

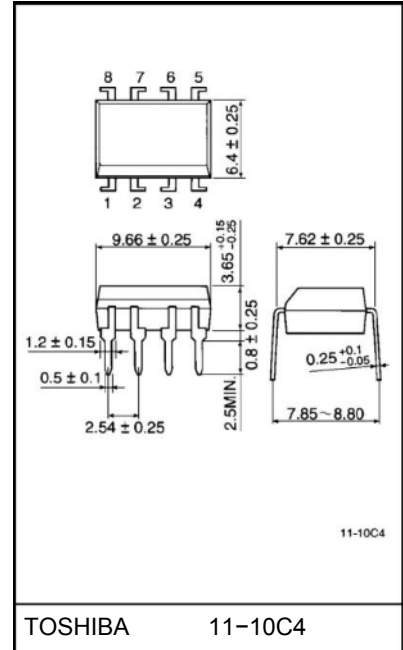
6N138, 6N139

Current Loop Driver.
 Low Input Current Line Receiver.
 CMOS Logic Interface.

The TOSHIBA 6N138 and 6N139 consists of a GaAlAs infrared emitting diode coupled with a split-Darlington output configuration. A high speed GaAlAs Ired manufactured with an unique LPE junction, has the virtue of fast rise and fall time at low drive current.

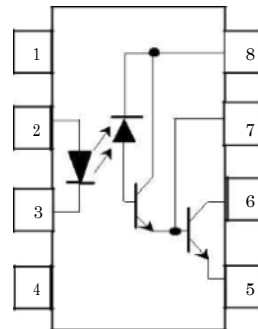
- Isolation voltage: 2500Vrms (min.)
- Current transfer ratio
 - : 6N138 - 300% (min.) (IF=1.6mA)
 - : 6N139 - 400% (min.) (IF=0.5mA)
- Switching time: 6N138 - tPHL=10μs (max.)
 - tPLH=35μs (max.)
 6N139 - tPHL=1μs (max.)
 - tPLH=7μs (max.)
- UL recognized: UL1577, file no. E67349

Unit in mm



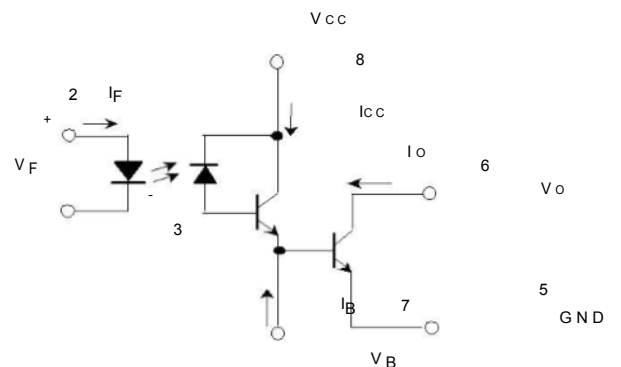
Weight: 0.54 g

Pin Configuration (top view)



- 1 : N.C.
- 2 : Anode
- 3 : Cathode
- 4 : N.C.
- 5 : Gnd
- 6 : Output
- 7 : Output Base
- 8 : Vcc

Schematic



Maximum Ratings (*) (Ta = 0°C to + 70°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current (Note 1)	I_F	20	mA
	Pulse forward current	$I_{FP}^{(*)}$	40	mA
	Total pulse forward current	$I_{FP}^{(*)}$	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation (Note 2)	P_D	35	mW
Detector	Output current (Note 3)	I_O	60	mA
	Emitter-base reverse voltage	V_{EB}	0.5	V
	Supply voltage	$V_{CC}^{(*)}$	-0.5 to 18	V
	Output voltage	$V_{O}^{(*)}$	-0.5 to 18	V
	Output power dissipation (Note 4)	P_O	100	mW
Operating temperature range		T_{opr}	0 to 70	°C
Storage temperature range		T_{stg}	-55 to 125	°C
Lead solder temperature (10s) ^(*)		T_{sol}	260	°C
Isolation voltage (1min., R.H.≤ 60%)		$BVS^{(**)}$	2500	V_{rms}
			3540	V_{dc}

