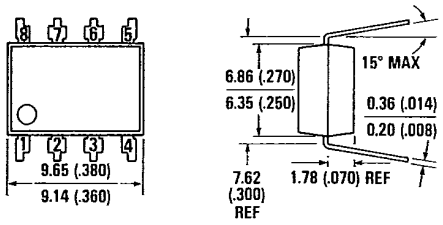
# GENERAL INSTRUMENT

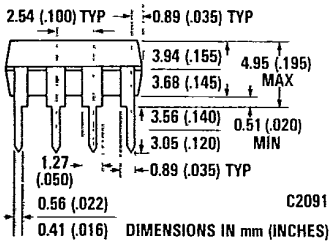
# DUAL PHOTOTRANSISTOR OPTOCOUPLERS

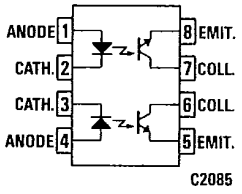


## NEW DUALS MCT6 (20%) MCT62 (100%) MCT61 (50%) MCT66 (6%)

### PACKAGE DIMENSIONS




*Equivalent Circuit*

### DESCRIPTION

The MCT6X optoisolators have two channels for high density applications. For four channel applications, two-packages fit into a standard 16-pin DIP socket. Each channel is an NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode.

### FEATURES

- Two isolated channels per package
- Two packages fit into a 16 lead DIP socket
- 2500 volt isolation
- Choice of 4 current transfer ratios
- Underwriters Laboratory (U.L.) recognized File E50151

### APPLICATIONS

- AC Line/Digital Logic — Isolate high voltage transients
- Digital Logic/Digital Logic — Eliminate spurious grounds
- Digital Logic/AC Triac Control — Isolate high voltage transients
- Twisted pair line receiver — Eliminate ground loop feedthrough
- Telephone/Telegraph line receiver — Isolate high voltage transients
- High Frequency Power Supply Feedback Control — Maintain floating ground
- Relay contact monitor — Isolate floating grounds and transients
- Power Supply Monitor — Isolate transients

### ABSOLUTE MAXIMUM RATINGS

Storage Temperature . . . . . −55°C to 150°C
Operating Temperature . . . . . −55°C to 100°C
Lead Temperature . . . . . (soldering, 10 sec.) 250°C

INPUT DIODE (each channel)
Forward current . . . . . 60mA
Reverse voltage . . . . . 3.0V
Peak forward current (1μs pulse, 300 pps) . . . . . 3A

TOTAL INPUT
Power dissipation at 25°C ambient . . . . . 100mW
Derate linearly from 25°C . . . . . 1.3mW/°C

OUTPUT TRANSISTOR (each channel)
Power dissipation @ 25°C ambient . . . . . 150mW
Derate linearly from 25°C . . . . . 2mW/°C
Collector Current . . . . . 30mA

COUPLED
Input to output breakdown voltage . . 2500 volts $V_{RMS}$
Total package power dissipation
@ 25°C ambient . . . . . 400mW
Derate linearly from 25°C . . . . . 5.33mW/°C

# MCT6 MCT61 MCT62 MCT66

## ELECTRO-OPTICAL CHARACTERISTICS (25°C Free Air Temperature Unless Otherwise Specified)

| CHARACTERISTICS | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|
| **INPUT DIODE** | | | | | |
| Rated forward voltage $V_F$ | | 1.25 | 1.50 | V | $I_F$ = 20mA |
| Reverse voltage $V_R$ | 3.0 | 25 | | V | $I_R$ = 10μA |
| Reverse current $I_R$ | | .001 | 10 | μA | $V_R$ = 3.0V |
| Junction capacitance $C_J$ | | 50 | | pF | $V_F$ = 0V |
| **OUTPUT TRANSISTOR ($I_F$ = 0)** | | | | | |
| Breakdown voltage, collector to emitter $BV_{CEO}$ | 30 | 85 | | V | $I_C$ = 1.0mA |
| Breakdown voltage, emitter to collector $BV_{ECO}$ | 6 | 13 | | V | $I_E$ = 100μA |
| Leakage current, collector to emitter $I_{CEO}$ | | 5 | 100 | nA | $V_{CE}$ = 10V |
| Capacitance collector to emitter $C_{CE}$ | | 8 | | pF | $V_{CE}$ = 0V |
| **COUPLED** | | | | | |
| DC current transfer ratio ($I_C/I_F$) = CTR | | | | | |
| MCT6 | 20 | | | % | $V_{CE}$ = 10V, $I_F$ = 10mA |
| MCT61 | 50 | | | % | $V_{CE}$ = 5 V, $I_F$ = 5 mA |
| MCT62 | 100 | | | % | $V_{CE}$ = 5 V, $I_F$ = 5 mA |
| MCT66 | 6 | | | % | $V_{CE}$ = 10V, $I_F$ = 10mA |
| Isolation voltage $BV_{(I-O)}$ | 2500 | | | $V_{RMS}$ | t = 1 minute |
| Isolation resistance MCT6X– $R_{(I-O)}$ | $10^{11}$ | $10^{12}$ | | Ω | $V_{I-O}$ = 500VDC |
| Breakdown voltage – channel-to-channel MCT6X | | 500 | | VDC | Relative humidity = 40% f = 1MHz |
| Capacitance between channels | | 0.4 | | pF | |
| Saturation voltage – collector to emitter $V_{CE(SAT)}$ | | | | | |
| MCT6, 61, 62 | | 0.2 | 0.4 | V | $I_C$ = 2mA, $I_F$ = 16mA |
| MCT66 | | 0.2 | 0.4 | V | $I_C$ = 2mA, $I_F$ = 40mA |
| Bandwidth $B_W$ | | 150 | | kHz | $I_C$ = 2mA, $V_{CC}$ = 10V, $R_L$ = 100Ω |
| **SWITCHING TIMES, OUPUT TRANSISTOR** | | | | | |
| Non-saturated rise time, fall time (Note 3) | | 2.4 | | μs | $I_C$ = 2mA, $V_{CE}$ = 10V, $R_L$ = 100Ω |
| Non-saturated rise time, fall time (Note 3) | | 15 | | μs | $I_C$ = 2mA, $V_{CE}$ = 10V, $R_L$ = 1KΩ |
| Saturated turn-on time (from 5.0V to 0.8V) | | 5 | | μs | $R_L$ = 2KΩ, $I_F$ = 40mA |
| Saturated turn-off time (from saturation to 2.0V) | | 25 | | μs | $R_L$ = 2KΩ, $I_F$ = 40mA |

