

CNY171, CNY172, CNY173, CNY174, CNY17F1, CNY17F2, CNY17F3, CNY17F4, MOC8101, MOC8102, MOC8103, MOC8104, MOC8105, MOC8106, MOC8107, MOC8108 Phototransistor Optocouplers

Features

- UL recognized (File # E90700)
- VDE recognized
 - Add option V for white package (e.g., CNY17F2VM)
 - File #102497
 - Add option '300' for black package (e.g., CNY17F2300)
 - File #94766
- Current transfer ratio in select groups
- High BV_{CEO} —70V minimum (CNY17X/M, CNY17FX/M, MOC8106/7/8)
- Closely matched current transfer ratio (CTR) minimizes unit-to-unit variation.
- Very low coupled capacitance along with no chip to pin 6 base connection for minimum noise susceptibility (CNY17FX/M, MOC810X)

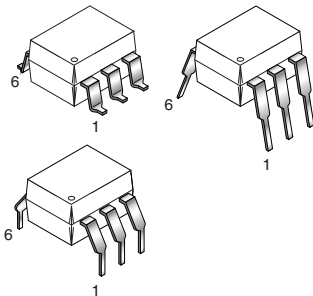
Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

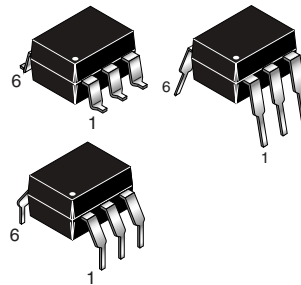
Description

The CNY17, CNY17F and MOC810X devices consist of a Gallium Arsenide IRED coupled with an NPN phototransistor in a dual in-line package.

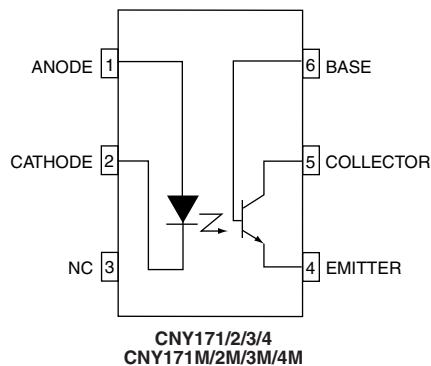
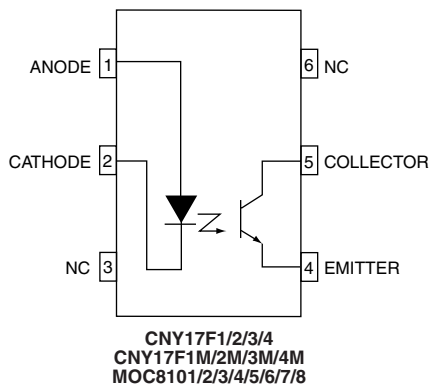
White Package (-M Suffix)



Black Package (No -M Suffix)



Schematic



Absolute Maximum Ratings

Symbol	Parameters	Device	Value	Units
TOTAL DEVICE				
T _{STG}	Storage Temperature	M	-40 to +150	°C
		non M	-55 to +150	
T _{OPR}	Operating Temperature	M	-40 to +100	°C
		non M	-55 to +100	
T _{SOL}	Lead Solder Temperature	All	260 for 10 sec	°C
P _D	Total Device Power Dissipation @ 25°C (LED plus detector)	M	250	mW
		non M	250	
	Derate Linearly From 25°C	M	2.94	mW/°C
		non M	3.30	
EMITTER				
I _F	Continuous Forward Current	M	60	mA
		non M	100	
V _R	Reverse Voltage	All	6	V
I _F (pk)	Forward Current - Peak (1 μs pulse, 300 pps)	M	1.5	A
		non M	1.0	
P _D	LED Power Dissipation 25°C Ambient	M	120	mW
		non M	150	
	Derate Linearly From 25°C	M	1.41	mW/°C
		non M	1.8	
DETECTOR				
I _C	Continuous Collector Current	All	50	mA
V _{CEO}	Collector-Emitter Voltage	CNY17X/M, CNY17FX/M, MOC8106/7/8	70	V
		MOC8101/2/3/4/5	30	V
V _{ECO}	Emitter Collector Voltage	All	7	V
P _D	Detector Power Dissipation @ 25°C	M	150	mW
		non M	150	
	Derate Linearly from 25°C	M	1.76	mW/°C
		non M	2.0	

Electrical Characteristics (T_A = 25°C Unless otherwise specified.)⁽¹⁾

Individual Component Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
EMITTER							
V _F	Input Forward Voltage	I _F = 60mA	CNY17FX/M CNY17X/M	1.0	1.35	1.65	V
		I _F = 10mA	MOC810X	1.0	1.15	1.50	
C _J	Capacitance	V _F = 0 V, f = 1.0MHz	All		18		pF
I _R	Reverse Leakage Current	V _R = 6 V	All		0.001	10	μA
DETECTOR							
BV _{CEO}	Breakdown Voltage Collector to Emitter	I _C = 1.0mA, I _F = 0	MOC8101/2/3/4/5	30	100		V
			MOC8106/7/8 CNY17F1/2/3/4/M CNY171/2/3/4/M	70	100		
BV _{CBO}	Collector to Base	I _C = 10μA, I _F = 0	CNY171/2/3/4/M	70	120		
BV _{ECO}	Emitter to Collector	I _E = 100μA, I _F = 0	All	7	10		
I _{CEO}	Leakage Current Collector to Emitter	V _{CE} = 10 V, I _F = 0	All		1	50	nA
I _{CBO}	Collector to Base	V _{CB} = 10 V, I _F = 0	CNY171/2/3/4/M			20	nA
C _{CE}	Capacitance Collector to Emitter	V _{CE} = 0, f = 1MHz	All		8		pF
C _{CB}	Collector to Base	V _{CB} = 0, f = 1MHz	CNY171/2/3/4/M		20		pF
C _{EB}	Emitter to Base	V _{EB} = 0, f = 1MHz	CNY171/2/3/4/M		10		pF

