



HK301X, HK302X, HK305X

6-Pin DIP Random-Phase Triac Driver Photocouplers

Description

The HK301X, HK302X, HK305X series of devices each consists of a GaAs infrared emitting diode optically coupled to a monolithic silicon random phase photo Triac.

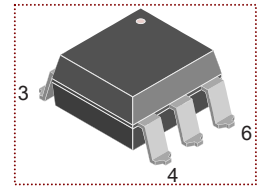
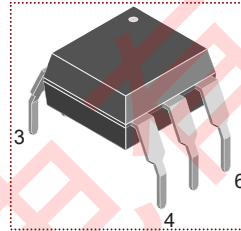
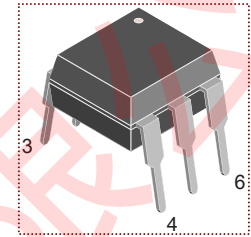
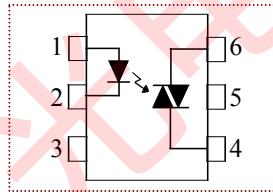
Features

- Peak breakdown voltage, 250V: HK301X; 400V: HK302X; 600V: HK305X
- High isolation voltage between input and output ($V_{iso}=5000\text{ V rms}$)
- Compact dual-in-line package
- Pb free and RoHS compliant.
- UL approved
- VDE approved

Applications

- Solenoid/valve controls
- Lamp ballasts
- Static AC power switch
- Interfacing microprocessors to 115 to 240Vac peripherals
- Incandescent lamp dimmers
- Temperature controls
- Motor controls

Block Diagram and Package



Absolute Maximum Ratings ($T_a=25^\circ\text{C}$)

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 $T_a = 85^\circ\text{C}$)		3.8	mW/°C	
Output	Off-state Output Terminal Voltage	V_{DRM}	HK301X	250	V
			HK302X	400	
			HK305X	600	
	Peak Repetitive Surge Current (pw=100μs, 120pps)	I_{TSM}	1	A	
	On-State RMS Current	$I_{T(RMS)}$	100	mA	
	Power Dissipation	P_C	300	mW	
Derating Factor (above $T_a = 85^\circ\text{C}$)	7.4		mW/°C		
Total Power Dissipation		P_{tot}	330	mW	
Isolation Voltage *		V_{iso}	5000	Vrms	
Operating Temperature		T_{opr}	-55~+100	°C	
Storage Temperature		T_{stg}	-55~+125	°C	
Soldering Temperature (10s)		T_{sol}	260	°C	

* 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.



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Electro-optical Characteristics (Ta=25°C, unless specified otherwise)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	
Input	Forward Voltage	V_F	$I_F=20\text{mA}$	-	1.18	1.5	V	
	Reverse Current	I_R	$V_R=6\text{V}$	-	-	10	μA	
Output	Peak Blocking Current	I_{DRM}	$V_{DRM} = \text{Rated}$ $V_{DRM}, I_F = 0\text{mA}$	-	-	100	nA	
	Peak On-state Voltage	V_{TM}	$I_{TM}=100\text{mA peak}$, $I_F=\text{Rated } I_{FT}$	-	-	2.5	V	
	Critical Rate of Rise off-state Voltage	HK301X	dv/dt	$V_{PEAK} = \text{Rated}$ $V_{DRM}, I_F=0$	-	100	-	V/ μs
		HK302X						
HK305X		$V_{PEAK} = 400\text{V}$, $I_F=0$						
Transfer Characteristics	LED Trigger Current	HK3020	I_{FT}	Main terminal Voltage=3V	-	-	30	mA
		HK3010						
		HK3021			-	-	15	
		HK3051						
		HK3011			-	-	10	
		HK3022						
		HK3052						
		HK3012						
		HK3023			-	-	5	
	HK3053							
Holding Current		I_H		-	250	-	μA	



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Typical Electro-Optical Characteristics Curves

