



# Test Report: LCM-60U

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50W Multiple-Stage Constant Current Mode LED Driver

## ■ DESIGN VERIFY TEST

Output Function Test  
Input Function Test  
Protection Function Test  
Control 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	VERDICT
1	DC VOLTAGE RANGE	500mA : 2~90V 600mA : 2~84V 700mA : 2~72V 900mA : 2~56V 1050mA : 2~48V 1400mA : 2~36V	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	500mA : 2~90V 600mA : 2~84V 700mA : 2~72V 900mA : 2~56V 1050mA : 2~48V 1400mA : 2~36V	P
2	OPEN CIRCUIT VOLTAGE	500mA : 102V 600mA : 102V 700mA : 102V 900mA : 76V 1050mA : 76V 1400mA : 76V	I/P : 115 VAC O/P : NO LOAD Ta : 25°C	500mA : 92.11 V 600mA : 86.16 V 700mA : 74.00 V 900mA : 58.05 V 1050mA : 50.06 V 1400mA : 38.00 V	P
3	CURRENT RIPPLE	5.0%(max).@ rated current	I/P : 115VAC O/P : LED LOAD Ta : 25°C	500mA : <5 % 600mA : <5 % 700mA : <5 % 900mA : <5 % 1050mA : <5 % 1400mA : <5 %	P
4	CURRENT TOLERANCE	±5%	I/P : 115VAC O/P : LED MIN~ LED MAX Ta : 25°C	500mA : <5 % 600mA : <5 % 700mA : <5 % 900mA : <5 % 1050mA : <5 % 1400mA : <5 %	P
5	AUXILIARY DC OUTPUT	Nominal 12V (deviation 11.4~12.6V) @ 50mA	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	11.863V/115V	P
6	SET UP TIME	115VAC : 1000 ms (Max)	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	115VAC/ 332 ms	P

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~132 VAC	I/P : TESTING O/P : LED LOAD Ta : 25°C	90 V~132V	P
			I/P : LOW-LINE-3V= 87 V (PLEASE CHECK DERATING CURVE) HIGH-LINE+10V=142 V O/P : LED LOAD ON : 30 Sec. OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P : 90 VAC ~ 132 VAC O/P : LED LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.98 / 115 VAC(TYP)	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	PF= 0.995	P
4	EFFICIENCY	89% (TYP)	I/P : 115 VAC O/P : LED 500mA/70V Ta : 25°C	89.27 %	P
5	INPUT CURRENT	115V/ 0.65 A (TYP)	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	I = 0.517 A	P
6	INRUSH CURRENT	115V/ 15 A (TYP) (twidth=270us measured at 50% Ipeak) COLD START	I/P : 115 VAC O/P : LED LOAD Ta : 25°C	I = 13.8 A T50= 234 us	P
7	LEAKAGE CURRENT	< 0.5 mA / 120 VAC	I/P : 120 VAC O/P : NO LOAD Ta : 25°C	L-FG : 0.0012 mA N-FG : 0.0013 mA	P
8	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher	I/P : 115 VAC O/P : 60% LOAD	THD : 11.94%	P