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.**	Max.	Units
V _{ISO}	Input-Output Isolation Voltage	f = 60 Hz, t = 1 min., I _{I-O} ≤ 2μA ⁽⁴⁾	Black Package	5300			Vac(rms)*
		f = 60 Hz, t = 1 sec., I _{I-O} ≤ 2μA ⁽⁴⁾	'M' White Package	7500			Vac(pk)
R _{ISO}	Isolation Resistance	V _{I-O} = 500 VDC ⁽⁴⁾	All	10 ¹¹			Ω
C _{ISO}	Isolation Capacitance	V _{I-O} = 0, f = 1MHz ⁽⁴⁾	Black Package		0.5		pF
			'M' White Package		0.2		

Note:

* 5300 Vac(rms) for 1 minute equates to approximately 9000 Vac (pk) for 1 second

** Typical values at T_A = 25°C

Transfer Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)⁽¹⁾

Symbol	DC Characteristics		Test Conditions	Min.	Typ.	Max.	Units
COUPLED							
(CTR) ⁽²⁾	Output Collector Current	MOC8101	$I_F = 10\text{mA}, V_{CE} = 10\text{V}$	50		80	%
		MOC8102		73		117	
		MOC8103		108		173	
		MOC8104		160		256	
		MOC8105		65		133	
		MOC8106		50		150	
		MOC8107		100		300	
		MOC8108		250		600	
		CNY17F1/1M	$I_F = 10\text{mA}, V_{CE} = 5\text{V}$	40		80	
		CNY17F2/2M		63		125	
		CNY17F3/3M		100		200	
		CNY17F4/4M		160		320	
		CNY171/1M		40		80	
		CNY172/2M		63		125	
		CNY173/3M		100		200	
		CNY174/4M		160		320	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	CNY17XM/FXM	$I_C = 2.5\text{mA}, I_F = 10\text{mA}$			0.4	V
		MOC8101/2/3/4/5/6/7/8	$I_C = 500\mu\text{A}, I_F = 5.0\text{mA}$				
		CNY17X/FX	$I_F = 10\text{mA}, I_C = 2.5\text{mA}$			0.3	V

Symbol	AC Characteristics ⁽³⁾		Test Conditions	Min.	Typ.*	Max.	Units
NON-SATURATED SWITCHING TIME							
t_{on}	Turn-On Time	MOC8101/2/3/4/5	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$		2	20	μs
		MOC8106/7/8					
		CNY17X/FX				10	
t_{off}	Turn-Off Time	MOC8101/2/3/4/5	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$		3	20	μs
		MOC8106/7/8					
		CNY17X/FX				10	
t_d	Delay Time	CNY17XM/FXM	$I_F = 10\text{mA}, V_{CC} = 5\text{V}, R_L = 75\Omega$			5.6	μs
t_r	Rise Time	All Devices	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$		1		μs
		CNY17XM/FXM	$I_F = 10\text{mA}, V_{CC} = 5\text{V}, R_L = 75\Omega$			4.0	
t_s	Storage Time	CNY17XM/FXM	$I_F = 10\text{mA}, V_{CC} = 5\text{V}, R_L = 75\Omega$			4.1	μs
t_f	Fall Time	All Devices	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$		2		μs
		CNY17XM/FXM	$I_F = 10\text{mA}, V_{CC} = 5\text{V}, R_L = 75\Omega$			3.5	

Transfer Characteristics (Continued) ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)⁽¹⁾

Symbol	AC Characteristics ⁽³⁾	Test Conditions	Min.	Typ.	Max.	Units
SATURATED SWITCHING TIMES						
t_{on}	Turn-on Time	CNY171/F1	$I_F = 20\text{mA}$, $V_{CE} = 0.4\text{V}$		5.5	μs
		CNY172/F2 CNY173/F3 CNY174/F4	$I_F = 10\text{mA}$, $V_{CE} = 0.4\text{V}$		8.0	
t_r	Rise Time	CNY171/F1	$I_F = 20\text{mA}$, $V_{CE} = 0.4\text{V}$		4.0	μs
		CNY172/F1 CNY173/F3 CNY174/F4	$I_F = 10\text{mA}$, $V_{CE} = 0.4\text{V}$		6.0	
		CNY171M/F1M	$I_F = 20\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		4.0	
		CNY172M/3M/4M CNY17F2M/F3M/F4M	$I_F = 10\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		6.0	
t_d	Delay Time	CNY171M/F1M	$I_F = 20\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		5.5	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	$I_F = 10\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		8.0	
t_{off}	Turn-off Time	CNY171/F1	$I_F = 20\text{mA}$, $V_{CE} = 0.4\text{V}$		34	μs
		CNY172/F2 CNY173/F3 CNY174/F4	$I_F = 10\text{mA}$, $V_{CE} = 0.4\text{V}$		39	
t_f	Fall Time	CNY171/F1	$I_F = 20\text{mA}$, $V_{CE} = 0.4\text{V}$		20	μs
		CNY172/F2 CNY173/F3 CNY174/F4	$I_F = 10\text{mA}$, $V_{CE} = 0.4\text{V}$		24	
		CNY171M/F1M	$I_F = 20\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		20.0	
		CNY172M/3M/4M CNY17F2M/F3M/F4M	$I_F = 10\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		24.0	
t_s	Storage Time	CNY171M/F1M	$I_F = 20\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		34.0	μs
		CNY172M/3M/4M CNY17F2M/F3M/F4M	$I_F = 10\text{mA}$, $V_{CC} = 5\text{V}$, $R_L = 1\text{k}\Omega$		39.0	

** All typicals at $T_A = 25^\circ\text{C}$

Notes:

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.
3. For test circuit setup and waveforms, refer to Figures 20.
4. For this test, Pins 1 and 2 are common, and Pins 4 and 5 are common.

