


# Small Outline Optoisolators

## Darlington Output

These devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector, in a surface mountable, small outline, plastic package. They are ideally suited for high density applications, and eliminate the need for through-the-board mounting.

- Convenient Plastic SOIC-8 Surface Mountable Package Style
- High Current Transfer Ratio (CTR) at Low LED Input Current, for Easier Logic Interfacing
- Standard SOIC-8 Footprint, with 0.050" Lead Spacing
- Shipped in Tape and Reel, which Conforms to EIA Standard RS481A
- Compatible with Dual Wave, Vapor Phase and IR Reflow Soldering
- High Input-Output Isolation of 3000 Vac (rms) Guaranteed
- UL Recognized  File #E54915

### Ordering Information:

- To obtain MOC223 in Tape and Reel, add R2 suffix to device numbers:  
R2 = 2500 units on 13" reel
- To obtain MOC223 in quantities of 50 (shipped in sleeves) — No Suffix

### Marking Information:

- MOC223 = 223

### Applications:

- Low power Logic Circuits
- Interfacing and coupling systems of different potentials and impedances
- Telecommunications equipment
- Portable electronics

### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
<b>INPUT LED</b>			
Forward Current — Continuous	I <sub>F</sub>	60	mA
Forward Current — Peak (PW = 100 μs, 120 pps)	I <sub>F(pk)</sub>	1.0	A
Reverse Voltage	V <sub>R</sub>	6.0	V
LED Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	90 0.8	mW mW/°C
<b>OUTPUT DARLINGTON</b>			
Collector-Emitter Voltage	V <sub>CEO</sub>	30	V
Collector-Base Voltage	V <sub>CBO</sub>	70	V
Emitter-Collector Voltage	V <sub>ECO</sub>	7.0	V
Collector Current — Continuous	I <sub>C</sub>	150	mA
Detector Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	150 1.76	mW mW/°C

NOTE: Thickness through insulation between input and output is ≥ 0.5 mm.

Preferred devices are Motorola recommended choices for future use and best overall value.

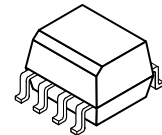
(Replaces MOC221/D)

# MOC223

[CTR = 500% Min]

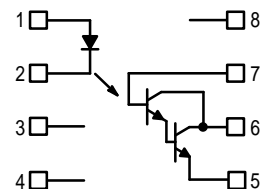
Motorola Preferred Device

**SMALL OUTLINE  
OPTOISOLATORS  
DARLINGTON OUTPUT**



**CASE 846-01, STYLE 1  
PLASTIC**

### SCHEMATIC



1. LED ANODE
2. LED CATHODE
3. NO CONNECTION
4. NO CONNECTION
5. EMITTER
6. COLLECTOR
7. BASE
8. NO CONNECTION

# MOC223

## MAXIMUM RATINGS — continued ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
<b>TOTAL DEVICE</b>			
Input–Output Isolation Voltage <sup>(1,2)</sup> (60 Hz, 1.0 sec. duration)	$V_{ISO}$	3000	Vac(rms)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range <sup>(3)</sup>	$T_A$	-55 to +100	$^\circ\text{C}$
Storage Temperature Range <sup>(3)</sup>	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Lead Soldering Temperature (1/16" from case, 10 sec. duration)	—	260	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)<sup>(4)</sup>

Characteristic	Symbol	Min	Typ <sup>(4)</sup>	Max	Unit
<b>INPUT LED</b>					
Forward Voltage ( $I_F = 1.0\text{ mA}$ )	$V_F$	—	1.05	1.3	V
Reverse Leakage Current ( $V_R = 6.0\text{ V}$ )	$I_R$	—	0.1	100	$\mu\text{A}$
Capacitance	C	—	18	—	pF
<b>OUTPUT DARLINGTON</b>					
Collector–Emitter Dark Current ( $V_{CE} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ )	$I_{CEO1}$	—	1.0	50	nA
	$I_{CEO2}$	—	1.0	—	$\mu\text{A}$
Collector–Emitter Breakdown Voltage ( $I_C = 100\text{ }\mu\text{A}$ )	$V_{(BR)CEO}$	30	90	—	V
Emitter–Collector Breakdown Voltage ( $I_E = 100\text{ }\mu\text{A}$ )	$V_{(BR)ECO}$	7.0	7.8	—	V
Collector–Emitter Capacitance ( $f = 1.0\text{ MHz}$ , $V_{CE} = 0$ )	$C_{CE}$	—	5.5	—	pF
<b>COUPLED</b>					
Output Collector Current ( $I_F = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	$I_C$ (CTR) <sup>(5)</sup>	5.0 (500)	10 (1000)	—	mA (%)
Collector–Emitter Saturation Voltage ( $I_C = 500\text{ }\mu\text{A}$ , $I_F = 1.0\text{ mA}$ )	$V_{CE(sat)}$	—	—	1.0	V
Turn–On Time ( $I_F = 5.0\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ )	$t_{on}$	—	3.5	—	$\mu\text{s}$
Turn–Off Time ( $I_F = 5.0\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ )	$t_{off}$	—	95	—	$\mu\text{s}$
Rise Time ( $I_F = 5.0\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ )	$t_r$	—	1.0	—	$\mu\text{s}$
Fall Time ( $I_F = 5.0\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\text{ }\Omega$ )	$t_f$	—	2.0	—	$\mu\text{s}$
Input–Output Isolation Voltage ( $f = 60\text{ Hz}$ , $t = 1.0\text{ sec.}$ ) <sup>(1,2)</sup>	$V_{ISO}$	3000	—	—	Vac(rms)
Isolation Resistance ( $V_{I-O} = 500\text{ V}$ ) <sup>(2)</sup>	$R_{ISO}$	$10^{11}$	—	—	$\Omega$
Isolation Capacitance ( $V_{I-O} = 0$ , $f = 1.0\text{ MHz}$ ) <sup>(2)</sup>	$C_{ISO}$	—	0.2	—	pF

