8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Features:

- High isolation voltage between input and output (Viso=5000 Vrms)
- Guaranteed performance from 0°C to 70°C
- Pb free and RoHS compliant.

Description

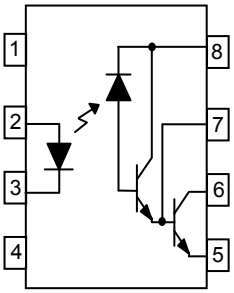
The 6N138 and 6N139 devices each consists of an infrared emitting diodes, optically coupled to a high gain split Darlington photo detectors.

They are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD options.

Applications

- Digital logic ground isolation
- RS-232C line receiver
- High common mode noise line receiver
- Microprocessor bus isolation
- Current loop receiver

Schematic



6N138/6N139

Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. V_B
8. Vcc

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Absolute Maximum Ratings (T_a=25°C unless otherwise specified)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	20	mA
	Peak forward current (50% duty, 1ms P.W)		I_{FP}	40	mA
	Peak transient current ($\leq 1\ \mu$s P.W, 300pps)		I_{Ftrans}	1	A
	Reverse voltage		V_R	5	V
	Power dissipation		P_{IN}	35	mW
Output	Power dissipation		P_O	100	mW
	Output current		I_O	60	mA
	Emitter-Base Reverse Voltage		VER	0.5	V
	Output voltage	6N138	V_O	-0.5 to 7	V
		6N139		-0.5 to 18	V
	Supply voltage	6N138	V_{CC}	-0.5 to 7	V
		6N139		-0.5 to 18	V
Isolation voltage *1			V_{ISO}	5000	V rms
Operating temperature			T_{OPR}	-55 ~ +85	°C
Storage temperature			T_{STG}	-55 ~ +125	°C
Soldering temperature *2			T_{SOL}	260	°C

Notes

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

*2 For 10 seconds.

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Electrical Characteristics (T_a=0 to 70°C unless specified otherwise)

Input

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Forward voltage	V_F	-	1.3	1.7	V	I_F = 1.6mA
Reverse Voltage	V_R	5.0	-	-	V	I_R = 10μA, TA=25°C
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.8	-	mV/°C	I_F =1.6mA

Output

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Condition
Logic High Output Current	6N139	I_{OH}	-	-	100	μA	I_F=0mA, V_O=V_{CC}=18V
	6N138		-	-	250		
Logic Low Supply Current	6N138 6N139	I_{CCL}	-	-	1.5	mA	I_F=1.6mA, V_O=Open, V_{CC}=18V
Logic High Supply Current	6N138 6N139	I_{CCH}	-	-	10	μA	I_F=0mA, V_O=Open, V_{CC}=18V

Transfer Characteristics (T_a=0 to 70°C unless specified otherwise, Vcc=4.5V)

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Condition
Current Transfer Ratio	6N139	CTR	400	-	-	%	I_F = 0.5mA, V_O = 0.4V, V_{CC}=4.5V
			500	-	-		I_F = 1.6mA, V_O = 0.4V, V_{CC}=4.5V
	6N138		300	-	-		
Logic Low Output Voltage	6N139	V_{OL}	-	-	0.4	V	I_F = 0.5mA, I_O = 2mA, V_{CC}=4.5V
			-	-	0.4		I_F = 1.6mA, I_O = 8mA, V_{CC}=4.5V
			-	-	0.4		I_F = 5mA, I_O = 15mA, V_{CC}=4.5V
			-	-	0.4		I_F = 12mA, I_O = 24mA, V_{CC}=4.5V
	6N138		-	-	0.4		I_F = 1.6mA, I_O = 4.8mA, V_{CC}=4.5V

* Typical values at T_a = 25°C

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Switching Characteristics (T_a=0 to 70°C unless specified otherwise, Vcc=5V)

