

ACFL-6211U, ACFL-6212U

Bi-directional High Speed, Low Power Digital Optocoupler with R²Coupler™ Isolation in a Stretched 12-Pin Surface Mount Plastic Package

Data Sheet

Description

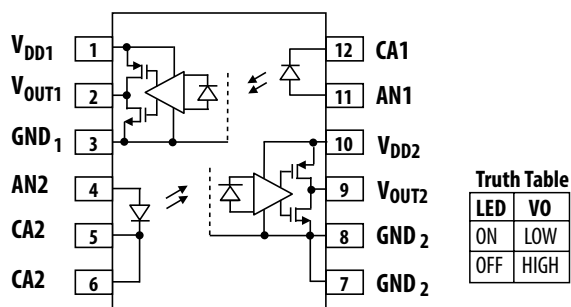
The ACFL-6211U and ACFL-6212U are dual channel, bi-directional, high speed digital CMOS optocouplers. The stretched SO-12 stretched package outline is designed to be compatible with standard surface mount processes and occupies the same land area as their single channel stretched SO8 package.

This digital optocoupler uses an insulating layer between the light emitting diode and an integrated photo detector to provide electrical insulation between input and output.

Each channel of the digital optocoupler has a CMOS detector IC with an integrated photodiode, a high speed trans-impedance amplifier, and a voltage comparator with an output driver. Each channel is also isolated from the other.

Avago R2Coupler technology provides reinforced insulation and reliability that delivers safe signal isolation critical in high temperature industrial applications.

Functional Diagram



NOTE The connection of a 1 μ F bypass capacitor between pins 1 and 3 and pins 8 and 10 is recommended.

Features

- Wide temperature range: -40 °C to +125 °C
- 5 V CMOS compatibility
- 40 kV/ μ s common-mode rejection at V_{CM}=1000V (typ)
- Low propagation delay:
 - ACFL-6211U: 25 ns at I_F = 10 mA (typ)
 - ACFL-6212U: 60 ns at I_F = 4 mA (typ)
- Compact, auto-insertable stretched SO12 packages
- Worldwide safety approval:
 - UL 1577 recognized, 5kV_{RMS}/1 min.
 - CSA Approved
 - IEC/EN/DIN EN 60747-5-5

Applications

- CANBus and SPI communications interface
- High temperature digital/analog signal isolation
- Power transistor isolation

CAUTION It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD. The components featured in this data sheet are not to be used in military or aerospace applications or environments.

Pin Description

| Pin No. | Pin Name | Description | Pin No. | Pin Name | Description |
|---------|-------------------|---------------------------|---------|-------------------|-----------------------------|
| 1 | V _{DD1} | Primary Side Power Supply | 7 | GND2 | Secondary Side Ground |
| 2 | V _{OUT1} | Output 1 | 8 | GND2 | Secondary Side Ground |
| 3 | GND1 | Primary Side Ground | 9 | V _{OUT2} | Output 2 |
| 4 | AN2 | Anode 2 | 10 | V _{DD2} | Secondary Side Power Supply |
| 5 | CA2 | Cathode 2 | 11 | AN1 | Anode 1 |
| 6 | CA2 | Cathode 2 | 12 | CA1 | Cathode 1 |

Ordering Information

| Part Number | Option (Ro HS Compliant) | Package | Surface Mount | Tape & Reel | UL 5000 Vrms/ 1 Minute Rating | IEC/EN/DIN EN 60747-5-5 | Quantity |
|-------------|--------------------------|-----------------|---------------|-------------|-------------------------------|-------------------------|---------------|
| ACFL-6211U | -000E | Stretched SO-12 | X | | X | | 80 per tube |
| | -060E | | X | | X | X | 80 per tube |
| | -500E | | X | X | X | | 1000 per reel |
| | -560E | | X | X | X | X | 1000 per reel |
| ACFL-6212U | -000E | Stretched SO-12 | X | | X | | 80 per tube |
| | -060E | | X | | X | X | 80 per tube |
| | -500E | | X | X | X | | 1000 per reel |
| | -560E | | X | X | X | X | 1000 per reel |

To order, choose a part number from the part number column and combine with the desired option from the option column to form an order entry.

Example 1:

ACFL-6212U-560E to order product of SSO-12 Surface Mount package in Tape and Reel packaging with IEC/EN/DIN EN 60747-5-5 Safety Approval in RoHS compliant.

Option datasheets are available. Contact your Avago sales representative or authorized distributor for information.

