LITEON LITE-ON TECHNOLOGY CORPORATION

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Lead Free RoHS COMPLIANT

MSL: Level 1

APPROVAL SHEET

PRODUCT NAME	PHOTO-COUPLER IGBT GATE DRIVER
LITE-ON PART NO.	LTV-155E
CUSTOMER NAME	LG PDP
CUSTOMER PART NO.	EAV62035601
ISSUED DATE	22 October 2012

ISSUED DEPARTMENT: PRODUCT DEVELOPMENT (PD)

ISSUED BY: MARK LIN / WALLACE HSU (PD ENGINEER)

REVIEWED BY: DIO TZENG (PD PRINCIPAL ENGINEER)

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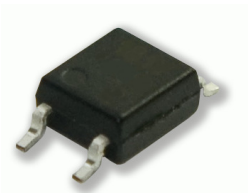
3.0 Type Document Revision History

Rev.	Date	Initiator	Description of Change
-	22 October 2012	Wallace Hsu	Original
A	4 December 2012	Wallace Hsu	To update safety approval, MSL and Pb free information
B	11 January 2013	Dio Tzeng	Cover page revised, Abnormal Lot management, Lead Co-planarity, Fab QC Flow, Delaminating Evaluation, REEL and internal and external packing material, MSDS / SGS

4.0 Datasheet & Application Notes & IR-Reflow Profile

LTV-155E

Plasma Display Panel (PDP)
Industrial Inverter
MOS FET/ IGBT Gate Driver



Description

The LTV-155E optocoupler is ideally suited for driving power IGBTs and MOSFETs used in plasma display panel. It contains an AlGaAs LED optically coupled to an integrated circuit with a power output stage. The Optocoupler operational parameters are guaranteed over the temperature range from -40 °C ~ +100 °C.

Features

- 0.6A maximum peak output current
- 2.5mA maximum supply current (I_{CC})
- Wide operating range: 10 to 30 Volts (V_{CC})
- Rail to rail output voltage
- Guaranteed performance over temperature -40°C ~ +100°C.
- Threshold input current: IFLH = 7.5mA (max)
- Common mode transient immunity: ±20kV/μs (min)
- Isolation voltage: 3750 V_{rms} (min)
- Fast switching speed, 200ns max propagation delay
- MSL 1 Level
- Safety approval

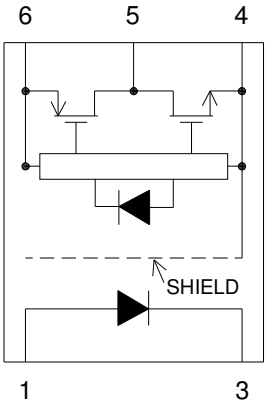
  UL/ cUL 1577, Cert. No.E113898.

  3750 Vrms/1 min

  VDE DIN EN60747-5-5, Cert. No. 40015248

  V_{IORM} = 560 V_{peak}

Functional Diagram



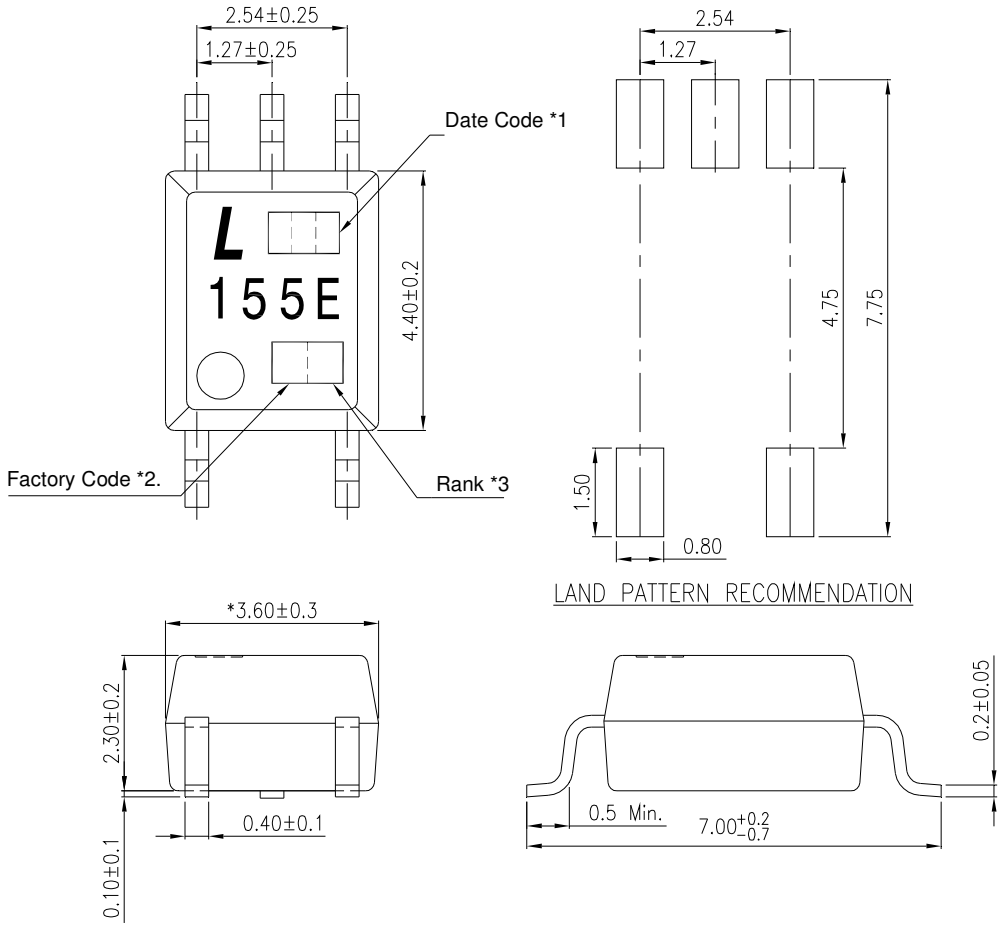
1. Anode
3. Cathode
4. GND
5. Vo (Output)
6. Vcc

Application

- Plasma Display Panel .
- IGBT/MOSFET gate drive
- Industrial Inverter
- Induction heating
- Uninterruptible power supply (UPS)

Package Dimensions

SOP-5 Package (LTV-155E)

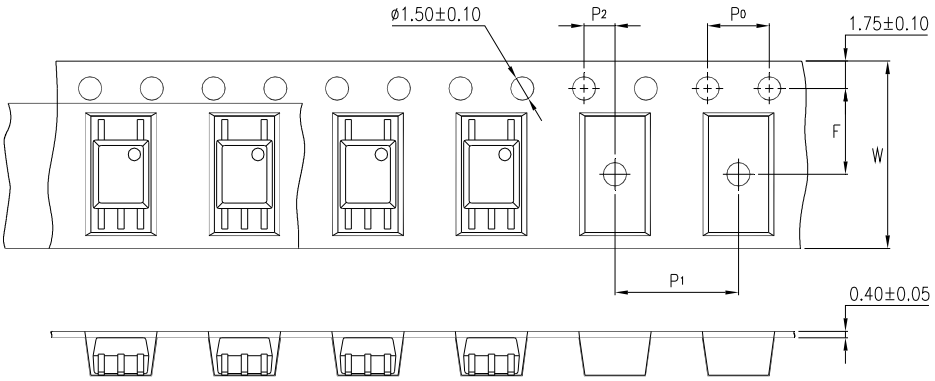


Notes :

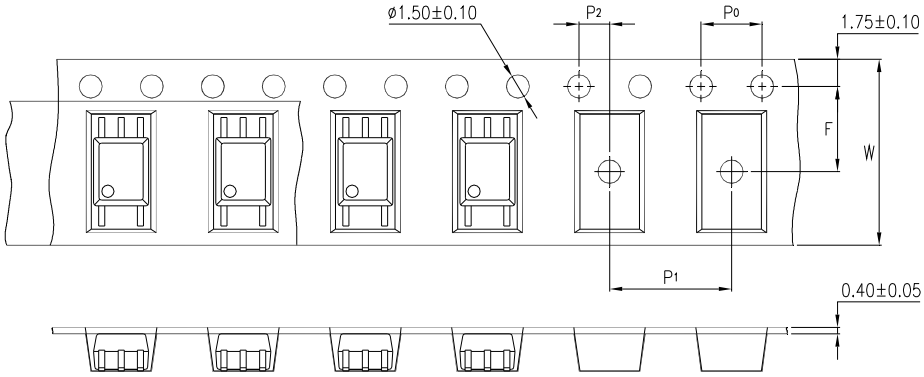
1. All Dimensions in Millimeters
2. Mold flash per side is 0.15mm

Taping Dimensions

LTV-155E-TP1



LTV-155E-TP



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	12±0.3 (0.47)
Pitch of sprocket holes	P0	4±0.1 (0.15)
Distance of compartment	F P2	5.5±0.1 (0.217) 2±0.1 (0.079)
Distance of compartment to compartment	P1	8±0.1 (0.315)

Quantity Per Reel

Package Type	LTV-155E
Quantities(pcs)	3000

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_{ST}	-55	125	°C	
Operating Temperature	T_A	-40	100	°C	
Isolation Voltage	V_{ISO}	3750		V_{RMS}	
Supply Voltage	V_{CC}	0	35	V	
Lead Solder Temperature			260	°C	
Input					
Average Forward Input Current	$I_{F(AVG)}$		25	mA	
Reverse Input Voltage	V_R		5	V	
Peak Transient Input Current (<1 μs pulse width, 300 pps)	$I_{F(TRAN)}$		1	A	
Input Current (Rise/Fall ime)	$t_{r(IN)}$ /$t_{f(IN)}$		500	ns	
Input Power Dissipation [2]	P_I		45	mW	
Output					
"High" Peak Output Current [1]	$I_{OH(PEAK)}$		0.6	A	
"Low" Peak Output Current [1]	$I_{OL(PEAK)}$		0.6	A	
Output oltage	V_O		35	V	
Output Power Dissipation [3]	P_O		250	mW	
Total Power Dissipation	P_T		295	mW	

1. At least a 0.1uF or bigger bypass capacitor must be connected across pin 4 and pin 6. Failure to provide the bypass may impair the switching property.
2. Derating Linearly above 70°C free-air temperature at a rate of 0.47 mW/°C
3. Derating Linearly above 70°C free-air temperature at a rate of 4.8mW/°C

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Operating Temperature	T_A	-40	100	°C
Supply Voltage	V_{CC}	10	30	V
Input Current (ON)	$I_{FL(ON)}$	10	15	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V

Electrical Specifications

Parameters	Test Condition		Symbol	Min	Typ	Max	Units	Fig
Input								
Input Forward Voltage	I_F=10mA		V_F	1.2	1.37	1.8	V	
Temperature Coefficient Forward Voltage	I_F = 10mA		$\Delta V_F/\Delta T_A$	—	-1.237	—	mV/℃	
Input Reverse Breakdown Voltage	I_R = 10μA		BV_R	5	—	—	V	
Input Capacitance	f = 1 MHz, V_F = 0 V		C_{IN}	—	33	—	pF	
Threshold Input Current Low to High	V_{CC}=15V, V_O > 5V		I_{FLH}	—	2.6	7.5	mA	9
Threshold Input Voltage High to Low	V_{CC}=15V, V_O < 5V		V_{FHL}	0.8	—	—	V	
Output								
High level output current (1)	V_{cc}=15V, I_F=10mA,	V_{6-5}=2V	I_{OPH1}	—	-0.5	-0.2	A	3, 5, 15
		V_{6-5}=10V	I_{OPH2}	—	—	-0.4		
Low level output current (1)	V_{cc}=15V, I_F=0mA,	V_{5-4}=2V	I_{OPL1}	0.2	0.5	—		4, 6, 16
		V_{5-4}=10V	I_{OPL2}	0.4	—	—		
High level output voltage	V_{CC}=10V. I_F = 10mA, I_O = -100mA		V_{OH}	9	9.55	—	V	1, 17
Low level output voltage	V_{CC}=10V, I_F = 0mA, I_O = 100mA		V_{OL}	—	0.3	1		2, 18
High Level Supply Current	V_{CC}=10 to 20V I_F = 10mA, V_O=Open		I_{CCH}	—	1.5	3.0	mA	7, 8, 19
Low Level Supply Current	V_{CC}=10 to 20V I_F = 0mA, V_O=Open		I_{CCL}	—	1.5	3.0		7, 8, 20

All Typical values at TA = 25℃, unless otherwise specified.

Switching Specifications

Parameter		Test Condition		Symbol	Min	Typ	Max	Units	Fig
Propagation Delay Time	L→H	V_{CC}=20V I_F= 10mA R_g= 30 Ω, C_g= 1 nF, f= 250 kHz, Duty= 50%	Ta=25°C IF=0→10mA	T_{PLH}	—	115	170	ns	10, 11, 12, 13, 14, 21
	H→L		Ta=25°C IF=10→0mA	T_{PHL}	—	110	170		
	L→H		IF=0→10mA	T_{PLH}	50	115	200		
	H→L		IF=10→0mA	T_{PHL}	50	110	200		
Switching Time Dispersion			IF=0→10mA	$\|t_{PHL}- t_{PLH}\|$	—	5	50		—
Output Rise Time (90 to 10%)			IF=0→10mA	Tr	—	30	—		21
Output Fall Time (90 to 10%)			IF=10→0mA	Tf	—	15	—		
Common Mode Transient Immunity at HIGH Level Output		I_F=10mA, V_{CM}=1000V, T_A=25°C, V_{CC}=20V		$\|CM_H\|$	-20	—	—	kV/μs	22
Common Mode Transient Immunity at LOW Level Output		V_F=0V, V_{CM}=1000V, T_A=25°C, V_{CC}=20V		$\|CM_L\|$	20	—	—		

Specified over recommended operating conditions (T_A = -40 to 100℃, I_F= 10 to 15mA, V_F(OFF) = -3.0 to 0.8 V, V_{CC} = 10 to 30 V) unless otherwise specified.

Isolation Characteristics

Parameter	Test Condition	Symbol	Min	Typ	Max	Units	Note
Withstand Insulation Test Voltage	RH ≤ 40-60%, t = 1min, T_A = 25°C	V_{ISO}	3750	–	–	V	2, 3
Input-Output Resistance	V_{I-O} = 500V DC	R_{I-O}	–	10^{12}	–	Ω	2
Input-Output Capacitance	f = 1MHz, T_A = 25°C	C_{I-O}	–	0.92	–	pF	

Specified over recommended operating conditions (T_A = -40 to 100℃, I_F= 10 to 15mA, V_F(OFF) = -3.0 to 0.8 V, V_{CC} = 10 to 30 V) unless otherwise specified.

