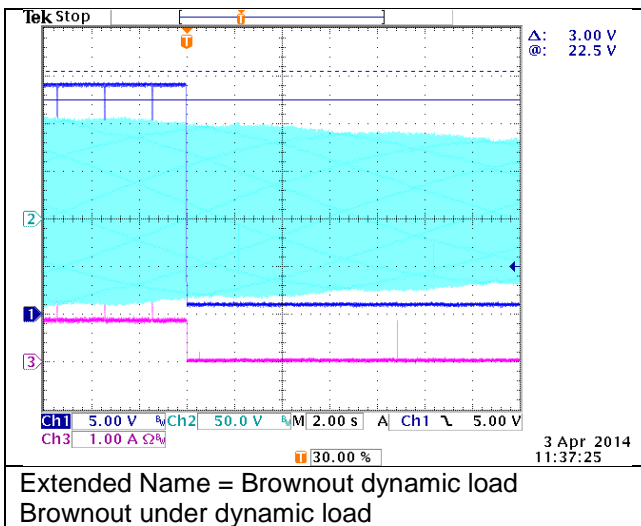
## Brownout and Recovery Tests

Note: the "Pass?" column in the Brownout and Recovery tables indicates "Vout in regulation". An inspection of the scope plots is required to evaluate other Pass/Fail criteria.

Brownout Static						
Vin_start (V)	F (Hz)	Vin_step (V)	Delay (ms)	Load (A)	Vin_off (V)	Pass?
90	50	1	1000	2.710	67	PASS

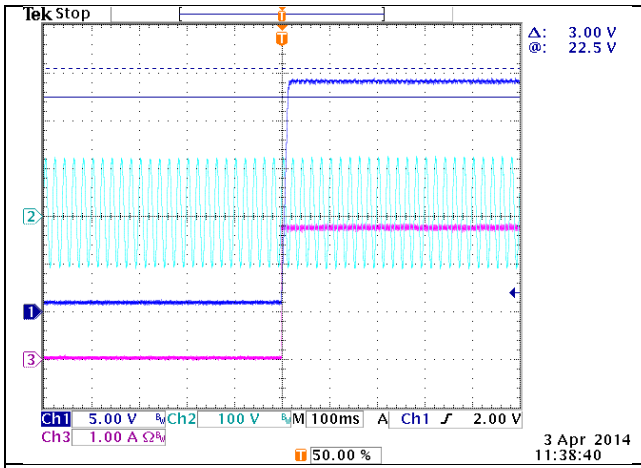


Brownout under dynamic load									
Vin_start (V)	F (Hz)	Vin_step (V)	Delay (ms)	Load_1 (A)	Time_1 (ms)	Load_2 (ms)	Time_2 (ms)	Vin_off (V)	Pass?
90	50	1.0	1000	0.833	1960	3.530	40	66	PASS





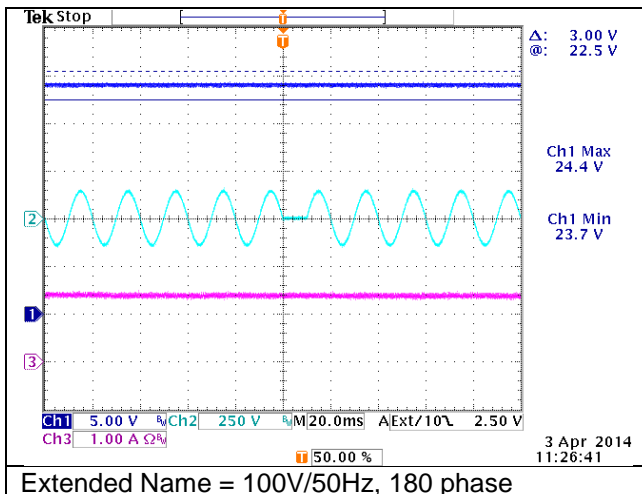
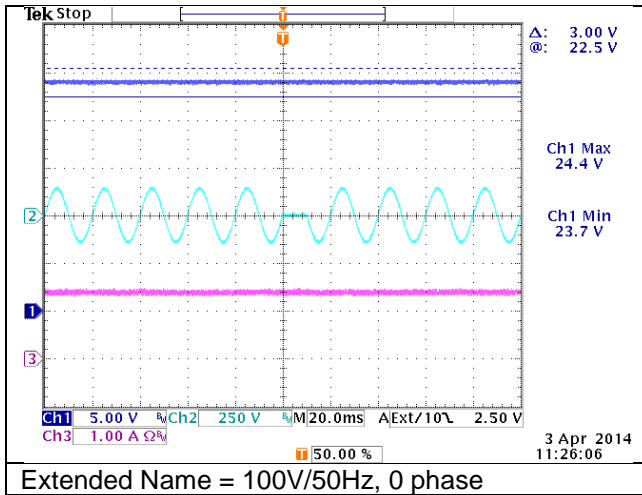
Recovery							
Vin_start (V)	F (Hz)	Vin_step (V)	Delay (ms)	Load (A)	Vout_trigger (V)	Vin_startup (V)	Pass?
20.0	50	1.0	1000.0	2.710	18	81	PASS

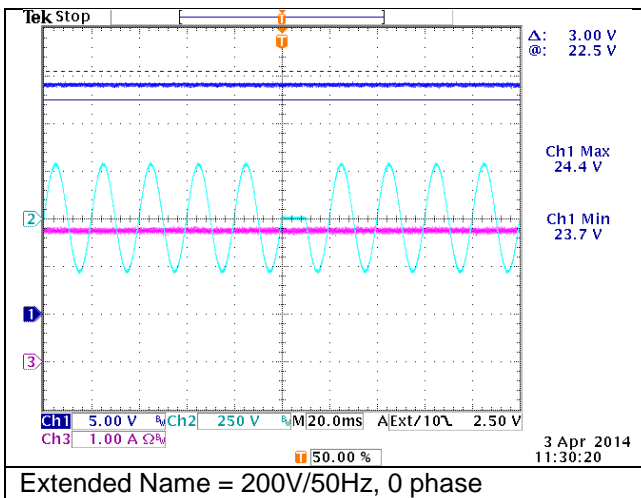
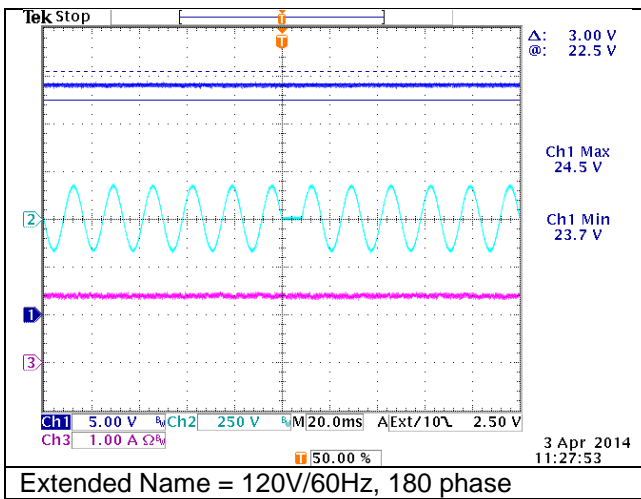
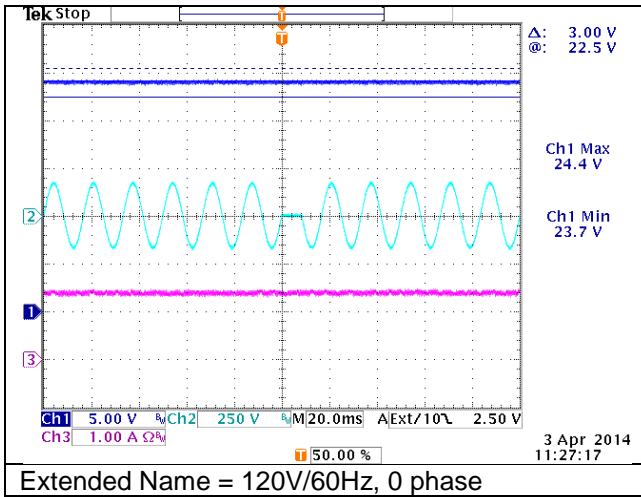