Package Outline Drawing

12-Lead Surface Mount



Dimensions in inches (millimeters)

Lead coplanarity = 0.004 inches (0.1 mm)

Recommended Pb-Free IR Profile

Recommended reflow condition as per JEDEC Standard, J-STD-020 (latest revision).

NOTE Non-halide flux should be used.

Regulatory Information

The ACFL-6211U and ACFL-6212U are approved by the following organizations:

| | |
|--------------------------------|--|
| UL | UL 1577, component recognition program up to VISO = 5kVRMS |
| CSA | Approved under CSA Component Acceptance Notice #5 |
| IEC/EN/DIN EN 60747-5-5 | Approved under IEC/EN/DIN EN 60747-5-5 |

Insulation and Safety Related Specifications

| Parameter | Symbol | ACFL-6211U / ACFL-6212U | Units | Conditions |
|---|--------|-------------------------|-------|--|
| Minimum External Air Gap (Clearance) | L(101) | 8.3 | mm | Measured from input terminals to output terminals, shortest distance through air. |
| Minimum External Tracking (Creepage) | L(102) | 8.5 | mm | Measured from input terminals to output terminals, shortest distance path along body. |
| Minimum Internal Plastic Gap (Internal Clearance) | | 0.08 | mm | Through insulation distance conductor to conductor, usually the straight line distance thickness between the emitter and detector. |
| Tracking Resistance (Comparative Tracking Index) | CTI | 175 | V | DIN IEC 112/VDE 0303 Part 1 |
| Isolation Group (DIN VDE0109) | | IIla | | Material Group (DIN VDE 0109) |

IEC/EN/DIN EN 60747-5-5 Insulation Related Characteristic (Option 060E and 560E)

| Description | Symbol | Characteristic | Units |
|--|----------------|----------------|-------------|
| Installation classification per DIN VDE 0110/1.89, Table 1 for rated mains voltage ≤ 600 V rms for rated mains voltage < 1000 V rms | | I-III I-III | |
| Climatic Classification | | 40/125/21 | |
| Pollution Degree (DIN VDE 0110/1.89) | | 2 | |
| Maximum Working Insulation Voltage | V_{IORM} | 1140 | V_{PEAK} |
| Input to Output Test Voltage, Method b $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m = 1$ sec, Partial Discharge < 5 pC | V_{PR} | 2137 | V_{PEAK} |
| Input to Output Test Voltage, Method a $V_{IORM} \times 1.6 = V_{PR}$, Type and sample test, $t_m = 10$ sec, Partial Discharge < 5 pC | V_{PR} | 1824 | V_{PEAK} |
| Highest Allowable Overvoltage (Transient Overvoltage, $t_{ini} = 60$ sec) | V_{IOTM} | 6000 | V_{PEAK} |
| Safety Limiting Values (Maximum values allowed in the event of a failure) | | | |
| Case Temperature | T_S | 175 | $^{\circ}C$ |
| Input Current | $I_{S,INPUT}$ | 230 | mA |
| Output Power | $P_{S,OUTPUT}$ | 600 | mW |
| Insulation Resistance at T_S , $V_{IO} = 500$ V | RS | 10^9 | Ω |

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Units | Condition |
|--|--|------|----------------|---------|---|
| Storage Temperature | T_S | -55 | +150 | °C | |
| Ambient Operating Temperature | T_A | -40 | +125 | °C | |
| Junction Temperature | T_J | | +150 | °C | |
| Supply Voltages | V_{DD} | 0 | 6.5 | V | |
| Output Voltage | V_O | -0.5 | $V_{DD} + 0.5$ | V | |
| Average Forward Input Current | I_F | - | 20.0 | mA | |
| Peak Transient Input Current (I_F at 1 μ s pulse width, <10% duty cycle) | $I_{F(TRAN)}$ | | 1 80 | A mA | $\leq 1 \mu$ s Pulse Width, 300pps $\leq 1 \mu$ s Pulse Width, <10% Duty Cycle |
| Reverse Input Voltage | V_R | - | 5 | V | |
| Input Power Dissipation | P_I | | 40 | mW | |
| Average Output Current | I_O | | 10 | mA | |
| Output Power Dissipation | P_O | | 30 | mW | |
| Lead Solder Temperature | 260 °C for 10 sec., 1.6 mm below seating plane | | | | |
| Solder Reflow Temperature Profile | See Solder Reflow Temperature Profile section | | | | |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Max. | Units | Note |
|---------------------------|--------------|------|------|-------|------|
| Supply Voltage | V_{DD} | 3.0 | 5.5 | V | |
| Operating Temperature | T_A | -40 | 125 | °C | |
| Forward Input Current | $I_{F(ON)}$ | 4.0 | 15 | mA | |
| Forward Off State Voltage | $V_{F(OFF)}$ | | 0.8 | V | |
| Input Threshold Current | I_{TH} | | 3.5 | mA | |

