

T-41-73

**MOTOROLA  
SEMICONDUCTOR**  
TECHNICAL DATA

## Slotted Optical Switches Transistor Output

These devices each consist of a gallium arsenide infrared emitting diode facing a silicon NPN phototransistor in a molded plastic housing. A slot in the housing between the emitter and the detector provides the means for mechanically interrupting the infrared beam. These devices are widely used as position sensors in a variety of applications.

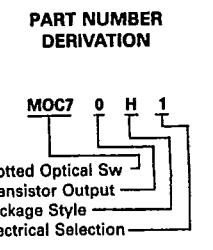
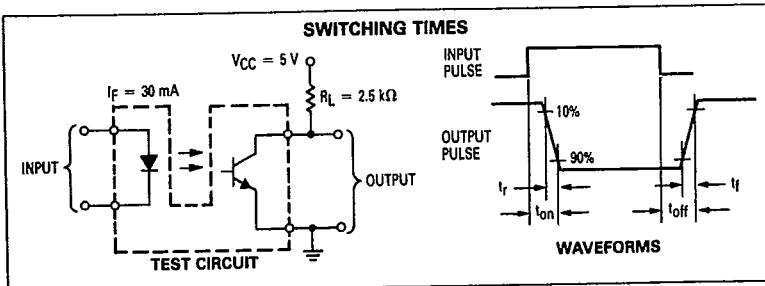
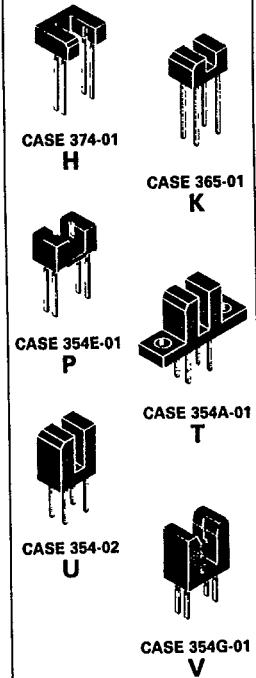
- Single Unit for Easy PCB Mounting
- Non-Contact Electrical Switching
- Long-Life Liquid Phase Epi Emitter
- Several Convenient Package Styles

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
<b>INPUT LED</b>			
Reverse Voltage	$V_R$	6	Volts
Forward Current — Continuous	$I_F$	60	mA
Input Transistor Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 2	mW $\text{mW}/^\circ\text{C}$
<b>OUTPUT TRANSISTOR</b>			
Collector-Emitter Voltage	$V_{CEO}$	30	Volts
Output Current — Continuous	$I_C$	100	mA
Output Transistor Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 2	mW $\text{mW}/^\circ\text{C}$
<b>TOTAL DEVICE</b>			
Ambient Operating Temperature Range	$T_A$	-40 to +100	°C
Storage Temperature	$T_{stg}$	-40 to +100	°C
Lead Soldering Temperature (5 seconds max)	—	260	°C
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 4	mW $\text{mW}/^\circ\text{C}$

## MOC70 Series

### SLOTTED OPTICAL SWITCHES TRANSISTOR OUTPUT



ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted. Note 1.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>INPUT LED</b>					
Forward Voltage ( $I_F = 50 \text{ mA}$ )	$V_F$	0.9	1.3	1.8	Volts
Reverse Leakage ( $V_R = 6 \text{ V}$ )	$I_R$	—	1	100	$\mu\text{A}$
Capacitance ( $V = 0 \text{ V}, f = 1 \text{ MHz}$ )	$C_J$	—	18	—	pF
<b>OUTPUT TRANSISTOR</b>					
Dark Current ( $V_{CE} = 10 \text{ V}$ )	$I_{CEO}$	—	5	100	nA
Collector-Emitter Breakdown Voltage ( $I_C = 10 \text{ mA}$ )	$V_{(BR)CEO}$	30	45	—	Volts
Emitter-Collector Breakdown Voltage ( $I_E = 100 \mu\text{A}$ )	$V_{(BR)ECO}$	5	7	—	Volts
DC Current Gain ( $V_{CE} = 10 \text{ V}, I_C = 2 \text{ mA}$ )	$h_{FE}$	—	700	—	—
<b>COUPLED (Note 2)</b>					
Output Collector Current ( $I_F = 5 \text{ mA}, V_{CE} = 10 \text{ V}$ )	$I_C$ MOC70_1	0.15	0.3	—	mA
	MOC70_2	0.3	0.6	—	
	MOC70_3	0.6	1	—	
Output Collector Current ( $I_F = 20 \text{ mA}, V_{CE} = 10 \text{ V}$ )	$I_C$ MOC70_1	1	2	—	mA
	MOC70_2	2	4	—	
	MOC70_3	4	7	—	
Output Collector Current ( $I_F = 30 \text{ mA}, V_{CE} = 10 \text{ V}$ )	$I_C$ MOC70_1	1.9	3.8	—	mA
	MOC70_2	3	6	—	
	MOC70_3	5.5	10	—	
Collector-Emitter Saturation Voltage ( $I_C = 1.8 \text{ mA}, I_F = 30 \text{ mA}$ )	$V_{CE(\text{sat})}$ MOC70_1	—	0.25	0.4	Volts
Collector-Emitter Saturation Voltage ( $I_C = 1.8 \text{ mA}, I_F = 20 \text{ mA}$ )	$V_{CE(\text{sat})}$ MOC70_2	—	0.25	0.4	Volts
	MOC70_3	—	0.25	0.4	
Turn-On Time ( $I_F = 30 \text{ mA}, V_{CE} = 5 \text{ V}, R_L = 2.5 \text{ k}\Omega$ )	$t_{on}$	—	20	—	$\mu\text{s}$
Turn-Off Time ( $I_F = 30 \text{ mA}, V_{CE} = 5 \text{ V}, R_L = 2.5 \text{ k}\Omega$ )	$t_{off}$	—	80	—	$\mu\text{s}$