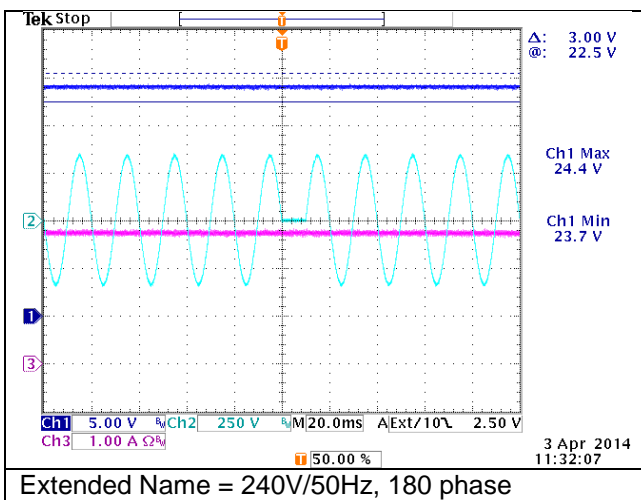
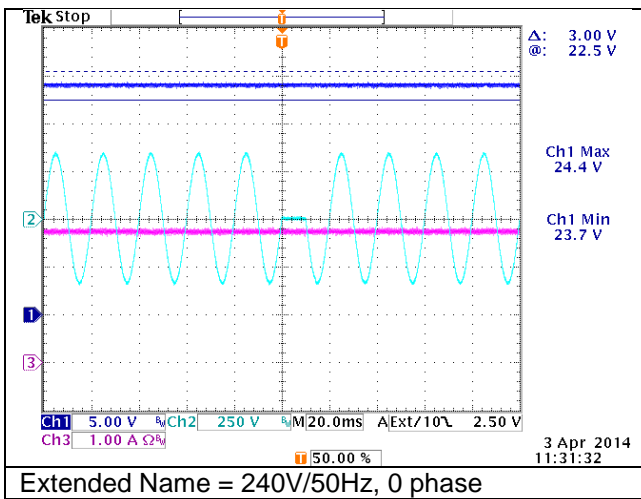
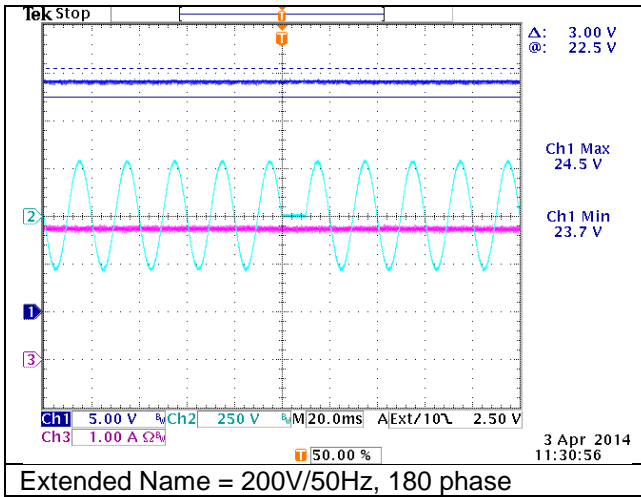
Extended Name = Brownout recovery  
Recovery under static load

# Power Line Disturbances

Dip Interrupt							
Description	Vin	Load (A)	Vpk Min (V) Measured	Vpk Min (V) Spec'd	Vpk Max (V) Measured	Vpk Max (V) Spec'd	Pass?
100V/50Hz, 0 phase	100	1.360	> 23	23	< 26	26	PASS
100V/50Hz, 180 phase	100	1.360	> 23	23	< 26	26	PASS
120V/60Hz, 0 phase	120	1.360	> 23	23	< 26	26	PASS
120V/60Hz, 180 phase	120	1.360	> 23	23	< 26	26	PASS
200V/50Hz, 0 phase	200	2.710	> 23	23	< 26	26	PASS
200V/50Hz, 180 phase	200	2.710	> 23	23	< 26	26	PASS
240V/50Hz, 0 phase	240	2.710	> 23	23	< 26	26	PASS
240V/50Hz, 180 phase	240	2.710	> 23	23	< 26	26	PASS