Electrical Specifications

Over recommended operating conditions. All typical specifications are at $T_A=25\text{ }^\circ\text{C}$, $V_{DD}=5\text{V}$.

| Parameter | Symbol | Min. | Typ. | Max | Units | Test Conditions | Fig |
|--|-----------|----------------|------|------|----------------------|---|-----|
| LED Forward Voltage | V_F | 1.45 | 1.5 | 1.75 | V | $I_F = 10\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$ | |
| | | 1.25 | 1.5 | 1.85 | V | $I_F = 10\text{ mA}$ | |
| VF Temperature Coefficient | | | -1.5 | | mV/ $^\circ\text{C}$ | | |
| Input Threshold Current | I_{TH} | | 1.3 | 3.5 | mA | | 2 |
| Input Capacitance | C_{IN} | | 90 | | pF | | |
| Input Reverse Breakdown Voltage | BV_R | 5.0 | | | V | $I_R = 10\text{ }\mu\text{A}$ | |
| Logic High Output Voltage | V_{OH} | $V_{DD} - 0.6$ | | | V | $I_{OH} = -3.2\text{ mA}$ | 4 |
| Logic Low Output Voltage | V_{OL} | | | 0.6 | V | $I_{OL} = 4\text{ mA}$ | 3 |
| Logic Low Output Supply Current (per channel) | I_{DDL} | | 0.9 | 1.5 | mA | | |
| Logic High Output Supply Current (per channel) | I_{DDH} | | 0.9 | 1.5 | mA | | |

ACFL-6211U High Speed Mode Switching Specifications

Over recommended operating conditions: $T_A = -40\text{ }^\circ\text{C}$ to $+125\text{ }^\circ\text{C}$, $4.5\text{ V} \leq V_{DD} \leq 5.5\text{ V}$. All typical specifications are at $T_A=25\text{ }^\circ\text{C}$, $V_{DD} = 5\text{V}$.

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions | Fig | Note |
|---|-----------|------|------|------|-------------------|---|----------|---------|
| Propagation Delay Time to Logic Low Output | t_{PHL} | | 25 | 35 | ns | $V_{in} = 4.5\text{V}-5.5\text{V}$, $R_{in} = 390\Omega \pm 5\%$, $C_{in} = 100\text{pF}$, $CL = 15\text{pF}$ Output low threshold = 0.8V Output high threshold = 80% of Vdd | 5, 9, 11 | a, b, c |
| Propagation Delay Time to Logic High Output | t_{PLH} | | 25 | 35 | ns | | | |
| Pulse Width Distortion | PWD | | 0 | 12 | ns | | | |
| Propagation Delay Skew | t_{PSK} | | | 15 | ns | | | |
| Output Rise Time (10% – 90%) | t_R | | 10 | | ns | | | |
| Output Fall Time (90% – 10%) | t_F | | 10 | | ns | | | |
| Common Mode Transient Immunity at Logic High Output | $ CM_H $ | 15 | 25 | | kV/ μs | $V_{in} = 0\text{V}$, $R_{in} = 390\Omega \pm 5\%$, $C_{in} = 100\text{pF}$, $V_{cm} = 1000\text{V}$, $T_A = 25\text{ }^\circ\text{C}$ | | d |
| Common Mode Transient Immunity at Logic Low Output | $ CM_L $ | 15 | 25 | | kV/ μs | $V_{in} = 4.5\text{V}-5.5\text{V}$, $R_{in} = 390\Omega \pm 5\%$, $C_{in} = 100\text{pF}$, $V_{cm} = 1000\text{V}$, $T_A = 25\text{ }^\circ\text{C}$ | | e |

- t_{PHL} propagation delay is measured from the 50% (V_{IN} or I_F) on the rising edge of the input pulse to the 0.8V of V_{DD} of the falling edge of the V_O signal. t_{PLH} propagation delay is measured from the 50% (V_{IN} or I_F) on the falling edge of the input pulse to the 80% level of the rising edge of the V_O signal.
- PWD is defined as $|t_{PHL} - t_{PLH}|$.
- t_{PSK} is equal to the magnitude of the worst case difference in t_{PHL} and/or t_{PLH} that will be seen between units at any given temperature within the recommended operating conditions.
- CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state.
- CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state.