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER VOLTAGE PROTECTION	105 V ~ 125 V	I/P : 115 VAC O/P : NO LOAD Ta : 25°C	117.25V/ 115 VAC Shut down o/p voltage, re- power on to recover	P
2	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P : 115 VAC O/P : LED LOAD	O.T.P. Active Shut down o/p voltage, re- power on to recover	P
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 132 VAC O/P : LED LOAD Ta : 25°C	NO DAMAGE Constant Current Limiting, recovers automatically after fault condition is removed	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																	
1	DIP Switch Table	<p>LCM-60U is a multiple-stage constant current driver, selection of output current through DIP switch is exhibited below.</p> <table border="1"> <thead> <tr> <th>Io \ DIP S.W.</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>500mA</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> </tr> <tr> <td>600mA</td> <td>ON</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> </tr> <tr> <td>700mA(factory default)</td> <td>ON</td> <td>ON</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> </tr> <tr> <td>900mA</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>----</td> <td>----</td> <td>ON</td> </tr> <tr> <td>1050mA</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>----</td> <td>ON</td> </tr> <tr> <td>1400mA</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table> <p>TEST : OK</p>	Io \ DIP S.W.	1	2	3	4	5	6	500mA	----	----	----	----	----	----	600mA	ON	----	----	----	----	----	700mA(factory default)	ON	ON	----	----	----	----	900mA	ON	ON	ON	----	----	ON	1050mA	ON	ON	ON	ON	----	ON	1400mA	ON	ON	ON	ON	ON	ON			P
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2	TEMPERATURE COMPENSATION OPERATION	<p>SPEC: LCM-60U have the built-in temperature compensation function;by connecting a temperature sensor ( NTC resistor) between the +NTC /-NTC terminal of LCM-60U and the detecting point on the lighting system or the surrounding environment, output current of LCM-60U could be correspondingly changed,based on the sensed temperature,to ensure the long life of LED.</p> <p style="text-align: center;"><b>NTC derating curve</b></p> <p style="text-align: center;"><b>Sensed Temperature(°C)</b></p> <p>© LCM-60U can still be operated normally when the NTC resistor is not connected and the value of output current will be the current level selected through the DIP switch. © NTC reference:</p> <table border="1"> <thead> <tr> <th>NTC resistance</th> <th>Output Current</th> </tr> </thead> <tbody> <tr> <td>220K</td> <td>&lt; 60°C , 100% of the rated current (corresponds to the setting current level) &gt; 60°C , output current begins to reduce,please refer to the curve for details.</td> </tr> <tr> <td>330K</td> <td>&lt; 70°C , 100% of the rated current (corresponds to the setting current level) &gt; 70°C , output current begin to reduce, please refer to the curve for details.</td> </tr> <tr> <td>470K</td> <td>&lt; 80°C , 100% of the rated current (corresponds to the setting current level) &gt; 80°C , output current begin to reduce, please refer to the curve for details.</td> </tr> </tbody> </table> <p>Notes: 1. MEAN WELL does not offer the NTC resistor and all the data above are measured by using THINKING TTC03 series. 2. If other brands of NTC resistor is applied,please check the temperature curve first.</p> <p>© Dimming and Synchronization function of the driver will be invalid when the "temperature compensation" function is in use TEST CONDITION : I/P : 115 VAC RESULT:OK</p>	NTC resistance	Output Current	220K	< 60°C , 100% of the rated current (corresponds to the setting current level) > 60°C , output current begins to reduce,please refer to the curve for details.	330K	< 70°C , 100% of the rated current (corresponds to the setting current level) > 70°C , output current begin to reduce, please refer to the curve for details.	470K	< 80°C , 100% of the rated current (corresponds to the setting current level) > 80°C , output current begin to reduce, please refer to the curve for details.			P																																									
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<p>3</p> <p>Dimming OPERATION</p>	<p>SPEC:</p> <ul style="list-style-type: none"> <li>※ 3 in 1 dimming function</li> <li>· 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.</li> <li>· Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.</li> <li>· Dimming source current from power supply: 100uA(typ.)</li> <li>DO NOT connect "DIM-" to "-V".</li> </ul> <p>Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <td rowspan="2">Resistance value</td> <td>Single driver</td> <td>Short</td> <td>10K Ω</td> <td>20K Ω</td> <td>30K Ω</td> <td>40K Ω</td> <td>50K Ω</td> <td>60K Ω</td> <td>70K Ω</td> <td>80K Ω</td> <td>90K Ω</td> <td>100K Ω</td> <td>OPEN</td> </tr> <tr> <td>Multiple drivers (N=driver quantity for synchronized dimming operation)</td> <td>Short</td> <td>10K Ω /N</td> <td>20K Ω /N</td> <td>30K Ω /N</td> <td>40K Ω /N</td> <td>50K Ω /N</td> <td>60K Ω /N</td> <td>70K Ω /N</td> <td>80K Ω /N</td> <td>90K Ω /N</td> <td>100K Ω /N</td> <td>.....</td> </tr> <tr> <td colspan="2">Percentage of rated current</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>100%~108%</td> </tr> </table> <p>※ 0 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Dimming value</td> <td>0V</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> <td>OPEN</td> </tr> <tr> <td>Output current</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>100%~108%</td> </tr> </table> <p>※ 10V PWM signal for output current adjustment (Typical) : Frequency range : 100Hz~3KHz</p> <table border="1"> <tr> <td>Duty value</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>OPEN</td> </tr> <tr> <td>Output current</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>100%~108%</td> </tr> </table> <p>Note: 1. Min. dimming level is about 6% and the output current is not defined when <math>0\% &lt; I_{out} &lt; 6\%</math>.          2. The output current could drop down to 0% when dimming input is about 0KΩ or 0Vdc, or 10V PWM signal with 0% duty cycle.          3. Please do not activate "temperature compensation" when performing dimming operation.</p> <p>TEST RESULT :</p> <p>I/P : 115 VAC ; Ta : 25°C</p> <p>Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Current</td> <td>Short</td> <td>10KΩ</td> <td>20KΩ</td> <td>30KΩ</td> <td>40KΩ</td> <td>50KΩ</td> <td>60KΩ</td> <td>70KΩ</td> <td>80KΩ</td> <td>90KΩ</td> <td>100KΩ</td> <td>OPEN</td> </tr> <tr> <td>500mA</td> <td>0%</td> <td>12.00 %</td> <td>22.00 %</td> <td>32.00 %</td> <td>42.00 %</td> <td>52.20 %</td> <td>62.20 %</td> <td>72.20 %</td> <td>82.40 %</td> <td>92.40 %</td> <td>102.40 %</td> <td>102.60 %</td> </tr> <tr> <td>1400mA</td> <td>0%</td> <td>12.21 %</td> <td>22.14 %</td> <td>32.14 %</td> <td>42.00 %</td> <td>52.07 %</td> <td>62.00 %</td> <td>72.07 %</td> <td>82.14 %</td> <td>92.14 %</td> <td>102.14 %</td> <td>101.93 %</td> </tr> </table> <p>0 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Current</td> <td>0V</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> <td>OPEN</td> </tr> <tr> <td>500mA</td> <td>0%</td> <td>12.00 %</td> <td>21.80 %</td> <td>31.80 %</td> <td>41.80 %</td> <td>51.80 %</td> <td>61.80 %</td> <td>71.80 %</td> <td>81.60 %</td> <td>91.60 %</td> <td>101.60 %</td> <td>102.60 %</td> </tr> <tr> <td>1400mA</td> <td>0%</td> <td>12.14 %</td> <td>22.00 %</td> <td>31.93 %</td> <td>41.86 %</td> <td>51.71 %</td> <td>61.64 %</td> <td>71.57 %</td> <td>81.43 %</td> <td>91.36 %</td> <td>101.29 %</td> <td>101.93 %</td> </tr> </table> <p>10V PWM signal for output current adjustment (Typical): Frequency range : 100Hz ~ 3KHz</p> <table border="1"> <tr> <td>Current</td> <td>0%</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>OPEN</td> </tr> <tr> <td>500mA</td> <td>0%</td> <td>13.60 %</td> <td>23.40 %</td> <td>33.00 %</td> <td>42.80 %</td> <td>52.20 %</td> <td>62.00 %</td> <td>71.40 %</td> <td>81.40 %</td> <td>90.80 %</td> <td>99.40 %</td> <td>102.60 %</td> </tr> <tr> <td>1400mA</td> <td>0%</td> <td>13.86 %</td> <td>23.57 %</td> <td>33.00 %</td> <td>42.71 %</td> <td>52.14 %</td> <td>62.00 %</td> <td>71.36 %</td> <td>81.14 %</td> <td>90.50 %</td> <td>99.14 %</td> <td>101.93 %</td> </tr> </table>	Resistance value	Single driver	Short	10K Ω	20K Ω	30K Ω	40K Ω	50K Ω	60K Ω	70K Ω	80K Ω	90K Ω	100K Ω	OPEN	Multiple drivers (N=driver quantity for synchronized dimming operation)	Short	10K Ω /N	20K Ω /N	30K Ω /N	40K Ω /N	50K Ω /N	60K Ω /N	70K Ω /N	80K Ω /N	90K Ω /N	100K Ω /N	.....	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<p>4</p> <p>SYNCHRONIZATION OPERATION</p>	<p>SPEC:</p> <ul style="list-style-type: none"> <li>· Synchronization up to 10 drivers (1 master + 9 slaves)</li> <li>· Dimming operating range : 10%~100%</li> <li>· Sync cable length : &lt; 5m</li> <li>· Sync cable type : Flat cable</li> <li>· Sync cable cross section area : 22 ~ 24 AWG (0.2~0.3mm<sup>2</sup>)</li> </ul> <p>TEST CONDITION : I/P : 115 VAC          RESULT: OK</p>	<p>P</p>																																																																																																																																																																																																																		

