

# PHOTO TRANSISTOR COUPLER

## MT6350, MT6360

T-41-83

### APPLICATIONS

- OFFICE MACHINERY
- COPIERS
- SOLID STATE RELAY
- SWITCHING POWER SUPPLY
- PROGRAMABLE CONTROLLERS

The MARKTECH MT6350 and MT6360 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.

MT6360 is no-base internal connection for high-EMI environments.

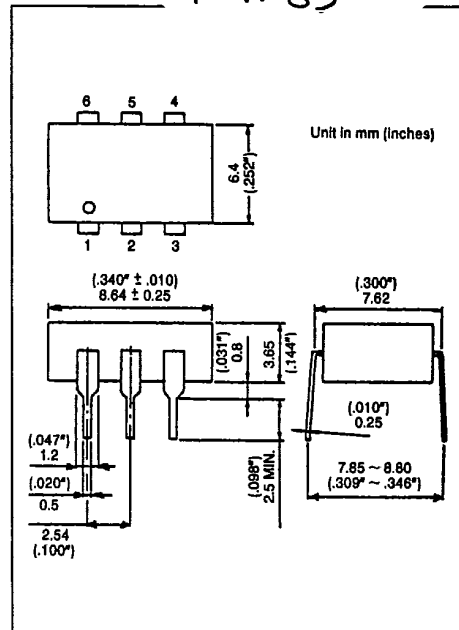
### FEATURES

- Collector-Emitter Voltage : 55V Min.
- Current Transfer Ratio : 50% Min.  
Rank GB : 100% Min.
- Isolation Voltage : 5000V<sub>rms</sub> Min.
- Guaranteed Requirements of IEC380/VDE0806
- Climatic Test Class : 55/150/21
- Isolation Creepage Path : 8.0mm Min.
- Isolation Clearance : 7.3mm Min.
- Isolation Operating Voltage : 500V<sub>ac</sub> or 600V<sub>dc</sub> for Isolation Group C. \*1
- Creeping Current Resistance : Group I \*2

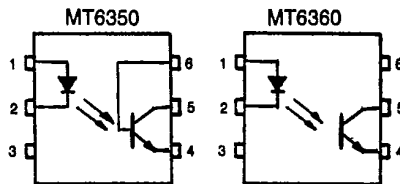
\*1 : According to VDE0110, table 4  
\*2 : According to VDE0110, table 3

THE MT6350 CONTAINS ALL MECHANICAL & OPTO ELECTRICAL PARAMETERS AS THE MT6310, WITH NEW SAFETY STANDARDS ADDED.

THE MT6360 CONTAINS ALL MECHANICAL & OPTO ELECTRICAL PARAMETERS AS THE MT6320, WITH NEW SAFETY STANDARDS ADDED.



### PIN CONFIGURATIONS (TOP VIEW)



- 1: ANODE  
2: CATHODE  
3: NC  
4: EMITTER  
5: COLLECTOR  
6: BASE

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	I <sub>F</sub>	60	mA
	Forward Current Derating (Ta ≥ 39°C)	ΔI <sub>F</sub> /°C	-0.7	mA/°C
	Peak Forward Current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Power Dissipation	P <sub>D</sub>	100	mW
	Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>D</sub> /°C	-1.0	mW/°C
	Reverse Voltage	V <sub>R</sub>	5	V
	Junction Temperature	T <sub>J</sub>	125	°C
DETECTOR	Collector-Emitter Voltage	V <sub>CEO</sub>	55	V
	Collector-Base Voltage (MT6350)	V <sub>CB0</sub>	80	V
	Emitter-Collector Voltage	V <sub>ECO</sub>	7	V
	Emitter-Base Voltage (MT6350)	V <sub>EBO</sub>	7	V
	Collector Current	I <sub>C</sub>	50	mA
	Power Dissipation	P <sub>C</sub>	150	mW
	Power Dissipation Derating (Ta ≥ 25°C)	ΔP <sub>C</sub> /°C	-1.5	mW/°C
	Junction Temperature	T <sub>J</sub>	125	°C
Storage Temperature Range		T <sub>stg</sub>	-55 ~ 150	°C
Operating Temperature Range		T <sub>opr</sub>	-55 ~ 100	°C
Lead Soldering Temperature (10 sec.)		T <sub>sold</sub>	260	°C
Total Package Power Dissipation		P <sub>T</sub>	250	mW
Total Package Power Dissipation Derating (Ta ≥ 25°C)		ΔP <sub>T</sub> /°C	-2.5	mW/°C
Isolation Voltage (AC, 1 min., RH ≤ 60%)		BV <sub>S</sub>	5000	V <sub>rms</sub>