Typical Performance Curves

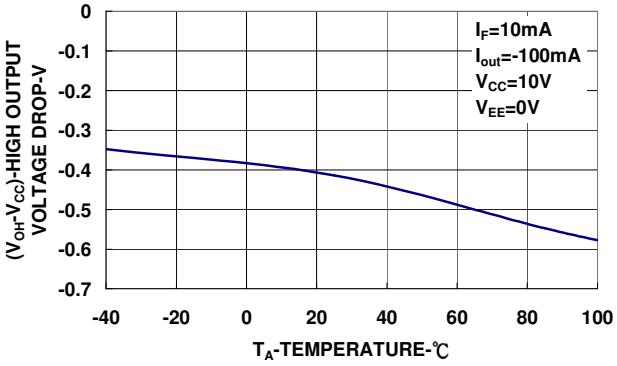


Figure 1: Output High Voltage drop vs. Temperature

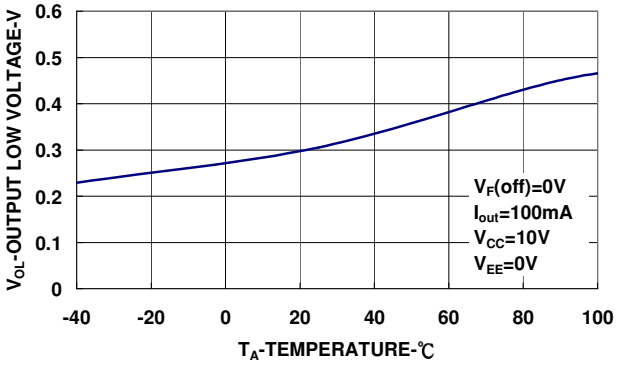


Figure 2: Output Low Voltage vs. Temperature

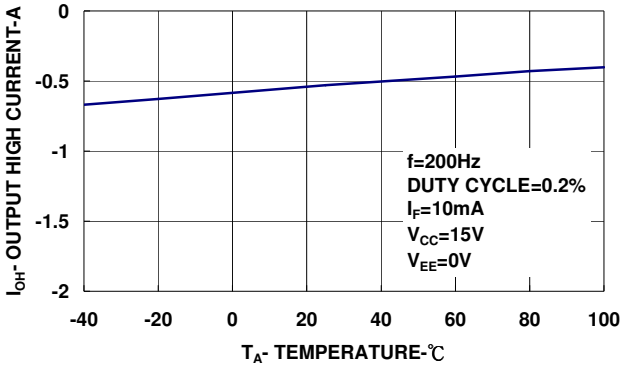


Figure 3: Output High Current vs. Temperature

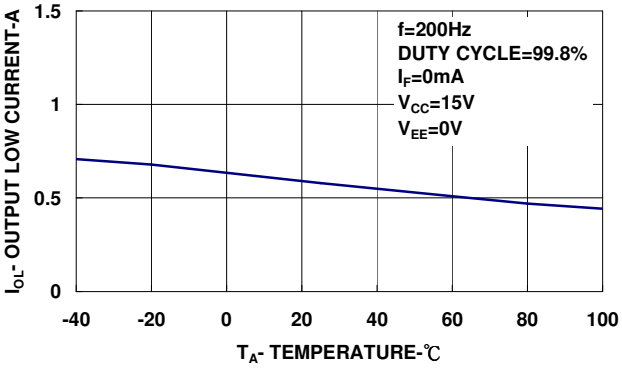


Figure 4: Output Low Current vs. Temperature

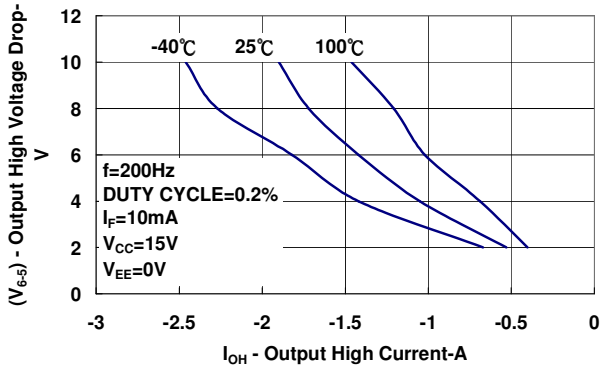


Figure 5 : Output High Voltage drop vs. High Current

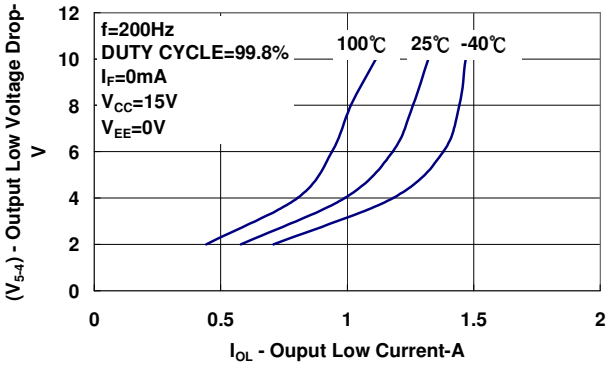


Figure 6 : Output High Voltage drop vs. Low Current

Typical Performance Curves

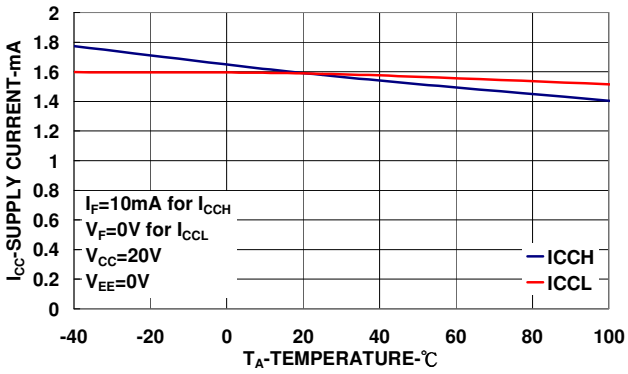


Figure 7 : Supply Current vs. Temperature

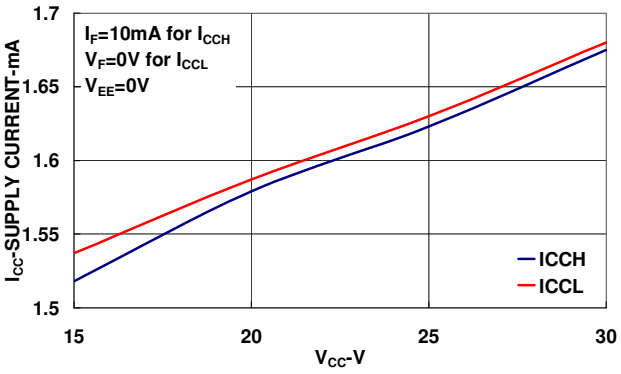


Figure 8 : Supply Current vs. Supply Voltage

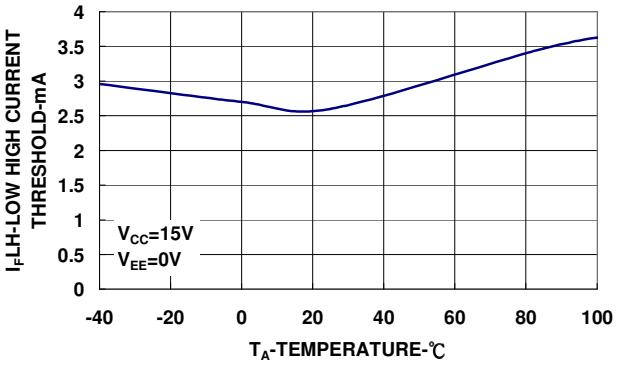


Figure 9 : Low to High Threshold Current vs. Temperature

Typical Performance Curves

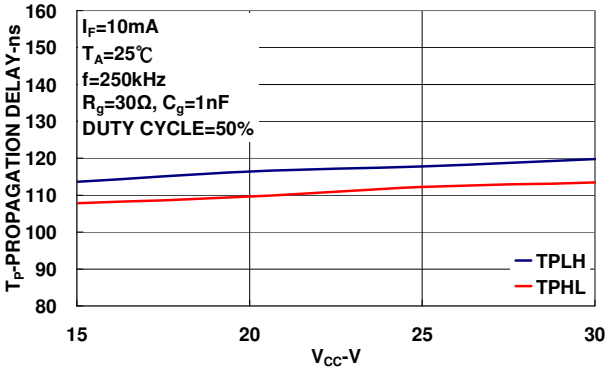


Figure 10 : Propagation vs. Supply Voltage

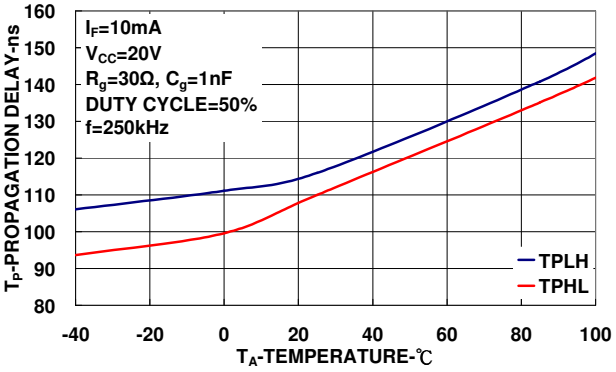


Figure 11 : Propagation vs. Temperature

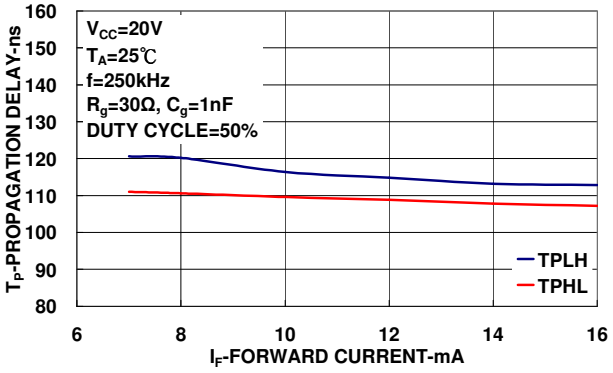


Figure 12 : Propagation vs. Forward Current

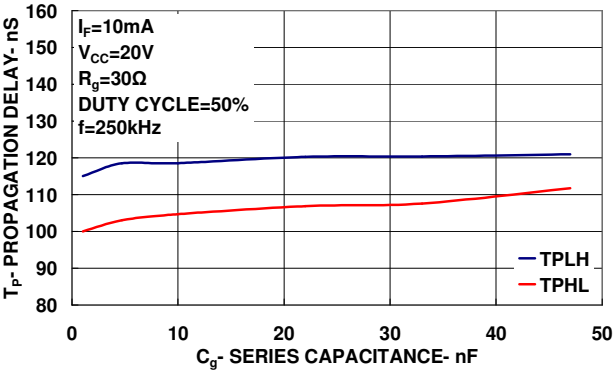


Figure 13 : Propagation vs. Load Capacitance

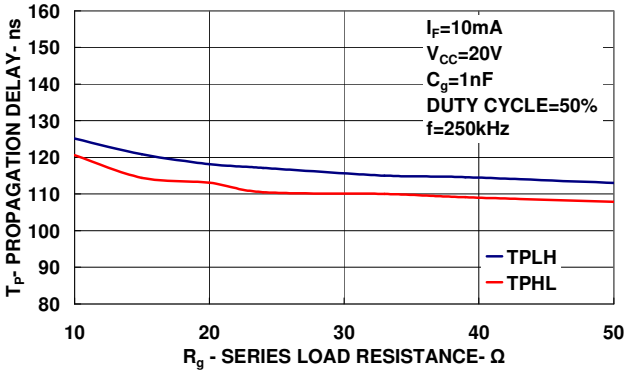


Figure 14 : Propagation vs. Load Resistance

Test Circuit

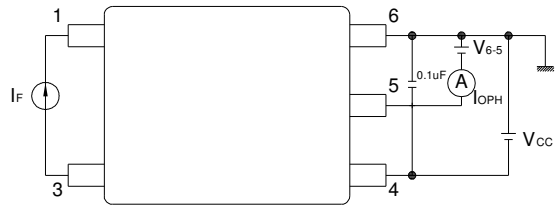


Figure 15：IOPH test circuit

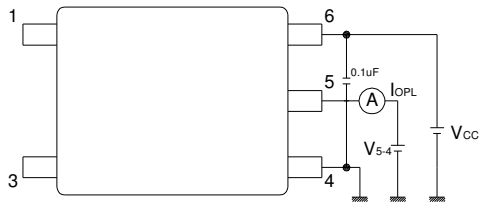


Figure 16：IOPL test circuit

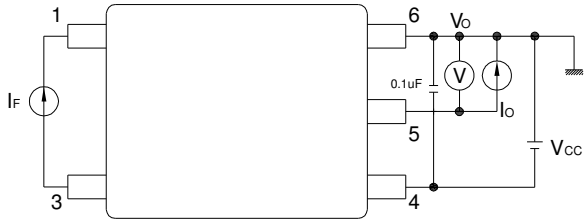


Figure 17：VOH test circuit

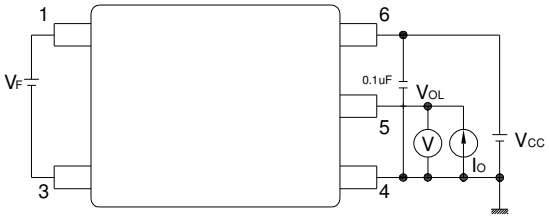


Figure 18：VOL test circuit

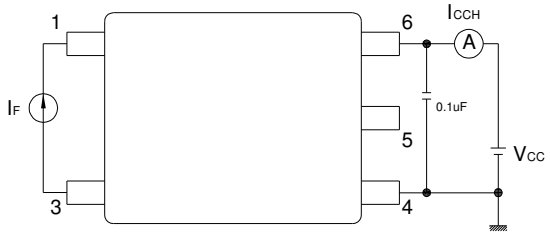


Figure 19：ICCH test circuit

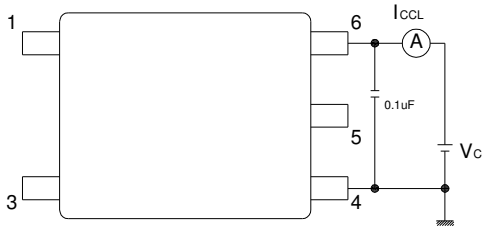


Figure 20：ICCL test circuit

Test Circuit

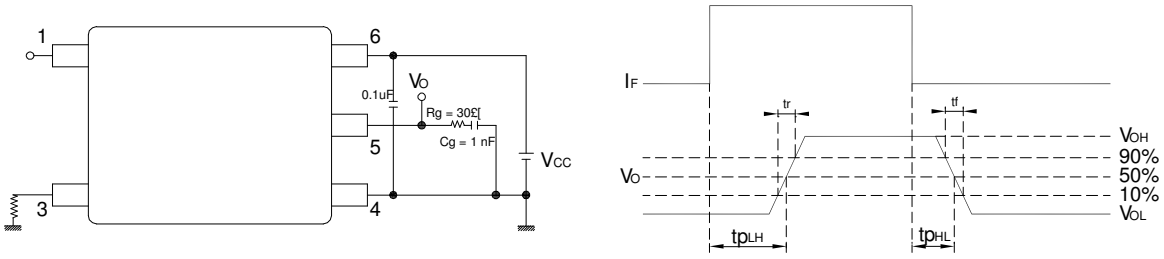


Figure 21：tpLH, tpHL, tr, tf, |tpHL-tpLH| test circuit

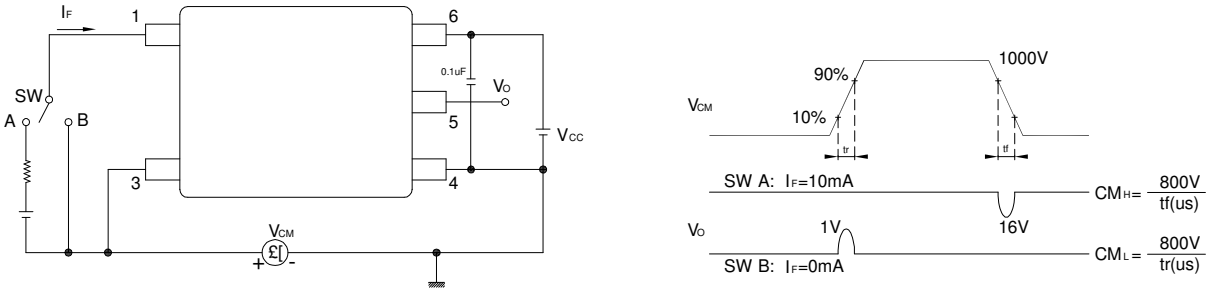
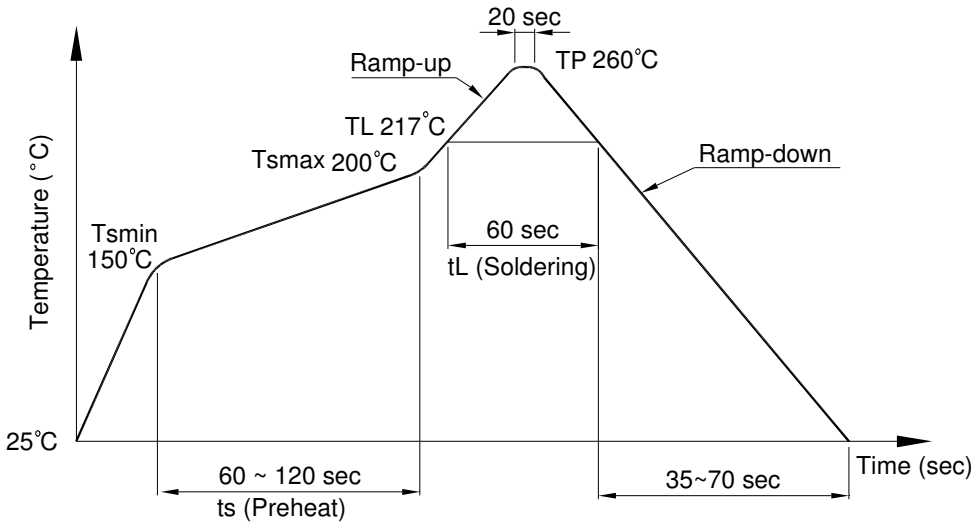


Figure 22：CMR test circuit with split resistors network and waveforms

Temperature Profile of Soldering Reflow

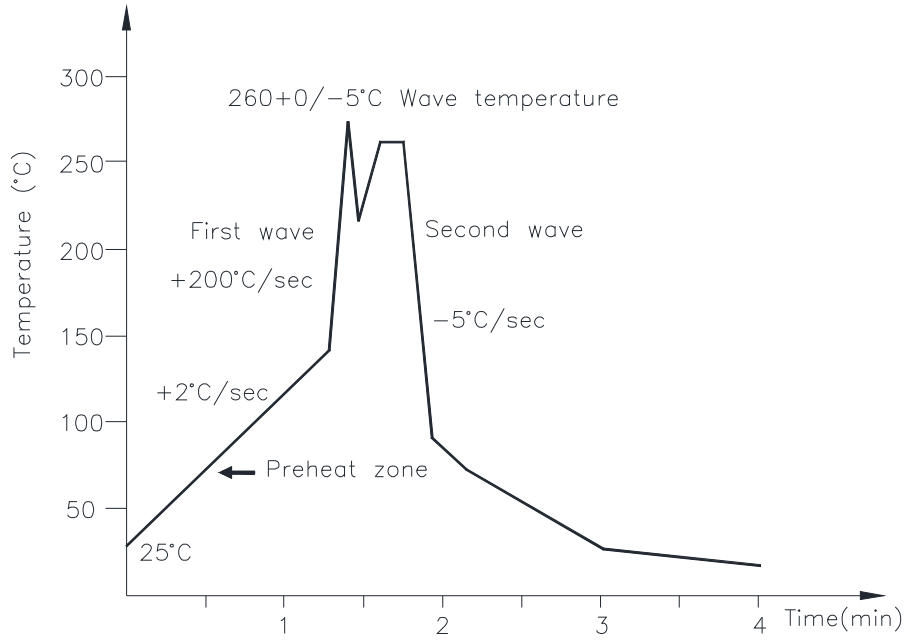
(1) IR Reflow soldering (JEDEC-STD-020C compliant)
One time soldering reflow is recommended within the condition of temperature and time profile shown below.