## MCT6 TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

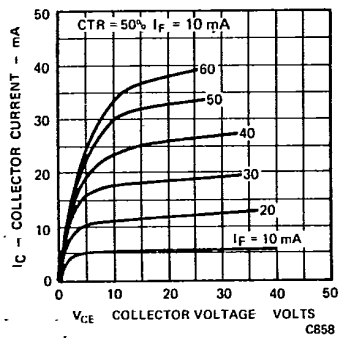



*Fig. 1. I-V Curve of Phototransistor*

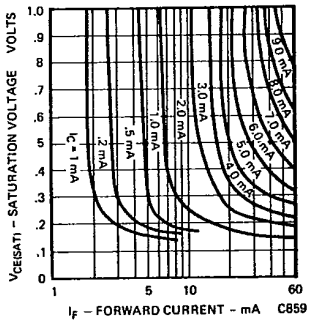



*Fig. 2. I-V Curve in Saturation*

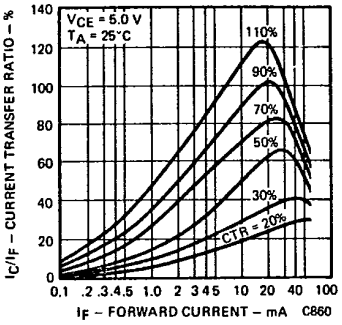



*Fig. 3. CTR vs. Forward Current*

## MCT6 TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES (Cont'd)

(25°C Free Air Temperature Unless Otherwise Specified)