Fig.1 LED Forward Voltage vs Forward Current

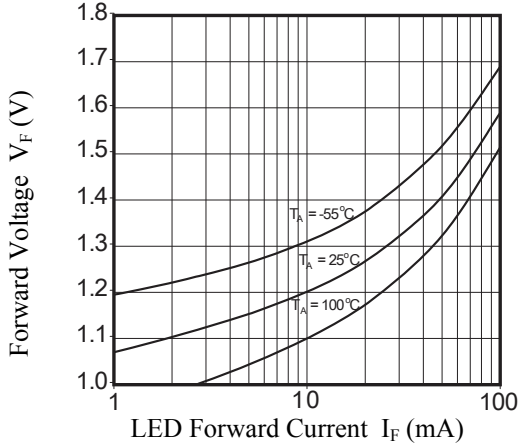


Fig.2 On-State Characteristics

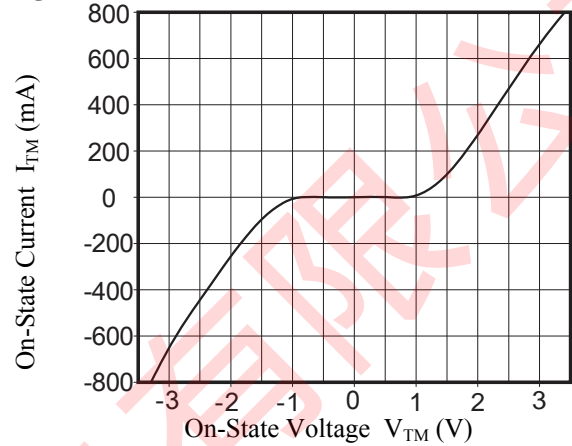


Fig.3 Trigger Current vs. Ambient Temperature

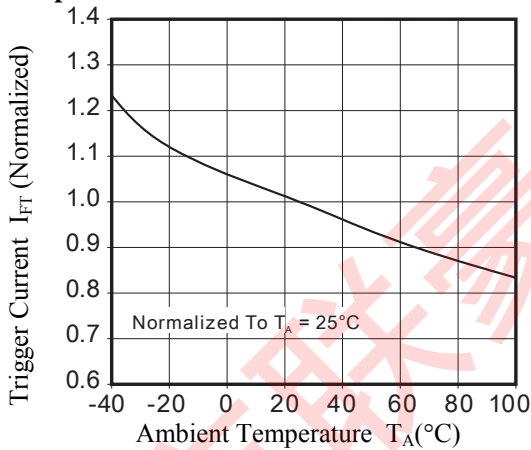


Fig.4 LED Current Required to Trigger vs. LED Pulse Width

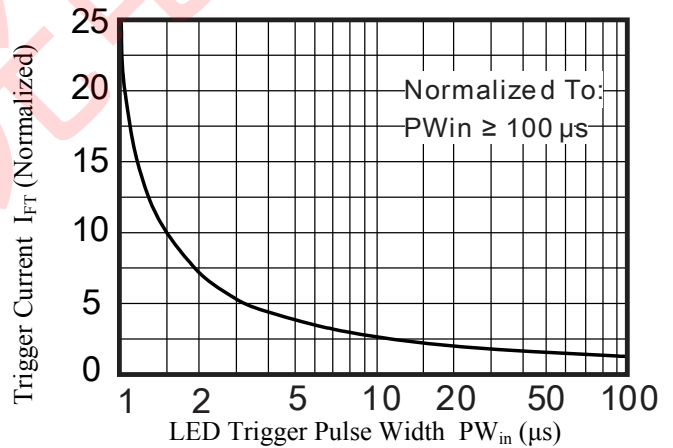


Fig.5 Holding Current vs. Temperature

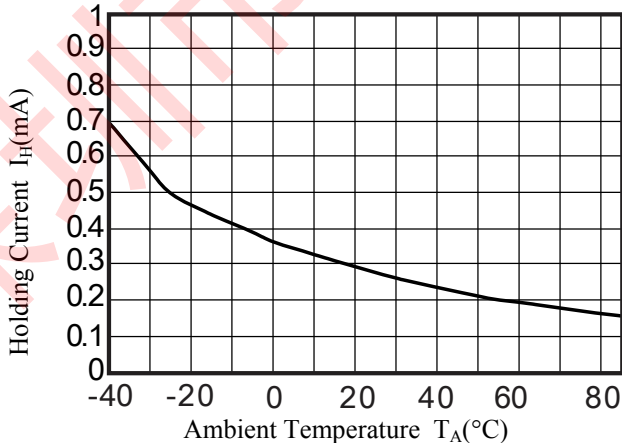
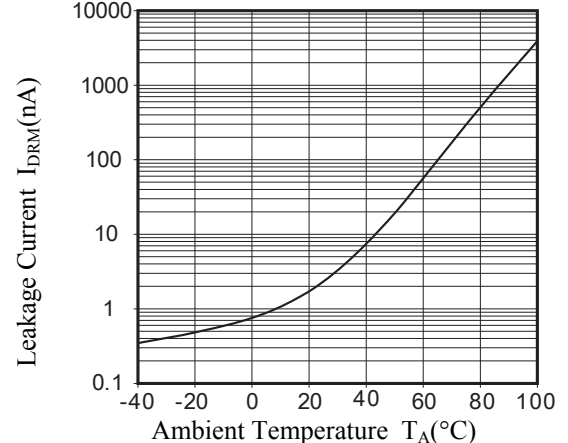


Fig.6 Leakage Current vs. Temperature

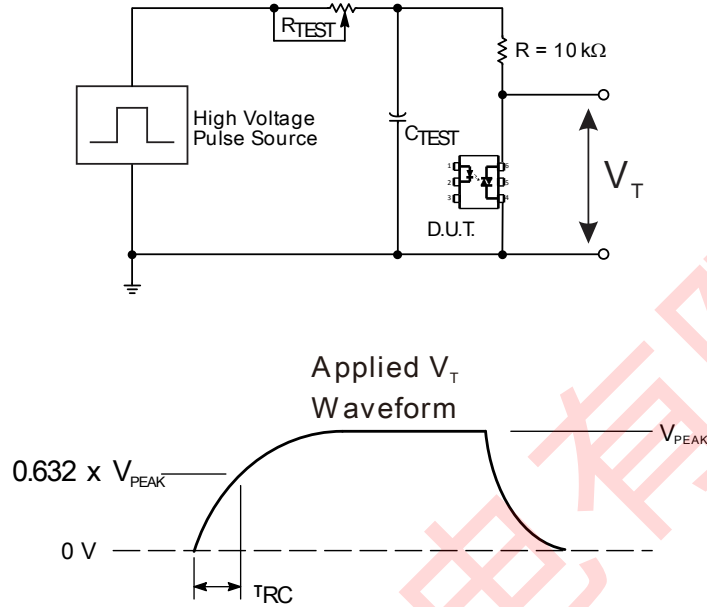




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Fig.7 Static dv/dt Test Circuit & Waveform



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 an 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.