Notes: 1. Stray radiation can alter values of characteristics. Adequate light shielding should be provided.

2. No actuator in sensing gap.

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## TYPICAL CHARACTERISTICS

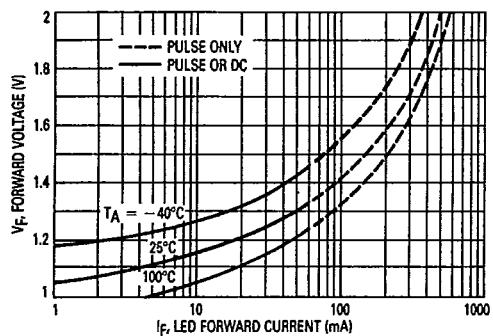


Figure 1. LED Forward Voltage versus Forward Current

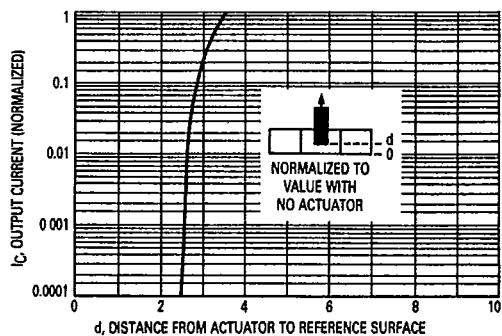


Figure 2. Output Current versus Actuator Position

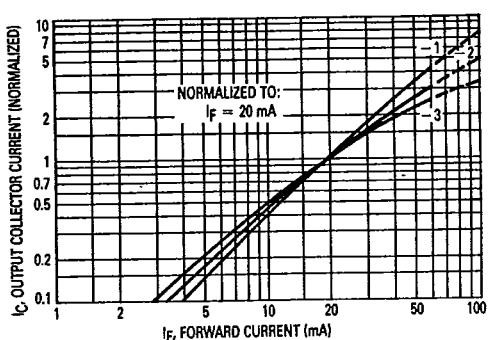


Figure 3. Output Current versus Input Current

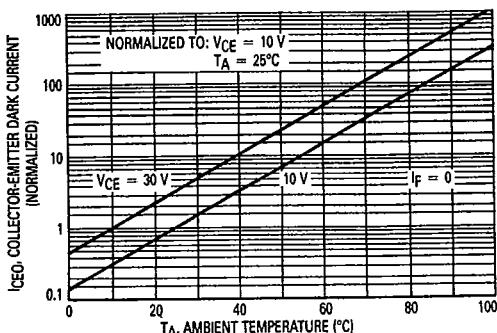


Figure 4. Dark Current versus Ambient Temperature

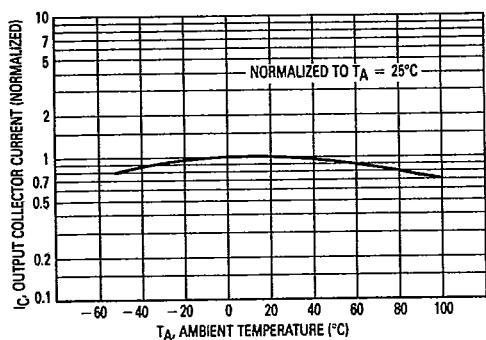


Figure 5. Output Current versus Ambient Temperature

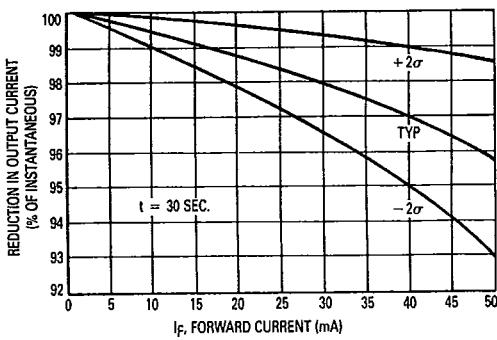


Figure 6. Reduction in Output Current Due to LED Heating versus Forward Current

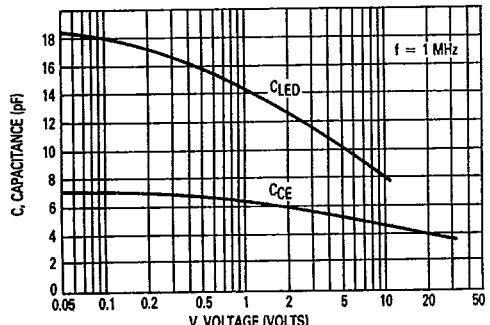


Figure 7. Capacitances versus Voltage

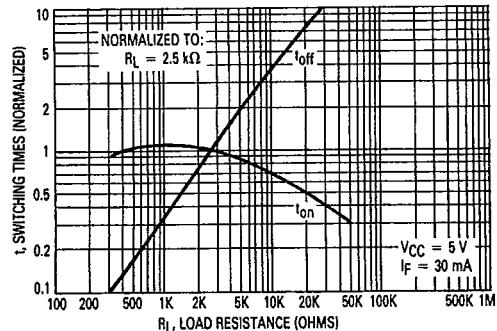


Figure 8. Switching Times versus Load Resistance

## OUTLINE DIMENSIONS

CASE 374-01 H		CASE 365-01 K		CASE 354A-01 T		CASE 354-02 U		CASE 354G-01 V																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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MAX.	INCHES	MM	MIN.	MAX.	INCHES	A	1.377	1.394	0.540	0.545	1.124	1.124	0.470	0.482	B	1.159	1.170	0.456	0.461	6.17	6.32	0.243	0.257	C	5.57	5.71	0.219	0.225	5.53	5.68	0.216	0.222	D	0.35	0.39	0.014	0.022	0.30	0.45	0.012	0.018	G	9.30 BSC	9.30 BSC	0.366 BSC	0.366 BSC	7.24 BSC	7.24 BSC	0.294 BSC	0.294 BSC	H	0.67	0.69	0.026	0.022	2.54 BSC	2.54 BSC	0.120 BSC	0.120 BSC	K	7.37	7.47	0.290	0.294	6.41	6.62	0.261	0.264	U	4.80	4.92	0.189	0.194	5.27	5.33	0.203	0.205	V	4.42	4.57	0.174	0.180	3.05	3.29	0.120	0.132	W	3.02	3.14	0.118	0.124	0.31	0.45	0.120	0.141	B1	0.84	1.01	0.033	0.040	0.39	0.44	0.015	0.018	C1	2.42 NOM	2.42 NOM			V	1.50	1.62	0.059	0.064		<table border="1"> <thead> <tr> <th>MM</th><th>MIN.</th><th>MAX.</th><th>INCHES</th><th>MM</th><th>MIN.</th><th>MAX.</th><th>INCHES</th></tr> </thead> <tbody> <tr> <td>A</td><td>11.54</td><td>11.74</td><td>0.450</td><td>0.462</td><td>U</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>B</td><td>6.17</td><td>6.32</td><td>0.243</td><td>0.257</td><td>V</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>C</td><td>5.53</td><td>5.68</td><td>0.216</td><td>0.222</td><td>W</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>D</td><td>0.30</td><td>0.45</td><td>0.012</td><td>0.018</td><td>X</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>G</td><td>19.00 BSC</td><td>19.00 BSC</td><td>0.748 BSC</td><td>0.748 BSC</td><td>Y</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>H</td><td>2.54 BSC</td><td>2.54 BSC</td><td>0.120 