# PHOTO TRANSISTOR COUPLER

T-41-83

## ISOLATION CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance Input to Output	C <sub>S</sub>	V <sub>S</sub> =0, f=1MHz	—	0.8	—	pF
Isolation Resistance	R <sub>S</sub>	V <sub>S</sub> =500V	5x10 <sup>9</sup>	10 <sup>11</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	5000	—	—	V <sub>rms</sub>
		AC, 1 second	—	10000	—	V <sub>rms</sub>
		DC, 1 minute	—	10000	—	V <sub>dc</sub>

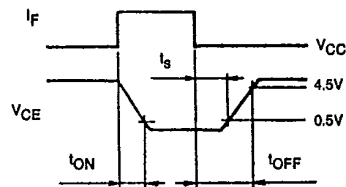
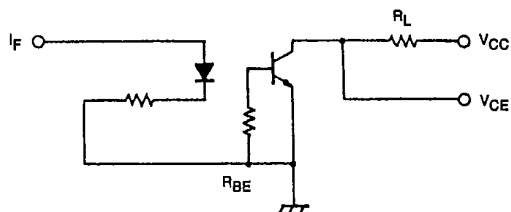
## SWITCHING CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t <sub>r</sub>	V <sub>CC</sub> =10V I <sub>C</sub> =2mA R <sub>L</sub> =100Ω	—	2	—	μs
Fall Time	t <sub>f</sub>		—	3	—	
Turn-on Time	t <sub>on</sub>		—	3	10	
Turn-off Time	t <sub>off</sub>		—	3	10	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> =1.9kΩ (Fig. 1)	—	2	—	μs
Storage Time	t <sub>S</sub>	R <sub>BE</sub> =OPEN	—	15	—	
Turn-off Time	t <sub>OFF</sub>	V <sub>CC</sub> =5V, I <sub>F</sub> =16mA	—	25	—	
Turn-on Time	t <sub>ON</sub>	R <sub>L</sub> =1.9kΩ (Fig. 1)	—	2	—	μs
Storage Time	t <sub>S</sub>	R <sub>BE</sub> =220kΩ (MT6350)	—	12	—	
Turn-off Time	t <sub>OFF</sub>	V <sub>CC</sub> =5V, I <sub>F</sub> =16mA	—	20	—	

## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>CC</sub>	—	5	24	V
Forward Current	I <sub>F</sub>	—	16	25	mA
Collector Current	I <sub>C</sub>	—	1	10	mA
Operating Temperature	T <sub>opr</sub>	-25	—	85	°C

