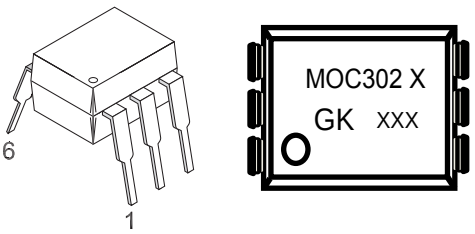
MOC302 SERIES
RANDOM-PHASE TRIAC DRIVER PHOTOCOUPLER

General Description

The MOC302 series of devices each consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon random phase photo Triac.
They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 to 240 VAC operations.



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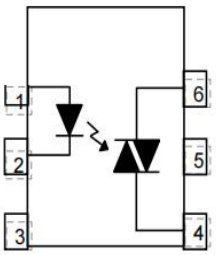
Features

High isolation voltage between input and output (Viso=5000 V rms)
Zero voltage crossing
Compliance with EU REACH
The product itself will remain within RoHS compliant version

Applications

Solenoid/valve controls
Light controls
Static power switch
AC motor drivers
E.M. contactors
Temperature controls
AC Motor starters

Schematic



Pin Configuration
1. Anode
2. Cathode
3. No Connection
4. Terminal
5. Substrate (do not connect)
6. Terminal

Absolute Maximum Ratings (Ta=25℃)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	60	mA
	Reverse voltage		V_R	6	V
	Power dissipation		P_D	100	mW
	Derating factor (above T_a = 85°C)			3 8	mW /°C
Output	Off-state Output Terminal Voltage	MOC3021	V_{DRM}	400	V
		MOC3023			
	Peak Repetitive Surge Current (pw=1ms,120pps)		I_{TSM}	1	A
	On-State RMS Current		$I_{T(RMS)}$	100	mA
	Power dissipation		P_C	300	mW
	Derating factor (above T_a = 85°C)			7.4	mW/℃
Total power dissipation			P_{TOT}	330	mW
Isolation voltage *1			V_{ISO}	5000	Vrms
Operating temperature			T_{OPR}	-55 to 100	℃
Storage temperature			T_{STG}	-55 to 125	℃
Soldering Temperature*2			T_{SOL}	260	℃

Notes:
*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2& 3 are shorted together, and pins 4, 5 & 6 are shorted together.
*2 For 10 seconds

Electro-Optical Characteristics (Ta=25℃ unless specified otherwise)

Input

Parameter	Symbol	Min.	Typ.*1	Max.	Unit	Condition
Forward Voltage	V_F	-	1.18	1.5	V	I_F = 30mA
Reverse Leakage current	I_R	-	-	10	μA	V_R = 6V

Output

Parameter		Symbol	Min.	Typ.*1	Max.	Unit	Condition
Peak Blocking Current		I_{DRM}	-	-	100	nA	V_{DRM} = Rated V_{DRM} I_F = 0mA*2
Peak On-state Voltage		V_{TM}	-	-	2.5	V	I_{TM}=100mA peak, I_F=Rated I_{FT}
Critical Rate of Rise off-state Voltage	MOC3021 MOC3023	dv/dt	-	100	-	V/μs	V_{PEAK} =Rated V_{DRM}, I_F=0 (Fig 8)*3

Notes:
*1.Typical values at T_a = 25°C
*2. Test voltage must be applied within dv/dt rating.
*3. This is static dv/dt. See Figure 10 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.

Transfer Characteristics

Parameter		Symbol	Min.	Typ.*1	Max.	Unit	Condition
LED Trigger Current	MOC3021	I_{FT}	-	-	15	mA	Main terminal Voltage=3V*4
	MOC3023		-	-	5		
Holding Current		I_H	-	250	-	μA	

Notes:
*4. All devices are guaranteed to trigger at an I_F value less than or equal to max I_{FT} Therefore recommended operating I_F lies between max I_{FT} (15mA for MOC3021 , 5 mA for MOC3023) and absolute maximum I_F (60 mA).