Parameter		Symbol	Min.	Typ.*	Max.	Unit	Condition
Propagation Delay Time to Logic Low	6N139	TPHL	-	-	25	µs	I_F = 0.5mA , R_L=4.7kΩ, T_A=25°C
			-	-	30		I_F = 0.5mA , R_L=4.7kΩ
			-	-	1		I_F = 12mA , R_L=270Ω, T_A=25°C
			-	-	2		I_F = 12mA , R_L=270Ω
	6N138		-	-	10		I_F = 1.6mA , R_L=2.2kΩ, T_A=25°C
			-	-	15		I_F = 1.6mA , R_L=2.2kΩ
Propagation Delay Time to Logic High	6N139	TPLH	-	-	60	µs	I_F = 0.5mA , R_L=4.7kΩ, T_A=25°C
			-	-	90		I_F = 0.5mA , R_L=4.7kΩ
			-	-	7		I_F = 12mA , R_L=270Ω, T_A=25°C
			-	-	10		I_F = 12mA , R_L=270Ω
	6N138		-	-	35		I_F = 1.6mA , R_L=2.2kΩ, T_A=25°C
			-	-	50		I_F = 1.6mA , R_L=2.2kΩ
Common Mode Transient Immunity at Logic High		CM_H	1,000	-	-	V/µs	I_F = 0mA , V_{CM}=10Vp-p, R_L=2.2KΩ, T_A=25°C
Common Mode Transient Immunity at Logic Low		CM_L	1,000	-	-	V/µs	I_F = 1.6mA , V_{CM}=10Vp-p, R_L=2.2KΩ, T_A=25°C