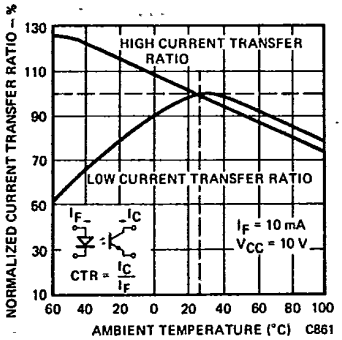



*Fig. 4. Current Transfer Ratio vs. Temperature*

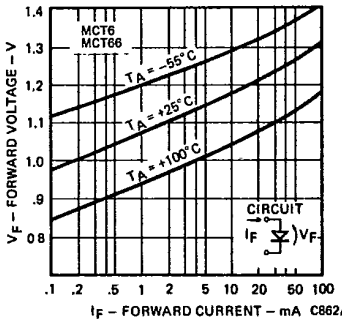



*Fig. 5. I-V Curve of LED vs. Temperature*

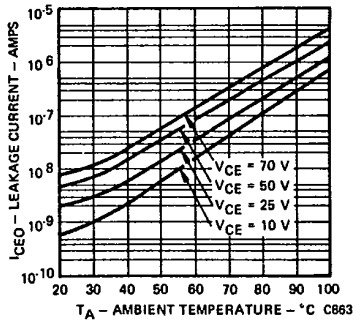



*Fig. 6. Leakage Current vs. Temperature vs. Collector Voltage*

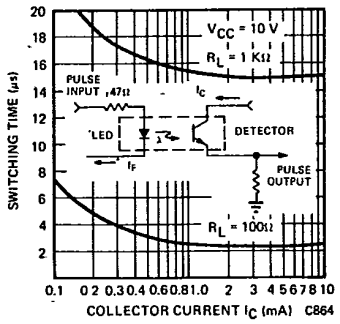



*Fig. 7. Switching Time vs. Collector Current*

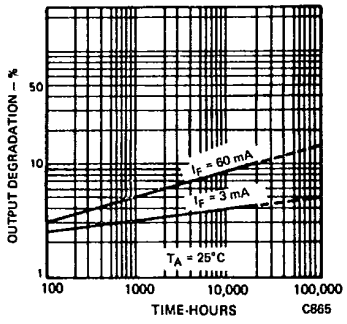



*Fig. 8. Lifetime vs. Forward Current (Note 1)*

## MCT66 TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

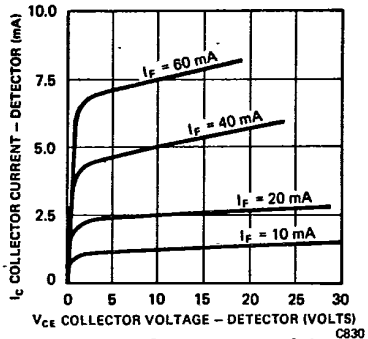



*Fig. 1. Detector Output Characteristics*

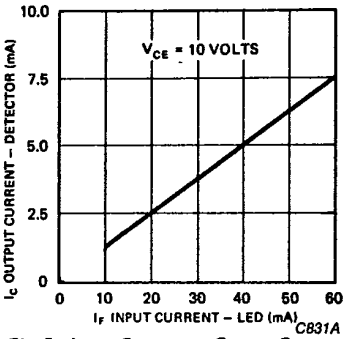



*Fig. 2. Input Current vs. Output Current*

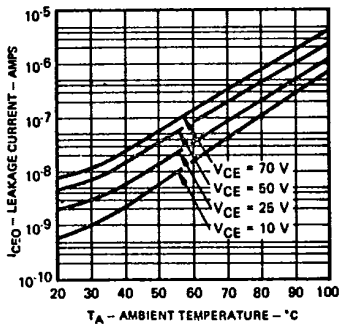



*Fig. 3. Leakage Current vs. Temperature vs. Collector Voltage*

## MCT66 TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES (Cont'd)

(25° C Free Air Temperature Unless Otherwise Specified)

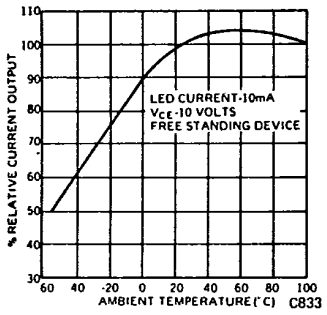



*Fig. 4. Current Output vs. Temperature*

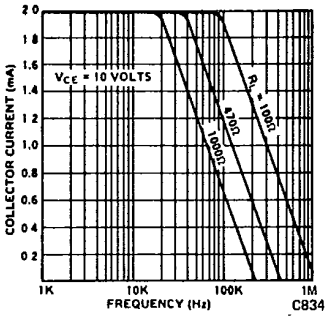



*Fig. 5. Output vs. Frequency*

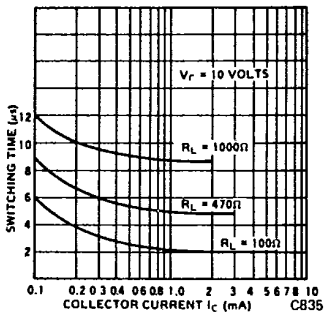



*Fig. 6. Switching Time vs. Collector Current*

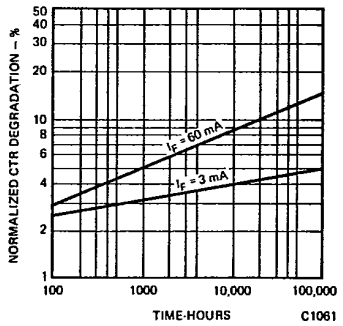
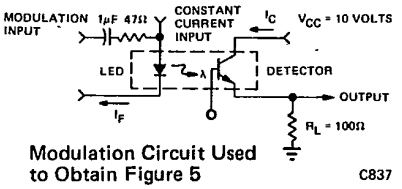
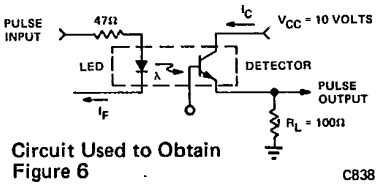



*Fig. 7. Lifetime vs. Forward Current*




Modulation Circuit Used to Obtain Figure 5 C837




Circuit Used to Obtain Figure 6 C838

### NOTES

1. *Normalized CTR degradation* $= \frac{CTR_O - CTR}{CTR_O}$
2. *The current transfer ratio* ($I_C/I_F$) *is the ratio of the detector collector current to the LED input current with* $V_{CE}$ *at 10 volts.*
3. *The frequency at which* $i_C$ *is 3 dB down from the 1 kHz value.*
4. *Rise time* ($t_r$) *is the time required for the collector current to increase from 10% of its final value to 90%. Fall time* ($t_f$) *is the time required for the collector current to decrease from 90% of its initial value to 10%.*