



Test Report: HBG-100-36

100W Constant Current Mode LED Driver

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

■ RELIABILITY TEST

Environment Test

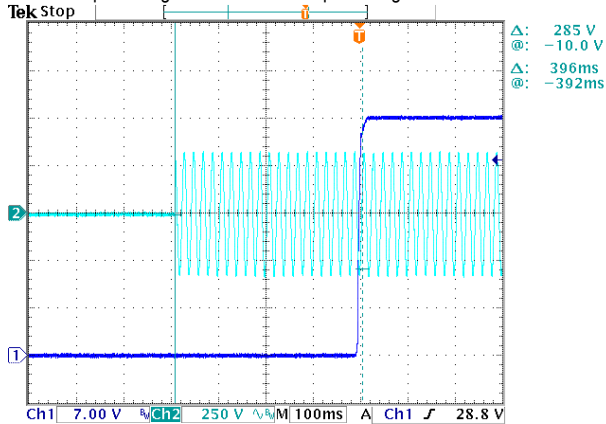
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	21.6V~36V	I/P: 230VAC O/P: LED MODE Ta: 25°C	21.6V~36V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type only)	1.62A~2.7A	I/P: 230VAC O/P: SETTING Ta: 25°C	1.33A~ 3.1 A
3	CURRENT RIPPLE	5.0% max.@rated current	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	3.08%
4	CURRENT TOLERANCE	<±5.0%	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	<5%
5	OPEN CIRCUIT VOLTAGE (max)	37V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	36.85V
6	SET UP TIME	500ms/230VAC 2000ms/115VAC	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	396ms/230VAC 254ms/115VAC

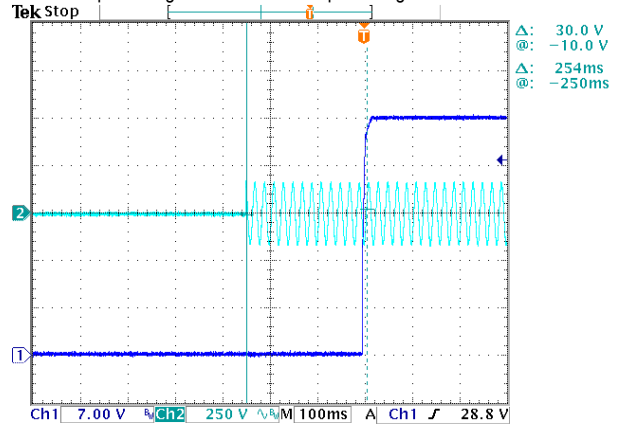
INPUT=230VAC/50HZ @ FULL LOAD

CH1: Output Voltage CH2: AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

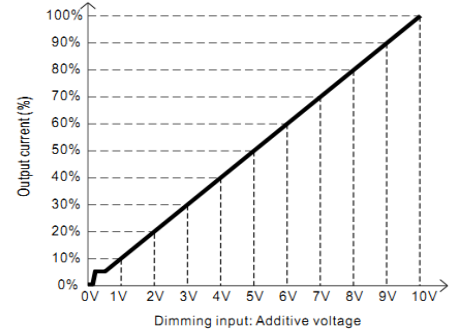
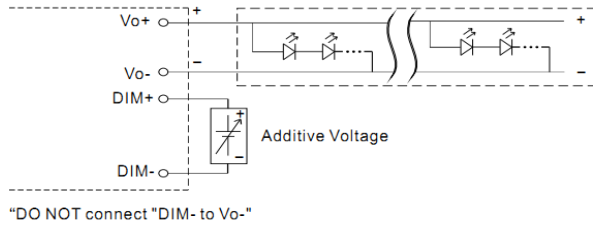
CH1: Output Voltage CH2: AC Input Voltage



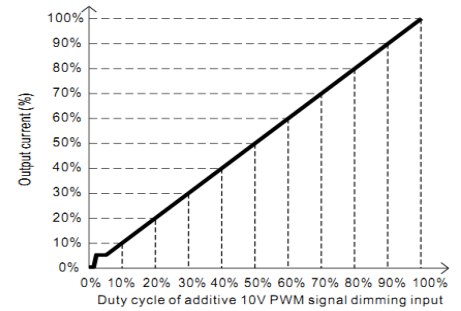
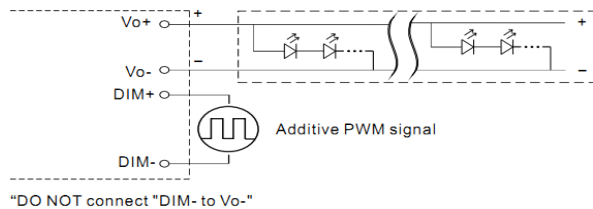
7 DIMMING OPERATION (for B-Type)

- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10Vdc, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100uA (typ.)