ACFL-6212U Low Power Mode Switching Specifications

Over recommended operating conditions: $T_A = -40\text{ }^\circ\text{C}$ to $+125\text{ }^\circ\text{C}$, $3.0\text{ V} \leq V_{DD} \leq 5.5\text{ V}$. All typical specifications at $25\text{ }^\circ\text{C}$ and $V_{DD} = 5\text{ V}$.

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions | Fig | Note |
|---|-----------|------|------|------|-------------|---|-------|---------|
| Propagation Delay Time to Logic Low Output | t_{PHL} | | 60 | 100 | ns | IF = 4mA, CL= 15pF | 7, 12 | a, b, c |
| Propagation Delay Time to Logic High Output | t_{PLH} | | 35 | 100 | ns | | | |
| Pulse Width Distortion | PWD | | 25 | 50 | ns | | | |
| Propagation Delay Skew | t_{PSK} | | | 60 | ns | | | |
| Output Rise Time (10% –90%) | t_R | | 10 | | ns | | | |
| Output Fall Time (90% - 10%) | t_F | | 10 | | ns | | | |
| Common Mode Transient Immunity at Logic High Output | $ CM_H $ | 25 | 40 | | kV/ μ s | Using Avago LED Driving Circuit, $V_{IN} = 0\text{ V}$, R1 = $330\ \Omega \pm 5\%$, R2 = $330\ \Omega \pm 5\%$, $V_{CM} = 1000\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$ | | d |
| Common Mode Transient Immunity at Logic Low Output | $ CM_L $ | 25 | 40 | | kV/ μ s | Using Avago LED Driving Circuit, $V_{IN}=4.5 - 5.5\text{V}$, R1 = $330\ \Omega \pm 5\%$, R2 = $330\ \Omega \pm 5\%$, $V_{CM} = 1000\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$ | | e |

- t_{PHL} propagation delay is measured from the 50% (V_{IN} or I_F) on the rising edge of the input pulse to the 0.8V of V_{DD} of the falling edge of the V_O signal. t_{PLH} propagation delay is measured from the 50% (V_{IN} or I_F) on the falling edge of the input pulse to the 80% level of the rising edge of the V_O signal.
- PWD is defined as $|t_{PHL} - t_{PLH}|$.
- t_{PSK} is equal to the magnitude of the worst case difference in t_{PHL} and/or t_{PLH} that will be seen between units at any given temperature within the recommended operating conditions.
- CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state.
- CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state.

Package Characteristics

All Typical at $T_A = 25\text{ }^\circ\text{C}$.

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions | Notes |
|--|-----------|------|-----------|------|----------|--|-------|
| Input-Output Momentary Withstand Voltage | V_{ISO} | 5000 | | | Vrms | $RH \leq 50\%$, $t = 1\text{ min}$, $T_A = 25\text{ }^\circ\text{C}$ | a, b |
| Input-Output Resistance | R_{I-O} | | 10^{14} | | Ω | $V_{I-O} = 500\text{ V dc}$ | a |
| Input-Output Capacitance | C_{I-O} | | 0.6 | | pF | $f = 1\text{ MHz}$, $T_A = 25\text{ }^\circ\text{C}$ | a |

- Device considered a two terminal device: pins 1 to 6 shorted together, and pins 7 to 12 shorted together.
- In accordance with UL 1577, each optocoupler is proof tested by applying an insulation test voltage $> 6000V_{RMS}$ for 1 second.

Figure 1 Typical Diode Input Forward Current Characteristic



Figure 2 Typical Output Voltage vs Input Forward Current

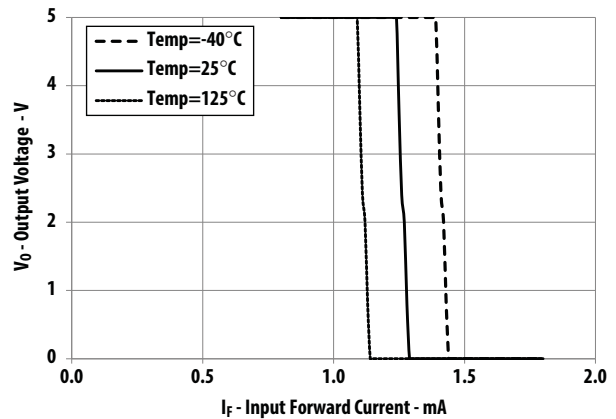


Figure 3 Typical Logic Low Output Voltage vs Logic Low Output Current



Figure 4 Typical Logic High Output Voltage vs Logic High Output Current



Figure 5 ACFL-6211U (High Speed) Typical Propagation Delay vs Temperature, $V_{IN}=4.5V$, $R_{IN}=390\Omega$, $C_{IN}=100pF$