Profile item	Conditions
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (T_L) - Time (t_L)	 217˚C 60 sec
Peak Temperature (T_P)	260˚C
Ramp-up rate	3˚C / sec max.
Ramp-down rate	3~6˚C / sec



Temperature Profile of Soldering Reflow

(2) Wave soldering (JEDEC22A111 compliant)
One time soldering is recommended within the condition of temperature.
Temperature: 260+0/-5˚C
Time: 10 sec.
Preheat temperature:25 to 140˚C
Preheat time: 30 to 80 sec.



(3) Hand soldering by soldering iron
Allow single lead soldering in every single process. One time soldering is recommended.
Temperature: 380+0/-5˚C
Time: 3 sec max.

Application Information

Recommended Application Circuit

The recommended application circuit shown in Figure 23 which is a typical gate drive application is using the LTV-155E. The following describes about driving IGBT. However, it is also suitable to MOSFET. Designer will need to tune the V_{CC} supply voltage, depend on the IGBT or MOSFET gate threshold requirements (Recommended V_{CC} = 15V for IGBT and 12V for MOSFET).

The supply bypass capacitors (0.1 µF) provide the large transient current necessary during a switching transition. Since the transient nature of the charging currents, a low current power supply (3.0mA) power supply will be enough to power the device. The split resistors (in the ratio of 1.5:1) across the LED will provide a high CMR response by providing a balanced resistance network across the LED.

The gate resistor R_g serves to limit gate charge current and controls the IGBT collector voltage rise and fall times.

In PC board design, care should be taken to avoid routing the IGBT collector or emitter traces close to the LTV-155E input as this can result in unwanted coupling of transient signals into LTV-155E and degrade performance.

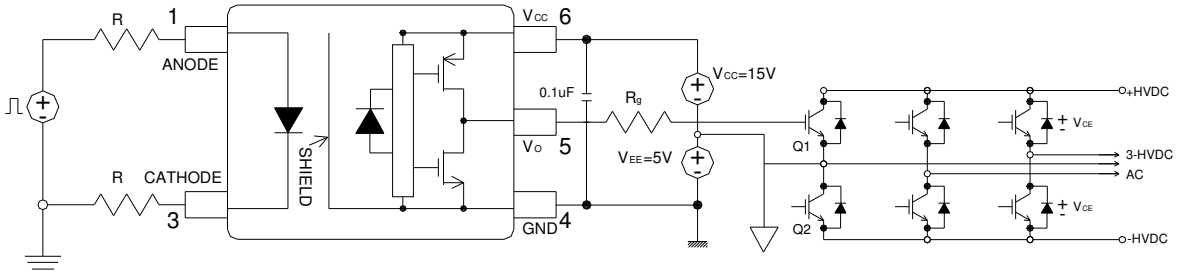
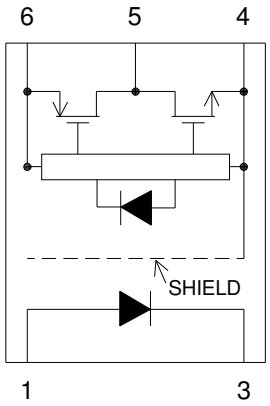


Figure 23 : Recommended application circuit with split LED drive

Application Information

Rail-to-Rail Output

LTV-155E uses a power PMOS to deliver the large current and pull it to V_{CC} to achieve rail-to-rail output voltage as shown in Figure 24. This ensures that the IGBT's gate voltage is driven to the optimum intended level with no power loss across IGBT even when an unstable power supply is used.



1. Anode
3. Cathode
4. GND
5. Vo (Output)
6. Vcc

Figure 24 : LTV-155E with PMOS and NMOS output stage for rail-to-rail output voltage

LED Drive Considerations for High CMR Performance

CMR with the LED On (CMR_H)
A high CMR LED drive circuit must keep the LED on (short A) during common mod transients. This is achieved by overdriving the LED current beyond the input threshold so that it is not pulled below the threshold during a transient. A minimum LED current of 10mA provides adequate margin over the maximum I_{FLH} of 7.5mA to achieve 20 kV/μs CMR

CMR with the LED off (CMR_L)
A high CMR LED drive circuit must keep the LED off (short B, $V_F \leqq V_{F(OFF)}$) during common mode transients. For example during a –dVcm/dt transient in Figure 25, the current flowing through CLEDP, the LED will remain off and no common mode failure will occur. Figure 25 is like the recommended application circuit (Figure 23), dose achieve ultra high CMR performance by shunting the LED in the off state.

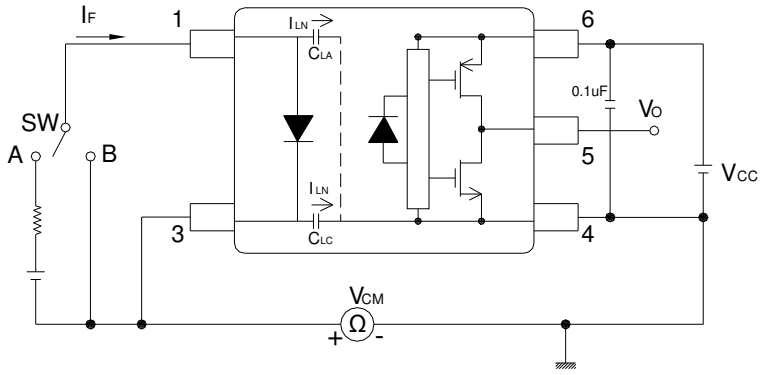


Figure 25 : Recommended high-CMR drive circuit for the LTV-155E

Application Information

Dead time and Propagation Delay Specification

The LTV-155E includes a Propagation Delay Difference (PDD) specification intended to help designers minimize “dead time” in their power inverter designs. Dead time is the time period during which both the high and low side power transistors (Q1 and Q2 in Figure 23) are off. Any overlap in Q1 and Q2 conduction will result in large currents fl owing through the power devices between the high and low voltage motor rails.

To minimize dead time in a given design, the turn on of LED2 should be delayed (relative to the turn off of LED1) so that under worst-case conditions, transistor Q1 has just turned off when transistor Q2 turns on, as shown in Figure 26. The amount of delay necessary to achieve this condition is equal to the maximum value of the propagation delay difference specification, PDD_{MAX}, which is specified to be 100 ns over the operating temperature range of 40° C to 100° C.

Delaying the LED signal by the maximum propagation delay difference ensures that the minimum dead time is zero, but it does not tell a designer what the maximum dead time will be. The maximum dead time is equivalent to the difference between the maximum and minimum propagation delay difference specifications as shown in Figure 27. The maximum dead time for the LTV-155E is 200 ns (= 100 ns - (-100 ns)) over an operating temperature range of -40° C to 100C.

Note that the propagation delays used to calculate PDD and dead time are taken at equal temperatures and test conditions since the Photocouplers under consideration are typically mounted in close proximity to each other and are switching identical IGBTs.

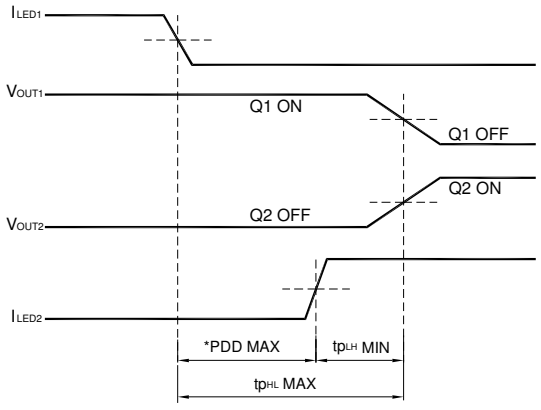


Figure 26 : Minimum LED skew for zero dead time

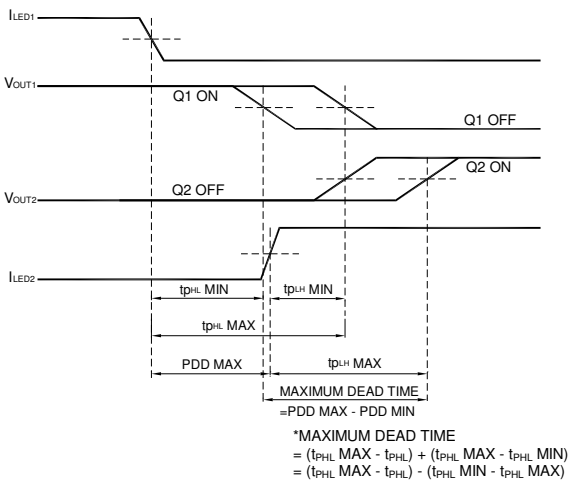


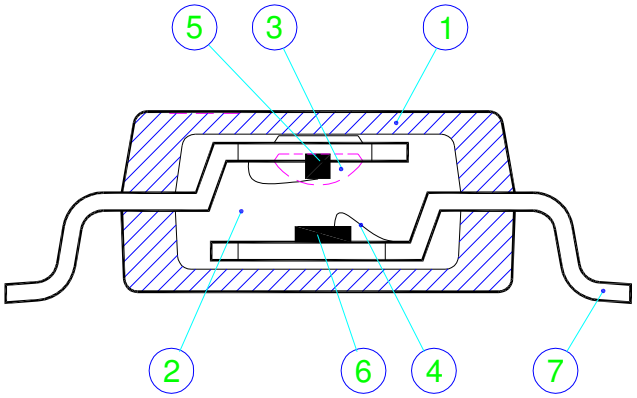
Figure 27 : Waveforms for dead time

*PDD = PROPAGATION DELAY DIFFERENCE
NOTE : FOR PDD CALCULATIONS THE PROPAGATION DELAYS ARE TAKEN AT THE SAME TEMPERATURE AND TEST CONDITION.

Notice

1) Maximum pulse width = 10us, maximum duty cycle = 0.2%.
2) Device is considered a two terminal device: pins 1, 3 are shorted together and pins 4, 5, 6 are shorted together.
3) According to UL1577, each optocoupler is tested by applying an insulation test voltage ≥ 3750 Vrms for 1 second (leakage detection current limit, $I_{I-O} \leq 10$ uA).
4) Common mode transient immunity in high stage is the maximum tolerable negative dVcm/dt on the trailing edge of the common mode impulse signal, Vcm, to assure that the output will remain high.
5) Common mode transient immunity in low stage is the maximum tolerable positive dVcm/dt on the leading edge of the common mode impulse signal, Vcm, to assure that the output will remain low.

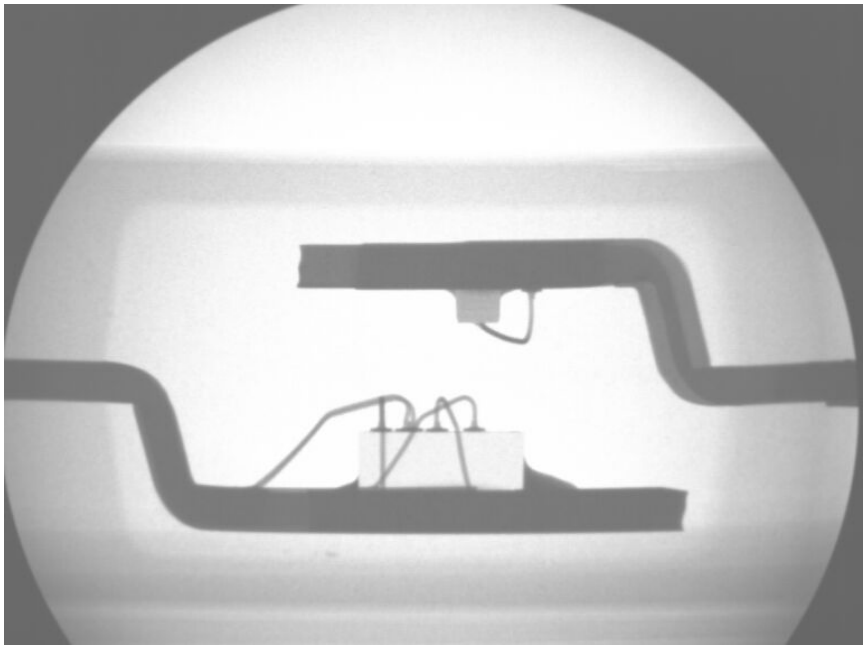
5.0 Package Assembly Specifications

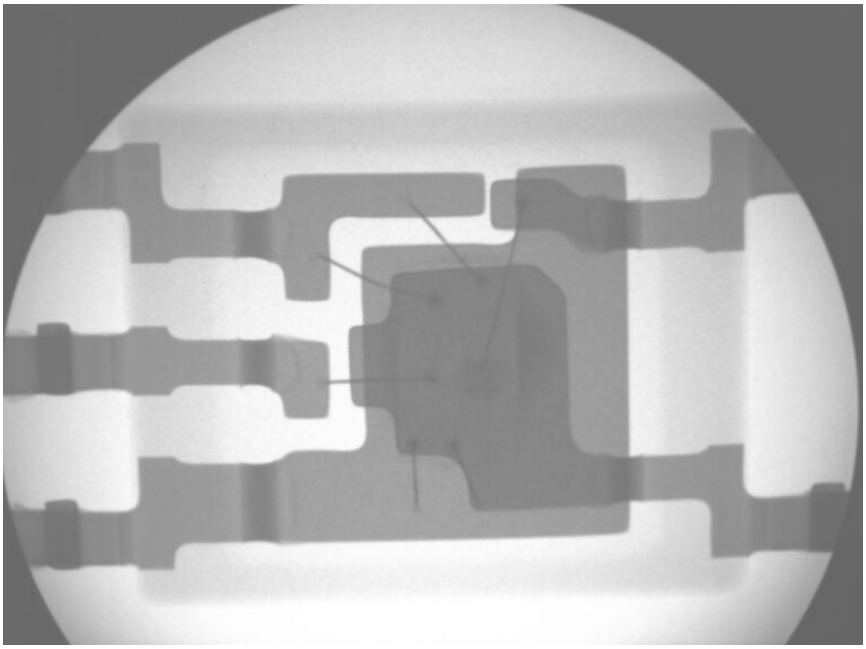


1. Black epoxy resin
2. Semitransparent epoxy resin
3. Transparent silicone resin
4. Gold wire
5. Emitter
6. Detector
7. Lead frame

6.0 Package inspection

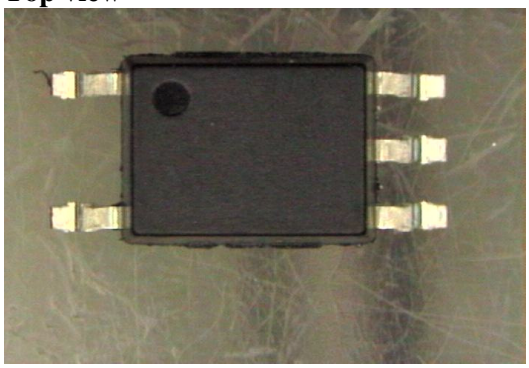
6.1 X-ray



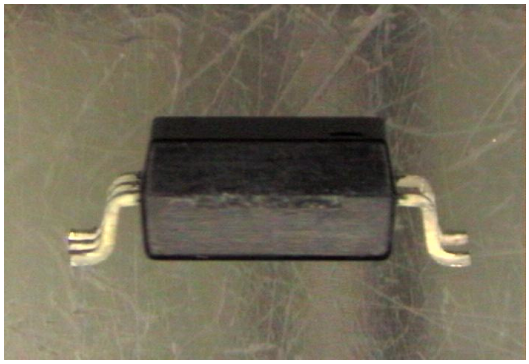


6.2 Top view & Bottom view & Side view

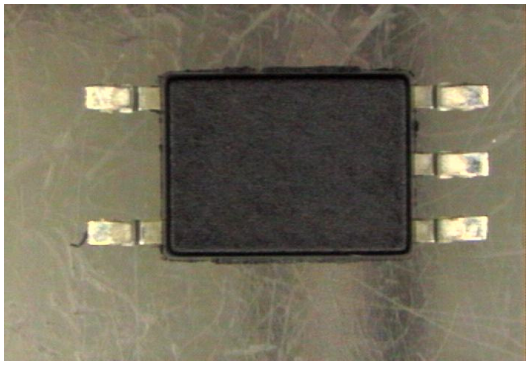
Top view



Side view



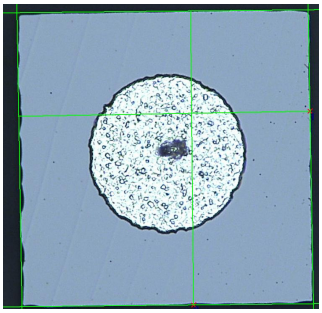
Bottom view



*. Lead Co-planarity: 0.10 mm Max. (Reference JEDEC-MO-155)