* Typical values at T_a = 25°C

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Typical Performance Curves

Fig.1 LED Forward Current vs. Forward Voltage

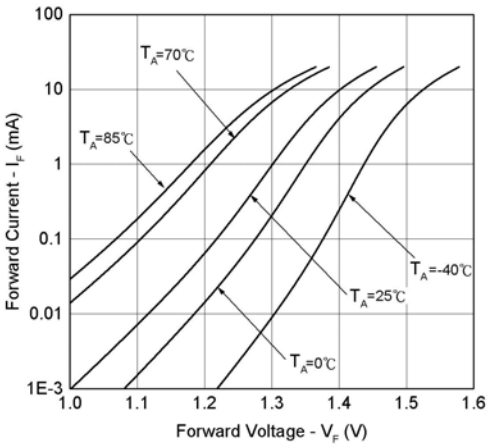


Fig.2 LED Forward Voltage vs. Temperature

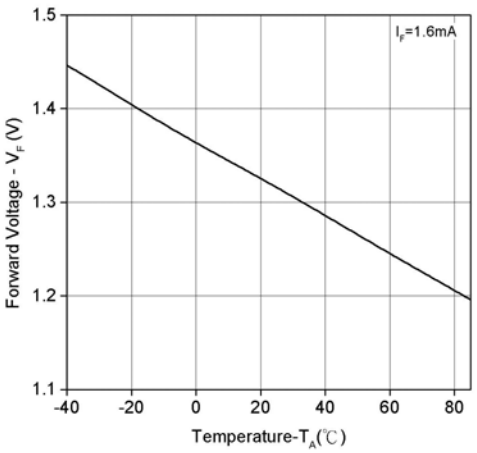


Fig.3 Output Current vs. Output Voltage

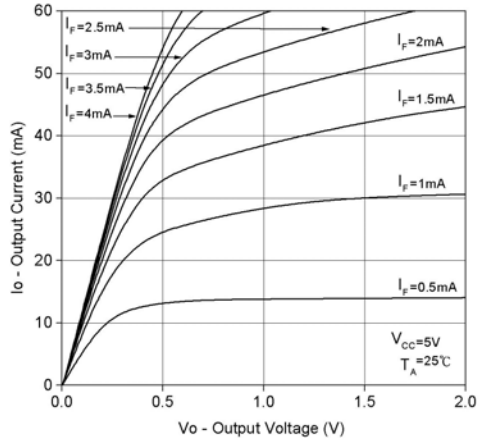


Fig.4 Output Current vs. Input Diode Forward Current

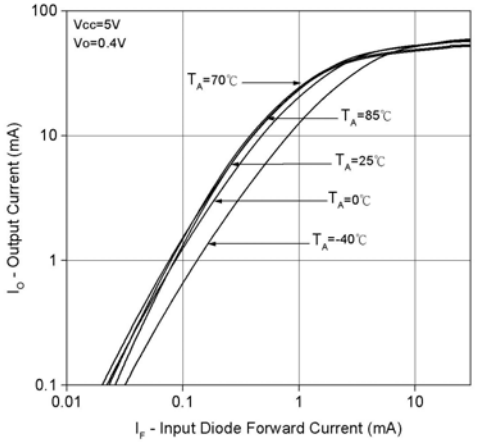


Fig.5 Current Transfer Ratio vs. Forward Current

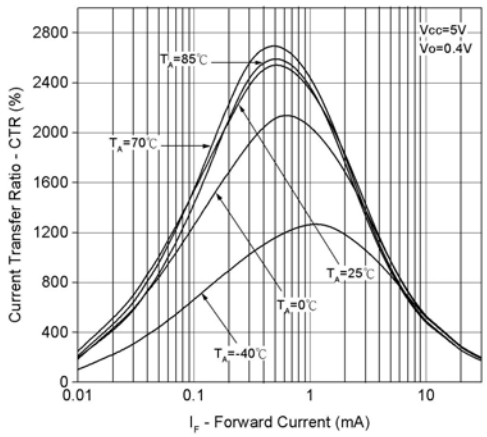


Fig.6 Current Transfer Ratio vs. Base-Emitter Resistance

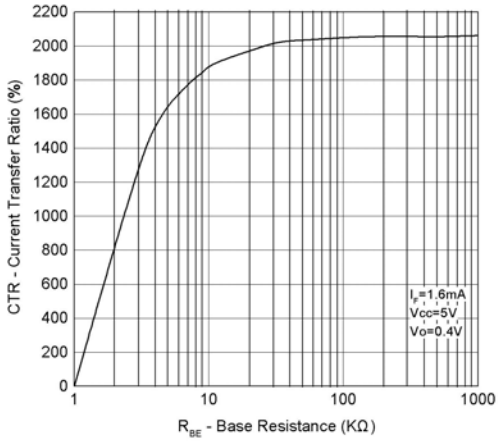


Fig.7 Non-saturated Rise nand Fall Times vs. Load Resistance

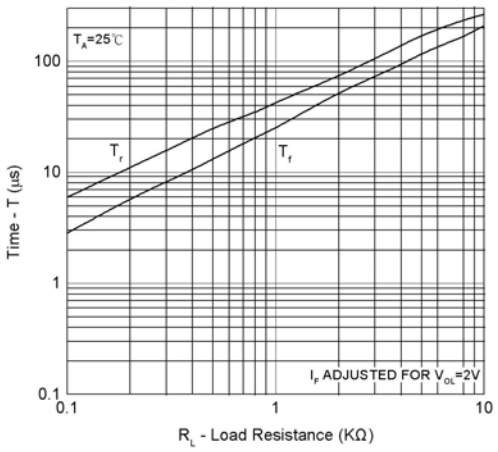
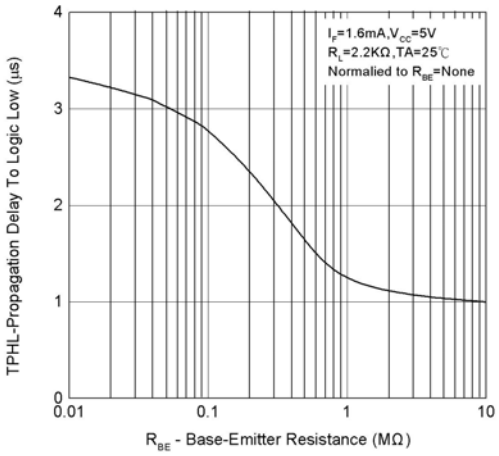