(*) JEDEC registered data

(**) Not registered JEDEC

(*1) 50% duty cycle, 1ms pulse width

(*2) Pulse width 1μs, 300pps

(*3) 6N138... -0.5 to 7V

(*4) 1.6mm below seating plane

Electrical Characteristics Over Recommended Temperature (Ta = 0°C to 70°C, unless otherwise noted)

Characteristic		Symbol	Test Condition	Min.	(*5)Typ.	Max.	Unit
Current transfer ratio (Note 5, 6)	6N139	CTR(*)	I _F =0.5mA, V _O =0.4V V _{CC} =4.5V	400	800	¾	%
	6N138		I _F =1.6mA, V _O =0.4V V _{CC} =4.5V	500	900	¾	
Logic low output voltage (Note 6)	6N139	V _{OL}	I _F =1.6mA, I _O =6.4mA V _{CC} =4.5V	¾	0.1	0.4	V
			I _F =5mA, I _O =15mA V _{CC} =4.5V	¾	0.1	0.4	
	I _F =12mA, I _O =24mA V _{CC} =4.5V		¾	0.2	0.4		
	6N138		I _F =1.6mA, I _O =4.8mA V _{CC} =4.5V	¾	0.1	0.4	
Logic high output current (Note 6)	6N139	I _{OH} (*)	I _F =0mA, V _O =V _{CC} =18V	¾	0.05	100	µA
	6N138		I _F =0mA, V _O =V _{CC} =7V	¾	0.05	250	
Logic low supply current (Note 6)		I _{CCL}	I _F =1.6mA, V _O =Open V _{CC} =5V	¾	0.2	¾	mA
Logic high supply current (Note 6)		I _{CCH}	I _F =0mA, V _O =Open, V _{CC} =5V	¾	10	¾	nA
Input forward voltage		V _F (*)	I _F =1.6mA, Ta=25°C	¾	1.65	1.7	V
Input reverse breakdown voltage		BV _R (*)	I _R =10µA, Ta=25°C	5	¾	¾	V
Temperature coefficient of forward voltage		ΔV _F / ΔTa	I _F =1.6mA	¾	-1.9	¾	mV / °C
Input capacitance		C _{IN}	f=1MHz, V _F =0	¾	60	¾	pF
Resistance (input-output)		R _{I-O}	V _{I-O} =500V (Note 7), R.H.≤ 60%	¾	10 ¹²	¾	Ω
Capacitance (input-output)		C _{I-O}	f=1MHz (Note 7)	¾	0.6	¾	pF

(**) JEDEC registered data.

(*5) All typicals at Ta=25°C and V_{CC}=5V, unless otherwise noted.

Switching Specifications (Ta=25°C, VCC=5V, unless otherwise specified)

Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time to logic low at output (Note 6, 8)	6N139	1	I _F =0.5mA, R _L =4.7kΩ	¾	5	25	ms
			I _F =12mA, R _L =270Ω	¾	0.2	1	
	6N138		I _F =1.6mA, R _L =2.2kΩ	¾	1	10	
Propagation delay time to logic high at output (Note 6, 8)	6N139	1	I _F =0.5mA, R _L =4.7kΩ	¾	5	60	ms
			I _F =12mA, R _L =270Ω	¾	1	7	
	6N138		I _F =1.6mA, R _L =2.2kΩ	¾	4	35	
Common mode transient immunity at logic high level output (Note 9)	CM _H	2	I _F =0mA, R _L =2.2kΩ V _{CM} =400V _{p-p}	¾	500	¾	V / ms
Common mode transient immunity at logic low level output (Note 9)	CM _L	2	I _F =1.6mA R _L =2.2kΩ V _{CM} =400V _{p-p}	¾	-500	¾	V / ms

(*)JEDEC registered data.