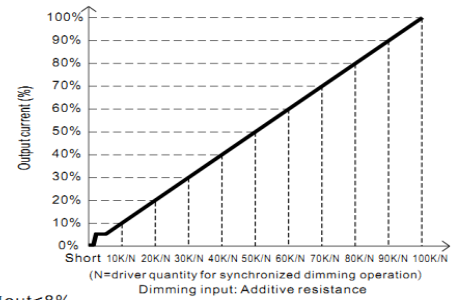
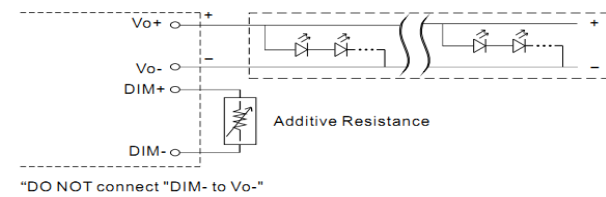
◎ Applying additive 0 ~ 10VDC



◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



◎ Applying additive resistance:



Note : 1. Min. dimming level is about 8% and the output current is not defined when $0\% < I_{out} < 8\%$.
 2. The output current could drop down to 0% when dimming input is about $0k\Omega$ or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P: 230 VAC

O/P: DIMMING TEST

Ta: 25°C

	V	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
1	Output Current	0	0.294A	0.570A	0.842A	1.118A	1.395A	1.669A	1.943A	2.223A	2.497A	2.727A
	%	0%	10.89%	21.11%	31.19%	41.41%	51.67%	61.81%	71.96%	82.33%	92.48%	101.0%
2	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output Current	0	0.316A	0.584A	0.853A	1.121A	1.392A	1.660A	1.928A	2.198A	2.465A	2.707A
	%	0%	11.70%	21.63%	31.59%	41.52%	51.56%	61.48%	71.41%	81.41%	91.30%	100.3%
3	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output Current	0	0.281A	0.542A	0.801A	1.062A	1.322A	1.582A	1.842A	2.100A	2.359A	2.618A
	%	0%	10.41%	20.07%	29.67%	39.33%	48.96%	58.59%	68.22%	77.78%	87.37%	96.96%

TEST RESULT: OK

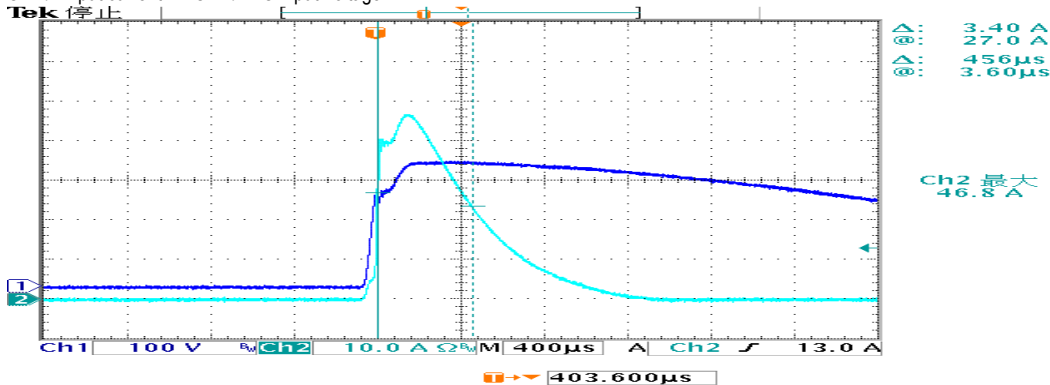
8	<p>DIMMING OPERATION (primary side;for DA-Type)</p>	<p>※DALI Interface ·Apply DALI signal between DA+ and DA-. ·DALI protocol comprises 16 groups and 64 addresses. ·First step is fixed at 8% of output. I/P: 230 VAC O/P: DIMMING TEST Ta: 25°C TEST RESULT: OK</p>
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	87V~305V
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 100 VAC ~305 VAC O/P: FULL~MIN LOAD Ta: 25°C	TEST: OK
3	AC CURRENT	1.1A/115VAC 0.5A/230VAC 0.45A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD/75% LOAD Ta: 25°C	I=0.958A/ 115VAC I=0.474A/ 230VAC I=0.397A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.600 mA N-FG: 0.596 mA
5	INRUSH CURRENT(Typ)	60A/230VAC Twidth =550us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I=46.8A/ 230VAC Twidth =456 us