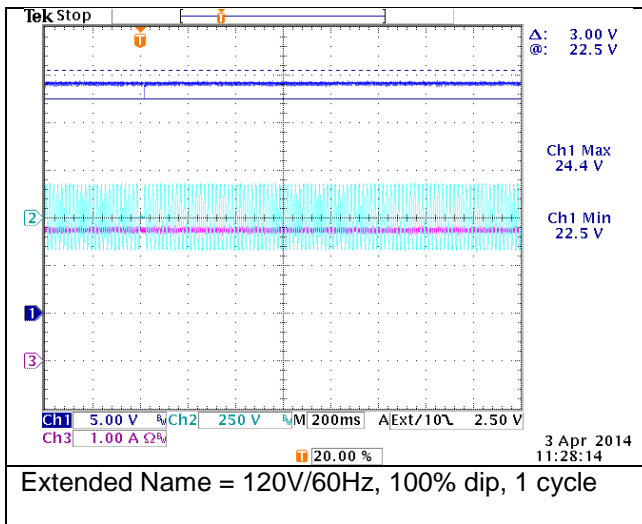


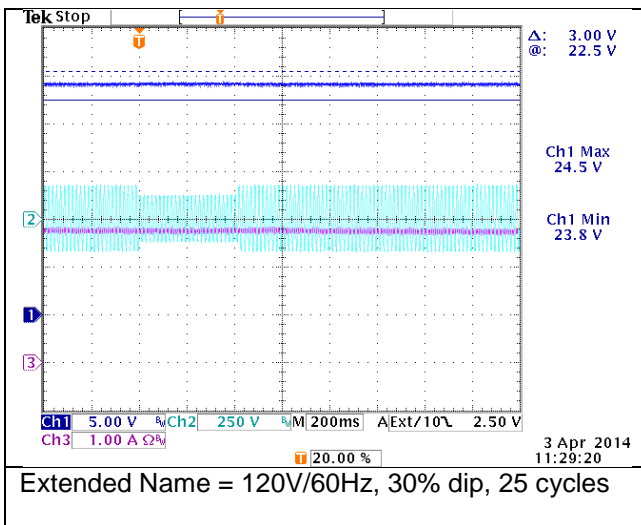
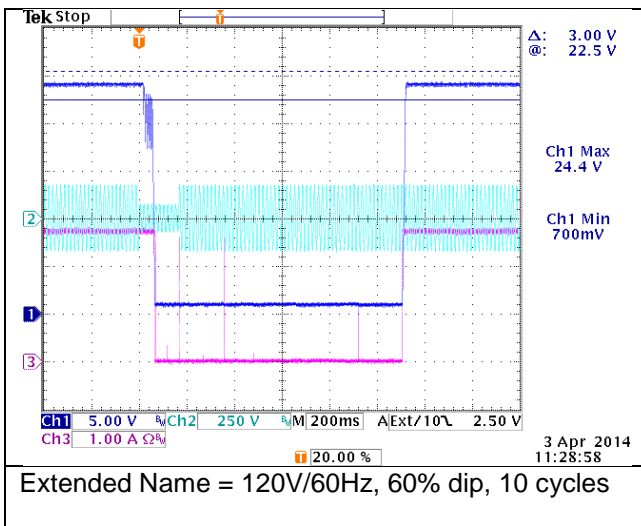
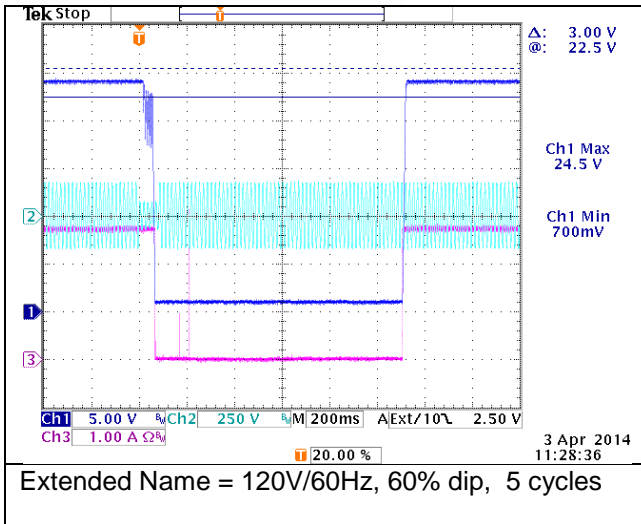


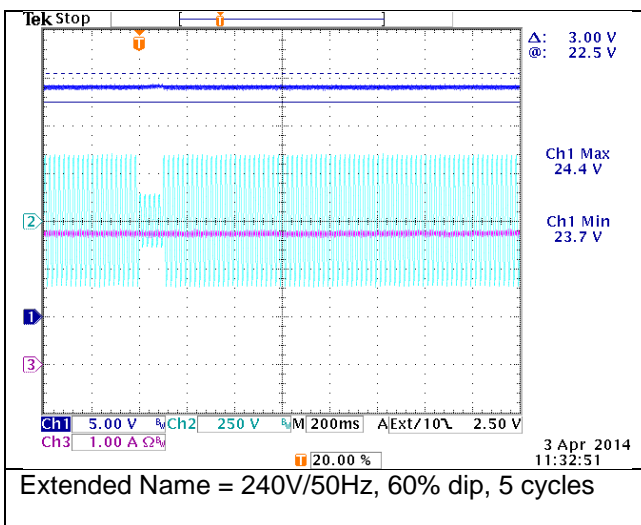
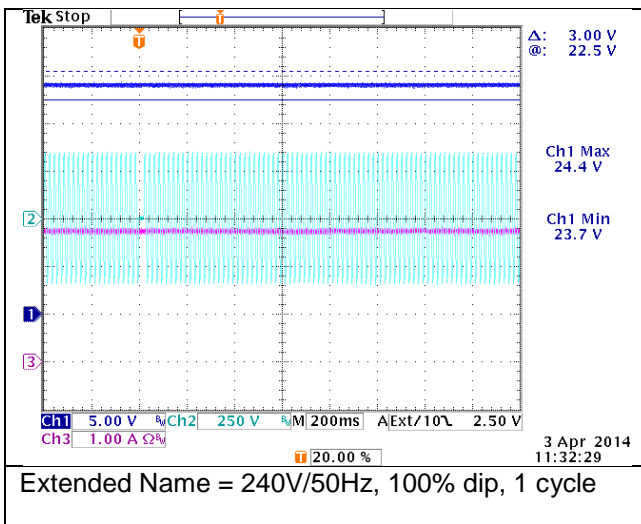
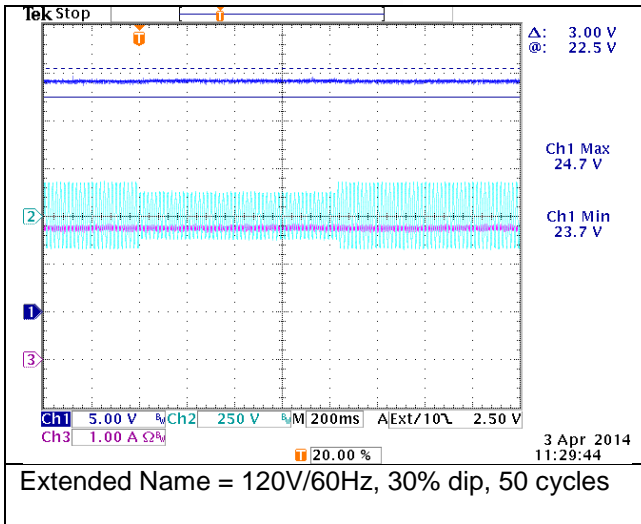