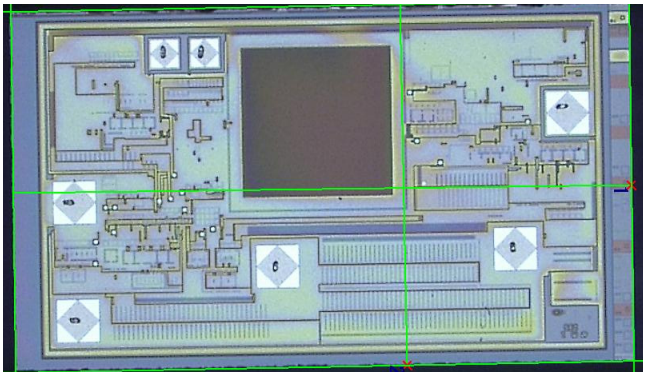
6.3 Chip dimensions (Top view by real measured)

Emitter



No.	Measure	Result
1	Parallel	220.31 um
2	Parallel	220.84 um

Detector



No.	Measure	Result
1	Parallel	1472.23 um
2	Parallel	859.68 um

7.0 Product Qualification Report (Reliability Report, ESD)

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Reliability Test Report

Lite-on electronics (Thailand) Co., Ltd

Qualification

Package: MFP / Potocouplers
Part Number: LTV-155E
Products Type: High Speed IGBT/MOSFET Gate Driver.
Test Purpose: New design IGBT of MFP qualification.
Test Period: 23-April ~ 25-June-2012
Page: 1/3

Test Item as require:

Test title	Sample size	Test Condition	Result	Remark
Pre-conditioning test	315	125°C=24Hrs, 85°C 85%RH=168Hrs and IR Reflow 260°C Peak=3Cycles	315	
Temp Cycling Test	45	Ta= -40~125°C, Dwell time = 15 min per Zone, 1000Cycles	45	
High temp High Humidity Bias test	45	Ta=85°C, 85%RH, IF=16mA, Vin= 5V, IO=20mA, Vcc= 30V, 1000Hrs.	45	
High Temp Operation Life	45	Ta=110°C, If=16mA, Vin= 5V, IO=20mA, Vcc= 30V, 1000Hrs.	45	
High Temp Reverse Bias Test	45	Ta=110°C, VCE = 30V, 1000Hrs.	45	
Autoclave	45	Temp=121°C, 100%RH and 15Psi, 96Hrs.	45	
High temp storage	45	Temp= 150°C, 1000Hrs.	45	
Low temp storage	45	Temp= -55°C, 1000Hrs.	45	
Non-Preconditioning test				
Autoclave	20	Temp=121°C, 100%RH and 15Psi, 96Hrs.	20	

Spec limit of product.

Parameter	Measurement condition	Symbol	Min	Max	Unit
Input Forward Voltage	IF= 10 mA	VF	-	1.8	V
Reverse Leakage Current	VR= 5V	IR	-	10	uA
High Level Output Current	Vo=(VCC-4V)	IOH	0.2	-	A
Low Level Output Current	Vo=(VEE+2V)	IOL	0.2	-	A
High Level Output Voltage	Io= -100mA, IF= 10mA	VOH	VCC-1	-	V
Low Level Output Voltage	Io=100mA	VOL		VEE+1	V
High Level Supply Current	IF=10 to 16 mA	ICCH	-	3.5	mA
Low Level Supply Current	IF=-3 to 0.8 V	ICCL	-	3.5	mA
Threshold Input Current Low to High	IO=0mA, Vo>5V	IFLH	-	7.5	mA
Threshold Input Voltage High to Low	IO=0mA, Vo<5V	VFHL	0.8	-	V

Reliability criteria:

1. Reading value for each step test not over 50% Delta for VF, VOH, VOL, ICCH, ICCL parameter.
2. Reading value for each step test go/no go for IOH, IOL, VFHL and IFLH parameter.
3. Short and open is criteria of Temp cycling and Autoclave test item.

Final Conclusion of reliability test:

All samples unit under test are conforming to reliability criteria.

Lab's comment:

- The value on each test item (next page) is average value from all units under test except defect sample.
- Effect this the results relate only to the items tested
- The report shall not be reproduced except in full, without the written approval of the laboratory.

Test Operator_____ Lumpley

Report Checker_____

Approve_____

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Test summary table. (Average value for all units under test)

Temperature Cycling (TCML) (Pre-Conditioning)											
Paramete	Unit	0 Cyc	100 Cyc	*Decay	200 Cyc	*Decay	500 Cyc	*Decay	1000 Cyc	*Decay	Remark
VF	V	1.389	1.388	-0.055	1.393	0.280	1.388	-0.100	1.390	0.229	
IR	µA	0.079	0.083	0.004	0.084	0.005	0.050	-0.029	0.056	-0.023	
IOH1	A	-1.147	-1.146	0.001	-1.156	-0.009	-1.129	0.018	-1.097	0.050	
IOH2	A	-1.899	-1.900	-0.001	-1.912	-0.013	-1.887	0.013	-1.874	0.021	
IOL1	A	0.694	0.688	-0.006	0.710	0.016	0.695	0.001	0.664	-0.030	
IOL2	A	1.360	1.354	-0.005	1.380	0.020	1.372	0.013	1.373	0.013	
VOH	V	9.683	9.723	0.415	9.730	0.482	9.718	0.358	9.717	0.347	
VOL	V	0.258	0.266	3.242	0.263	2.016	0.271	4.920	0.280	8.654	
ICCH	mA	1.731	1.734	0.205	1.733	0.129	1.734	0.218	1.734	0.107	
ICCL	mA	1.712	1.716	0.269	1.708	-0.222	1.717	0.296	1.716	0.054	
IFLH	mA	2.536	2.554	0.018	2.539	0.003	2.209	-0.326	2.094	-0.494	
VFHL	mA	1.055	1.155	0.100	1.171	0.116	1.176	0.121	1.160	0.108	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

High Temp High Humidity Bias (THBT) (Pre-Conditioning)									
Parameter	Unit	0 Hr	168 Hrs	*Decay	500 Hrs	*Decay	1000 Hrs	*Decay	Remark
VF	V	1.387	1.391	0.293	1.384	-0.193	1.386	-0.051	
IR	µA	0.089	0.083	-0.006	0.050	-0.039	0.056	-0.033	
IOH1	A	-1.150	-1.142	0.009	-1.107	0.043	-1.096	0.052	
IOH2	A	-1.899	-1.895	0.004	-1.860	0.039	-1.857	0.040	
IOL1	A	0.694	0.708	0.014	0.694	0.000	0.676	-0.019	
IOL2	A	1.357	1.382	0.025	1.371	0.013	1.371	0.014	
VOH	V	9.685	9.725	0.418	9.714	0.304	9.715	0.314	
VOL	V	0.257	0.265	2.786	0.272	5.544	0.277	7.479	
ICCH	mA	1.723	1.718	-0.226	1.717	-0.294	1.718	-0.382	
ICCL	mA	1.704	1.696	-0.447	1.709	0.303	1.709	0.226	
IFLH	mA	2.611	2.640	0.029	2.586	-0.025	1.783	-0.787	
VFHL	mA	1.044	1.167	0.123	1.173	0.129	1.112	0.071	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

High Temp Operation Life (HTOL) (Pre-Conditioning)									
Parameter	Unit	0 Hr	168 Hrs	*Decay	500 Hrs	*Decay	1000 Hrs	*Decay	Remark
VF	V	1.391	1.392	0.082	1.386	-0.408	1.387	-0.223	
IR	µA	0.088	0.083	-0.005	0.049	-0.040	0.056	-0.033	
IOH1	A	-1.159	-1.149	0.010	-1.109	0.050	-1.105	0.054	
IOH2	A	-1.912	-1.901	0.011	-1.861	0.051	-1.864	0.047	
IOL1	A	0.700	0.712	0.013	0.687	-0.013	0.681	-0.019	
IOL2	A	1.364	1.383	0.019	1.369	0.005	1.371	0.008	
VOH	V	9.687	9.728	0.416	9.714	0.279	9.717	0.302	
VOL	V	0.255	0.262	2.679	0.274	7.227	0.275	7.905	
ICCH	mA	1.732	1.732	-0.046	1.731	-0.075	1.724	-0.137	
ICCL	mA	1.709	1.707	-0.066	1.719	0.639	1.712	0.415	
IFLH	mA	2.495	2.516	0.021	2.020	-0.475	1.647	-0.871	
VFHL	mA	1.047	1.171	0.124	1.176	0.129	1.123	0.075	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

High Temp Reverse Bias (HTRB) (Pre-Conditioning)									
Parameter	Unit	0 Hr	168 Hrs	*Decay	500 Hrs	*Decay	1000 Hrs	*Decay	Remark
VF	V	1.390	1.391	0.091	1.384	-0.438	1.386	-0.308	
IR	μA	0.087	0.083	-0.004	0.050	-0.037	0.055	-0.032	
IOH1	A	-1.158	-1.152	0.006	-1.120	0.038	-1.123	0.034	
IOH2	A	-1.909	-1.903	0.006	-1.870	0.040	-1.873	0.033	
IOL1	A	0.700	0.714	0.014	0.693	-0.006	0.695	-0.005	
IOL2	A	1.365	1.383	0.018	1.369	0.004	1.373	0.008	
VOH	V	9.687	9.729	0.432	9.718	0.314	9.720	0.346	
VOL	V	0.255	0.261	2.428	0.272	6.420	0.271	6.269	
ICCH	mA	1.740	1.740	-0.027	1.742	0.096	1.740	0.065	
ICCL	mA	1.717	1.714	-0.224	1.726	0.481	1.724	0.284	
IFLH	mA	2.501	2.503	0.001	2.109	-0.392	1.597	-0.883	
VFHL	mA	1.050	1.167	0.117	1.171	0.121	1.111	0.062	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

Autoclave (AC) (Pre-Conditioning)					
Parameter	Unit	0 Hr	96 Hrs	*Decay	Remark
VF	V	1.391	1.392	0.075	
IR	μA	0.088	0.084	-0.004	
IOH1	A	-1.158	-1.124	0.035	
IOH2	A	-1.913	-1.876	0.037	
IOL1	A	0.701	0.707	0.006	
IOL2	A	1.367	1.383	0.016	
VOH	V	9.687	9.720	0.342	
VOL	V	0.255	0.265	3.821	
ICCH	mA	1.735	1.746	0.630	
ICCL	mA	1.713	1.714	0.022	
IFLH	mA	2.582	2.424	-0.158	
VFHL	mA	1.043	1.170	0.127	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

High Temp Storage Life (HTSL) (Pre-Conditioning)									
Parameter	Unit	0 Hr	168 Hrs	*Decay	500 Hrs	*Decay	1000 Hrs	*Decay	Remark
VF	V	1.389	1.392	0.263	1.385	-0.240	1.387	-0.142	
IR	μA	0.087	0.084	-0.003	0.052	-0.036	0.054	-0.033	
IOH1	A	-1.152	-1.135	0.017	-1.097	0.055	-1.081	0.071	
IOH2	A	-1.900	-1.884	0.016	-1.831	0.069	-1.814	0.087	
IOL1	A	0.699	0.712	0.013	0.689	-0.010	0.680	-0.018	
IOL2	A	1.363	1.384	0.021	1.370	0.007	1.369	0.007	
VOH	V	9.686	9.724	0.399	9.712	0.278	9.701	0.159	
VOL	V	0.256	0.262	2.616	0.274	6.925	0.282	10.275	
ICCH	mA	1.735	1.728	-0.396	1.670	-3.774	1.623	-6.306	
ICCL	mA	1.717	1.717	0.006	1.722	0.278	1.714	0.027	
IFLH	mA	2.485	2.546	0.061	2.828	0.343	3.695	1.161	
VFHL	mA	1.045	1.171	0.126	1.177	0.132	1.186	0.139	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

Low Temp Storage Life (LTSL) (Pre-Conditioning)									
Parameter	Unit	0 Hr	168 Hrs	*Decay	500 Hrs	*Decay	1000 Hrs	*Decay	Remark
VF	V	1.389	1.393	0.253	1.387	-0.187	1.389	-0.133	
IR	µA	0.086	0.083	-0.004	0.050	-0.036	0.055	-0.031	
IOH1	A	-1.148	-1.133	0.015	-1.103	0.045	-1.115	0.036	
IOH2	A	-1.896	-1.885	0.012	-1.856	0.041	-1.865	0.036	
IOL1	A	0.696	0.708	0.012	0.690	-0.006	0.687	-0.009	
IOL2	A	1.361	1.382	0.020	1.370	0.009	1.372	0.012	
VOH	V	9.684	9.723	0.401	9.713	0.303	9.718	0.340	
VOL	V	0.257	0.265	2.911	0.275	6.773	0.273	6.185	
ICCH	mA	1.733	1.730	-0.158	1.731	-0.104	1.726	-0.132	
ICCL	mA	1.715	1.709	-0.245	1.719	0.333	1.713	0.251	
IFLH	mA	2.527	2.566	0.039	2.128	-0.399	1.723	-0.794	
VFHL	mA	1.051	1.173	0.122	1.178	0.127	1.152	0.100	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

Autoclave (AC) (Non-Preconditioning)					
Parameter	Unit	0 Hr	96 Hrs	*Decay	Remark
VF	V	1.382	1.392	0.734	
IR	µA	0.419	0.092	-0.326	
IOH1	A	-1.148	-1.127	0.022	
IOH2	A	-1.895	-1.900	-0.005	
IOL1	A	0.697	0.662	-0.034	
IOL2	A	1.362	1.368	0.005	
VOH	V	9.660	9.683	0.246	
VOL	V	0.331	0.263	-0.068	
ICCH	mA	1.706	1.725	1.097	
ICCL	mA	1.703	1.696	-0.371	
IFLH	mA	2.589	2.543	-0.046	
VFHL	mA	1.052	1.057	0.005	

*Decay of VF, VOH, VOL, ICCH and ICCL are '%Delta" / *Decay of IR, IOH, IOL, VFLH and IFLH are "Delta"

ESD & Latch up

Applicant brief	
光寶科技 LTV-155E SOP-5 B130123003 Application:2013/01/23 Finish:2013/01/24 30124A-E	Human Body Model (HBM) ESDA/JEDEC JS-001-2010 Equipment: Thermo KeyTek Zapmaster 7/4(G) Temperature: 25℃ ±5℃ Humidity: 55% ±10% RH Failure Criteria: A;IV curve drift: voltage changes more than ± 30% at ± 1uA reference current. V+I envelope around pre-zap REFERENCE I-V curve. (I tolerance ± 30% ; V tolerance ± 30%.) Absolute At |-V|<=6V, |I |>10uA Test Voltage: 500V(±)~8000V(±) Step:500V

Human Body Model (HBM) Testing Result	
Sensitivity Pass:8000V **Class: 3B** follow standerd: ESDA/JEDEC JS-001-2010 Class-0 : <249V Class-1A: 250V-<499V Class-1B: 500V-<999V Class-1C: 1000V-<1999V Class-2 : 2000V-<3999V Class-3A: 4000V-<7999V Class-3B: >8000V	

Pin Combination	Sample	Pass
Anode(±)-Cathode	3	8000
Vo(±)-GND		8000
Vo(±)-Vcc		8000
Vcc(±)-GND		8000

* Remark: *: DUT failed at first level of customer defined test condition. Note: Red color in raw data indicates failed pins, if any.

Applicant brief

光寶科技
LTV-155E
SOP-5
B130123003

Application:2013/01/23
Finish:2013/01/24
30124A-E

Machine Model(MM)
JESD22-A115C

Equipment: Thermo KeyTek Zapmaster 7/4(G)
Temperature: 25℃ ±5℃ Humidity: 55% ±10% RH
Failure Criteria:
IV curve drift:
voltage changes more than ± 30% at ± 1uA reference current.
V+I envelope around pre-zap REFERENCE I-V curve.
(I tolerance ± 30% ; V tolerance ± 30%.)
Absolute At |-V|<=6V, |I |>10uA
Test Voltage:
100V(±)~2000V(±) Step:100V

Machine Model(MM) Testing Result

Sensitivity Pass:1000V

Class: C

follow standerd:
JESD22-A115C

Class-A: <199V
Class-B: 200V-<399V
Class-C: >400V

Pin Combination	Sample	Pass
Anode(±)-Cathode	3	2000
Vo(±)-GND		1000
Vo(±)-Vcc		1100
Vcc(±)-GND		1100

* Remark: *: DUT failed at first level of customer defined test condition. Note: Red color in raw data indicates failed pins, if any.