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	U2 Rated 530V/5.2A	I/P : High-Line +3V = 135 V O/P : (1)LED LOAD Turn on (2) Output Short (3)LED LOAD continue Ta : 25°C	(1) 458 V (2) 448 V (3) 462 V	P
2	Diode Peak Voltage	D100 Rated 300V/10A	I/P : High-Line +3V = 135 V O/P : (1)LED LOAD Turn on (2)Output Short (3)LED LOAD continue Ta : 25°C	(1) 199 V (2) 16.5 V (3) 195 V	P
3	Input Capacitor Voltage	C5 Rated: 22u/450V	I/P : High-Line +3V = 135 V O/P : (1)LED LOAD Turn on /Off (2) Min load Turn on /Off (3) Burn-IN 1Hour Ta : 25°C	(1) 446 V (2) 448 V (3) 446 V	P
4	Control IC Voltage Test	U2 Rated 15V	I/P : High-Line +3V = 135 V O/P : (1)LED LOAD Turn on /Off (2) Output Short (3) LED LOAD continue Ta : 25°C	(1) 13.4 V (2) 13.3 V (3) 13.3 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated 7.3A/600V	I/P : High-Line +3V = 135 V O/P : (1)LED LOAD Turn on (2) Output Short (3)LED LOAD continue Ta : 25°C	(1) 456 V (2) 442 V (3) 448 V	P