Fig.8 Propagation Delay To Logic Low vs. Base-Emitter Resistance



8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

Fig.9 Propagation Delay vs. Input Diode Forward Current

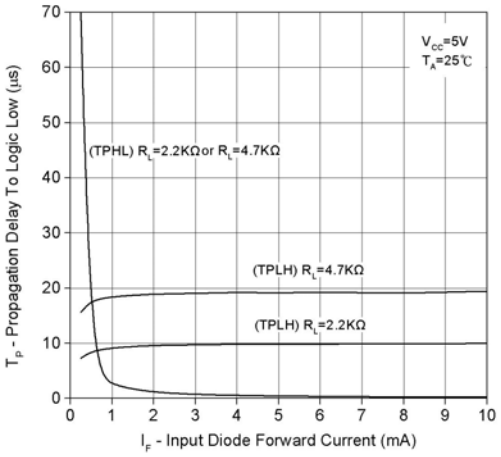


Fig.10 Propagation Delay to Logic Low vs. Pulse Period

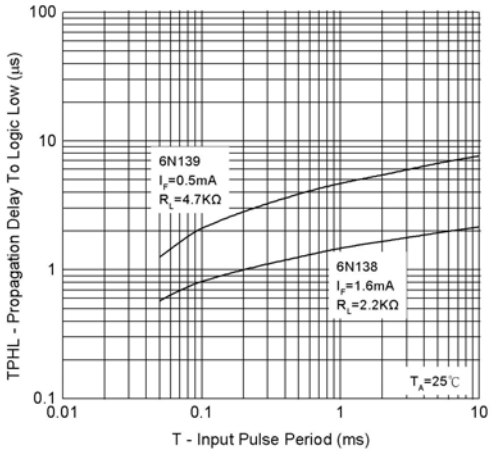


Fig.11 Propagation Delay vs. Temperature

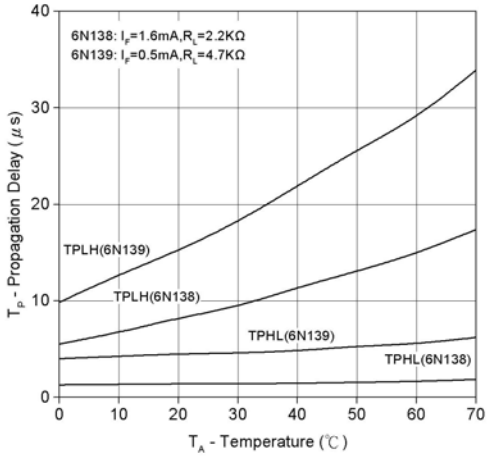
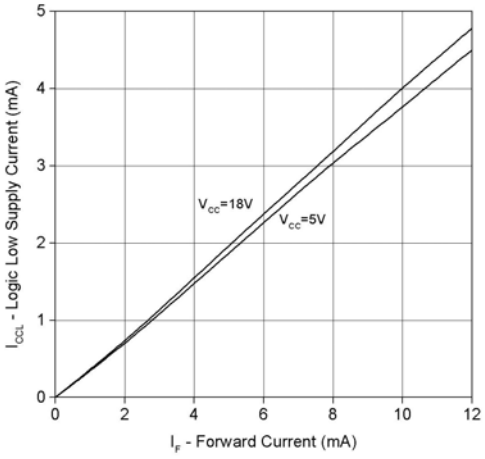