Figure 6 ACFL-6211U (High Speed) Typical Propagation Delay vs Input Forward Current, $V_{IN}=4.5V$, $R_{IN}=390\Omega$, $C_{IN}=100pF$, $T_A=25^\circ C$



Figure 7 ACFL-6212U (5V) Typical Propagation Delay vs Temperature



Figure 8 ACFL-6212U (5V) Typical Propagation Delay vs Input Forward Current

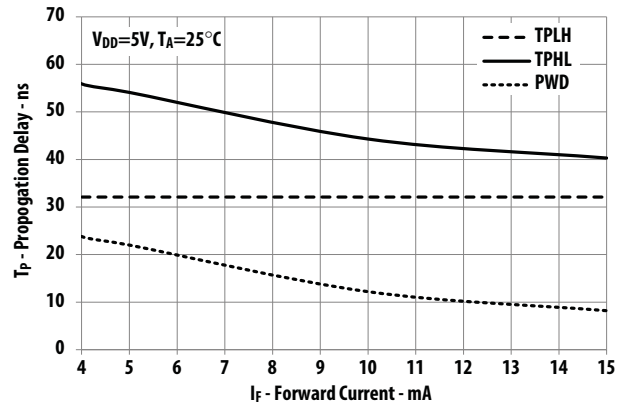


Figure 9 ACFL-6212U (3V) Typical Propagation Delay vs Temperature

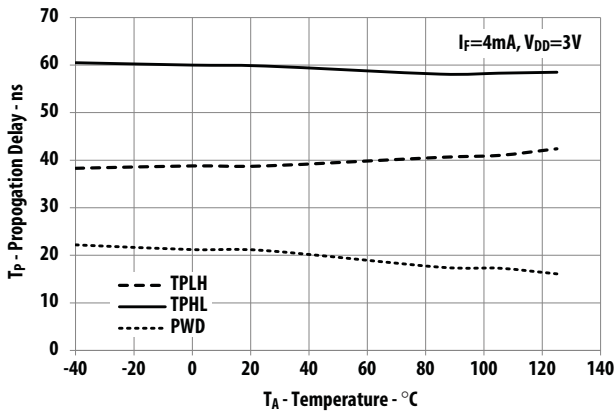


Figure 10 ACFL-6212U (3V) Typical Propagation Delay vs Input Forward Current

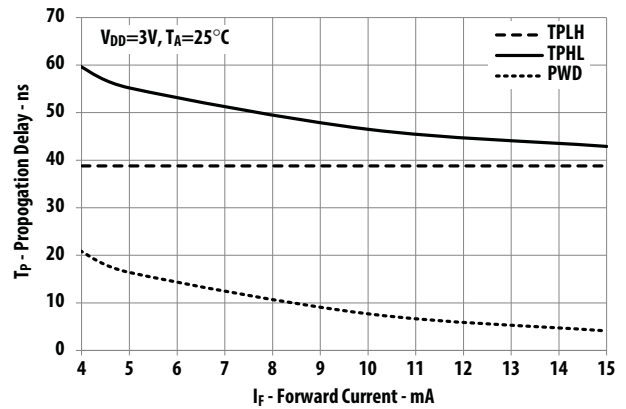
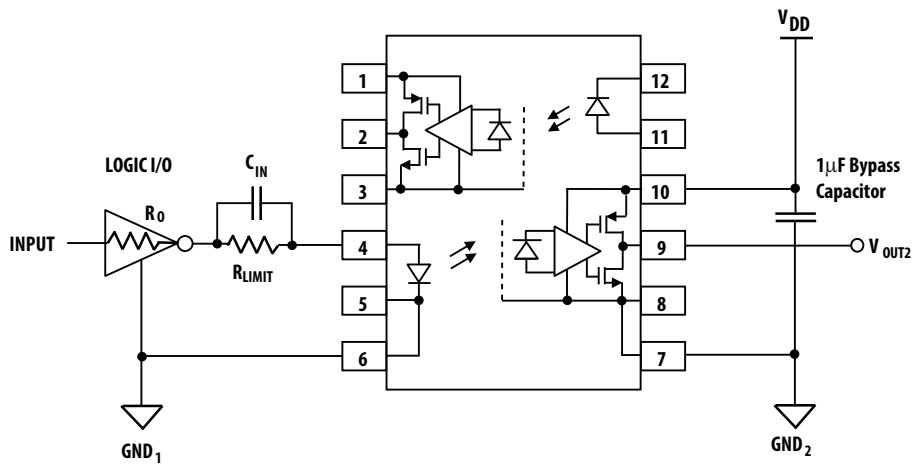