Fig.1 Normalized CTR vs. Forward Current (Black Package)

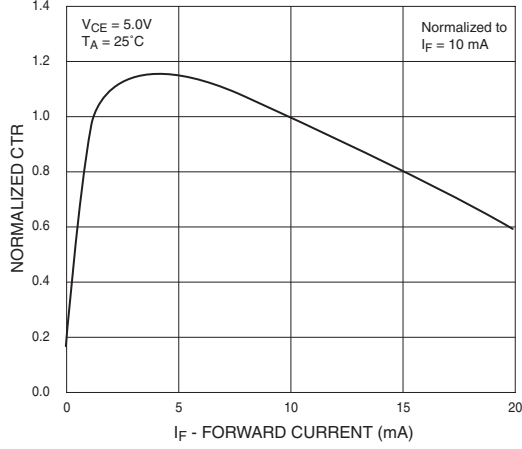


Fig.2 Normalized CTR vs. Forward Current (White Package)

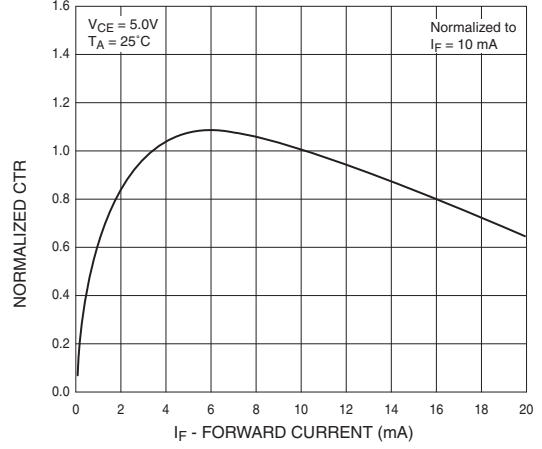


Fig. 3 Normalized CTR vs. Ambient Temperature (Black Package)

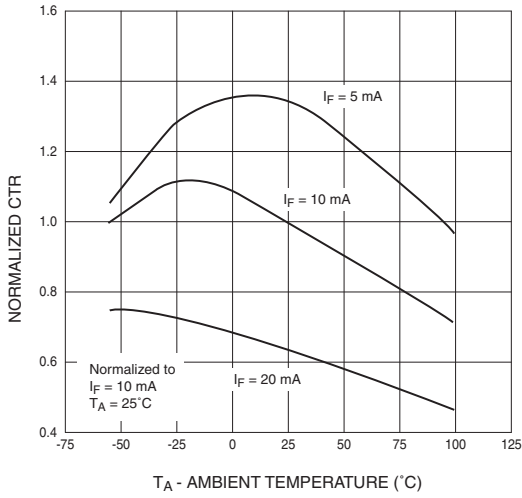


Fig. 4 Normalized CTR vs. Ambient Temperature (White Package)

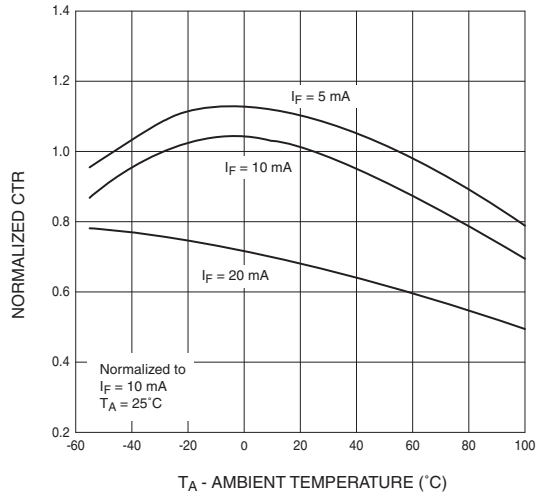


Fig. 5 CTR vs. RBE (Unsatrated) (Black Package)

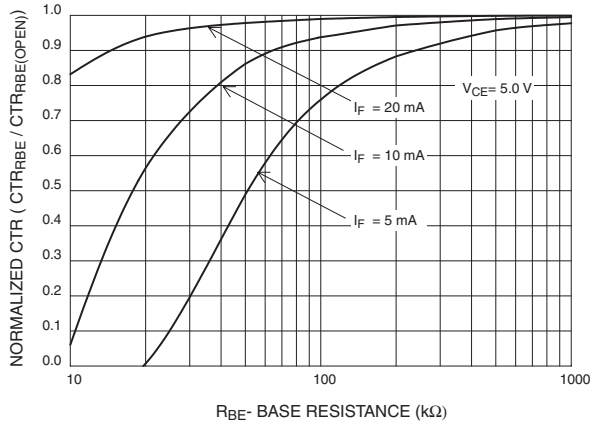
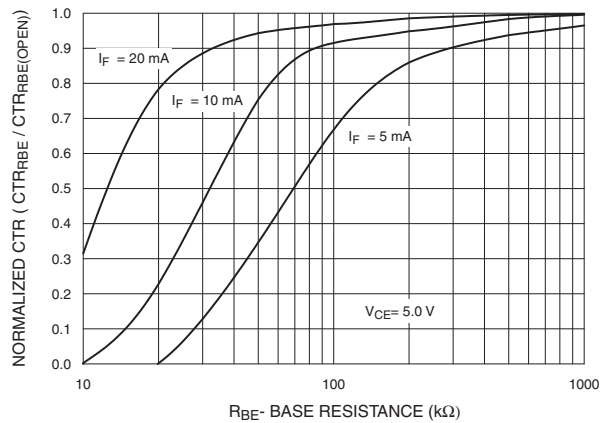
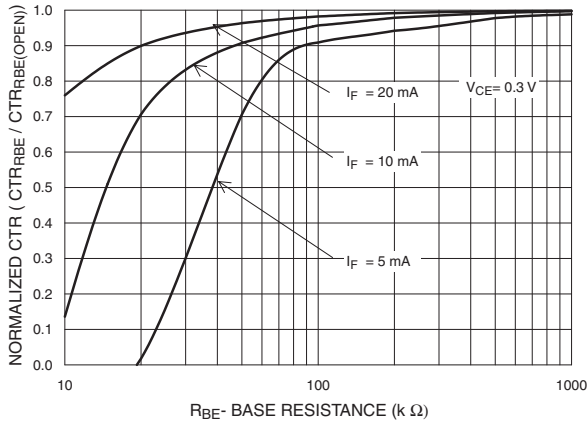