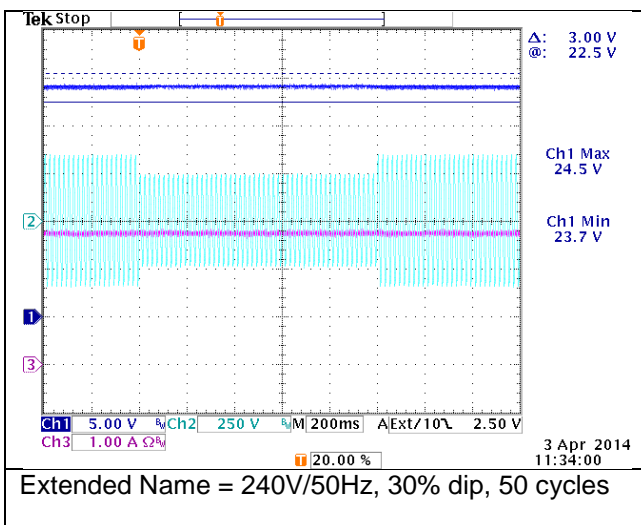
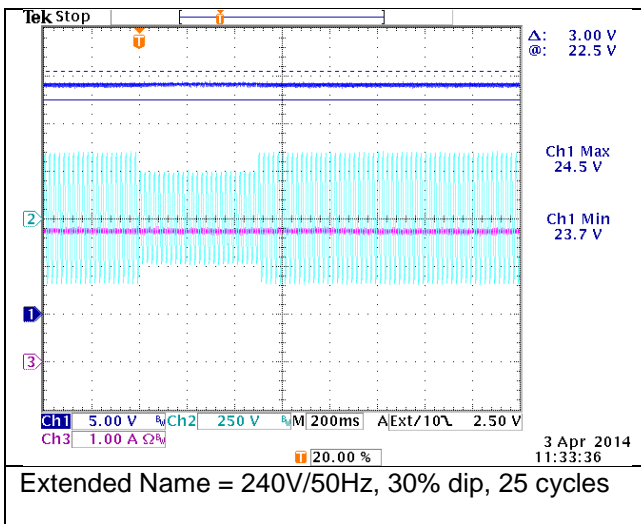
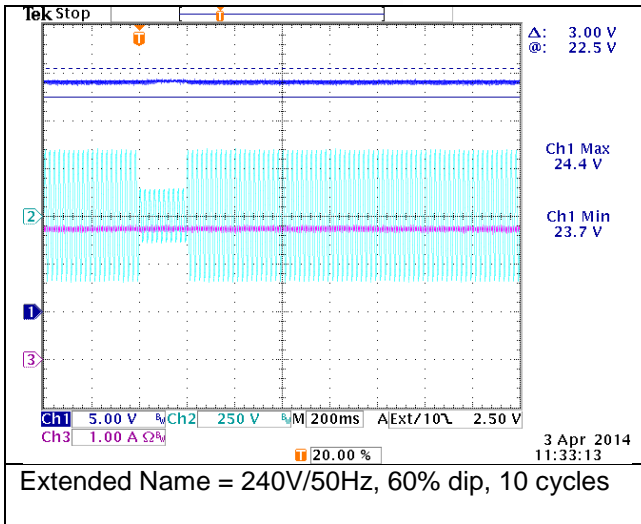
During the dip interrupt recovery tests, there is a short delay after the disturbance before Vout is measured

Dip Interrupt Recovery							
Description	Vin	Load (A)	Time before Vout measurement (ms)	Vout; measured (V)	Vout spec min (V)	Vout spec max(V)	Pass?
120V/60Hz, 100% dip, 1 cycle	120	2.710	3000	24.119	22.500	25.500	PASS
120V/60Hz, 60% dip, 5 cycles	120	2.710	3000	24.125	22.500	25.500	PASS
120V/60Hz, 60% dip, 10 cycles	120	2.710	3000	24.126	22.500	25.500	PASS
120V/60Hz, 30% dip, 25 cycles	120	2.710	3000	24.135	22.500	25.500	PASS
120V/60Hz, 30% dip, 50 cycles	120	2.710	3000	24.141	22.500	25.500	PASS
240V/50Hz, 100% dip, 1 cycle	240	2.710	3000	24.055	22.500	25.500	PASS
240V/50Hz, 60% dip, 5 cycles	240	2.710	3000	24.054	22.500	25.500	PASS
240V/50Hz, 60% dip, 10 cycles	240	2.710	3000	24.061	22.500	25.500	PASS
240V/50Hz, 30% dip, 25 cycles	240	2.710	3000	24.057	22.500	25.500	PASS
240V/50Hz, 30% dip, 50 cycles	240	2.710	3000	24.060	22.500	25.500	PASS





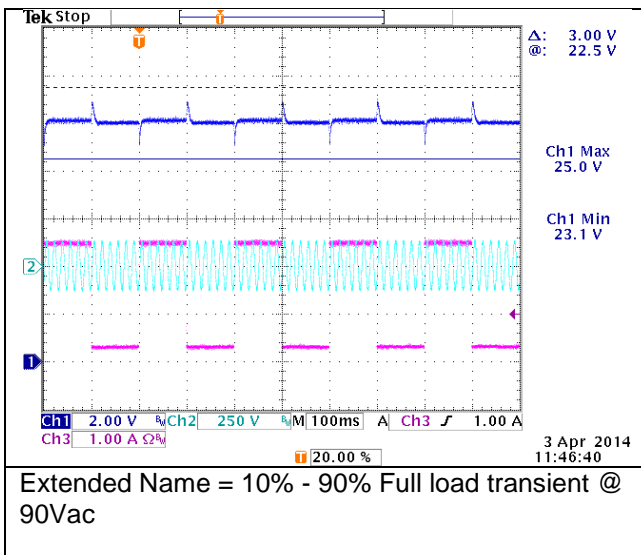
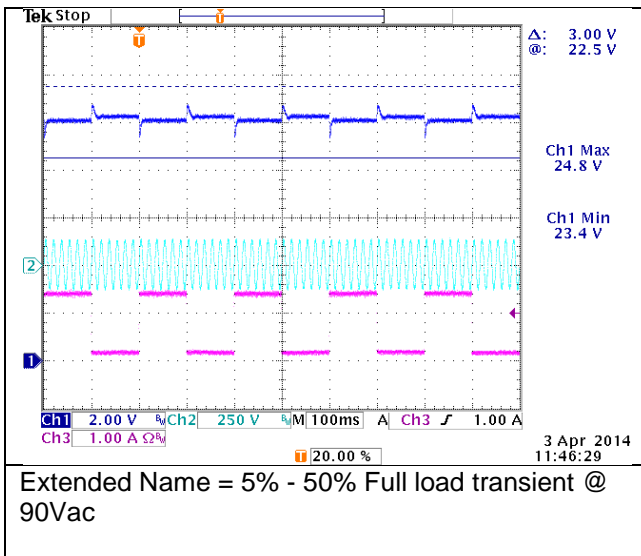