### ■ SAFETY & E.M.C. TEST

#### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.75 KVAC/min	I/P-O/P : 4.2 KVAC/min Ta : 25°C	I/P-O/P : 1.153 mA NO DAMAGE	P

#### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CONDUCTION	FCC part 15 CLASS B	I/P : 115 VAC (50HZ) O/P : LED LOAD Ta : 25°C	PASS Test by certified Lab	P
2	RADIATION	FCC part 15 CLASS B	I/P : 115 VAC (50HZ) O/P : LED LOAD Ta : 25°C	PASS Test by certified Lab	P

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL : LCM-60U      DIP switch : 1400mA 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 115VAC    O/P : LED LOAD    Ta=28.8 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 115VAC    O/P : LED LOAD    Ta= 42.6 °C			P
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 132VAC/100VAC O/P : LED LOAD Ta= -35 °C	TEST : OK	P
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 30 °C NO DAMAGE	I/P : 135 VAC O/P : LED LOAD Ta= 30 °C HUMIDITY= 95 %R.H	TEST : OK	P
4	TEMPERATURE COEFFICIENT	±0.03 %/°C(0~40°C)	I/P : 115 VAC O/P : LED LOAD	±0.001 %/°C(0~40°C)	P

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	P
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C~ +45°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 : 115VAC/LED LOAD AC ON/OFF TEST turn on 58sec ; turn off 2sec	TEST : OK	P
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	P
8	CAPACITOR LIFE CYCLE	LCM-60U ;SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 115VAC O/P : LED LOAD Ta= 25 °C LIFE TIME (2) I/P : 115VAC O/P : LED LOAD Ta= 30 °C LIFE TIME (3) I/P : 115VAC O/P : 75% LOAD Ta= 30 °C LIFE TIME (4) I/P : 115VAC O/P : 50% LOAD Ta= 30 °C LIFE TIME	(1) 356774 HRS (2) 295878 HRS (3) 293265 HRS (4) 380098 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 193.6K hrs min. MIL-HDBK-217F (25°C)		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ Tcase 75°C ; 50,000 hours @ Tcase 65°C		P

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHUOKB	SKY	LIUWY

2009/08/04 A50-F023