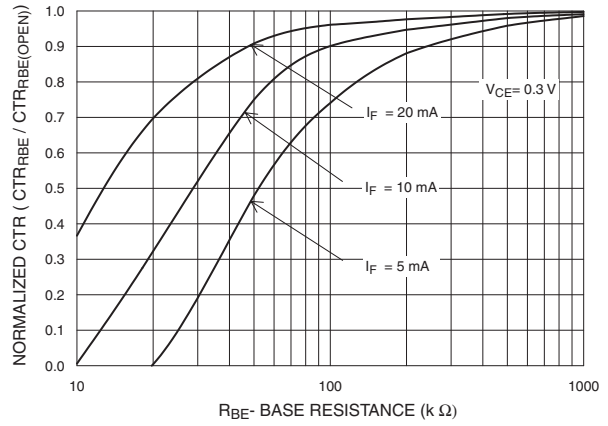
Fig. 6 CTR vs. RBE (Unsatrated) (White Package)



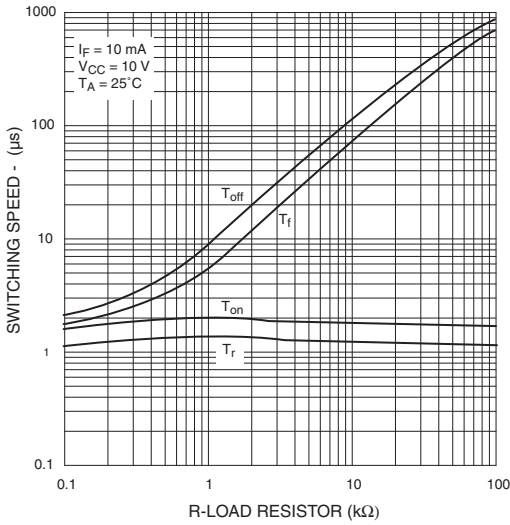
**Fig. 7 CTR vs. RBE (Saturated)
(Black Package)**



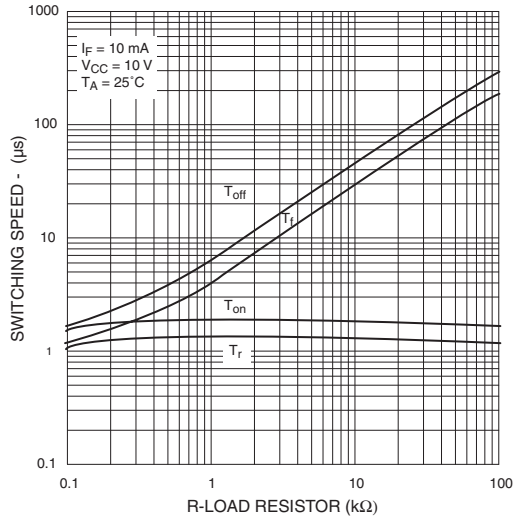
**Fig. 8 CTR vs. RBE (Saturated)
(White Package)**



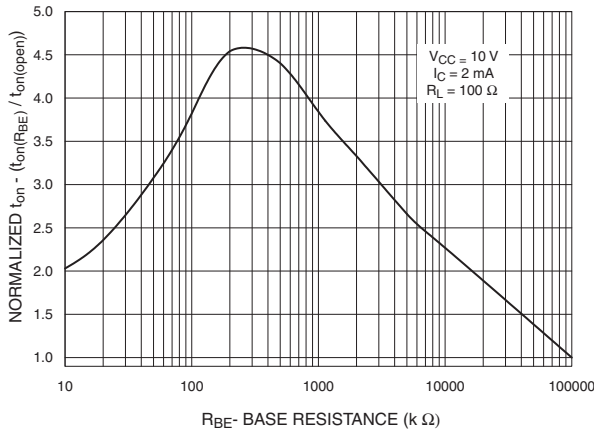
**Fig. 9 Switching Speed vs. Load Resistor
(Black Package)**



**Fig. 10 Switching Speed vs. Load Resistor
(White Package)**



**Fig. 11 Normalized t_{on} vs. RBE
(Black Package)**



**Fig. 12 Normalized t_{on} vs. RBE
(White Package)**

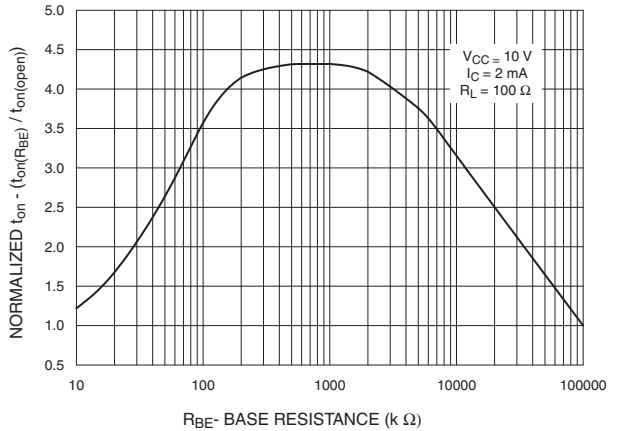


Fig. 13 Normalized t_{off} vs. R_{BE} (Black Package)

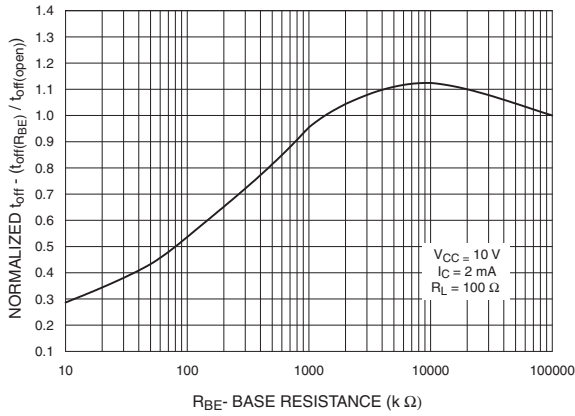


Fig. 14 Normalized t_{off} vs. R_{BE} (White Package)