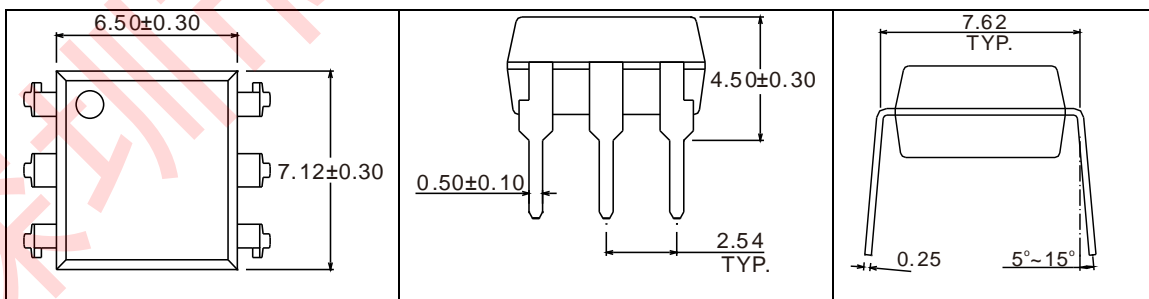
$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

For example, $V_{PEAK} = 400V$ for HK302X series. The dv/dt value is calculated as follows:

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252}{\tau_{RC}}$$

Outline Dimensions

Unit: mm

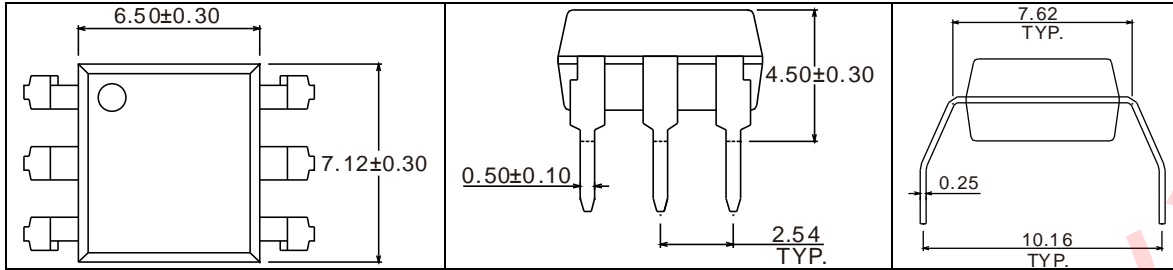


6-pin DIP

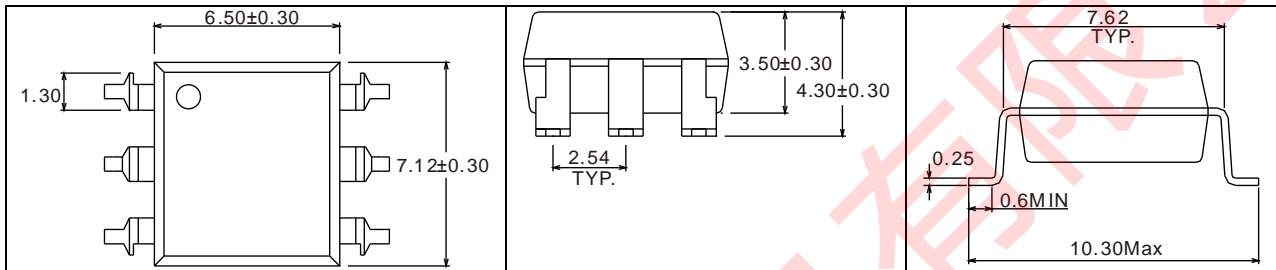


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6-pin DIP (M Type)



6-pin SMD

Marking

HK30VT
 YYWW

- “V” denotes V_{DRM} digit: 1/2/5; “T” denotes I_{FT} digit: 0/1/2/3
- “YY” denotes YEAR; “WW” denotes WEEK

Device Table

Part Name	Main Marking	Package
HK3010D/M/S	HK3010	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3011D/M/S	HK3011	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3012D/M/S	HK3012	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3020D/M/S	HK3020	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3021D/M/S	HK3021	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3022D/M/S	HK3022	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3023D/M/S	HK3023	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3051D/M/S	HK3051	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3052D/M/S	HK3052	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD
HK3053D/M/S	HK3053	6-pin DIP / 6-pin DIP (M Type) / 6-pin SMD



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