1. Input–Output Isolation Voltage,  $V_{ISO}$ , is an internal device dielectric breakdown rating.
2. For this test, pins 1 and 2 are common, and pins 5, 6 and 7 are common.
3. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.
4. Always design to the specified minimum/maximum electrical limits (where applicable).
5. Current Transfer Ratio (CTR) =  $I_C/I_F \times 100\%$ .

TYPICAL CHARACTERISTICS

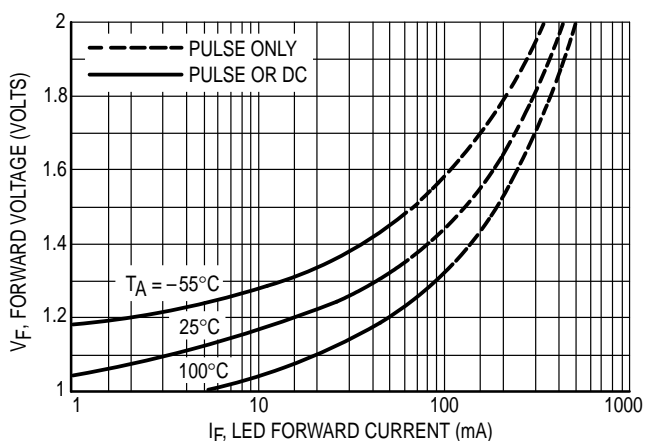


Figure 1. LED Forward Voltage versus Forward Current

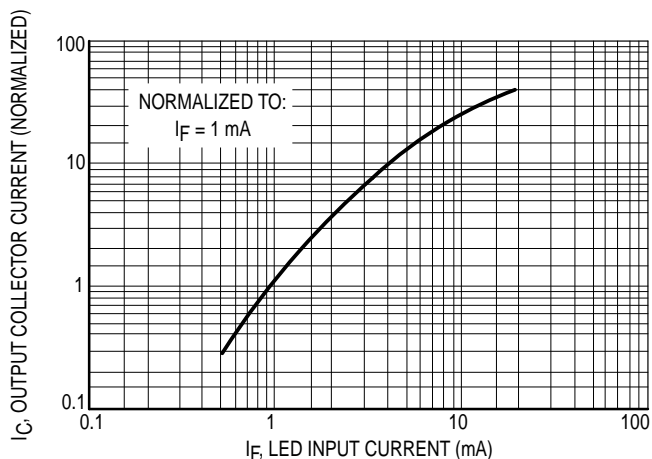


Figure 2. Output Current versus Input Current

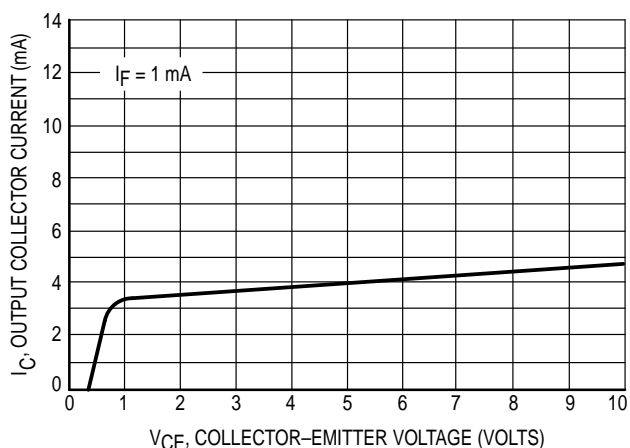


Figure 3. Output Current versus Collector-Emitter Voltage

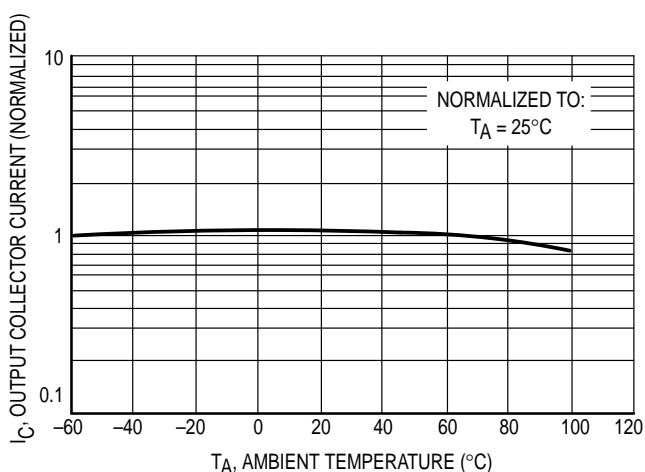