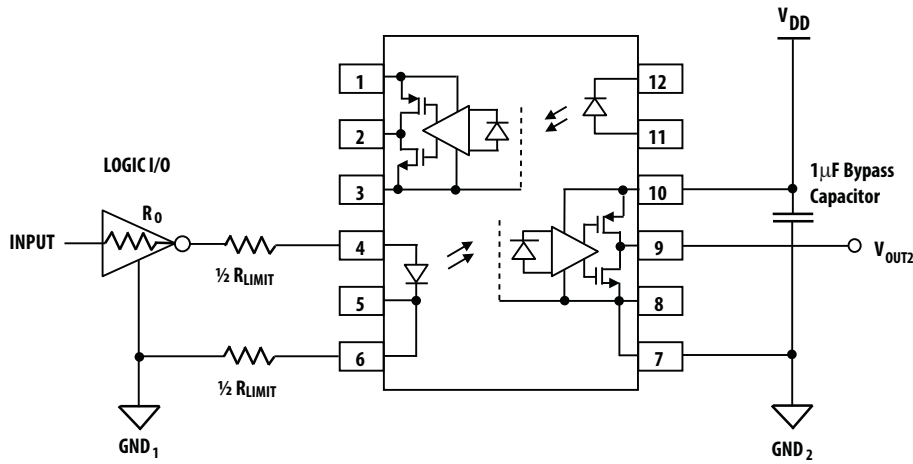
Figure 11 Recommended Application Circuit for ACFL-6211U High Speed Performance