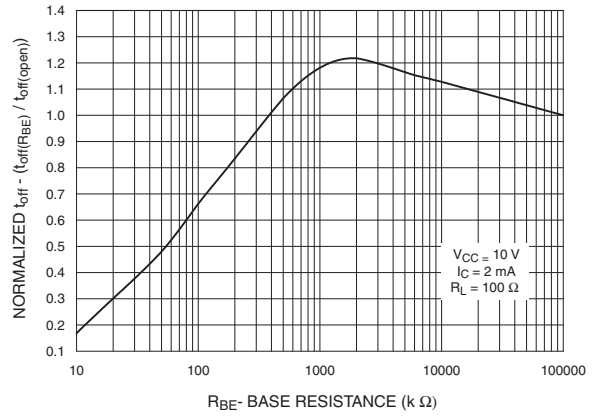


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

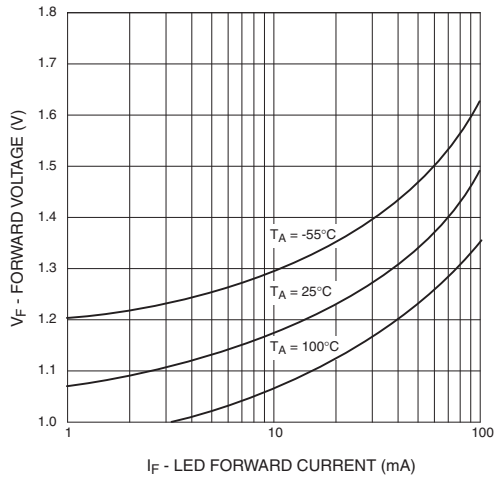


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

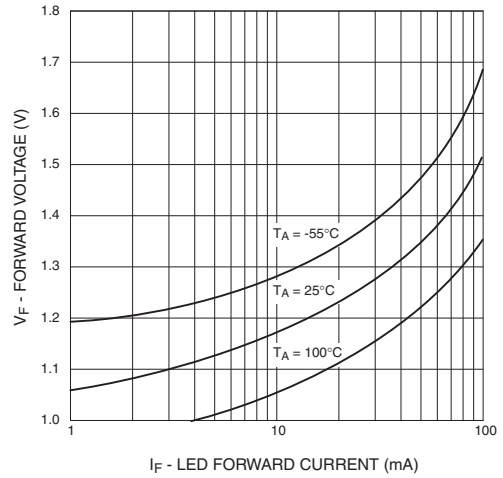


Fig. 17 Collector-Emitter Saturation Voltage vs. Collector Current (Black Package)

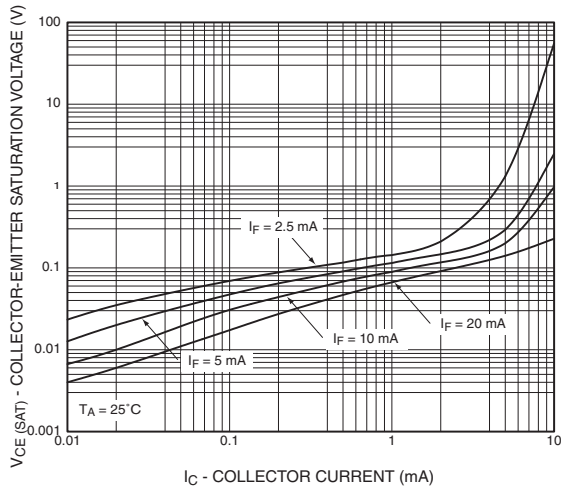


Fig. 18 Collector-Emitter Saturation Voltage vs. Collector Current (White Package)

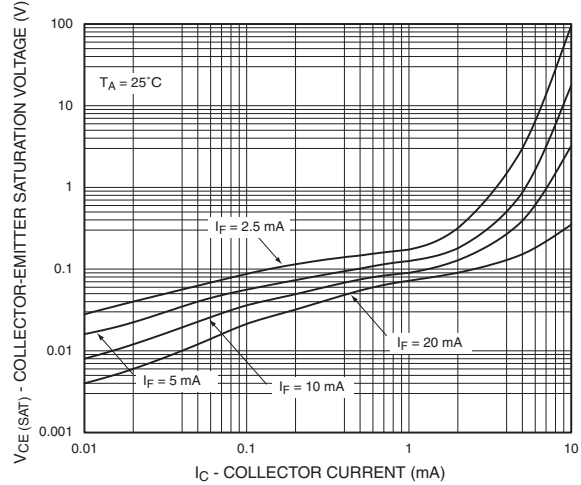


Fig. 19 Dark Current vs. Ambient Temperature (Black Package)

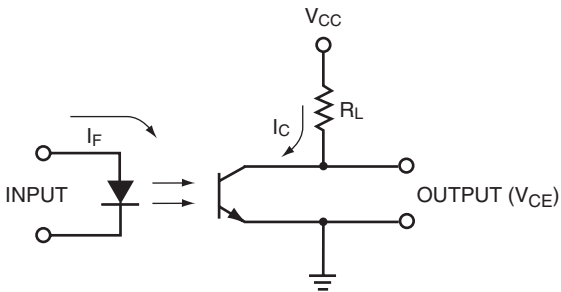
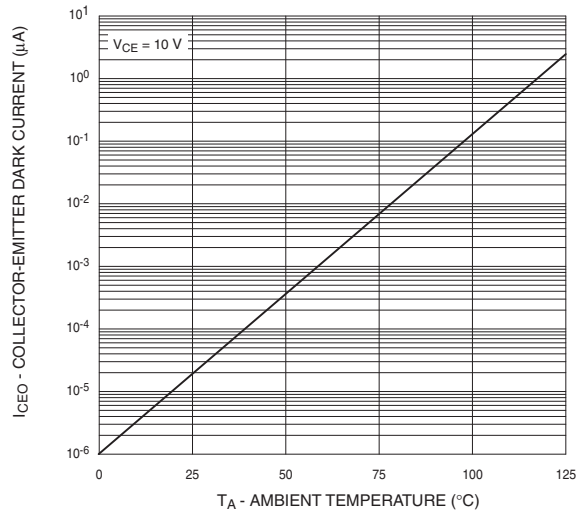