Figure 4. Output Current versus Ambient Temperature

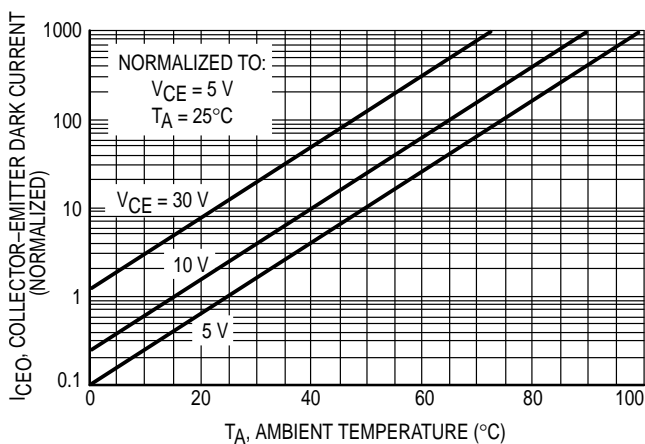


Figure 5. Dark Current versus Ambient Temperature

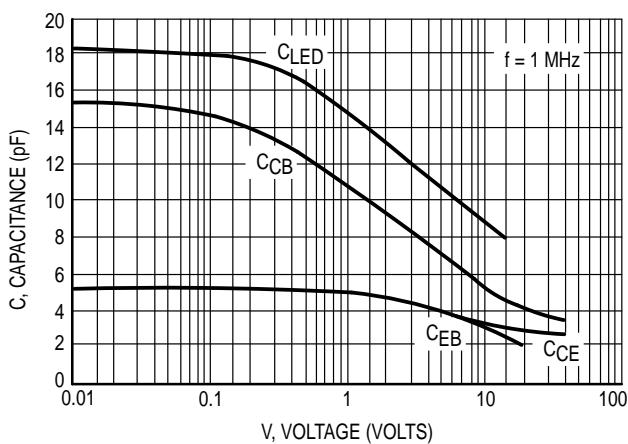
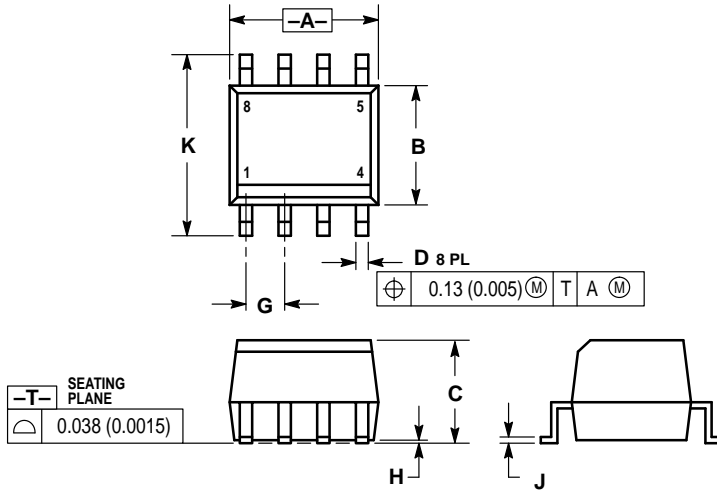


Figure 6. Capacitance versus Voltage

PACKAGE DIMENSIONS



- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.182	0.202	4.63	5.13
B	0.144	0.164	3.66	4.16
C	0.123	0.143	3.13	3.63
D	0.011	0.021	0.28	0.53
G	0.050 BSC		1.27 BSC	
H	0.003	0.008	0.08	0.20
J	0.006	0.010	0.16	0.25
K	0.224	0.244	5.69	6.19

- STYLE 1:  
 PIN 1. ANODE  
 PIN 2. CATHODE  
 3. NC  
 4. NC  
 5. EMITTER  
 6. COLLECTOR  
 7. BASE  
 8. NC

CASE 846-01  
 ISSUE B

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