Applicant brief	
光寶科技 LTV-155E SOP-5 B130123003 Application:2013/01/23 Finish:2013/01/24 30124A-E	Charged Device Model (Socket CDM) ANSI / ESD SP5.3.2-2008 Equipment: Thermo KeyTek Zapmaster 7/4(G) Temperature: 25℃ ±5℃ Humidity: 55% ±10% RH Failure Criteria: A;IV curve drift: voltage changes more than ± 30% at ± 1uA reference current. V+I envelope around pre-zap REFERENCE I-V curve. (I tolerance ± 30% ; V tolerance ± 30%.) Absolute At |-V|<=6V, |I |>10uA Test Voltage: 100V(±)~2000V(±) Step:100V

Charged Device Mode (CDM) Test Report

Sensitivity Pass: 2000V

Class: 5

follow standerd:
ANSI / ESD SP5.3.2-2008
1：250V
2：500V
3：750V
4：1000V
5：1250V

Pin Combination	Sample	Pass
Anode(±)-Cathode	3	2000
Vo(±)-GND		2000
Vo(±)-Vcc		2000
Vcc(±)-GND		2000

* Remark: *: DUT failed at first level of customer defined test condition. Note: Red color in raw data indicates failed pins, if any.

Latch Up Test (LUT)

Test Condition:

a. Trigger Current: 100mA~400mA (±), Step: 50mA (±)

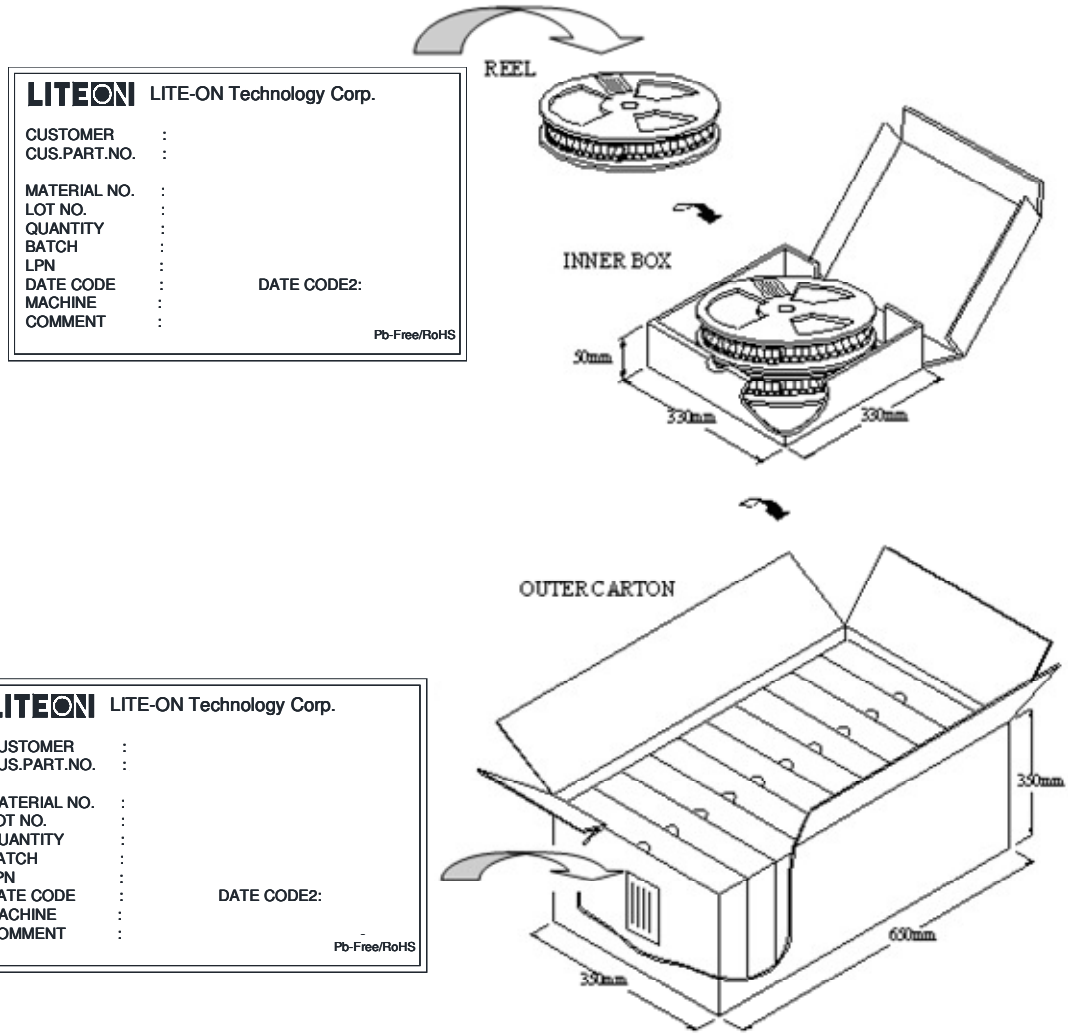
b. Vsupply OVER VOLTAGE Test: 30V (+) ~ 40V (+), Step +1V (+)

Test Result:

TRIGGER MODEL	TEST PIN	SAMPLE SIZE	TRIGGER SOURCE INDUCE LATCH-UP	IT CLASS: 3 NOTE: CLASS 1: +IT: 0mA~+39mA -IT: 0mA~-39mA CLASS 2: +IT: 40mA~+99mA -IT: -40mA~-99mA CLASS 3: +IT: >100mA -IT: <100mA
+IT	I/P	3	PASS	
	O/P		PASS	
-IT	I/P	3	PASS	
	O/P		PASS	
Vsupply OVER VOLTAGE TEST	VCC	3	PASS	

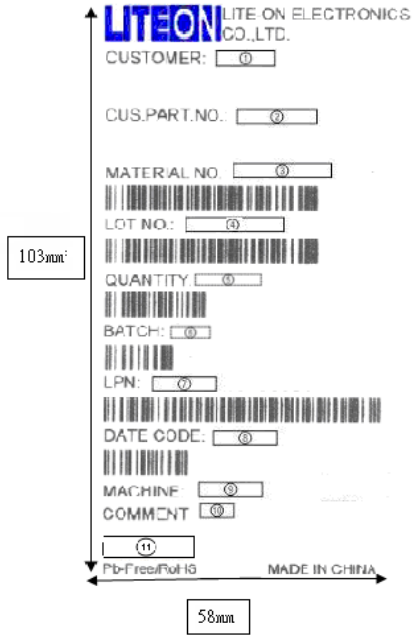
8.0 Packing specification

LTV-155E PACKING DATA



MSL label: This label will be attached on inner & outer cartons additionally

REEL PIZZA BOX LABEL :



Reel packing photo

Material:

1. Carrier: Conductive Polystyrene Alloy
2. Reel : Polystyrene

9.0 QC Flow

9.1. Assembly QC Flow

Process / Quality Control Plan

Area Number : 70
Product : Photo Coupler
Part Name / Device : LTV-155E
Key Contact / Phone : Mr.Sin

Process	Process Flow Chart	Process Control		Tooling
Receiving	Dice, Silver Epoxy, L/F → Sampling Inspection Get Mat'l			
IQC		L/F - Dimension. - Visual DICE - Elec trical - Visual		-Profile Projector -Curve Tracer
Store		Temp. Control 25 ± 5 FIFO		
Dice preparation (110)	Silver epoxy → Dice preparation	Silver Epoxy storage 3 months Silver Epoxy storage temp. Dice expansion temp control	 < - 15 ° C 60 ± 5 ° C	- Refrigerator - Refrigerator Dice expansion M/C
Auto Mount	Silver Epoxy, L/F → A/M monitor → Curing → Monitor	Check Appearance Dice Shear (IR side) Dice position .	 : $\overline{X}$ - R CHART : $\overline{X}$ - R CHART	Power Microscope Bond Shear Power Microscope
Auto Bonding	Gold Wire → A/B → A/B monitor	Check Appearance : 5 times/ shift Ball shear Pull tension Loop Height	 : $\overline{X}$ - R CHART : $\overline{X}$ - R CHART : $\overline{X}$ - R CHART	Power Microscope Bond Shear Gramgauge Measuring
Auto Coating	X-Silicone Epoxy → Coating I, II → A/C monitor → Curing → Coating insp. → Monitor	Check Appearance : Every 6 Time / Shift Dipping position Curing after coating Coating thickness	 : Record sheet Time 145 ± 5 min Temp 170 ± 5 ° C : $\overline{X}$ - R CHART	Microscope Microscope
1st Molding	White Compound →	Compound storage Die Temp Preheat Temp. Transfer Time Transfer pressure	: under 0 ° C : 175 ± 5 ° C Temp 73 ± 5 ° C As specified 40 ± 10 kg/cm.cm	-Thermometer -Thermometer Visual check Stop watch Display

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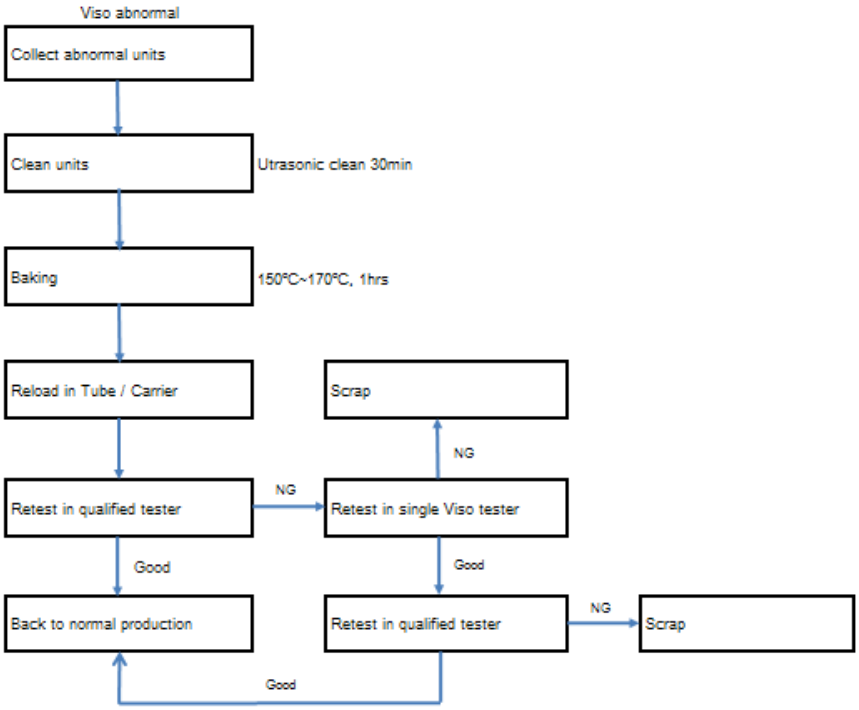
Property of LITE-ON Only

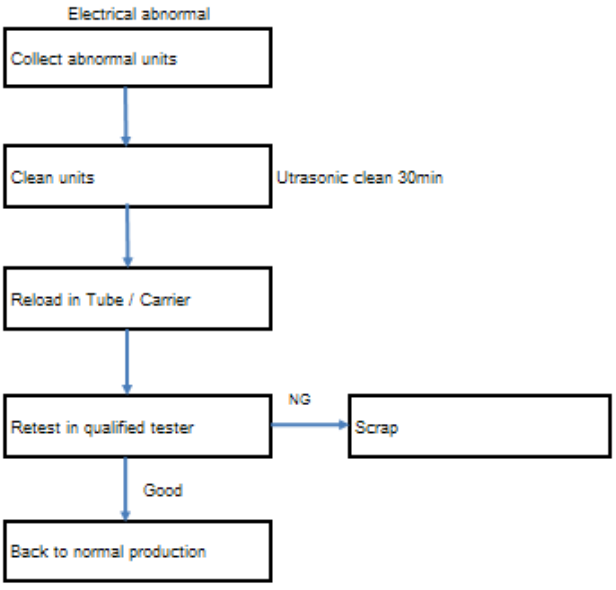
Process	Process Flow Chart	Process Control		Tooling
1 st D/T				
2 nd Molding	Black Compound	Die Temp Preheat Temp. Transfer Time Transfer pressure	: 175 ± 5 ° C Temp 83 ± 5 ° C As specified 40 + 10 kg/cm.cm	-Thermometer Visual check Stop watch Display
	Molding monitor			
	Post curing	Post curing Temp Post curing Time	Temp 175 ± 5 ° C Time 4 ± 0.5 hour	OVEN OVEN
2 nd D/T				
Store		Checking quantity		-Visual Inspection
Solder Platingh	Send to Supplier			
	Receiving	Quantity Confriming		
I.Q.C and Store Receiving	from Supplier	Incoming insp. Solder plating Tin thickness	: As specific : As specific	
Trim & From	100% Inspec.			
	Tube			
	Triming	Lead width Lead spread	: $\bar{X}$ - R CHART : $\bar{X}$ - R CHART	-Projector
Inspection	Prod. V/M L/A	100 % inspection		
Test & Mark		100% HIGH voltage & EE test 100% Marking	: AS specific	-Tester -CCD Auto Inspection
Packing	packing	Quantity Marking	= 100 % insp. =100% insp.	
	QC packing	100 % inspection .		
Store	Store	Temp control 25 ± 5 °c FIFO		
Out going inspection.	QA Outgoing	Sampling AQL=0.1%(3 lot/day)		
Shipping	Shipping			
Reliability test	Reliability test	1. Operation life 2. High temp % & High Humidity Reverse bias 3. High temp reverse bias 4. High temp storage 5. Low temp storage 6. Auto clave 7. Temp cycle 8. Thermal Shock 9. Solder Resis temp 10. Solder ability		- Life Tester -Humidity chamber -Oven -Oven '-Ultra freeze chamber -Pressure Cooker -Temp cycle -Thermal Shock -Wetting balance -Wetting balance
	End			