Figure 20. Switching Time Test Circuit

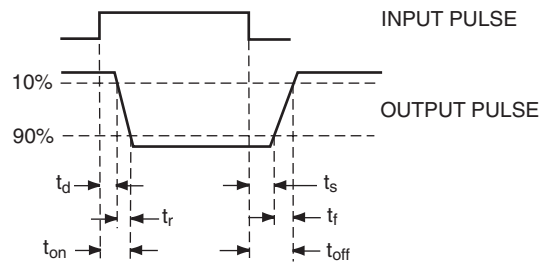
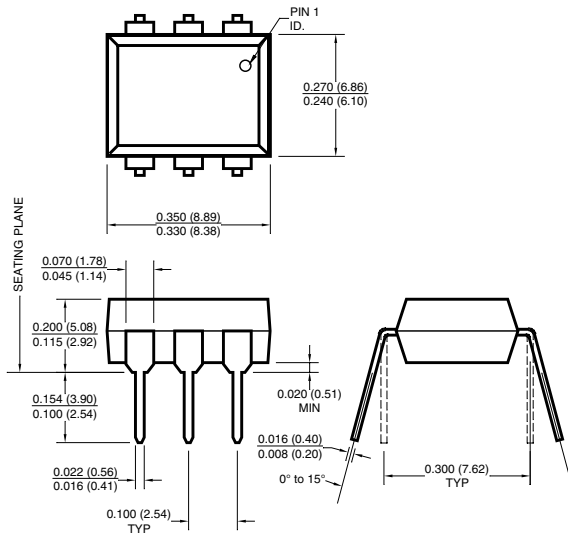


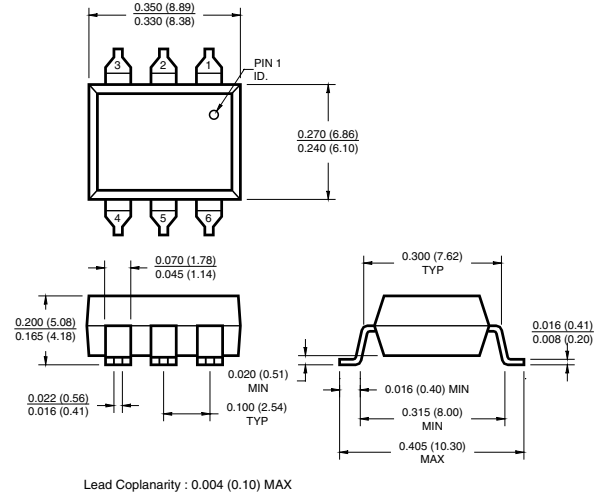
Figure 21. Switching Time Test Circuit

Black Package (No -M Suffix)

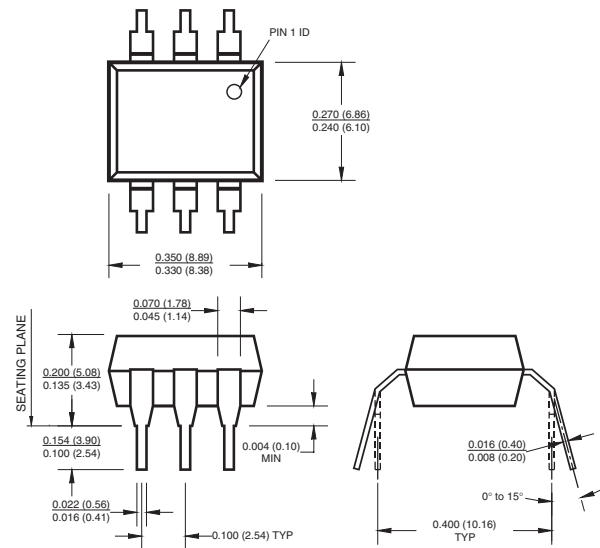
Package Dimensions (Through Hole)



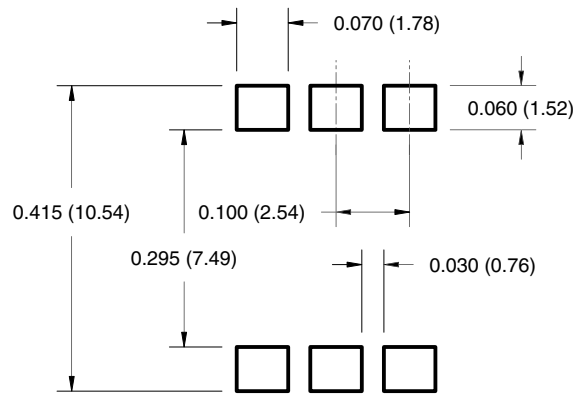
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform (Black Package Only)

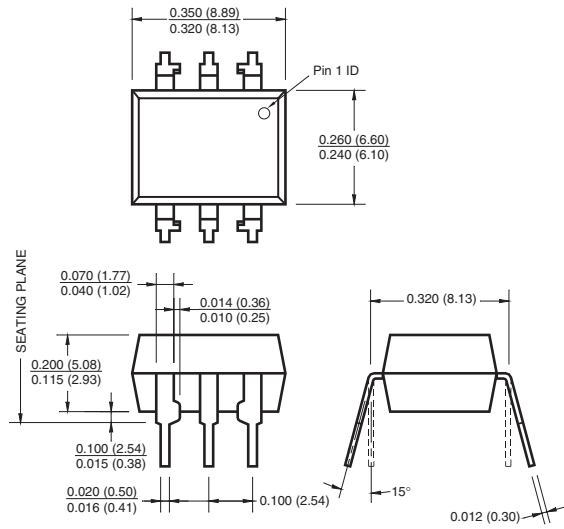


Note:

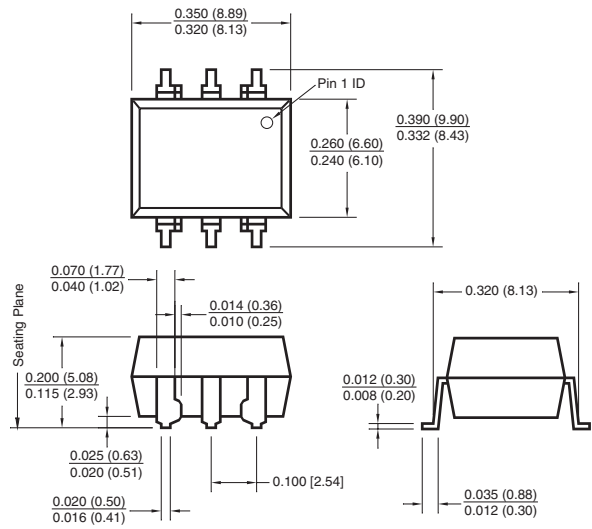
All dimensions are in inches (millimeters)

White Package (-M Suffix)

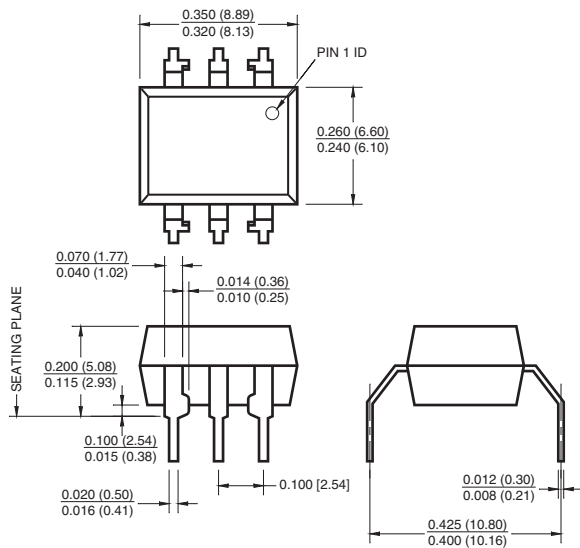
Package Dimensions (Through Hole)



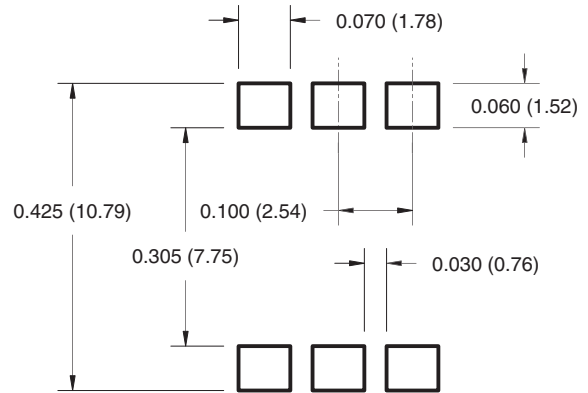
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



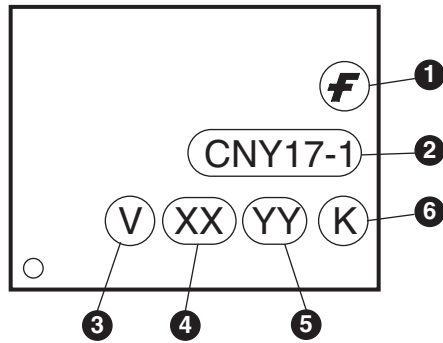
Recommended Pad Layout for Surface Mount Leadform (White Package Only)



Note:

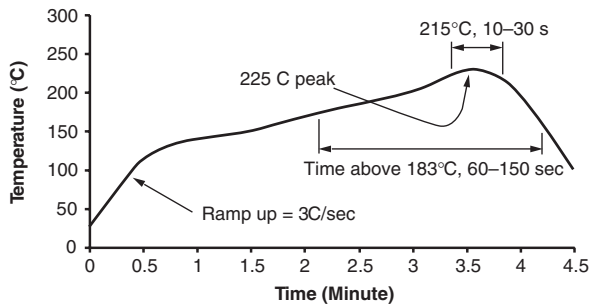
All dimensions are in inches (millimeters)

Marking Information (Black package non 'M' suffix)



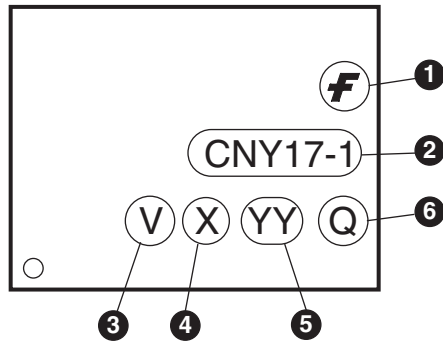
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digits year code, e.g., '03'; One digit year code for 'M' version, e.g. '5'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Reflow Profile (Black Package, No Suffix)



