

MICROCOUPLERS FOR HYBRID CIRCUITS

MC022, MC035, MC074

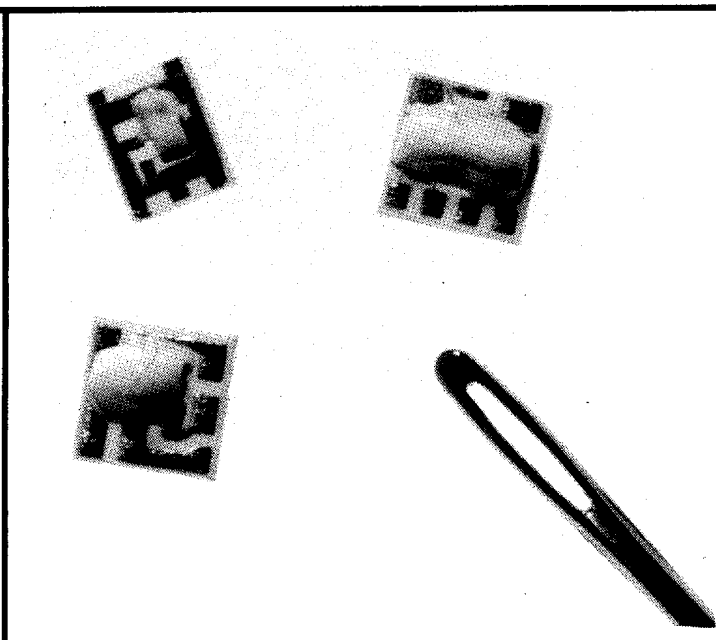


FEATURES

- Variety of output circuits
- Small size saves real estate
- Guaranteed performance over full military temperature range
- Large thick film gold bonding pads
- Element evaluation performed upon request
- Custom and multichannel versions available

APPLICATIONS

- Eliminate ground loops
- Level shifting
- Line receiver
- Microprocessor system interface
- Switching power supplies
- Solid state switches
- Pulse transformer replacement
- Motor control



DESCRIPTION

The MC022, MC035 and MC074 Microcouplers are designed to be epoxy mounted and bonded into hybrid circuits. All versions are .120" x .120" maximum and none is taller than .060". The Microcouplers are all built on thick film metalized ceramic substrates. Large thick film gold bonding pads provide ample space for quick, easy wire bonding.

Utilizing state-of-the-art optocoupler technology, high efficiency infrared LEDs are optically coupled to light sensitive detectors. Various output versions are available, thus making the Microcoupler the right choice for almost any circuit application. Custom and multichannel versions are also available.

Micropac fully understands the hybrid manufacturer's concern for reliability. With this understanding Micropac provides the Microcouplers with full 100% DC test (+ 125°C test option upon request) or 100% DC test and element evaluation. All Microcouplers are capable of operating over the full military temperature range.

ABSOLUTE MAXIMUM RATINGS

Input-to-Output Voltage	± 1 KV
Input Diode Continuous Forward Current ¹	100 mA
Input Diode Peak Forward Current ²	1 A
Operating Temperature Range	- 55°C to + 125°C
Storage Temperature Range	- 65°C to + 150°C
Mounting Temperature ³	150°C

NOTES:

1. Derate linearly at a rate of 0.8 mA/°C above 25°C
2. This value applies for a $t_w \leq 1 \mu s$. $P_{RR} < 300$ pps.
3. 1 hour maximum.