BSC</td><td>0.120 BSC</td><td>Z</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>J</td><td>6.41</td><td>6.62</td><td>0.261</td><td>0.264</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>K</td><td>12.70</td><td>13.33</td><td>0.500</td><td>0.525</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>R</td><td>3.05</td><td>3.29</td><td>0.120</td><td>0.132</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>S</td><td>0.31</td><td>0.45</td><td>0.012</td><td>0.018</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>T</td><td>0.39</td><td>0.44</td><td>0.015</td><td>0.018</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <td>U</td><td>1.50</td><td>1.62</td><td>0.059</td><td>0.064</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> </tbody> </table>	MM	MIN.	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B	6.17	6.32	0.243	0.257	V	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
C	5.53	5.68	0.216	0.222	W	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
D	0.30	0.45	0.012	0.018	X	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
G	19.00 BSC	19.00 BSC	0.748 BSC	0.748 BSC	Y	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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J	6.41	6.62	0.261	0.264	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
K	12.70	13.33	0.500	0.525	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
R	3.05	3.29	0.120	0.132	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
S	0.31	0.45	0.012	0.018	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
T	0.39	0.44	0.015	0.018	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
U	1.50	1.62	0.059	0.064	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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A	7.413	7.511	0.291	0.295	U	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
B	6.19	6.32	0.244	0.256	V	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
C	15.64	15.84	0.614	0.641	W	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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V	4.36	4.53	0.172	0.178	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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S	2.24	2.37	0.124	0.130	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
T	7.37	7.51	0.291	0.295	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
V	4.36	4.53	0.172	0.178	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
W	2.38	2.69	0.094	0.106	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
B1	0.88	1.14	0.035	0.045	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
C1	2.54 NOM	2.54 NOM	0.120 NOM	0.120 NOM	—	—	—	—	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												