RATING AND CHARACTERISTIC CURVES

Figure 1. Forward Current vs Forward Voltage

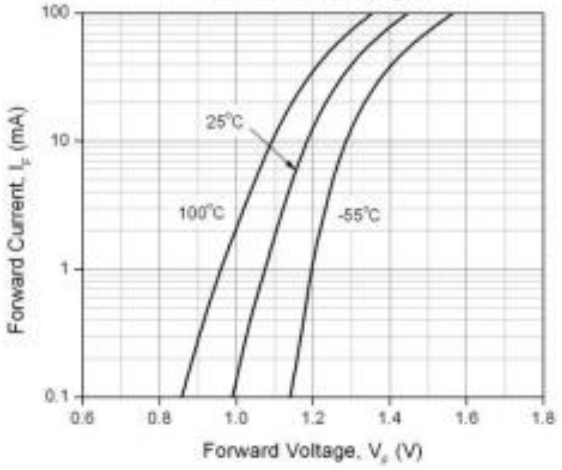


Figure 2. On-State Characteristics

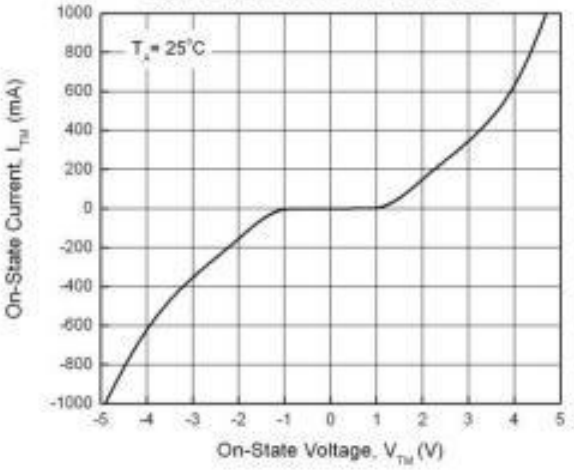


Figure 3. Holding Current vs. Ambient Temperature

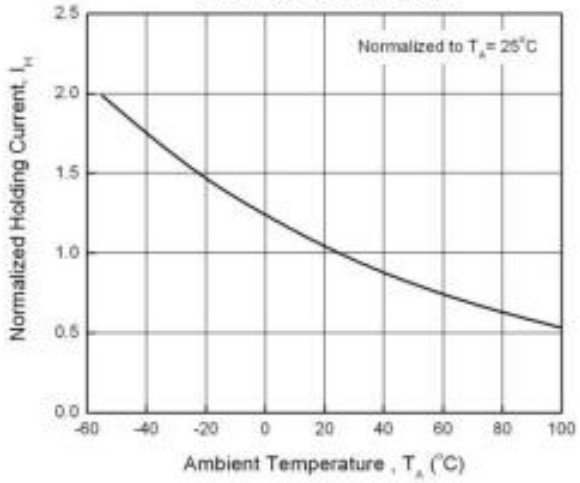


Figure 4. LED Current Required to Trigger vs. LED Pulse Width

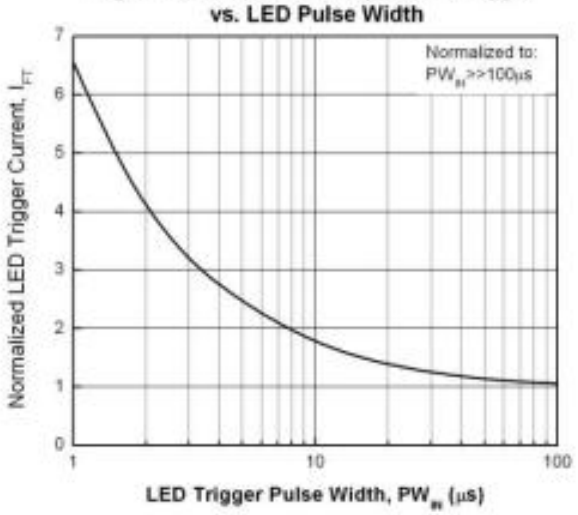


Figure 5. Leakage Current vs. Ambient Temperature

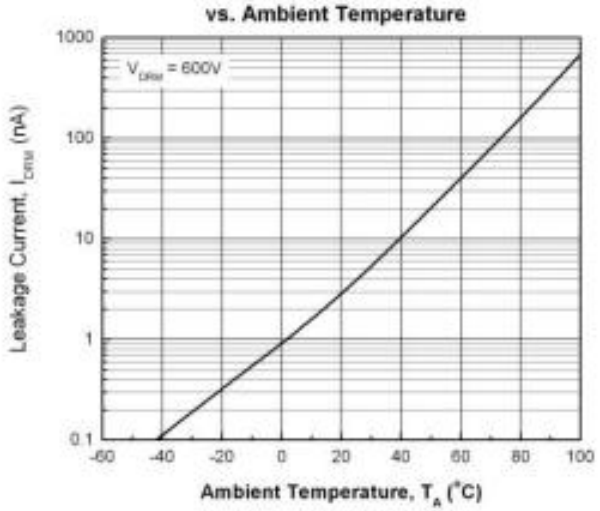
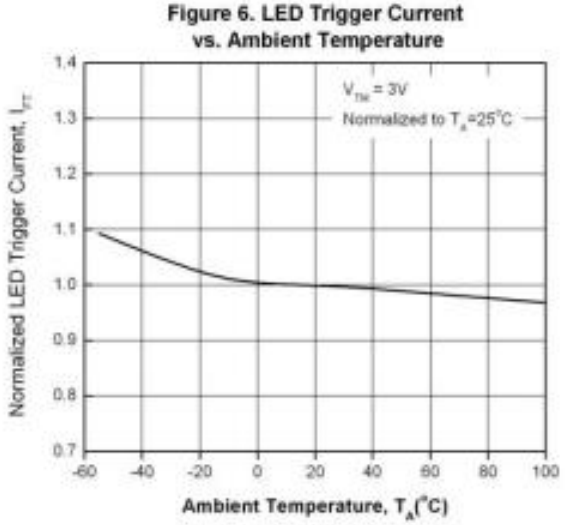