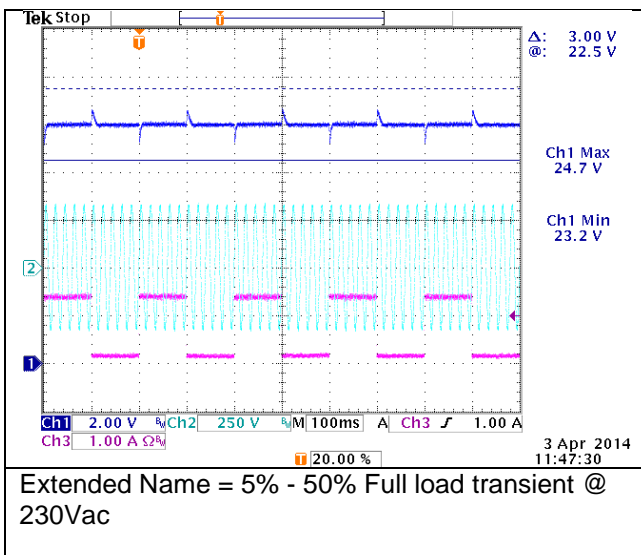
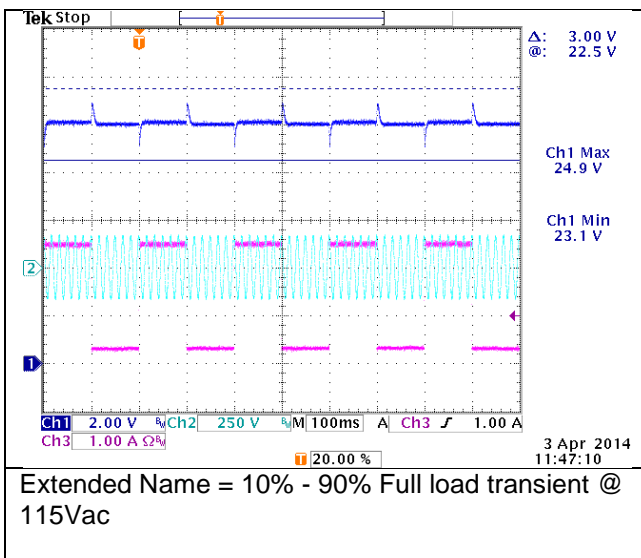
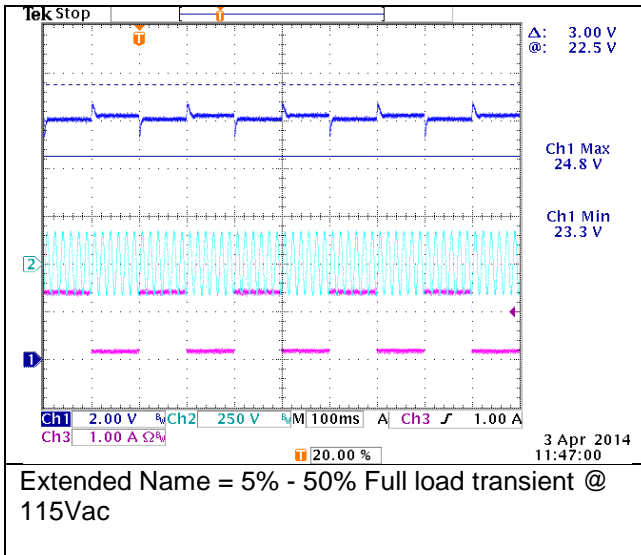


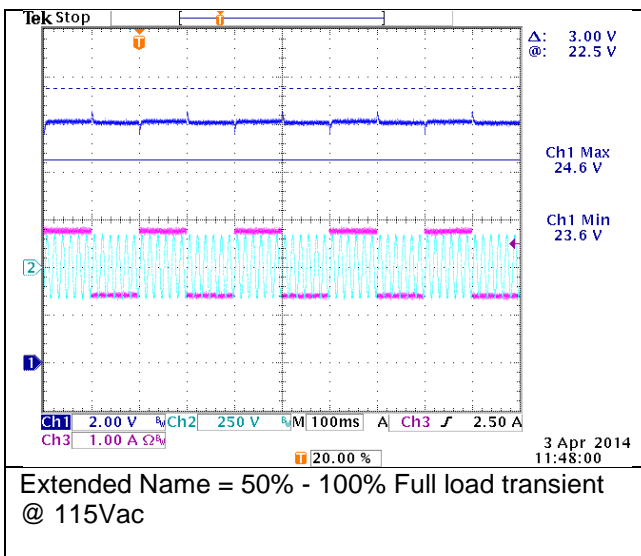
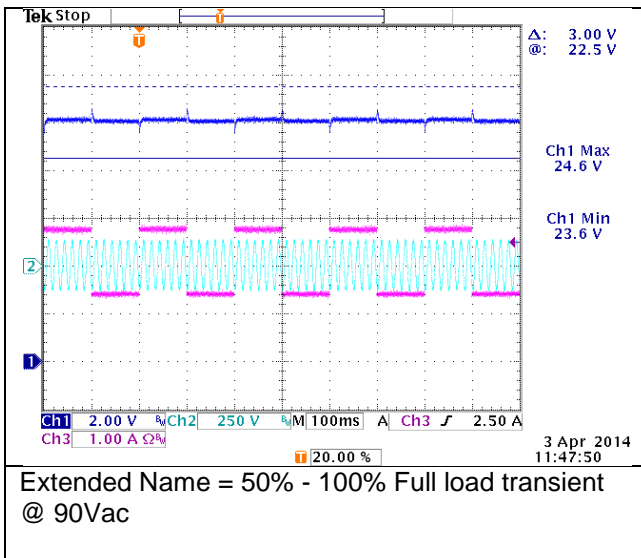
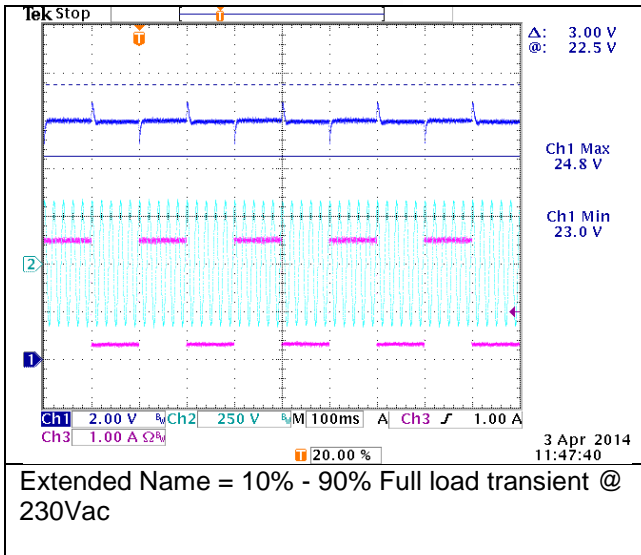