INPUT=230VAC/50HZ @ FULL LOAD

CH2: Input current CH1: AC Input Voltage



6	EFFICIENCY(Typ)	91%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	91.23%																																												
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>115V (%)</th> <th>230V (%)</th> <th>277V (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>83.5</td><td>84.5</td><td>84.5</td></tr> <tr><td>20%</td><td>83.0</td><td>85.5</td><td>85.5</td></tr> <tr><td>30%</td><td>85.0</td><td>83.0</td><td>83.0</td></tr> <tr><td>40%</td><td>86.5</td><td>86.5</td><td>86.5</td></tr> <tr><td>50%</td><td>88.0</td><td>88.0</td><td>88.0</td></tr> <tr><td>60%</td><td>89.0</td><td>89.5</td><td>89.5</td></tr> <tr><td>70%</td><td>89.0</td><td>90.0</td><td>90.0</td></tr> <tr><td>80%</td><td>89.0</td><td>90.5</td><td>90.5</td></tr> <tr><td>90%</td><td>89.0</td><td>91.0</td><td>91.0</td></tr> <tr><td>100%</td><td>89.0</td><td>91.5</td><td>91.5</td></tr> </tbody> </table>					Load (%)	115V (%)	230V (%)	277V (%)	10%	83.5	84.5	84.5	20%	83.0	85.5	85.5	30%	85.0	83.0	83.0	40%	86.5	86.5	86.5	50%	88.0	88.0	88.0	60%	89.0	89.5	89.5	70%	89.0	90.0	90.0	80%	89.0	90.5	90.5	90%	89.0	91.0	91.0	100%	89.0	91.5	91.5
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7	POWER FACTOR	0.96/ 115VAC 0.96/ 230VAC 0.94/ 277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	PF=0.996 /115VAC PF=0.984 /230VAC PF=0.969 /277VAC																																												
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8	TOTAL HARMONIC DISTORTION	THD < 20% (@load ≥ 60%/115VAC, 230VAC; @load ≥ 75%/277VAC)	I/P: 115 VAC/60% LOAD I/P: 230 VAC/60% LOAD I/P: 277 VAC/75% LOAD Ta: 25°C	THD=9.31% @60% load /115VAC THD=14.87% @60% load /230VAC THD=13.37% @75% load /277VAC																																												
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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P: 100VAC I/P: 230 VAC I/P: 305VAC O/P: TESTING Ta: 25°C	101.07 %/100 VAC 101.03 %/ 230 VAC 101.10 %/ 305VAC Constant current limiting
2	OVER VOLTAGE PROTECTION	41V~49V	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: NO LOAD Ta: 25°C	46.0 V/ 90VAC 46.0 V/ 230VAC 46.0V/ 305VAC Shut down o/p voltage re-power on to recovery
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage re-power on to recovery

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q 1 Rated 700V/12A	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 588 V (2) 474 V (3) 584 V
2	O/P Diode (MOSFET)	Q101 Rated 170V/20A	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 151 V (2) 116 V (3) 149 V
3	Input Capacitor	C5 Rated 82u/450V	I/P: High-Line +3V =308 V O/P: (1) FULL LOAD input on/off (2) NO LOAD input on /Off (3) FULL LOAD /NO LOAD Change Ta: 25°C	(1) 442 V (2) 410 V (3) 430 V
4	Control IC	U1 Rated 38V (MAX.)	I/P: High-Line +3V =308 V O/P: (1) Full Load Turn on /Off (2) Min load Turn on /Off (3) Full Load /Min load Change Ta: 25°C	(1) 22.3 V (2) 22.3 V (3) 22.3 V
5	PFC Power Transistor	Q 2 Rated 600V/11A	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 486 V (2) 428 V (3) 440 V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG: 2.0KVAC/min O/P-FG: 0.5KVAC/min	I/P-O/P: 4.2 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6KVAC/min Ta: 25°C	I/P-O/P: 3.882 mA I/P-FG: 3.821 mA O/P-FG: 3.076 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG: 500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta: 25°C	I/P-O/P: >9999 MΩ I/P-FG: >9999 MΩ O/P-FG: >9999 MΩ
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta: 25°C /70% RH	17 mΩ