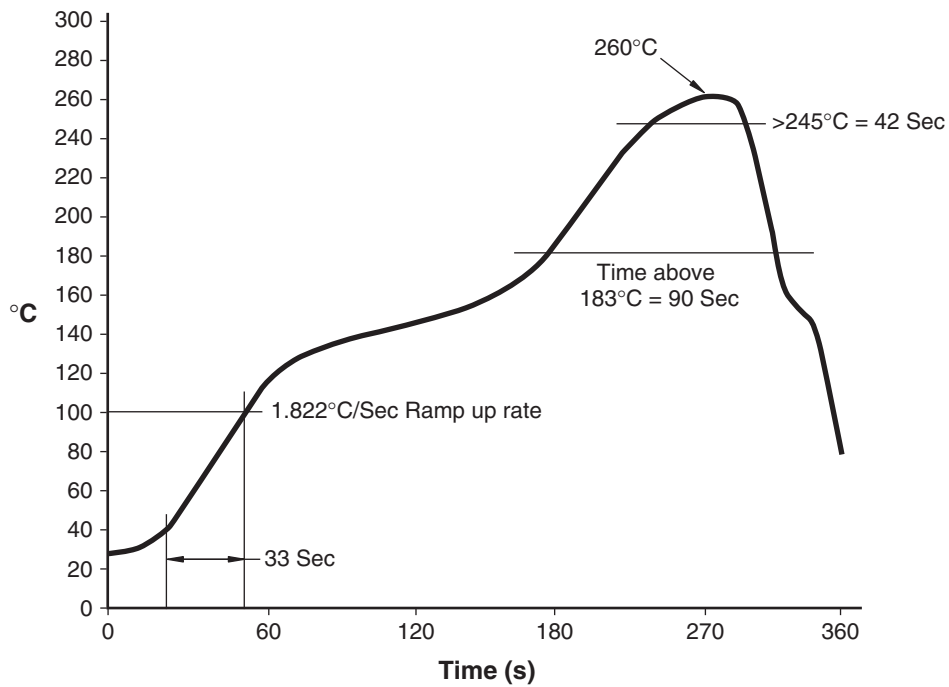
- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended

Marking Information (White package M suffix)



Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Single digit year code, e.g. '5'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Reflow Profile (White Package, M Suffix)



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ACEx™	FACT Quiet Series™	OCX™	SILENT SWITCHER®	UniFET™
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Bottomless™	GTO™	OPTOLOGIC®	SPM™	VCX™
Build it Now™	HiSeC™	OPTOPLANAR™	Stealth™	Wire™
CoolFET™	I ² C™	PACMAN™	SuperFET™	
CROSSVOLT™	i-Lo™	POP™	SuperSOT™-3	
DOE™	ImpliedDisconnect™	Power247™	SuperSOT™-6	
EcoSPARK™	IntelliMAX™	PowerEdge™	SuperSOT™-8	
E ² C MOS™	ISOPLANAR™	PowerSaver™	SyncFET™	
EnSigna™	LittleFET™	PowerTrench®	TCM™	
FACT™	MICROCOUPLER™	QFET®	TinyBoost™	
FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
FPS™	MICROWIRE™	Quiet Series™	TinyPower™	
FRFET™	MSX™	RapidConfigure™	TinyLogic®	
	MSXPro™	RapidConnect™	TINYOPTO™	
Across the board. Around the world.™		μSerDes™	TruTranslation™	
The Power Franchise®		ScalarPump™	UHC™	
Programmable Active Droop™				

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I20

Home >> Find products >>

MOC8102

6-Pin DIP Phototransistor Output Optocoupler- No Base Connection

Contents

- [Features](#)
- [Applications](#)
- [Product status/pricing/packaging](#)
- [Order Samples](#)
- [Application notes](#)
- [Safety agency certificates](#)
- [Qualification Support](#)

Features

- UL recognized (File # E90700)
- VDE recognized
 - Add option V for white package (e.g., CNY17F2VM)
 - File #102497
 - Add option '300' for black package (e.g., CNY17F2300)
 - File #94766
- Current transfer ratio in select groups
- High BV_{CEO} - 70V minimum (CYN17X/M, CNY17FX/M, MOC8106/7/8)
- Closely matched current transfer ratio (CTR) minimizes unit-to-unit variation
- Very low coupled capacitance along with no chip to pin 6 base connection for minimum noise susceptibility (CNY17FX/M, MOC810X)

[back to top](#)

Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

[back to top](#)

BUY

Datasheet

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This page

[Print version](#)

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[Product Change Notices \(PCNs\)](#)

[Support](#)










[Sales support](#)


[Quality and reliability](#)

[Design center](#)

Product status/pricing/packaging

BUY

Product	Product status	Pb-free Status	Package type	Leads	Packing method
MOC8102	Lifetime Buy		DIP-B	6	BULK
MOC8102300	Lifetime Buy		DIP-B	6	BULK
MOC8102300W	Lifetime Buy		DIP-B	6	BULK
MOC81023S	Lifetime Buy		SMDIP-B	6	BULK
MOC81023SD	Lifetime Buy		SMDIP-B	6	TAPE REEL
MOC81023SDL	Lifetime Buy		SMDIP-B	6	TAPE REEL
MOC8102S	Lifetime Buy		SMDIP-B	6	BULK
MOC8102SD	Lifetime Buy		SMDIP-B	6	TAPE REEL
MOC8102W	Lifetime Buy		DIP-B	6	BULK

 Indicates product with Pb-free second-level interconnect. For more information [click here](#).

[back to top](#)

Application notes

[ABR-42021: Control Interface for Standard 0 - 10VDC Dimmers](#) (110 K) Jul 27, 2007

[AN-42026: Phase Modulated PWM Topology with the ML4818](#) (279 K) Jul 27, 2007

[back to top](#)

Safety agency certificates

Certificate	Agency	
E90700, Vol. 1 (936 K)	UL (1577)	Underwriters Laboratories Inc.
E90700, Vol. 1 (936 K)	C-UL	Underwriters Laboratories Inc.
FI 12482 (245 K)	FIMKO	FIMKO

0122085 (677 K)	SEMKO	SEMKO
P01101067 (1638 K)	NEMKO	NEMKO
310684-02 (623 K)	DEMKO	DEMKO Testing & Certification
1027742 (2305 K)	CSA	Canadian Standards Association
94766 (1673 K)	VDE	VDE Pruf-und Zertifizierungsinstitut
P98102918 (138 K)	NEMKO	NEMKO

[back to top](#)

Qualification Support

Click on a product for detailed qualification data

Product
MOC8102
MOC8102300
MOC8102300W
MOC81023S
MOC81023SD
MOC81023SDL
MOC8102S
MOC8102SD
MOC8102W

[back to top](#)

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