Figure 6. LED Trigger Current vs. Ambient Temperature



RATING AND CHARACTERISTIC CURVES

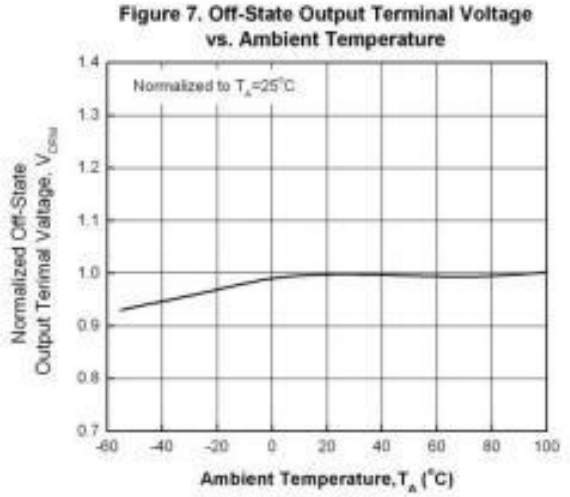
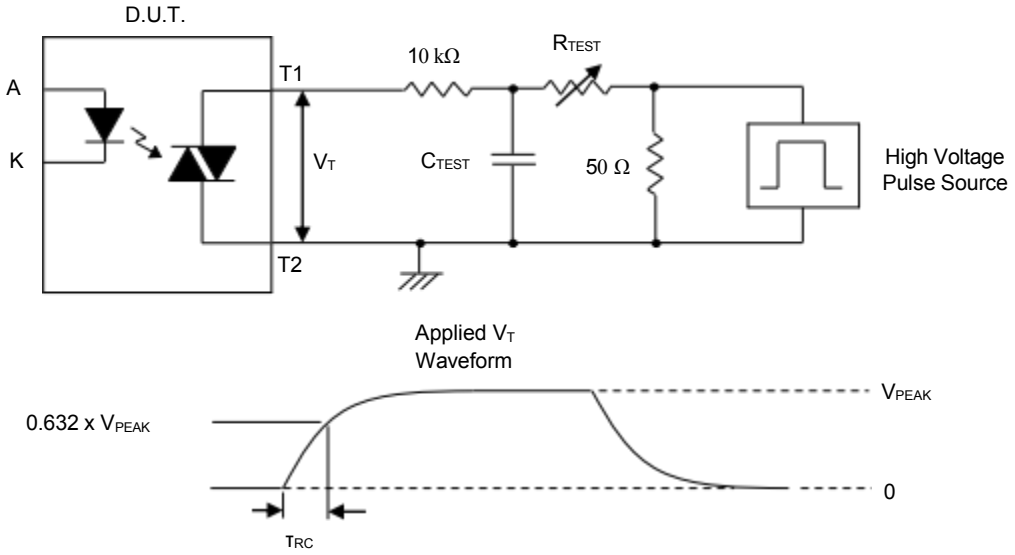


Figure 8. Static dv/dt Test Circuit & Waveform



Measurement Method

The high voltage pulse is set to the required V_{PEAK} value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform V_T is monitored using a x100 scope probe. By varying R_{TEST}, the dv/dt (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The dv/dt is then decreased until the D.U.T. stops triggering. At this point, τ_{RC} is recorded and the dv/dt calculated.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

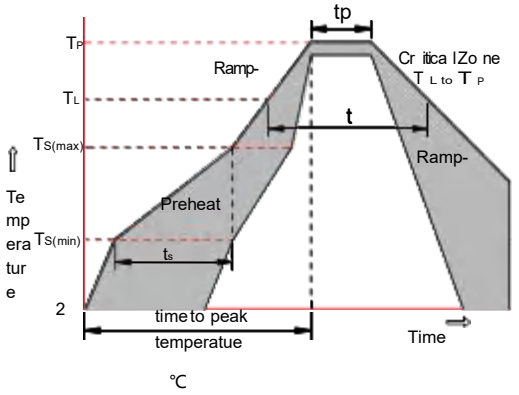
For example, V_{PEAK} = 400V for EF302X series. The dv/dt value is calculated as follows:

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252.8}{\tau_{RC}}$$

Soldering parameters

Reflow Condition		Pb-Free assembly (see as bellow)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150℃
	-Temperature Max($T_{s(max)}$)	+200℃
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3℃/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3℃/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217℃
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)℃
Time within 5℃ of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6℃/sec. Max
Time 25℃ to Peak Temp (T_P)		8 min. Max
Do not exceed		+260℃

FIG5: Reflow condition



Package Dimensions & Suggested Pad Layout

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