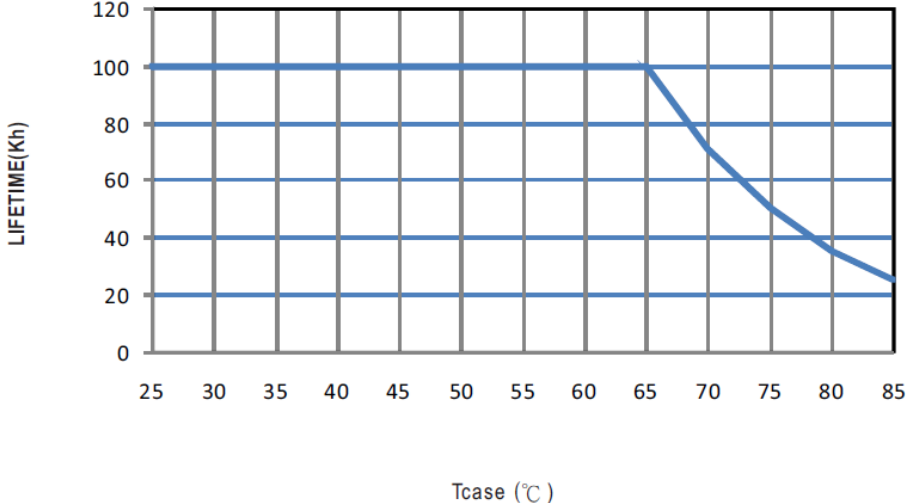
E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 Class C	I/P: 230VAC/50HZ O/P: FULL/60% LOAD Ta: 25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR: 8KV Contact: 4KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
6	SURGE	EN61000-4-5 INDUSTRY L-N: 2KV L,N-PE: 4KV	I/P: 230VAC/50HZ O/P: FULL LOAD L-N: 4KV L,N-PE: 6KV Ta: 25°C	PASS
7	Test by certified Lab & Test Report Prepare			

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL: HBG-100-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=26.3 °C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=59.0 °C																																														
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7	Q101	55.3°C	85.9°C																																													
8	C106	53.5°C	84.0°C																																													
9	RTH2	47.3°C	77.5°C																																													
10	TC	44.2°C	74.7°C																																													
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/90VAC O/P: FULL /80% LOAD Ta= -45°C /-30°C	TEST: OK																																												
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60°C NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta=60°C HUMIDITY= 95 %R.H	TEST: OK																																												
4	TEMPERATURE COEFFICIENT	±0.03 %/°C (0~50°C)	I/P: 230 VAC O/P: FULL LOAD	±0.005 %/°C (0~50°C)																																												
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -45°C ~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 5 CYCLE 5. Input/Output condition: STATIC		TEST: OK																																												
6	THERMAL SHOCK TEST	1. Thermal shock Temperature: -45°C ~ +65°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 10 CYCLE 5. Input/Output condition: 230VAC/ FULL LOAD AC ON/OFF TEST AC on 3 sec/AC off 1 sec TEST		TEST: OK																																												
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 12min/sweep cycle (4) Acceleration: 5G (5) Test Time: 72min in each axis (X.Y.Z) (6) Ta: 25°C		TEST: OK																																												

8	CAPACITOR LIFE CYCLE	<p>HBG-100-24: SUPPOSE C103 IS THE MOST CRITICAL COMPONENT</p> <p>(1) I/P: 230VAC O/P: FULL LOAD Ta= 25 °C LIFE TIME</p> <p>(2) I/P: 230VAC O/P: FULL LOAD Ta= 60 °C LIFE TIME</p> <p>(3) I/P: 230VAC O/P: 75% LOAD Ta= 60 °C LIFE TIME</p> <p>(4) I/P: 230VAC O/P: MIN LOAD Ta= 60 °C LIFE TIME</p>	<p>(1) 271950 HRS</p> <p>(2) 28000 HRS</p> <p>(3) 43609 HRS</p> <p>(4) 53804 HRS</p>																												
9	MTBF	<p>Conducted by Parts Stress Analysis Prediction</p> <p>2433.4K hrs min. Telcordia SR-332 (Bellcore) ; 299.3K hrs min. MIL-HDBK-217F (25°C)</p>																													
10	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure (Expected Life):</p> <p>Above 50000 hours @ Tc 75°C</p>  <table border="1"> <caption>Graph Data: Lifetime (kh) vs Tcase (°C)</caption> <thead> <tr> <th>Tcase (°C)</th> <th>Lifetime (kh)</th> </tr> </thead> <tbody> <tr><td>25</td><td>100</td></tr> <tr><td>30</td><td>100</td></tr> <tr><td>35</td><td>100</td></tr> <tr><td>40</td><td>100</td></tr> <tr><td>45</td><td>100</td></tr> <tr><td>50</td><td>100</td></tr> <tr><td>55</td><td>100</td></tr> <tr><td>60</td><td>100</td></tr> <tr><td>65</td><td>100</td></tr> <tr><td>70</td><td>70</td></tr> <tr><td>75</td><td>50</td></tr> <tr><td>80</td><td>35</td></tr> <tr><td>85</td><td>25</td></tr> </tbody> </table>		Tcase (°C)	Lifetime (kh)	25	100	30	100	35	100	40	100	45	100	50	100	55	100	60	100	65	100	70	70	75	50	80	35	85	25
Tcase (°C)	Lifetime (kh)																														
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TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	SHENJW/ZHUOKB	SKY	LIUWY