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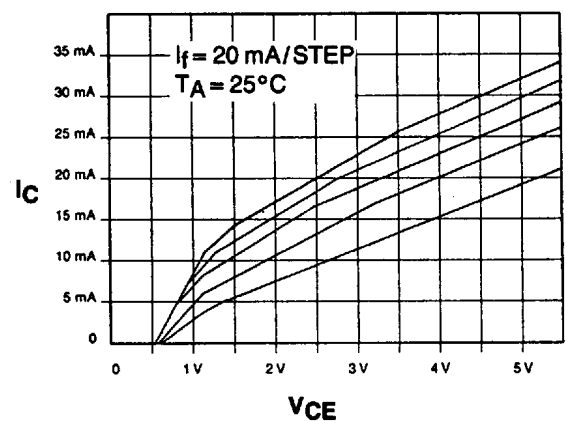
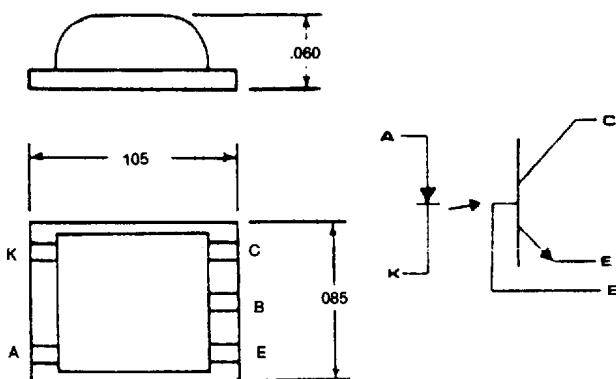
MC022**SMALL PHOTOTRANSISTOR OUTPUT**

OPTICAL/ELECTRICAL CHARACTERISTICS AT 25°C (UNLESS OTHERWISE SPECIFIED)								
PARAMETER	INPUT DIODE STATIC REVERSE CURRENT	INPUT DIODE STATIC FORWARD VOLTAGE	INPUT-TO-OUTPUT INTERNAL RESISTANCE	INPUT-TO-OUTPUT CAPACITANCE		COLLECTOR-EMITTER SATURATION VOLTAGE		
TEST CONDITION	$V_R = 2\text{ V}$	$I_f = 50\text{ mA}$	$V_{in-out} = 1\text{ KV}$ See Note A	$f = 1\text{ MHz}$ $V_{in-out} = 0$ See Note A		$I_f = \text{As shown}$ $I_B = 0$ $I_C = \text{As shown}$		
SYMBOL	I_R	V_f	R_{IO}	C_{IO}		$V_{CE}(\text{SAT})$		
UNIT	$\mu\text{ A}$	VDC	Ω	pF		VDC		
	MAX	MAX	MIN	TYP	MAX	I_f	I_C	MAX
- XX2	100	1.7	10^{11}	2.5	5	20 mA	10 $\mu\text{ A}$	.3
- XX3	100	1.7	10^{11}	2.5	5	7 mA	200 $\mu\text{ A}$	.3

NOTE A—These parameters are measured between all phototransistor leads shorted together and both input diode leads shorted together.

PARAMETER	COLLECTOR-BASE BREAKDOWN VOLTAGE	COLLECTOR-EMITTER BREAKDOWN VOLTAGE	EMITTER-BASE BREAKDOWN VOLTAGE	ON-STATE COLLECTOR CURRENT		OFF-STATE COLLECTOR CURRENT	
TEST CONDITION	$I_C = 100\text{ } \mu\text{ A}$ $I_B = 0$ $I_f = 0$	$I_C = 1\text{ mA}$ $I_B = 0$ $I_f = 0$	$I_C = 0$ $I_E = 100\text{ } \mu\text{ A}$ $I_f = 0$	$I_f = \text{As shown}$ $V_{CE} = 5\text{ V}$ $I_B = 0$		$V_{CE} = 30\text{ V}$ $I_f = 0$ $I_B = 0$	
SYMBOL	$V_{(BR)CBO}$	$V_{(BR)CEO}$	$V_{(BR)EBO}$	$I_{C(ON)}$		I_d	
UNIT	V	V	V	mA		nA	
	MIN	MIN	MIN	I_f	MIN	TYP	MAX
- XX2	50	50	—	25 mA	2	5	25
- XX3	35	35	7	10 mA	10	25	100

SWITCHING CHARACTERISTICS AT 25°C FREE-AIR TEMPERATURE							
PARAMETER		TEST CONDITIONS	XX2		XX3		UNIT
t_r Rise Time	Phototransistor Operation	$I_f = 25\text{ mA}$ $V_{CE} = 5\text{ V}$ $R_L = 100\text{ } \Omega$	TYP	MAX	TYP	MAX	$\mu\text{ sec}$
t_f Fall Time			—	30	—	10	
			—	20	—	10	