Fig. 1 SWITCHING TIME TEST CIRCUIT



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T-41-83

## INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta=25°C)

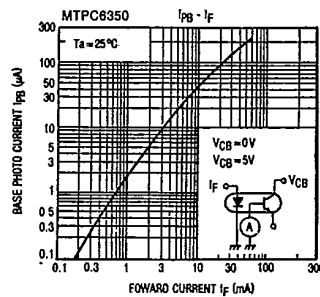
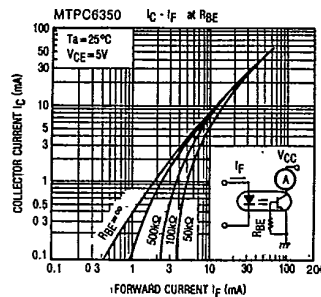
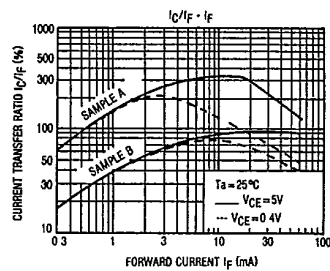
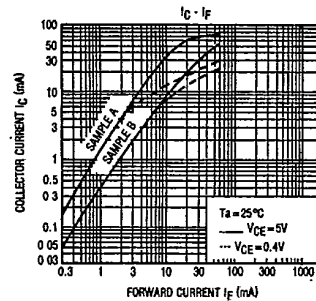
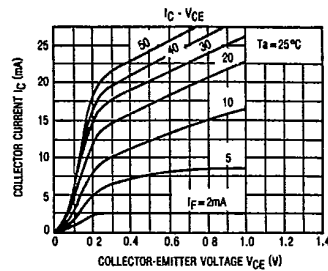
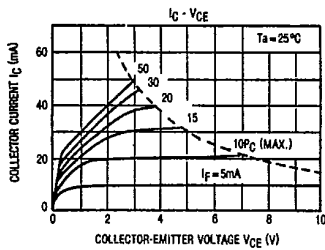
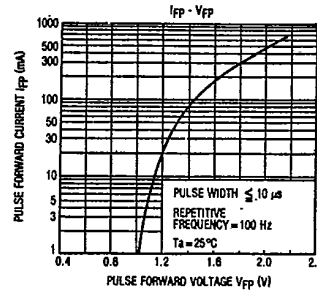
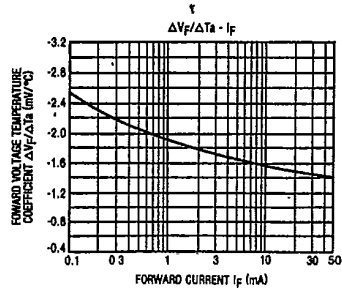
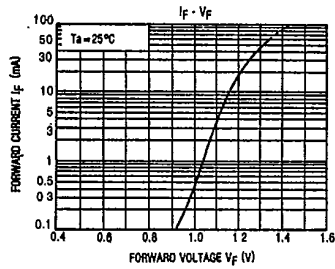
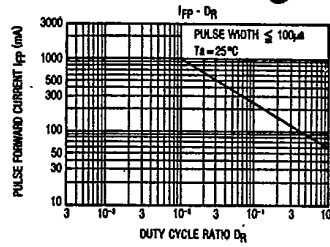
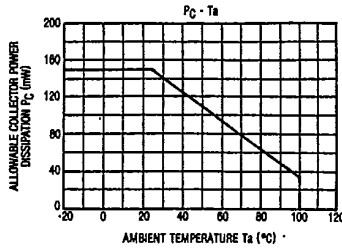
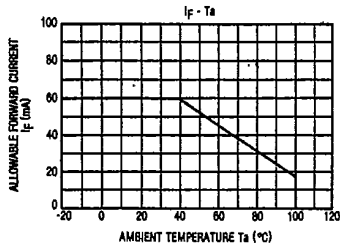
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	$V_F$	$I_F=10mA$	1.0	1.15	1.3	V
	Reverse Current	$I_R$	$V_R=5V$	—	—	10	$\mu A$
	Capacitance	$C_T$	$V=0, f=1MHz$	—	30	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=0.5mA$	55	—	—	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	$I_E=0.1mA$	7	—	—	V
	Collector-Base Breakdown Voltage (MT6350)	$V_{(BR)CBO}$	$I_C=0.1mA$	80	—	—	V
	Emitter-Base Breakdown Voltage (MT6350)	$V_{(BR)EBO}$	$I_E=0.1mA$	7	—	—	V
	Collector Dark Current	$I_{CEO}$	$V_{CE}=24V$	—	10	100	nA
			$V_{CE}=24V, T_a=85^\circ C$	—	2	50	$\mu A$
	Collector Dark Current (MT6350)	$I_{CER}$	$V_{CE}=24V, T_a=85^\circ C, R_{BE}=1M\Omega$	—	0.5	10	$\mu A$
	Collector Dark Current (MT6350)	$I_{CBO}$	$V_{CB}=10V$	—	0.1	—	nA
	DC Forward Current Gain (MT6350)	$h_{FE}$	$V_{CE}=5V, I_C=0.5mA$	—	400	—	—
	Capacitance Collector to Emitter	$C_{CE}$	$V=0, f=1MHz$	—	10	—	pF

## COUPLED ELECTRICAL CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	$I_C/I_F$	$I_F=5mA, V_{CE}=5V$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C/I_F(sat)$	$I_F=1mA, V_{CE}=0.4V$ Rank GB	—	60	—	%
			30	—	—	
Base Photo-Current (MT6350)	$I_{PB}$	$I_F=5mA, V_{CB}=5V$	—	10	—	$\mu A$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=2.4mA, I_F=8mA$	—	—	0.4	V
		$I_C=0.2mA, I_F=1mA$ Rank GB	—	0.2	—	
			—	—	0.4	

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