(Note 1): Derate linearly above 50°C free-air temperature at a rate of 0.4mA / °C

(Note 2): Derate linearly above 50°C free-air temperature at a rate of 0.7mW / °C

(Note 3): Derate linearly above 25°C free-air temperature at a rate of 0.7mA / °C

(Note 4): Derate linearly above 25°C free-air temperature at a rate of 2.0mW / °C

(Note 5): DC CURRENT TRANSFER RATIO is defined as the ratio of output collector current, I_O, to the forward LED input current, I_F, times 100%.

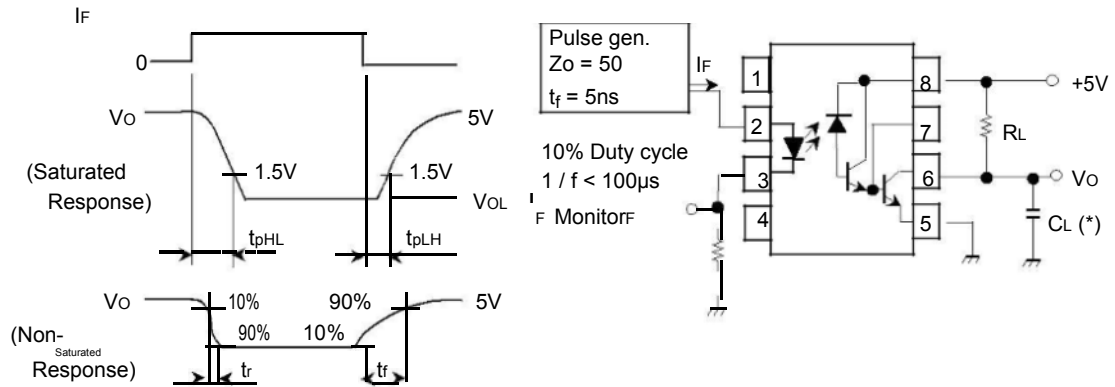
(Note 6): Pin 7 open.

(Note 7): Device considered a two-terminal device: Pins 1, 2, 3, and 4 shorted together and Pins 5, 6, 7 and 8 shorted together.

(Note 8): Use of a resistor between pin 5 and 7 will decrease gain and delay time.

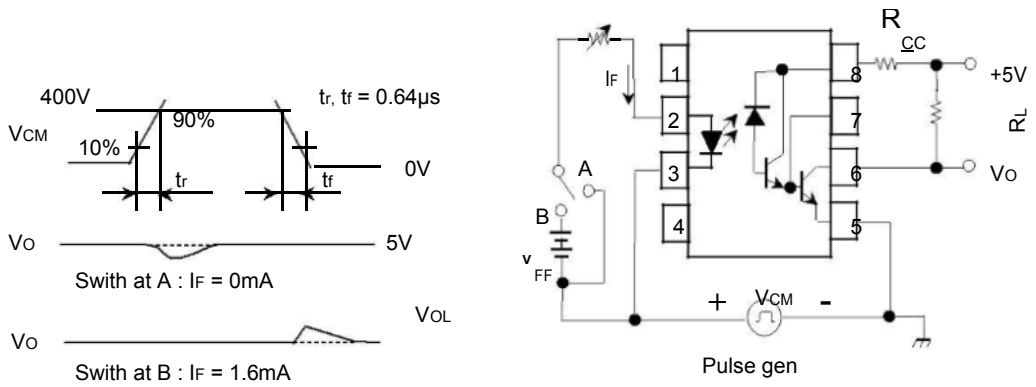
(Note 9): Common mode transient immunity in logic high level is the maximum tolerable (positive) dv_{CM} / dt on the leading edge of the common mode pulse, V_{CM}, to assure that the output will remain in a logic high state (i.e., V_O > 2.0V).
Common mode transient immunity in Logic Low level is the maximum tolerable (negative) dv_{CM} / dt on the trailing edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a logic low state (i.e., V_O < 0.8V).

Test Circuit 1.



(*) C_L is approximately 15pF which includes probe and stray wiring capacitance.

Test Circuit 2.



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