**MC022 - XX3**

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MC035**LARGE PHOTOTRANSISTOR OUTPUT****OPTICAL/ELECTRICAL CHARACTERISTICS AT 25°C (UNLESS OTHERWISE SPECIFIED)**

PARAMETER	INPUT DIODE STATIC REVERSE CURRENT	INPUT DIODE STATIC FORWARD VOLTAGE	INPUT-TO-OUTPUT INTERNAL RESISTANCE	INPUT-TO-OUTPUT CAPACITANCE		COLLECTOR-EMITTER SATURATION VOLTAGE		
TEST CONDITION	$V_R = 2\text{ V}$	$I_f = 50\text{ mA}$	$V_{in-out} = 1\text{ KV}$ See Note A	$f = 1\text{ MHz}$ $V_{in-out} = 0$ See Note A		$I_f = \text{As shown}$ $I_B = 0$ $I_C = \text{As shown}$		
SYMBOL	I_R	V_f	R_{IO}	C_{IO}		$V_{CE}(\text{SAT})$		
UNIT	$\mu\text{ A}$	VDC	Ω	pF		VDC		
	MAX	MAX	MIN	TYP	MAX	I_f	I_C	MAX
- XX1	100	1.7	10^{11}	2.5	5	2 mA	2 mA	.3

NOTE A—These parameters are measured between all phototransistor leads shorted together and both input diode leads shorted together.

PARAMETER	COLLECTOR-BASE BREAKDOWN VOLTAGE	COLLECTOR-EMITTER BREAKDOWN VOLTAGE	EMITTER-BASE BREAKDOWN VOLTAGE	ON-STATE COLLECTOR CURRENT			OFF-STATE COLLECTOR CURRENT
TEST CONDITION	$I_C = 100\text{ }\mu\text{ A}$ $I_B = 0$ $I_f = 0$	$I_C = 1\text{ mA}$ $I_B = 0$ $I_f = 0$	$I_C = 0$ $I_E = 100\text{ }\mu\text{ A}$ $I_f = 0$	$I_f = 1\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_B = 0$			$V_{CE} = 30\text{ V}$ $I_f = 0$ $I_B = 0$
SYMBOL	$V_{(BR)CBO}$	$V_{(BR)CEO}$	$V_{(BR)EBO}$	$I_C(\text{ON})$			I_d
UNIT	V	V	V	mA			nA
	MIN	MIN	MIN	I_f	MIN	TYP	MAX
- XX1	45	40	7	1 mA	2	5	100

SWITCHING CHARACTERISTICS AT 25°C FREE-AIR TEMPERATURE

PARAMETER		TEST CONDITIONS	XX1		UNIT
t_r Rise Time	Phototransistor	$I_f = 25\text{ mA}$ $V_{CE} = 5\text{ V}$ $R_L = 100\text{ }\Omega$	TYP	MAX	$\mu\text{ sec}$
			—	25	
			—	25	
t_f Fall Time	Operation				

MC074**PHOTOVOLTAIC OUTPUT****OPTICAL/ELECTRICAL CHARACTERISTICS AT 25°C (UNLESS OTHERWISE SPECIFIED)**

PARAMETER	INPUT DIODE STATIC REVERSE CURRENT	INPUT DIODE STATIC FORWARD VOLTAGE	INPUT-TO-OUTPUT INTERNAL RESISTANCE	INPUT-TO-OUTPUT CAPACITANCE		OPEN CIRCUIT VOLTAGE	SHORT CIRCUIT CURRENT
TEST CONDITION	$V_R = 2\text{ V}$	$I_f = 20\text{ mA}$	$V_{in-out} = 500\text{ V}$ See Note A	$f = 1\text{ MHz}$ $V_{in-out} = 0$ See Note A		$I_f = 20\text{ mA}$	$I_f = 20\text{ mA}$
SYMBOL	I_R	V_f	R_{IO}	C_{IO}		V_{OC}	I_{SC}
UNIT	$\mu\text{ A}$	VDC	Ω	pF		V	$\mu\text{ A}$
	MAX	MAX	MIN	TYP	MAX	MIN	MIN
- XX1	100	1.7	10^{11}	2.5	10	12.5	2.5

NOTE A—These parameters are measured between all phototransistor leads shorted together and both input diode leads shorted together.