9.2. FAB QC Flow

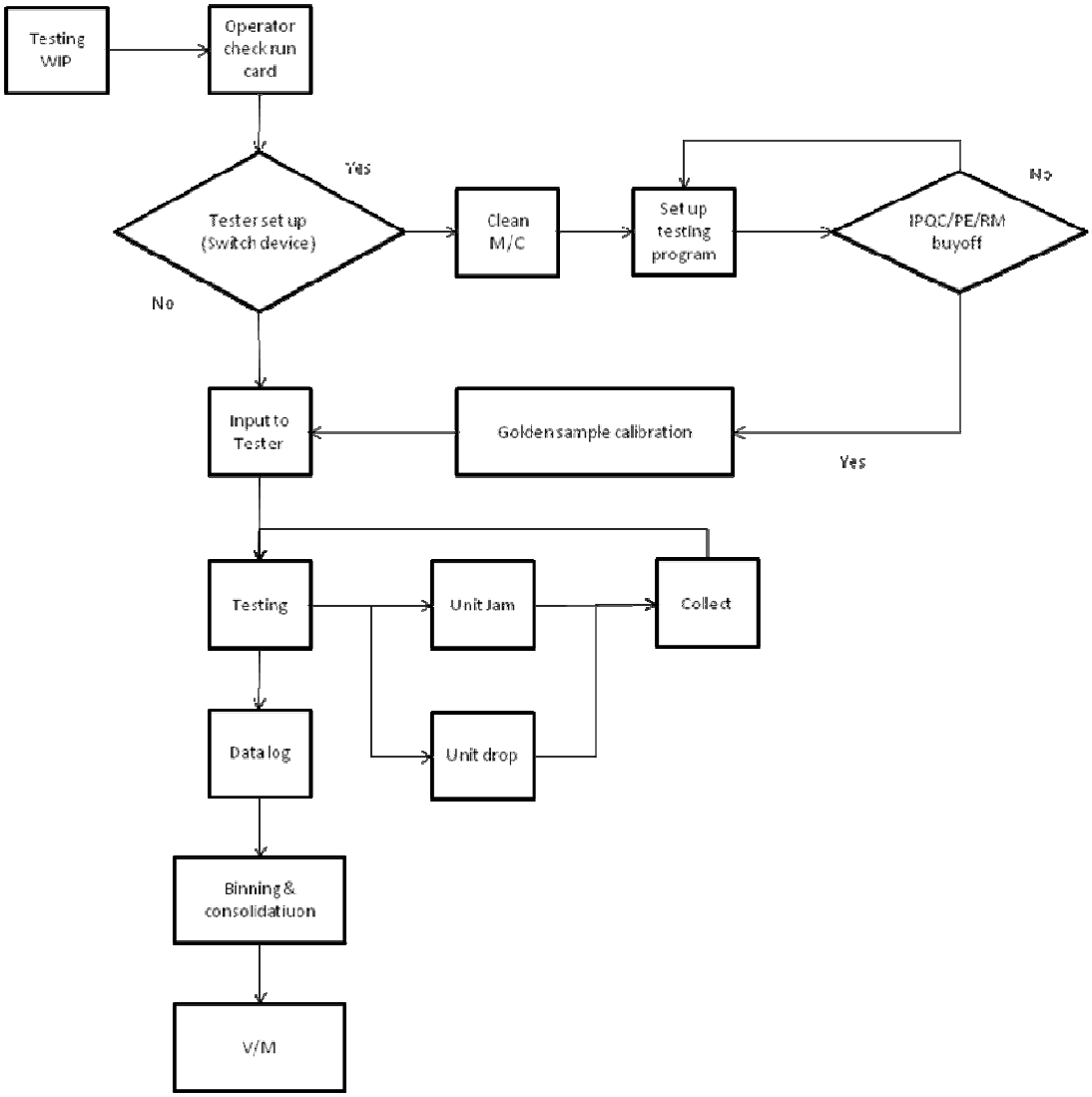
No	Manufacturing	Characteristics	Control Method		
	Process	Product / Process	Specification	Method	Frequency
1	Wafer launch	Total Piece	-	Recording & Scanning	Per Wafer
2	Pre Evaporation Cleaning	Appearance	As SOP	Visual Inspection	1 Time/Batch
3	BM Metal evaporation	Back Thickness	As SOP	α-Step	3 Point/Batch
4	BM Masking	Appearance	As SOP	Microscope	Per Wafer
5	BM Etching	Appearance	As SOP	Microscope	Per Wafer
6	Sintering	Resistance	As SOP	Rs Tester	5 Point/Pcs
		Appearance	As SOP	Microscope	Per Wafer
7	Pre Evaporation Cleaning	Appearance	As SOP	Visual Inspection	1 Time/Batch
8	2M Metal evaporation	Front Thickness	As SOP	α-Step	3 Point/Batch
9	2M Masking	Appearance	As SOP	Microscope	Per Wafer
10	2M Etching	Appearance	As SOP	Microscope	Per Wafer
11	Sintering	Resistance	As SOP	Rs Tester	5 Point/Pcs
		Appearance	As SOP	Microscope	Per Wafer
12	Peeling Test	Bonding and Shear force	As SOP	Shear Force Tester	9 Point/1 Wafer/Lot
				Tape	Per Wafer
13	Half Sawing	Sawing Depth	As SOP	High Magnification Microscope	1 Pcs/3Pcs
		Appearance	As SOP	Microscope	Per Wafer
14	Cleaning	Appearance	As SOP	Timer alarm	1 Time/Batch
15	100% Probing	Electrical Characteristic	As SOP	Selected-Program Confirmation	1 Time/Pcs
16	Full Sawing	Appearance	As SOP	Microscope	Per Wafer
17	Cleaning	Appearance	As SOP	Microscope	Per Wafer
18	Extension	Gap	AS SOP	Microscope	1 Time/Batch
19	Cleaning	Appearance	As SOP	Microscope	Per Wafer
20	Sampling Test	E.O Characteristic	As SOP	E.O. Tester	Over 40 ea/Pcs
21	Bonding Test	Bonding and Shear Force Test	As SOP	Shear Force Tester	9 Point/1 Wafer/Lot
22	QA Inspection	Electrical Characteristic	As SOP	E.O. Tester	ASQC Z.1.4 L S3 AQL 0.65
23	Visual Inspection	Appearance	As SOP	Microscope	Per Wafer
24	QA Inspection	Appearance	As SOP	Microscope	ASQC Z.1.4 L II AQL 0.015
25	Sampling Test	Thickness	As SOP	Thickness meter	Per Wafer
26	Splitting and Packaging	Package Spec	As SOP	Visual Inspection	Per Wafer
27	Counting and Labeling	Q'ty / Label Check	As SOP	Visual check	Random
28	QA Inspection	Appearance	As SOP	Visual Inspection	1Time /5Package
		Data Checking	As SOP	Visual Inspection	Per tape/1Time /5Package
29	Warehouse	-	-	-	-

9.3. Abnormal Lot checking flow in final test

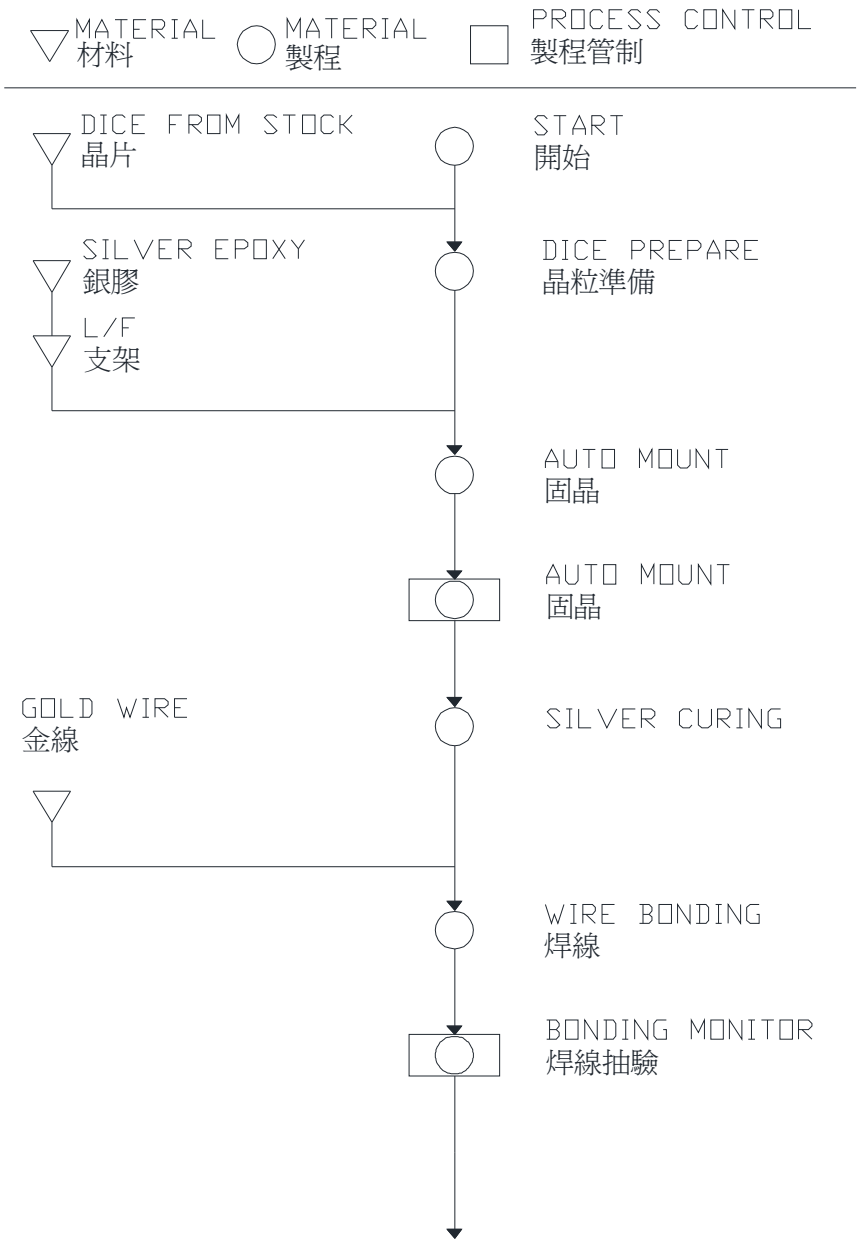


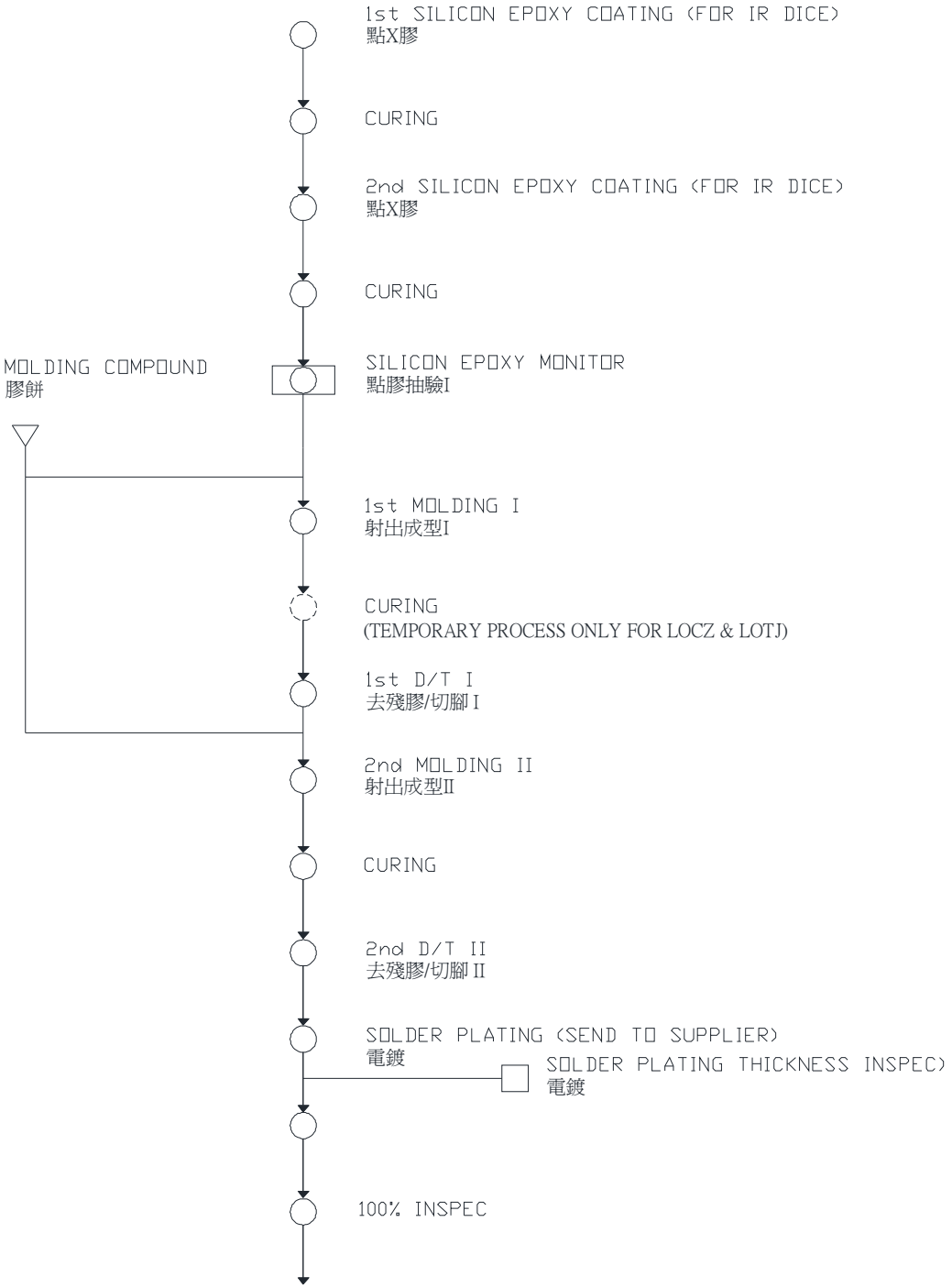


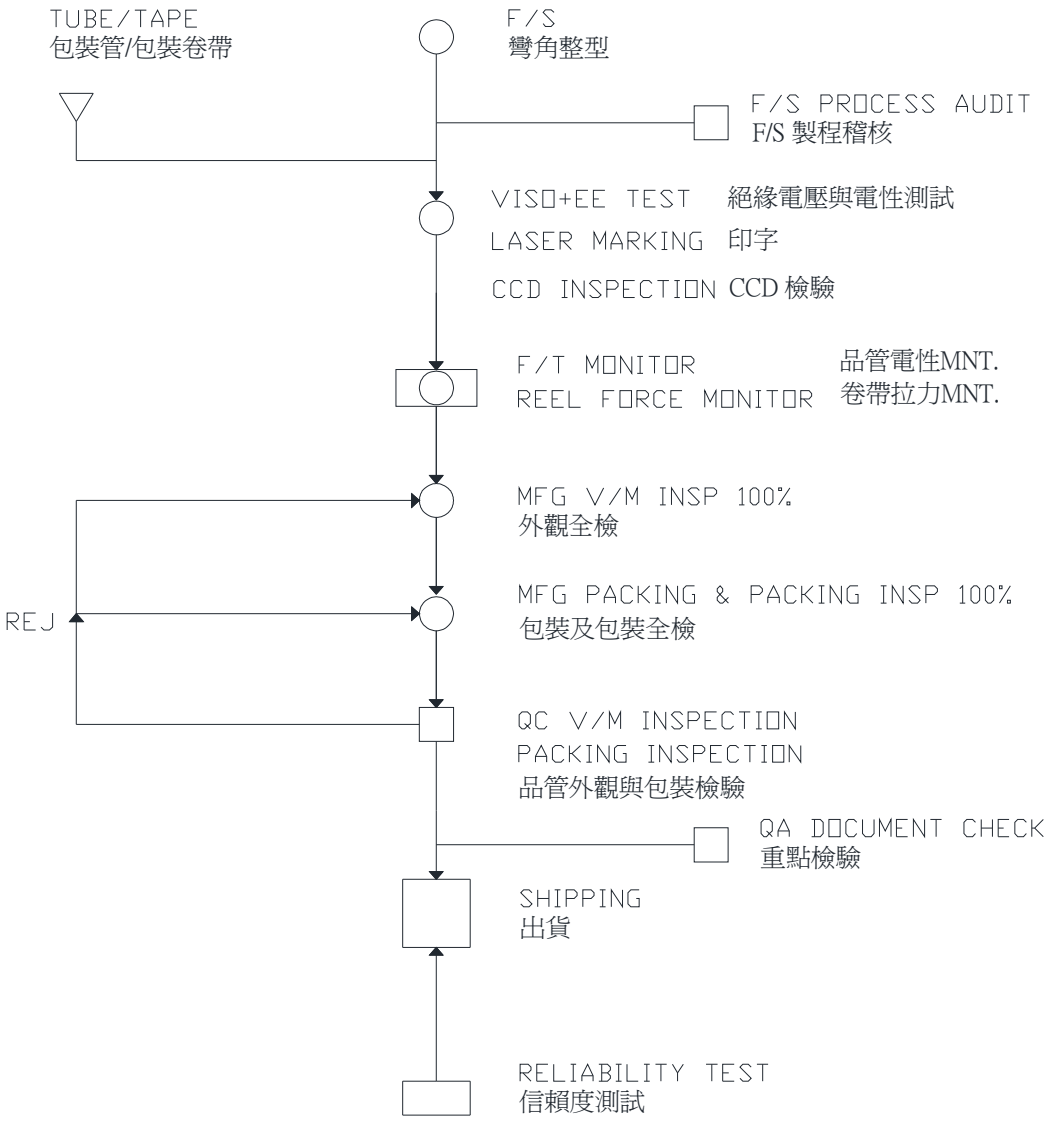
9.4 Testing QC flow



10.0 Manufacturing Control Plan




1st SILICON EPOXY COATING (FOR IR DICE)
點X膠
CURING
2nd SILICON EPOXY COATING (FOR IR DICE)
點X膠
CURING
MOLDING COMPOUND
膠餅
SILICON EPOXY MONITOR
點膠抽驗I
1st MOLDING I
射出成型I
CURING
(TEMPORARY PROCESS ONLY FOR LOCZ & LOTJ)
1st D/T I
去殘膠/切腳 I
2nd MOLDING II
射出成型II
CURING
2nd D/T II
去殘膠/切腳 II
SOLDER PLATING (SEND TO SUPPLIER)
電鍍
SOLDER PLATING THICKNESS INSPEC)
電鍍
100% INSPEC


TUBE/TAPE
包裝管/包裝卷帶
F/S
彎角整型
F/S PROCESS AUDIT
F/S 製程稽核
VISU+EE TEST 絕緣電壓與電性測試
LASER MARKING 印字
CCD INSPECTION CCD 檢驗
F/T MONITOR 品管電性MNT.
REEL FORCE MONITOR 卷帶拉力MNT.
MFG V/M INSP 100%
外觀全檢
REJ
MFG PACKING & PACKING INSP 100%
包裝及包裝全檢
QC V/M INSPECTION
PACKING INSPECTION
品管外觀與包裝檢驗
QA DOCUMENT CHECK
重點檢驗
SHIPPING
出貨
RELIABILITY TEST
信賴度測試