TRUTH TABLE

| INPUT | LED | OUTPUT |
|-------|-----|--------|
| L | ON | L |
| H | OFF | H |

Figure 12 Recommended Application Circuit for ACFL-6212U Low Power Performance



TRUTH TABLE

| INPUT | LED | OUTPUT |
|-------|-----|--------|
| L | ON | L |
| H | OFF | H |

Test Circuits

Figure 13 Test Circuit for t_{PHL} , t_{PLH} , t_F and t_R

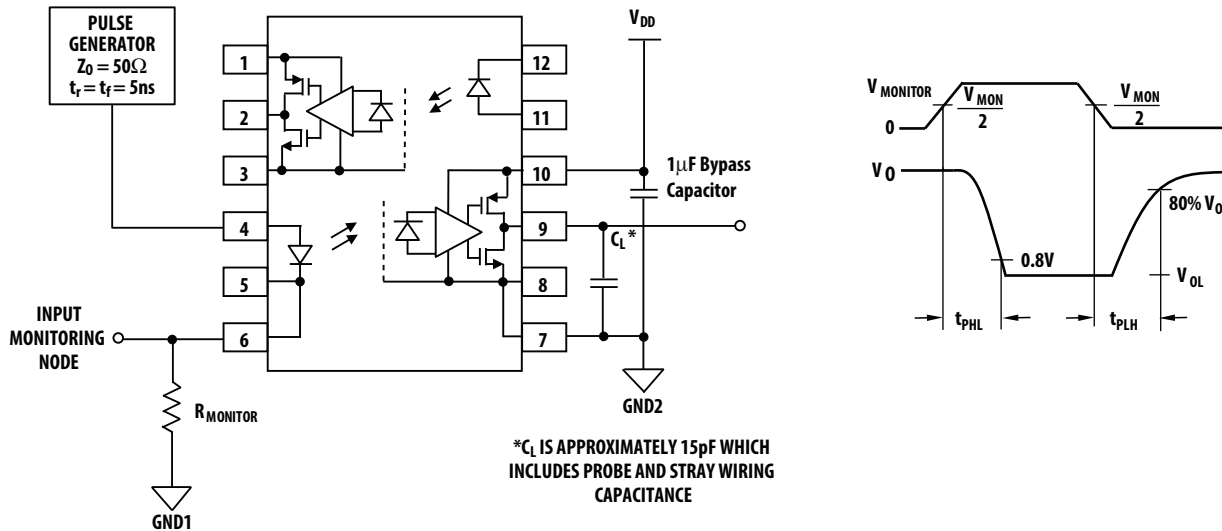
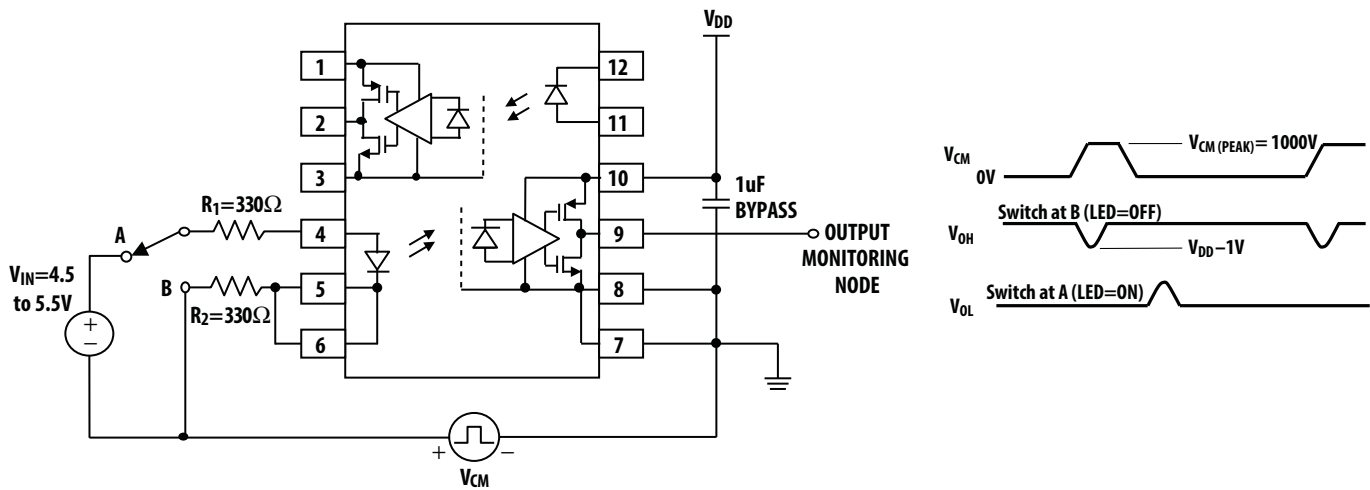


Figure 14 Test Circuit for Common Mode Transient Immunity



Thermal Resistance Measurement

The diagram of ACFL-6211U/6212U for measurement is shown in Figure 15. This is a multi-chip package with four heat sources, the effect of heating of one die due to the adjacent dice are considered by applying the theory of linear superposition. Here, one die is heated first and the temperatures of all the dice are recorded after thermal equilibrium is reached. Then, the 2nd die is heated and all the dice temperatures are recorded and so on until the 4th die is heated. With the known ambient temperature, the die junction temperature and power dissipation, the thermal resistance can be calculated. The thermal resistance calculation can be cast in matrix form. This yields a 4 by 4 matrix for our case of two heat sources.

| | | | | | | | |
|-----|-----|-----|-----|---|----|---|-----|
| R11 | R12 | R13 | R14 | · | P1 | = | ΔT1 |
| R21 | R22 | R23 | R24 | | P2 | | ΔT2 |
| R31 | R32 | R33 | R34 | | P3 | | ΔT3 |
| R41 | R42 | R43 | R44 | | P4 | | ΔT4 |

R₁₁: Thermal Resistance of Die1 due to heating of Die1 (°C/W)
 R₁₂: Thermal Resistance of Die1 due to heating of Die2 (°C/W)
 R₁₃: Thermal Resistance of Die1 due to heating of Die3 (°C/W)
 R₁₄: Thermal Resistance of Die1 due to heating of Die4 (°C/W)

R₂₁: Thermal Resistance of Die2 due to heating of Die1 (°C/W)
 R₂₂: Thermal Resistance of Die2 due to heating of Die2 (°C/W)
 R₂₃: Thermal Resistance of Die2 due to heating of Die3 (°C/W)
 R₂₄: Thermal Resistance of Die2 due to heating of Die4 (°C/W)