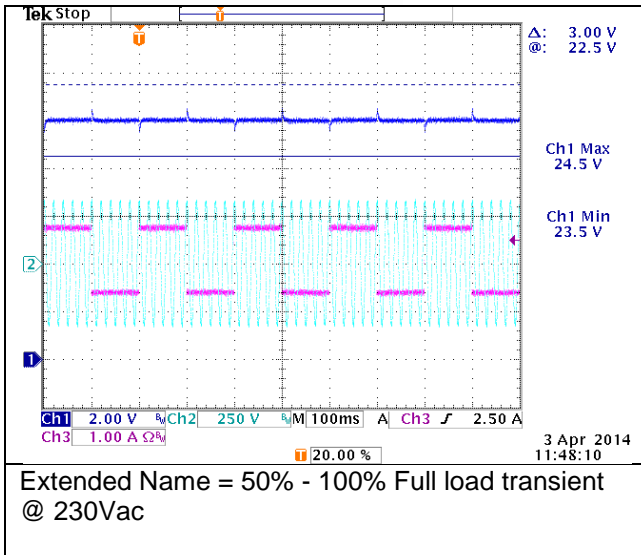
# Step Load

Dynamic test										
Vin (V)	Load_1 (A)	Time_1 (ms)	Load_2 (A)	Time_2 (ms)	Slew rate (A/us)	Vpk min meas'd (V)	Vpk min spec'd (V)	Vpk max meas'd (V)	Vpk max spec'd (V)	Pass?
90	0.136	100	1.360	100	0.200	23.36	21.500	24.760	25.500	PASS
90	0.271	100	2.438	100	0.200	23.08	22.500	25.040	25.500	PASS
115	0.136	100	1.360	100	0.200	23.28	22.500	24.760	25.500	PASS
115	0.271	100	2.438	100	0.200	23.08	22.500	24.920	25.500	PASS
230	0.136	100	1.360	100	0.200	23.16	22.500	24.680	25.500	PASS
230	0.271	100	2.438	100	0.200	23.04	22.500	24.800	25.500	PASS
90	1.360	100	2.710	100	0.200	23.56	22.500	24.600	25.500	PASS
115	1.360	100	2.710	100	0.200	23.60	22.500	24.560	25.500	PASS
230	1.360	100	2.710	100	0.200	23.52	22.500	24.520	25.500	PASS



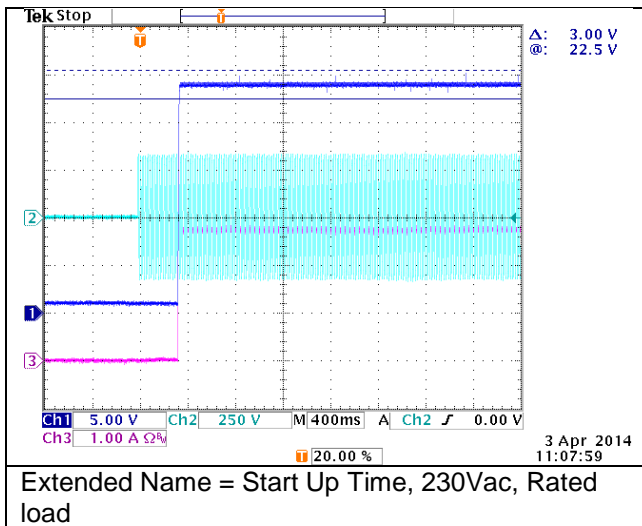
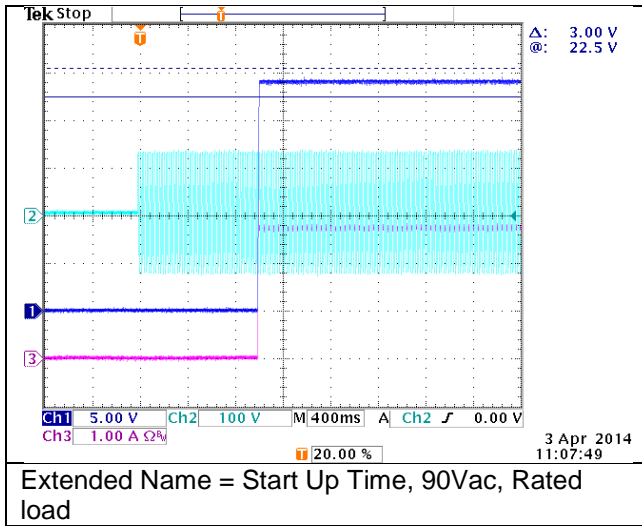




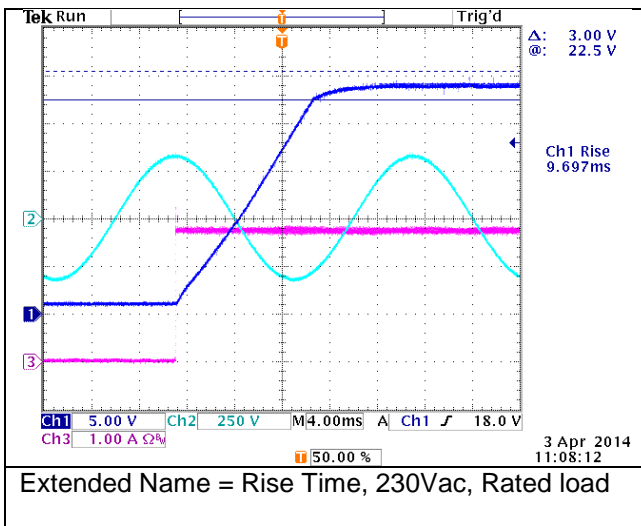
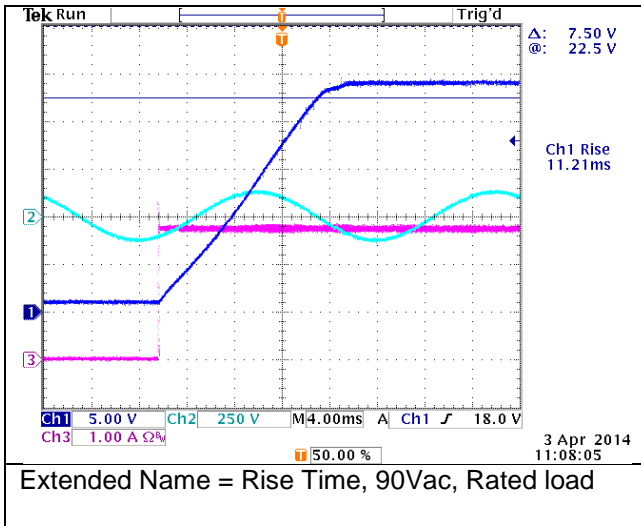


# Startup and Risetime

Startup time					
Vin (V)	F (Hz)	Load (A)	Startup time (ms); measured	Startup time (ms); spec max	Pass?
90	50	2.710	1014	4000	PASS
230	50	2.710	342	4000	PASS



Risetime 10% - 90%					
Vin (V)	F (Hz)	Load (A)	Risetime 10%-90% (ms)	Risetime (ms) max; Spec	Pass?
90	50	2.710	11	100	PASS
230	50	2.710	10	100	PASS



## On/off cycling

UUT is power cycled with 0.5, 1, 2, 4, 8, 16, 32, 64 and 128 second On/Off times, repeating each cycle four times. Output must be in regulation for On-time greater than four (4) seconds. If it is not in regulation, the On/Off time and cycle is recorded (see "Failed on cycle?" in table below). A zero indicates no-fail.