11.0 Electrical Characteristics

11.1 Actual measured value of product electrical characters

	VF1(V)	VBR(V)	IR1(uA)	IOPH1(A)	IOPH2(A)	IOPL1(A)	IOPL2(A)	VOH(V)
Min	1.2	5	-	-	-	0.2	0.4	9
Typ	1.37	-	-	-0.5	-	0.5	-	9.55
Max	1.8	-	10	-0.2	-0.4	-	-	-
No.1	1.38	16.40	0.08	-1.13	-1.91	0.69	1.36	9.68
No.2	1.39	11.52	0.08	-1.12	-1.90	0.68	1.35	9.68
No.3	1.39	16.66	0.08	-1.16	-1.91	0.69	1.36	9.69
No.4	1.38	14.92	0.08	-1.16	-1.91	0.70	1.36	9.69
No.5	1.39	14.92	0.07	-1.14	-1.90	0.70	1.38	9.68
No.6	1.40	16.84	0.08	-1.11	-1.86	0.68	1.36	9.67
No.7	1.39	14.64	0.08	-1.17	-1.92	0.69	1.37	9.69
No.8	1.39	16.66	0.08	-1.17	-1.92	0.70	1.36	9.69
No.9	1.39	15.52	0.08	-1.17	-1.93	0.69	1.36	9.69
No.10	1.38	14.59	0.08	-1.16	-1.90	0.70	1.36	9.69
No.11	1.39	16.52	0.08	-1.14	-1.89	0.70	1.38	9.68
No.12	1.40	11.60	0.08	-1.15	-1.90	0.69	1.37	9.68
No.13	1.39	16.85	0.08	-1.14	-1.89	0.70	1.37	9.68
No.14	1.38	14.64	0.09	-1.15	-1.90	0.70	1.37	9.68
No.15	1.39	16.37	0.07	-1.16	-1.92	0.70	1.36	9.69
No.16	1.38	14.52	0.08	-1.15	-1.88	0.70	1.35	9.69
No.17	1.40	14.32	0.08	-1.12	-1.90	0.69	1.36	9.68
No.18	1.40	16.54	0.08	-1.13	-1.87	0.69	1.37	9.68
No.19	1.38	12.99	0.06	-1.15	-1.90	0.70	1.37	9.69
No.20	1.38	16.05	0.07	-1.12	-1.88	0.68	1.35	9.68
No.21	1.40	16.68	0.08	-1.15	-1.89	0.69	1.35	9.68
No.22	1.38	16.21	0.08	-1.17	-1.94	0.69	1.35	9.69
No.23	1.40	14.42	0.08	-1.17	-1.93	0.69	1.36	9.69
No.24	1.38	16.43	0.08	-1.16	-1.91	0.70	1.37	9.69
No.25	1.40	16.01	0.08	-1.15	-1.91	0.70	1.37	9.68
No.26	1.39	16.69	0.08	-1.16	-1.92	0.70	1.36	9.69
No.27	1.39	15.13	0.08	-1.16	-1.92	0.70	1.35	9.69
No.28	1.39	15.16	0.08	-1.14	-1.88	0.69	1.37	9.68
No.29	1.38	11.25	0.08	-1.16	-1.90	0.69	1.35	9.69
No.30	1.39	15.21	0.08	-1.15	-1.90	0.69	1.36	9.68
Min	1.38	11.25	0.06	-1.17	-1.94	0.68	1.35	9.67
Max	1.40	16.85	0.09	-1.11	-1.86	0.70	1.38	9.69
Avg	1.39	15.21	0.08	-1.15	-1.90	0.69	1.36	9.68

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	VOL(V)	ICCH(mA)	ICCL(mA)	IFLH(mA)	VFHL(V)	tpLH(nS)	tpHL(nS)	tr(nS)	tf(nS)
Min	-	-	-	-	0.8	50	50	-	-
Typ	0.3	1.5	1.5	2.6	-	115	110	30	15
Max	1	3	3	7.5	-	200	200	-	-
No.1	0.26	1.67	1.65	2.89	1.07	115	111	29	18
No.2	0.26	1.68	1.65	2.89	1.07	117	113	30	19
No.3	0.26	1.71	1.68	2.58	1.07	118	114	31	18
No.4	0.26	1.69	1.66	2.03	1.03	119	115	29	18
No.5	0.25	1.72	1.69	1.88	1.03	120	116	29	19
No.6	0.27	1.71	1.68	2.19	1.07	118	113.8	29	17
No.7	0.26	1.75	1.74	3.13	1.07	114	110	30	18
No.8	0.25	1.70	1.69	3.13	1.07	113	109	30	18
No.9	0.26	1.72	1.71	2.43	1.07	112	108	30	17
No.10	0.26	1.66	1.67	2.51	1.07	113	109	30	19
No.11	0.25	1.77	1.76	2.11	1.03	112	108	29	17
No.12	0.26	1.77	1.75	2.27	1.07	113	108.8	30	18
No.13	0.25	1.77	1.75	2.82	1.03	112	108	29	17
No.14	0.25	1.80	1.77	2.66	1.03	114	110	29	18
No.15	0.25	1.70	1.67	1.96	1.03	114	110	31	19
No.16	0.26	1.67	1.66	2.34	1.07	114	110	30	17
No.17	0.26	1.72	1.72	2.19	1.07	113	109	29	18
No.18	0.26	1.81	1.80	2.74	1.07	113	109.4	30	18
No.19	0.26	1.74	1.73	1.80	1.07	115	111	30	17
No.20	0.26	1.69	1.69	3.05	1.07	116	112	29	17
No.21	0.26	1.73	1.71	2.66	1.03	114	110	29	19
No.22	0.26	1.72	1.70	2.66	1.07	115	111	30	18
No.23	0.26	1.73	1.71	2.03	1.07	116	112	28	19
No.24	0.25	1.78	1.78	2.74	1.03	117	113	29	17
No.25	0.25	1.73	1.70	2.66	1.07	114	110	29	19
No.26	0.26	1.75	1.72	2.58	1.03	113	109	29	18
No.27	0.26	1.72	1.70	2.82	1.07	114	110	31	18
No.28	0.26	1.78	1.78	2.58	1.03	113	109	30	18
No.29	0.26	1.74	1.70	2.43	1.03	115	111	28	19
No.30	0.26	1.73	1.71	2.51	1.06	115	111	30	18
Min	0.25	1.66	1.65	1.80	1.03	112	108	28	17
Max	0.27	1.81	1.80	3.13	1.07	120	116	31	19
Avg	0.26	1.73	1.71	2.51	1.06	114.69	110.69	29.52	18

11.2 Actual measured value of important electrical characteristics by operation temperature

	VOH(max temp 100°C)	VOH(min temp -40°C)	VOL(max temp 100°C)	VOL(min temp -40°C)
Condition	VCC=10V. IF = 10mA, IO = -100mA		VCC=10V, IF = 0mA, IO = 100mA	
Unit	V		V	
Min	9.00	9.00	-	-
Typ	9.55	9.55	0.30	0.30
Max	-	-	1.00	1.00
1	9.43	9.65	0.46	0.24
2	9.42	9.65	0.48	0.22
3	9.44	9.65	0.48	0.23
4	9.45	9.64	0.47	0.23
5	9.43	9.66	0.48	0.24
6	9.43	9.66	0.47	0.22
7	9.43	9.65	0.46	0.23
8	9.42	9.65	0.46	0.24
9	9.45	9.65	0.46	0.23
10	9.44	9.64	0.47	0.23
11	9.45	9.65	0.47	0.22
12	9.43	9.65	0.46	0.22
13	9.42	9.66	0.48	0.23
14	9.43	9.66	0.46	0.22
15	9.44	9.64	0.48	0.24
16	9.45	9.65	0.47	0.23
17	9.43	9.64	0.46	0.23
18	9.43	9.66	0.46	0.24
19	9.42	9.64	0.48	0.23
20	9.45	9.65	0.47	0.22
21	9.43	9.65	0.47	0.22
22	9.44	9.65	0.48	0.24
23	9.44	9.64	0.48	0.23
24	9.45	9.66	0.47	0.23
25	9.42	9.64	0.46	0.24
26	9.43	9.66	0.47	0.23
27	9.43	9.64	0.47	0.22
28	9.42	9.66	0.48	0.24
29	9.44	9.66	0.47	0.22
30	9.45	9.64	0.47	0.24
Min	9.42	9.64	0.46	0.22
Max	9.45	9.66	0.48	0.24
Avg	9.435	9.650	0.470	0.230

	IOPH1(max temp 100°C)	IOPH1(min temp -40°C)	IOL1(max temp 100°C)	IOL1(min temp -40°C)
Condition	Vcc=15V, IF=10mA, V6-5=2V		Vcc=15V, IF=0mA, V5-4=2V	
Unit	A		A	
Min	-	-	0.20	0.20
Typ	-0.50	-0.50	0.50	0.50
Max	-0.20	-0.02	-	-
1	-0.46	-0.67	0.47	0.71
2	-0.46	-0.66	0.49	0.71
3	-0.48	-0.67	0.47	0.73
4	-0.47	-0.67	0.47	0.71
5	-0.47	-0.66	0.48	0.72
6	-0.46	-0.68	0.47	0.72
7	-0.48	-0.67	0.48	0.73
8	-0.46	-0.68	0.47	0.71
9	-0.48	-0.67	0.48	0.73
10	-0.46	-0.66	0.47	0.72
11	-0.48	-0.67	0.47	0.73
12	-0.47	-0.66	0.49	0.72
13	-0.48	-0.67	0.47	0.71
14	-0.46	-0.68	0.49	0.73
15	-0.47	-0.67	0.48	0.71
16	-0.47	-0.67	0.47	0.72
17	-0.48	-0.68	0.49	0.71
18	-0.47	-0.67	0.47	0.73
19	-0.48	-0.66	0.48	0.71
20	-0.46	-0.67	0.47	0.72
21	-0.48	-0.68	0.49	0.71
22	-0.47	-0.67	0.47	0.72
23	-0.47	-0.66	0.48	0.73
24	-0.48	-0.68	0.49	0.72
25	-0.47	-0.66	0.49	0.73
26	-0.48	-0.67	0.48	0.72
27	-0.46	-0.68	0.49	0.72
28	-0.47	-0.67	0.49	0.71
29	-0.48	-0.67	0.48	0.73
30	-0.48	-0.68	0.49	0.73
Min	-0.48	-0.68	0.47	0.71
Max	-0.46	-0.66	0.49	0.73
Avg	-0.471	-0.670	0.479	0.720

	TPLH(max temp 100°C)	TPLH(min temp -40°C)	TPHL(max temp 100°C)	TPHL(min temp -40°C)
Condition	VCC=20V, IF= 10mA, Rg= 30, Cg= 1 nF,, f= 250 kHz,, Duty= 50%			
Unit	ns		ns	
Min	50.00	50.00	50.00	50.00
Typ	115.00	115.00	110.00	110.00
Max	200.00	200.00	200.00	200.00
1	145	106	140	91
2	145	108	143	91
3	146	106	140	93
4	145	108	140	94
5	146	107	141	91
6	146	108	143	92
7	149	106	141	92
8	146	107	141	93
9	149	106	140	92
10	149	106	142	91
11	145	108	143	93
12	147	108	142	91
13	149	108	142	93
14	149	107	141	94
15	146	108	142	93
16	146	107	143	92
17	148	107	142	92
18	146	108	143	91
19	145	107	140	94
20	145	106	142	93
21	148	106	143	94
22	149	107	142	93
23	148	107	140	92
24	145	108	143	92
25	146	107	140	94
26	145	107	142	93
27	148	108	143	94
28	149	107	141	91
29	148	106	141	94
30	149	108	143	94
Min	145.00	106.00	140.00	91.00
Max	149	108	143	94
Avg	146.900	107.100	141.633	92.567

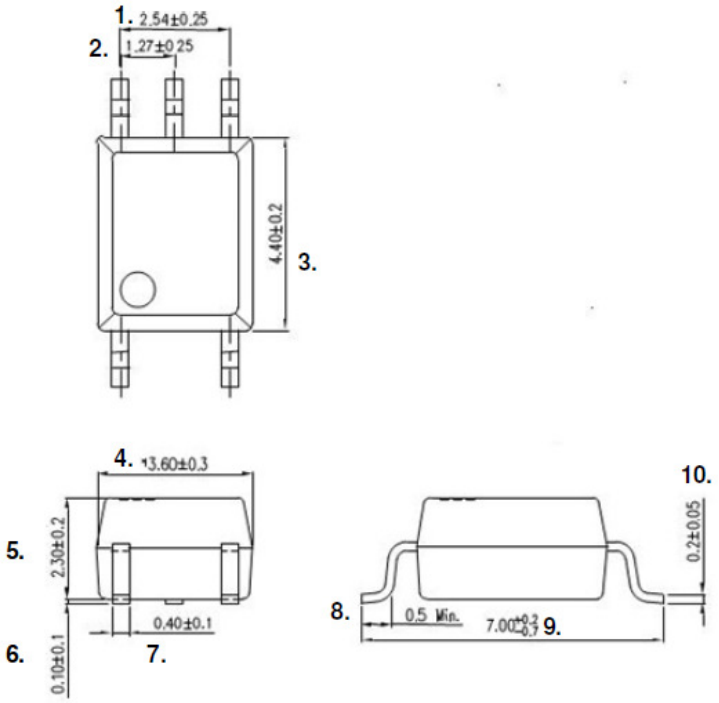
11.3 Actual measured value of important electrical characteristics by voltage

	ICCH		ICCL	
Condiiton	VCC=10V IF = 10mA, VO=Open	VCC=30V IF = 10mA, VO=Open	VCC=10V IF = 0mA, VO=Open	VCC=30V IF = 0mA, VO=Open
Unit	mA		mA	
Min	-	-	-	-
Typ	1.5	1.5	1.5	1.5
Max	3	3	3	3
1	1.49	1.66	1.52	1.67
2	1.51	1.66	1.52	1.67
3	1.5	1.67	1.52	1.67
4	1.5	1.66	1.53	1.68
5	1.5	1.67	1.53	1.67
6	1.51	1.66	1.52	1.67
7	1.5	1.67	1.52	1.68
8	1.51	1.67	1.53	1.67
9	1.49	1.66	1.52	1.67
10	1.49	1.66	1.52	1.68
11	1.51	1.67	1.53	1.67
12	1.49	1.66	1.52	1.67
13	1.5	1.67	1.53	1.68
14	1.51	1.66	1.52	1.68
15	1.5	1.66	1.53	1.68
16	1.51	1.67	1.52	1.68
17	1.49	1.66	1.53	1.68
18	1.49	1.66	1.52	1.67
19	1.51	1.67	1.53	1.67
20	1.49	1.66	1.52	1.68
21	1.49	1.66	1.52	1.67
22	1.51	1.66	1.53	1.67
23	1.49	1.67	1.52	1.68
24	1.49	1.66	1.52	1.68
25	1.51	1.67	1.53	1.67
26	1.5	1.67	1.52	1.67
27	1.5	1.67	1.53	1.68
28	1.49	1.67	1.52	1.68
29	1.49	1.66	1.53	1.68
30	1.51	1.66	1.53	1.67
Min	1.49	1.66	1.52	1.67
Max	1.51	1.67	1.53	1.68
Avg	1.499	1.664	1.524	1.675

Property of LITE-ON Only

	TPLH(VCC=10V)	TPLH(VCC=30V)	TPHL(VCC=10V)	TPHL(VCC=30V)
Condiiton	IF= 10mA, Rg= 30, Cg= 1 nF, f= 250 kHz,, Duty= 50%			
Unit	ns		ns	
Min	50.00	50.00	50.00	50.00
Typ	115.00	115.00	110.00	110.00
Max	200.00	200.00	200.00	200.00
1	110	119	107	111
2	112	120	108	115
3	110	120	107	112
4	112	120	108	111
5	111	119	106	112
6	112	118	107	115
7	110	120	108	112
8	112	121	107	112
9	110	119	107	115
10	112	118	108	112
11	111	120	107	113
12	112	122	106	111
13	111	118	107	115
14	110	122	107	112
15	111	119	106	115
16	110	118	106	115
17	110	119	108	111
18	111	118	107	112
19	110	122	106	111
20	112	118	107	114
21	112	118	106	111
22	112	122	106	112
23	110	119	107	114
24	111	119	108	112
25	112	119	106	114
26	110	118	106	114
27	112	118	107	111
28	111	122	108	111
29	110	118	107	114
30	112	122	108	111
Min	110	118	106	111
Max	112	122	108	115
Avg	111.033	119.500	106.967	112.667

12.0 Actual Measurement Value of each Exterior Part



All Dimensions in Millimeters

	1	2	3	4	5	6	7	8	9	10
1	2.552	1.276	4.388	3.615	2.33	0.083	0.4	0.643	6.935	0.203
2	2.465	1.285	4.418	3.614	2.332	0.055	0.42	0.682	6.917	0.205
3	2.512	1.271	4.393	3.591	2.31	0.112	0.43	0.639	6.905	0.21
4	2.488	1.277	4.365	3.602	2.312	0.139	0.412	0.642	6.906	0.206
5	2.479	1.282	4.444	3.606	2.33	0.111	0.411	0.637	6.924	0.199
6	2.541	1.273	4.441	3.612	2.31	0.104	0.398	0.666	6.903	0.198
7	2.551	1.277	4.399	3.613	2.331	0.083	0.405	0.688	6.912	0.201
8	2.548	1.276	4.387	3.642	2.329	0.09	0.407	0.654	6.922	0.204
9	2.491	1.272	4.366	3.608	2.299	0.103	0.398	0.643	6.945	0.212
10	2.541	1.291	4.379	3.632	2.301	0.107	0.402	0.672	6.895	0.204
11	2.553	1.264	4.442	3.643	2.33	0.08	0.411	0.642	6.932	0.203
12	2.547	1.271	4.412	3.601	2.311	0.064	0.415	0.631	6.915	0.212
13	2.531	1.277	4.376	3.58	2.335	0.101	0.389	0.656	6.924	0.198
14	2.542	1.275	4.442	3.584	2.332	0.077	0.406	0.673	6.935	0.197
15	2.553	1.288	4.411	3.591	2.312	0.105	0.395	0.665	6.936	0.202
16	2.541	1.29	4.382	3.579	2.307	0.103	0.394	0.638	6.928	0.204
17	2.554	1.294	4.392	3.605	2.309	0.111	0.403	0.652	6.92	0.242
18	2.498	1.277	4.408	3.611	2.305	0.08	0.407	0.648	6.924	0.217
19	2.512	1.281	4.482	3.591	2.331	0.072	0.402	0.662	6.926	0.2
20	2.544	1.277	4.482	3.591	2.306	0.085	0.412	0.648	6.884	0.201
21	2.543	1.271	4.376	3.605	2.311	0.092	0.399	0.639	6.873	0.204
22	2.549	1.276	4.4	3.604	2.309	0.076	0.398	0.671	6.882	0.206
23	2.551	1.292	4.382	3.601	2.301	0.059	0.402	0.683	6.861	0.199
24	2.555	1.289	4.412	3.606	2.334	0.111	0.401	0.678	6.879	0.208
25	2.553	1.277	4.445	3.62	2.311	0.104	0.405	0.682	6.858	0.2
26	2.541	1.271	4.442	3.611	2.329	0.078	0.403	0.692	6.872	0.2
27	2.465	1.265	4.382	3.598	2.307	0.124	0.41	0.693	6.865	0.197
28	2.491	1.262	4.422	3.588	2.301	0.095	0.399	0.683	6.843	0.205
29	2.512	1.255	4.438	3.612	2.335	0.085	0.397	0.667	6.888	0.201
30	2.553	1.271	4.366	3.611	2.324	0.092	0.395	0.654	6.873	0.2

13.0 Mean Time to Failure

MTTF/ FIT report for LTV-155E

(Mean time to failure / Failure rate report)

(According to MIL-STD-690C)

Sample size	1080	Pcs		
Test Hours	1000	Hours		
Total Hours	1080000	Hours		
Total Failure	0	Pcs		
Typical MTTF	1080000	Hours	r	1
Typical Failure rate/1Khours	0.0925926	%		
@ 90% Confidence level				
MTTF *more than or equal*	469035	Hours		
FIT/1Khours *less than or equal*	3.53	FIT		

Note: if no failures occurred during testing, the typical MTTF and the Failure rate calculated assuming one (1) failure.