R₃₁: Thermal Resistance of Die3 due to heating of Die1 (°C/W)
 R₃₂: Thermal Resistance of Die3 due to heating of Die2 (°C/W)
 R₃₃: Thermal Resistance of Die3 due to heating of Die3 (°C/W)
 R₃₄: Thermal Resistance of Die3 due to heating of Die4 (°C/W)

R₄₁: Thermal Resistance of Die4 due to heating of Die1 (°C/W)
 R₄₂: Thermal Resistance of Die4 due to heating of Die2 (°C/W)
 R₄₃: Thermal Resistance of Die4 due to heating of Die3 (°C/W)
 R₄₄: Thermal Resistance of Die4 due to heating of Die4 (°C/W)

P₁: Power dissipation of Die1 (W)
 P₂: Power dissipation of Die2 (W)
 P₃: Power dissipation of Die3 (W)
 P₄: Power dissipation of Die4 (W)

T₁: Junction temperature of Die1 due to heat from all dice (°C)
 T₂: Junction temperature of Die2 due to heat from all dice (°C)
 T₃: Junction temperature of Die3 due to heat from all dice (°C)
 T₄: Junction temperature of Die4 due to heat from all dice (°C)

T_a: Ambient temperature.

ΔT₁: Temperature difference between Die1 junction and ambient (°C)

ΔT₂: Temperature difference between Die2 junction and ambient (°C)

ΔT₃: Temperature difference between Die3 junction and ambient (°C)

ΔT₄: Temperature difference between Die4 junction and ambient (°C)

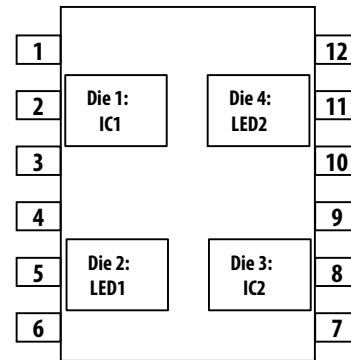
$$T_1 = (R_{11} \times P_1 + R_{12} \times P_2 + R_{13} \times P_3 + R_{14} \times P_4) + T_a \text{ -- (1)}$$

$$T_2 = (R_{21} \times P_1 + R_{22} \times P_2 + R_{23} \times P_3 + R_{24} \times P_4) + T_a \text{ -- (2)}$$

$$T_3 = (R_{31} \times P_1 + R_{32} \times P_2 + R_{33} \times P_3 + R_{34} \times P_4) + T_a \text{ -- (3)}$$

$$T_4 = (R_{41} \times P_1 + R_{42} \times P_2 + R_{43} \times P_3 + R_{44} \times P_4) + T_a \text{ -- (4)}$$

Figure 15 Diagram of ACFL-6211U/6212U for Measurement



Measurement data on a low K (conductivity) board:

R₁₁ = 181 °C/W
 R₂₁ = 103 °C/W
 R₃₁ = 82 °C/W
 R₄₁ = 110 °C/W
 R₁₂ = 91 °C/W
 R₂₂ = 232 °C/W
 R₃₂ = 97 °C/W
 R₄₂ = 86 °C/W
 R₁₃ = 85 °C/W
 R₂₃ = 109 °C/W
 R₃₃ = 180 °C/W
 R₄₃ = 101 °C/W
 R₁₄ = 112 °C/W
 R₂₄ = 91 °C/W
 R₃₄ = 91 °C/W
 R₄₄ = 277 °C/W

Measurement data on a high K (conductivity) board:

R₁₁ = 117 °C/W
 R₂₁ = 37 °C/W
 R₃₁ = 35 °C/W
 R₄₁ = 47 °C/W
 R₁₂ = 42 °C/W
 R₂₂ = 161 °C/W
 R₃₂ = 53 °C/W
 R₄₂ = 30 °C/W
 R₁₃ = 32 °C/W
 R₂₃ = 39 °C/W
 R₃₃ = 114 °C/W
 R₄₃ = 29 °C/W
 R₁₄ = 60 °C/W
 R₂₄ = 33 °C/W
 R₃₄ = 34 °C/W
 R₄₄ = 189 °C/W

For product information and a complete list of distributors, please go to our web site:

www.avagotech.com

Avago Technologies and the A logo are trademarks of Avago Technologies in the United States and other countries. All other brand and product names may be trademarks of their respective companies.

Data subject to change. Copyright © 2015 Avago Technologies. All Rights Reserved.

pub-005390 – December 25, 2015



Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.