Fig.12 Logic Low Supply Current vs. Input Diode Forward Current



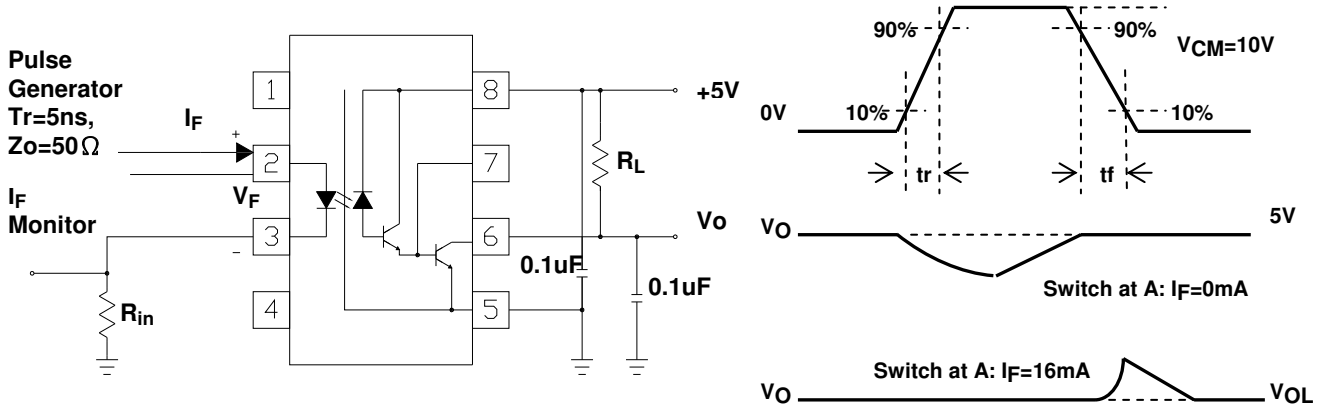


Fig. 13 Switching Time Test Circuit

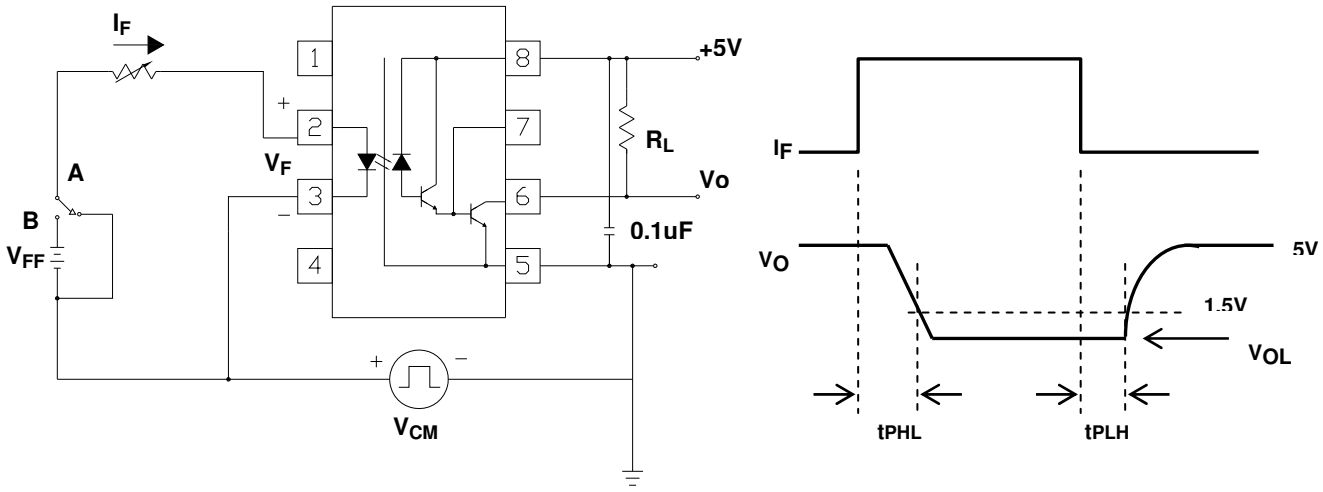


Fig. 14 Common Mode Transient Immunity Test Circuit

Order Information

Part Number

6N13XY

Note

X = Part No. (X = 8 or 9)
Y = Lead form option (G SM T+R or none)

Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
G	Wide lead bend (0.4 inch spacing)	45 units per tube
SM	Surface mount lead form	45 units per tube
SM T+R	Surface mount lead form + tape & reel	1000 units per reel

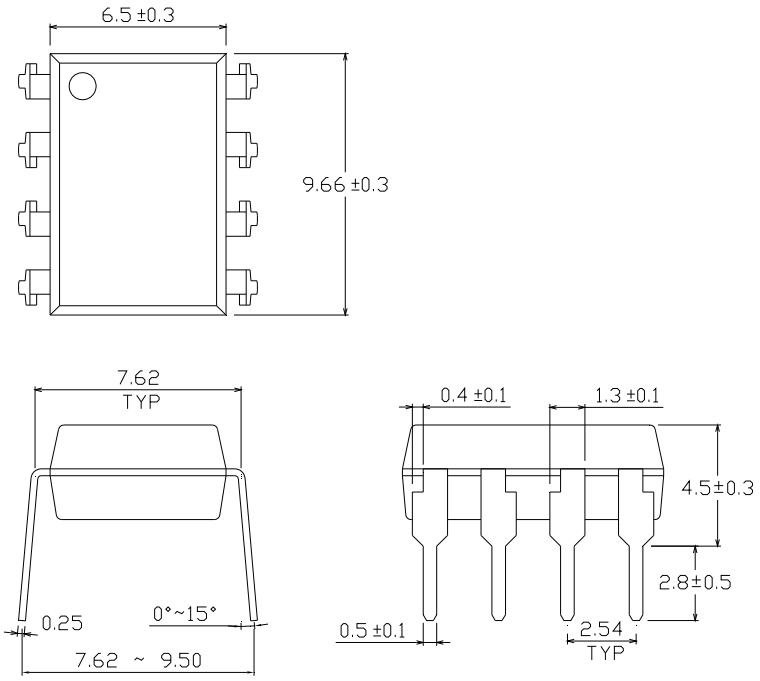
8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

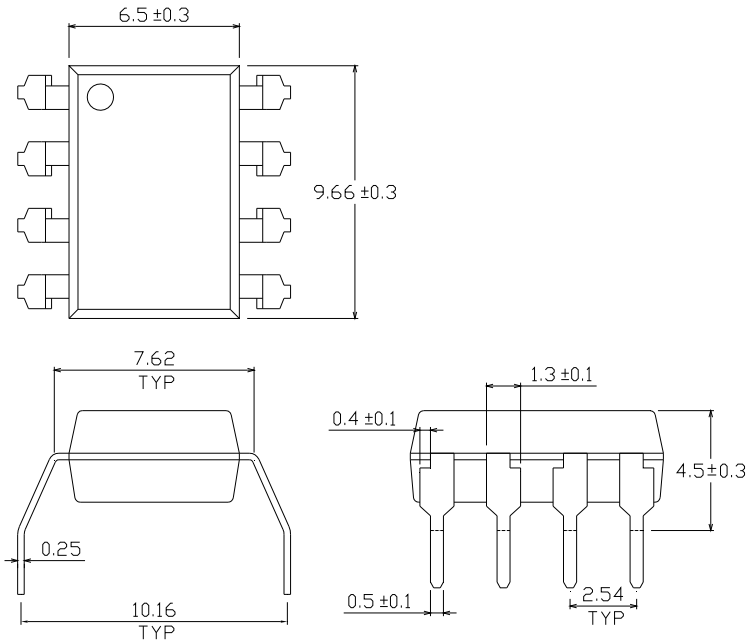
Package Drawing

(Dimensions in mm)