Vin (V)	F (Hz)	Load (A)	Cycle Period (s)	Failed On Cycle?	Result
90	50	0.000	0.50	0	PASS
		---	1.00	0	
		---	2.00	0	
		---	4.00	0	
		---	8.00	0	
		---	16.00	0	
		---	0.00	0	
		---	0.00	0	
		---	0.00	0	
90	50	2.710	0.50	0	PASS
		---	1.00	0	
		---	2.00	0	
		---	4.00	0	
		---	8.00	0	
		---	16.00	0	
		---	0.00	0	
		---	0.00	0	
		---	0.00	0	
230	50	0.000	0.50	0	PASS
		---	1.00	0	
		---	2.00	0	
		---	4.00	0	
		---	8.00	0	
		---	16.00	0	
		---	0.00	0	
		---	0.00	0	
		---	0.00	0	
230	50	2.710	0.50	0	PASS
		---	1.00	0	
		---	2.00	0	
		---	4.00	0	
		---	8.00	0	
		---	16.00	0	
		---	0.00	0	
		---	0.00	0	
		---	0.00	0	

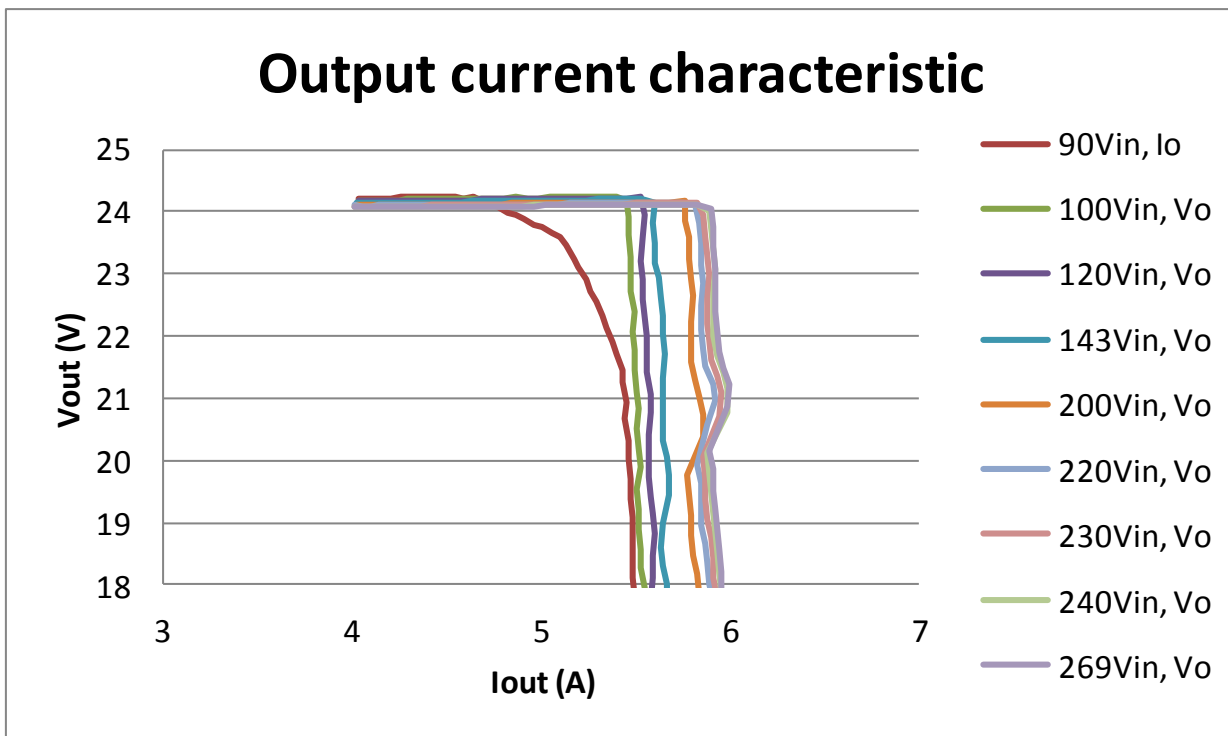
# Over Current Protection

## Short Circuit Test

Vin (V)	F (Hz)	Vout before short (V)	Vout after short (V)	Pass?
115	60	24.12	0.01	PASS

## Output Current Characteristics

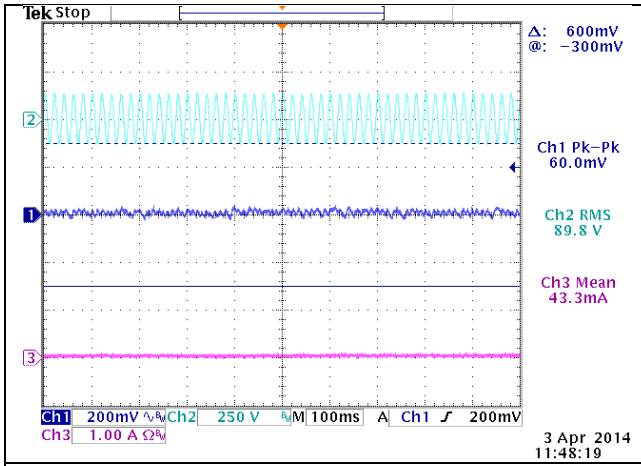
Load in CR mode. Apply a low load resistance for 200ms, measure Vout, Iout. Apply a background load resistance (e.g. 200R) for 1000ms. Decrease the low load resistance and repeat the cycle until load resistance < 1.5R.



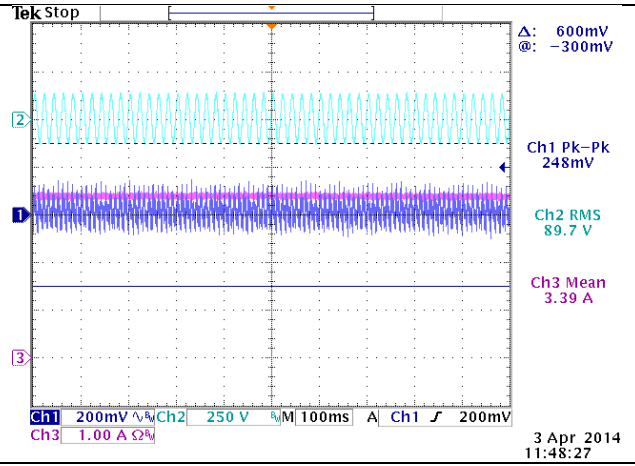


# Ripple and Noise Test

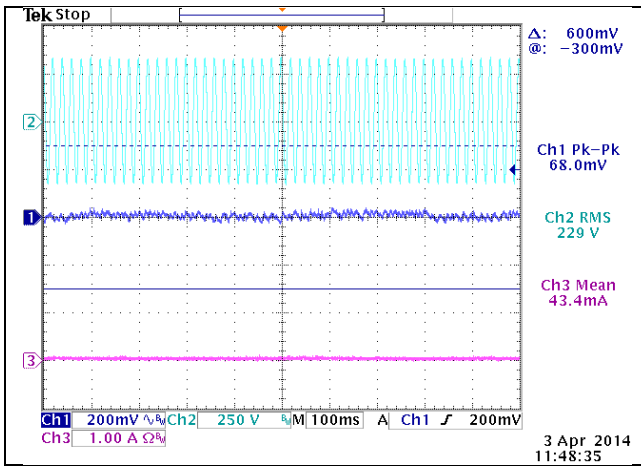
PARD				
Vin (V)	Load (A)	meas. (V)	max (V)	Pass ?
90	0.00	0.060	0.450	PASS
90	3.34	0.248	0.450	PASS
230	0.00	0.068	0.450	PASS
230	3.34	0.192	0.450	PASS