Sample size =Monthly routine operating test x sample size of every time

Test Hours = 1000 (Hours)

Total Hours = Sample size x Test Hours

Total failures = Failure number of yearly test.

Typical MTTF = Total hours / Total failure (T/r)

Typical failure rate (%) = (1/Typical MTTF) x 1000 x100

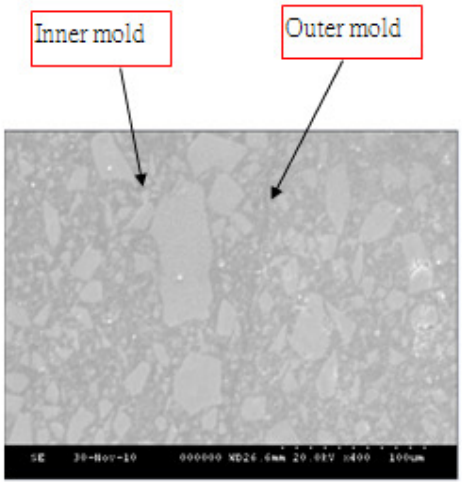
MTTF @ 90% CL = Typical MTTF/Critical value at 90%CL (from GEM table)

FITs : $\frac{nc(n)*109}{N*t*A}$ (Refer to Intrinsic Failure Rate (IFR))

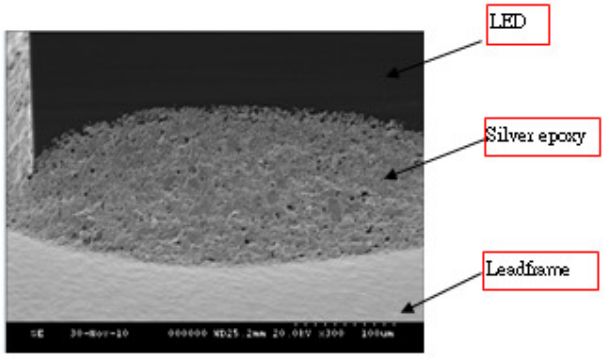
**Follow as WI-QA-00999-046 MTTF (Mean Time To Failure) to be study Wearout.

14.0 Delaminating Evaluation

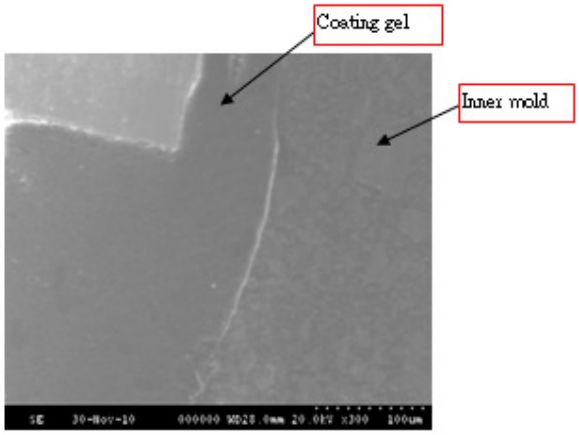
1. Inner mold & Outer mold



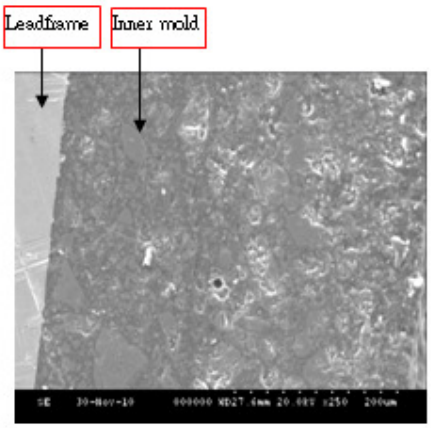
2. LED & Silver epoxy & LF



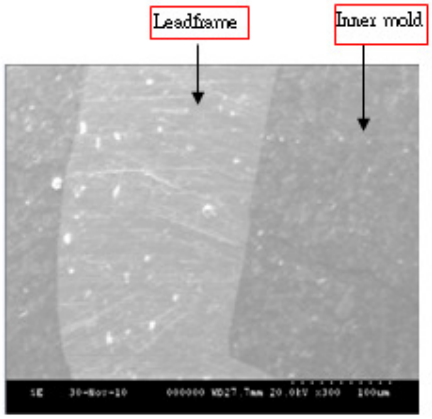
3. Coating gel & Inner mold



4. Inner mold & LF



5.Outer mold & LF



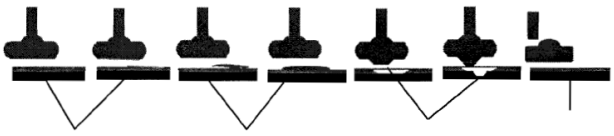
15.0 CTQ Actual Measurement Results in QC Flow

NO.	Process	Check item	Fail Mode	SPEC	Qty	Result		1	2	3	4	5	6	7	8	9	10	11	12.00	13.00
1	Wire Bond(IR)	Wire pull	refer to photo1	7.0(min)	20	MAX	15.45	12.91	13.49	13.93	13.84	14.12	14.57	14.04	14.29	14.44	14.56	14.02	14.55	14.47
						Min	12.91													
						AVG	14.24													
2	Die Bond(IR)	Die shear	refer to photo2	60(min)	20	MAX	300	267.28	237.17	255.84	260.52	259.27	258.45	284.38	288.96	264.47	267.19	266.57	258.43	245.00
						Min	161													
						AVG	244													
3	Die Bond(PTR)	Wire pull	refer to photo1	4.1(min)	20	MAX	13.7	12.96	12.27	12.55	12.82	13.31	12.51	13.15	13.65	13.00	13.23	13.28	13.28	12.80
						Min	12.2													
						AVG	12.9													
4	Die Bond(PTR)	ball shear	refer to photo2	25(min)	20	MAX	93.7	76.96	78.05	76.43	74.24	61.79	62.70	78.67	86.40	93.71	77.08	84.51	69.78	89.36
						Min	61.8													
						AVG	79.1													

14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00
14.28	14.97	15.45	14.55	14.45	14.02	13.95	14.56	14.18	14.35	13.87	14.20	14.57	13.93	14.12	14.32	13.99
173.60	167.30	292.30	161.00	196.40	174.40	300.00	285.43	281.11	278.32	252.42	267.19	266.57	255.55	264.42	266.38	261.30
12.15	12.17	12.17	13.01	12.46	13.65	13.11	11.64	11.68	11.73	11.91	11.81	11.87	11.58	10.81	12.08	10.56
81.02	77.14	80.01	75.04	91.85	88.41	78.47	64.39	56.34	73.13	68.56	73.06	57.05	59.77	53.22	62.76	68.70

6.3 推金球和拉力效果判定/Judgement of ball shear & pull tension effect :

6.3.1推金球效果判定(Ball shear effect judgement):



A
無殘金
no remains of Au

B
有殘金
have remains of Au

C
有凹洞
have cratering

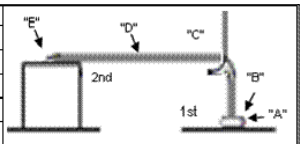
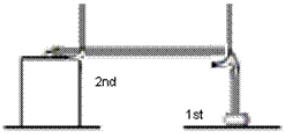
D
誤操作
wrong judgement

注釋:

1.推球後任何一點爲C種狀況則判定爲不良.

2.推球後如全部爲A種狀況則判定爲不良.

3.推球後如爲D種狀況則判定爲誤判,QC需重新測試.

Location	Failure mode	Description	Result	
LOTJ	A	No gold remain on the pad (Dice) after wire pull (ball shift)	Reject	
	B	Break off from the neck of the loop, little higher upon the ball (<2mil)	Accept	
	C	Break off from between B & D point	Accept	
	D	Break off from the tail of the loop (tail remain on the pad)	Accept	
	E	No gold remain on the pad after wire pull (tail shift)	Reject	
LOBK	A	Lifted ball	Reject	
	B	Wire break at neck bond	Accept	
	C	Loop wire break	Accept	
	D	Stitch bond (Wire break at stitch)	Accept	
	E	Weld lifted	Reject	
	F	Gold remain >80% on pad	Accept	
	G	Gold remain 50-80% on pad	Accept	
	H	Gold remain 10-50% on pad	Accept	
	I	Gold remain <10% on pad	Reject	
	J	Peeling pad	Reject	

16.0 MSDS/SGS

Material Safety Data Sheet

物質安全資料表

一、物品與廠商資料/Product and Company Identification

物品名稱： **Photocoupler** Product Name
物品編號： **LTV-155E** Product Code
製造商或供應商名稱、地址及電話： Address & Tel. of Manufacturer or Agent LITEON TECHNOLOGY CORPORATION 90, Chien 1 Rd, Chung Ho dist. New Taipei city, Taiwan R.O.C.
緊急聯絡電話/傳真電話：+886-222226181 #1252 Emergency Phone Number/Fax

二、成分辨識資料/Composition, Information on Ingredients

1.

In substance fame is called: Epoxy Compound		
Chemical nature ： Resin		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
White compound	25068-38-6	42.63%
Black compound	25068-38-6	57.37%

2.

In substance fame is called ： Lead frame		
Physical property ： Metal		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
Copper	7440-50-8	99.2%
Silver	140415-84-5	0.8%

3.

In substance fame is called ：Emitter chip		
Physical property ：		
The substance component name	CAS number	Concentration either concentration limit (component percent)
Gallium Arsenide	7440-55-3	
Ga		51.4%
As		48.6%

4.

In substance fame is called ：Detector chip		
Physical property ：		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
Silicon	7440-21-3	99.726%
Aluminum	7429-90-5	0.163%
Copper	7440-50-8	0.001%
Tungsten	7440-33-7	0.11%

5.

In substance fame is called ：Golden wire		
Physical property ： Au		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
Au	7440-57-5	100%

6.

In substance fame is called ：Ag Paste		
Physical property ：		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
Ag-based Epoxy	14391-65-2	
Epoxy Resin		17.64%
Ag		82.36%

7.

In substance fame is called ：Silicon gel		
Physical property ：		
The substance component name	CAS number	Concentration either concentration limit (component percentage)
Silicone	63148-62-9	
Si		10%~20%
Epoxy-resin		Remain

三、危害辨識資料/ Hazard Identification

最重要危害效應 Most Important Health Hazards and Reactions	健康危害效應/Health Hazards and Reactions： N/A
	環境影響/Environmental Impact： N/A
	物理性及化學性危害/Physical and Chemical Hazards： N/A
	特殊危害/Specific Hazards： N/A
主要症狀/Cardinal Symptoms： N/A	
物品危害分類/Hazard Classification： N/A	

四、急救措施/ First Aid Measures

不同暴露途徑之急救方法/ First Aid Measures for Different Kinds of Exposures：
- 吸入/Inhalation：N/A
- 皮膚接觸/Skin Contact：N/A
- 眼睛接觸/Eye Contact：N/A
- 食入/Ingestion：N/A

最重要症狀及危害效應/Most Important Symptoms and Hazard Reactions：
N/A

對急救人員之防護/Protection to First-Aid Attendants： N/A

對醫師之提示/Suggestions to Doctors： N/A

五、滅火措施/ Fire Fighting Measures

適用滅火劑/Suitable Extinguishing Media： Water 、Carbon dioxide 、Dried vermicelli made from bean starch fire-extinguishing chemical
滅火時可能遭遇之特殊危害/Special Hazards in Fire：N/A
特殊滅火程序/Special Fire-Fighting Procedures： N/A
消防人員之特殊防護設備/Required Special Protective Equipment for Fire-Fighters： N/A

六、洩漏處理方法/ Accidental Release Measures

個人應注意事項/ Personal Precautions： N/A
環境注意事項/Environmental Precautions： N/A
清理方法/Methods for Cleaning： N/A

七、安全處置與儲存方法/ Handling and Storage

處置/Handling： N/A
儲存/ Storage： Temp:-55℃~150℃

八、暴露預防措施/ Exposure Controls, Personal Protection

工程控制/ Engineering Measures： N/A
控制參數/ Control Parameters： • 八小時日時量平均容許濃度(TWA)/短時間時量平均容許濃度(STEL)/最高容許濃度(CEILING)：N/A • 生物指標/ BEIs： N/A

個人防護設備/ Personal Protection Equipment： • 呼吸防護/Respiration：N/A • 手部防護/Hand：N/A • 眼睛防護/Eye：N/A • 皮膚及身體防護/Skin & Body： N/A
衛生措施/Hygiene Measures： N/A

九、物理及化學性質/ Physical and Chemical Properties

物質狀態/ State of Substance： solid	形狀/Appearance： Square-like
顏色/Color： N/A	氣味/Odor： N/A
pH 值/pH Value： N/A	沸點/沸點範圍/Boiling Point： N/A
分解溫度/Decomposing Temperature： 无	閃火點： ℉ ℃ Flashpoint 測試方法： 開杯 閉杯 Test Methods：Open Slot Closed Slot
自燃溫度/Self-Igniting Temperature： N/A	爆炸界限/Explosion Limits： N/A
蒸氣壓/Vapor Pressure： N/A	蒸氣密度/Vapor Density： N/A
密度/Density： N/A	溶解度/Dissolution： N/A

十、安定性及反應性/Stability and Reactivity

安定性/Stability： N/A
特殊狀況下可能之危害反應/Possible Hazard Reaction Under Special Conditions： N/A
應避免之狀況/Conditions to Avoid： N/A
應避免之物質/Materials to Avoid： N/A
危害分解物/Hazardous Decomposition Products： N/A

十一、毒性資料/ Toxicological Information

急毒性/Acute Toxicity： N/A
局部效應/Local Reactions： N/A
致敏感性/Sensitivity： N/A
慢毒性或長期毒性/Chronic or Long Term Toxicity： N/A
特殊效應/Special Reactions： N/A

十二、生態資料/ Ecological information

可能之環境影響/環境流佈/Possible Environmental Impact/Environmental Run-offs：N/A

十三、廢棄處置方法/Disposal considerations

廢棄處置方法/Disposal Methods：N/A

十四、運送資料/Transport information

國際運送規定/International Transportation Regulations： N/A
聯合國編號/UN Reference No.： N/A
國內運送規定/Domestic Transportation Regulations： N/A
特殊運送方法及注意事項/Special Transportation Methods and Precautions： N/A

十五、法規資料/Regulatory information

適用法規/Applicable Regulation： J-STD-020D

十六、其他資料/Other information

參考文獻 Ref. Document		
製表單位 Department	名稱/Dept. Name： LITE-ON ELECTRONICS(TIANJIN) CO.,LTD	
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製 表 人 Made By	職稱/Title： PD Principle Engineer	姓名(簽章) Name(Signature)： Dio Tzeng
製表日期 Date Prepared	Jan. 1, 2013	

*. SGS report please see attachment.

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