TRANSISTOR OUTPUT

PARAMETER	CURRENT TRANSFER RATIO			COLLECTOR-EMITTER SATURATION VOLTAGE			OFF-STATE COLLECTOR CURRENT		SWITCHING SPEED			FEATURES
SYMBOL	CTR			$V_{CE(SAT)}$			I_{CEO}		t_r/t_f			Typical CTR 250% Typical CTR 500% Rad Hard Version
UNITS	%			V			nA		μs			
	I_F (mA)	V_{CE} (V)	MIN	I_F (mA)	I_C (mA)	MAX	$V_{CE(V)}$	MAX	I_F (mA)	R_L (Ω)	MAX	
MC022	10	5	100	7	0.2	0.3	30	100	25	100	10	
MC035	1	5	200	2	2	0.3	30	100	25	100	25	
MC099	10	5	100	10	10	0.3	20	100	10	100	20	

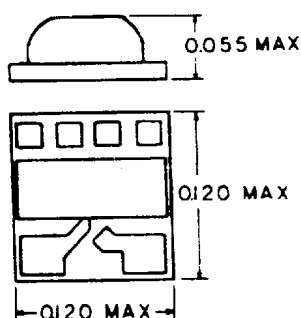
PHOTOVOLTAIC OUTPUT

PARAMETER	OPEN CIRCUIT VOLTAGE		SHORT CIRCUIT CURRENT		SWITCHING SPEED						FEATURES	
SYMBOL	V _{OC}		I _{sc}		t _r			t _f			RL	Dual Photocells
UNITS	V		μA		μs			μs			MΩ	
	I _F (mA)	MIN	I _F (mA)	MIN	I _F (mA)	TYP	MAX	I _F (mA)	TYP	MAX		
MC074	20	12.5	20	2.5	50	25	50	50	350	500	10	

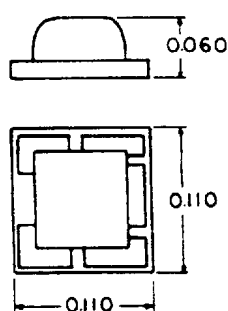
OPEN - COLLECTOR DIGITAL/ANALOG OUTPUT

PARAMETER	CURRENT TRANSFER RATIO			LOW LEVEL OUTPUT VOLTAGE			PROPAGATION DELAYS				FEATURES
SYMBOL	CTR			V_{OL}					T_{PLH}	T_{PHL}	Low Input Current, High Gain Typical CTR 1000% ($I_F = 0.5mA$) Very High Speed (5 mhz) TTL Compatible Input, Output
UNITS	%			V					μs	μs	
	I_F (mA)	V_{OL} (V)	MIN	I_F (mA)	I_{OL} (mA)	MAX	I_F (mA)	R_L (Ω)	MAX	MAX	
MC012	0.5	0.4	300	0.5	1.5	0.4	0.5	4.7K	60	100	
MC013	10	0.6	100	10	10	0.4	13	470	0.1	0.1	

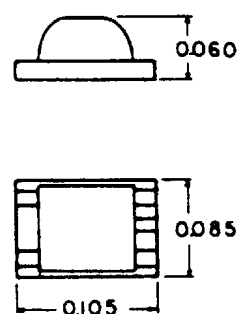
MC074



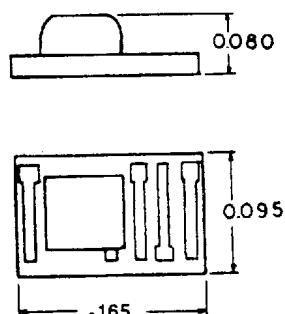
MC035



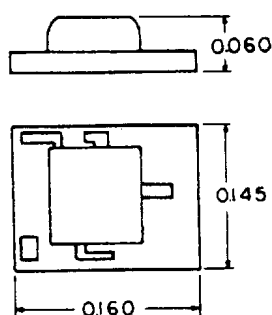
MC022



MC013



MC012



MC099