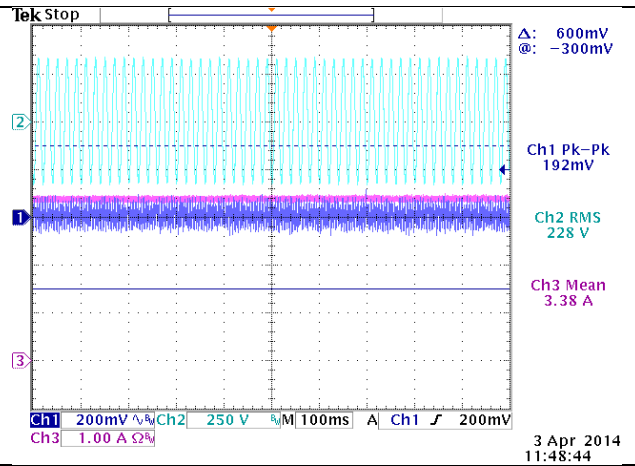
Extended Name = 90V/50Hz, Load = 0W



Extended Name = 90V/50Hz, Load = 65W



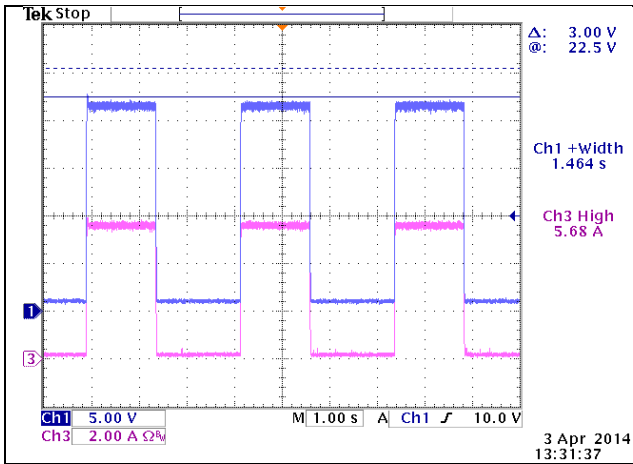
Extended Name = 230V/50Hz, Load = 0W



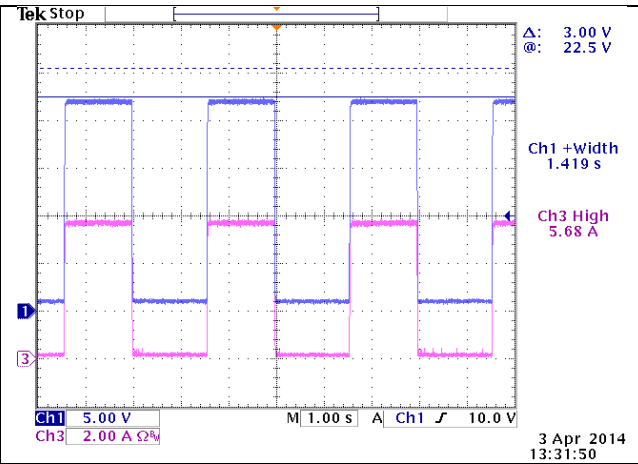
Extended Name = 230V/50Hz, Load = 65W

## Overload timer

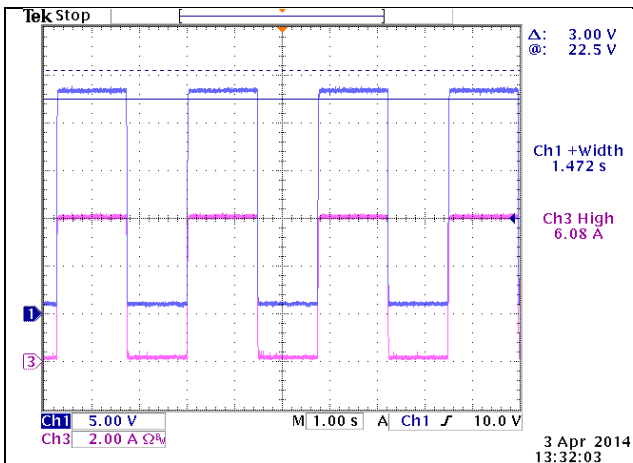
Line		Load		On time			Pass ?
Vin (V)	Freq (Hz)	(Ohm)	(A)	Min (s)	Max (s)	Meas (s)	
90	60	4.0	5.68	1.35	1.75	1.46	PASS
115	60	4.0	5.68	1.35	1.75	1.42	PASS
230	50	4.0	6.08	1.35	1.75	1.47	PASS



Extended Name = 90V



Extended Name = 115V



Extended Name = 230V

## IMPORTANT NOTICE FOR TI REFERENCE DESIGNS

Texas Instruments Incorporated ("TI") reference designs are solely intended to assist designers ("Buyers") who are developing systems that incorporate TI semiconductor products (also referred to herein as "components"). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer's systems and products.

TI reference designs have been created using standard laboratory conditions and engineering practices. **TI has not conducted any testing other than that specifically described in the published documentation for a particular reference design.** TI may make corrections, enhancements, improvements and other changes to its reference designs.

Buyers are authorized to use TI reference designs with the TI component(s) identified in each particular reference design and to modify the reference design in the development of their end products. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI REFERENCE DESIGNS ARE PROVIDED "AS IS". TI MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE REFERENCE DESIGNS OR USE OF THE REFERENCE DESIGNS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. TI DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO TI REFERENCE DESIGNS OR USE THEREOF. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY BUYERS AGAINST ANY THIRD PARTY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON A COMBINATION OF COMPONENTS PROVIDED IN A TI REFERENCE DESIGN. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY AND WHETHER OR NOT TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, ARISING IN ANY WAY OUT OF TI REFERENCE DESIGNS OR BUYER'S USE OF TI REFERENCE DESIGNS.

TI reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques for TI components are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

Reproduction of significant portions of TI information in TI data books, data sheets or reference designs is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards that anticipate dangerous failures, monitor failures and their consequences, lessen the likelihood of dangerous failures and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in Buyer's safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed an agreement specifically governing such use.

Only those TI components that TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components that have **not** been so designated is solely at Buyer's risk, and Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.