Standard DIP Type



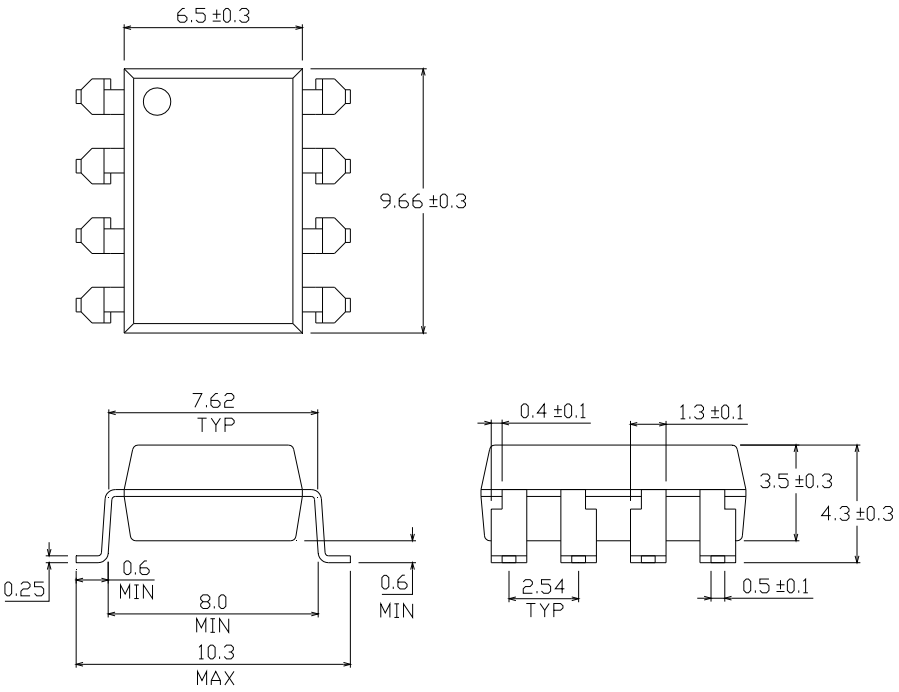
Option G Type



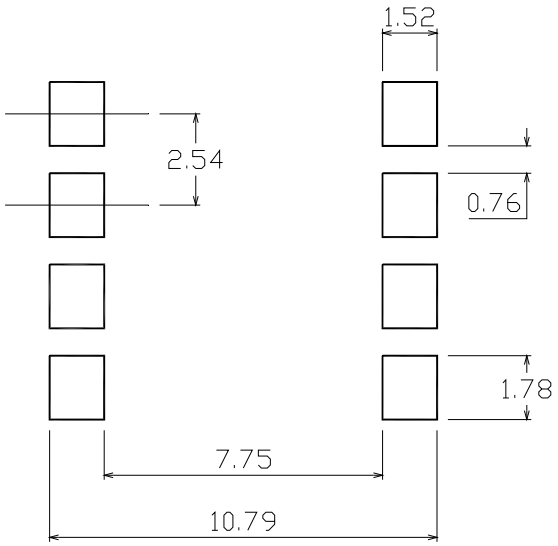
8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

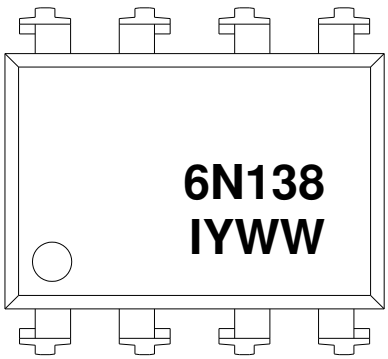
Option SM Type



Recommended pad layout for surface mount leadform



Device Marking



Notes

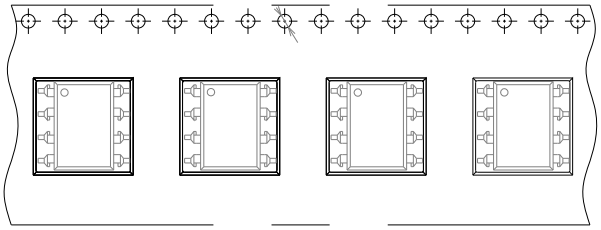
6N138	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
I	denotes Isocom

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

6N138 6N139

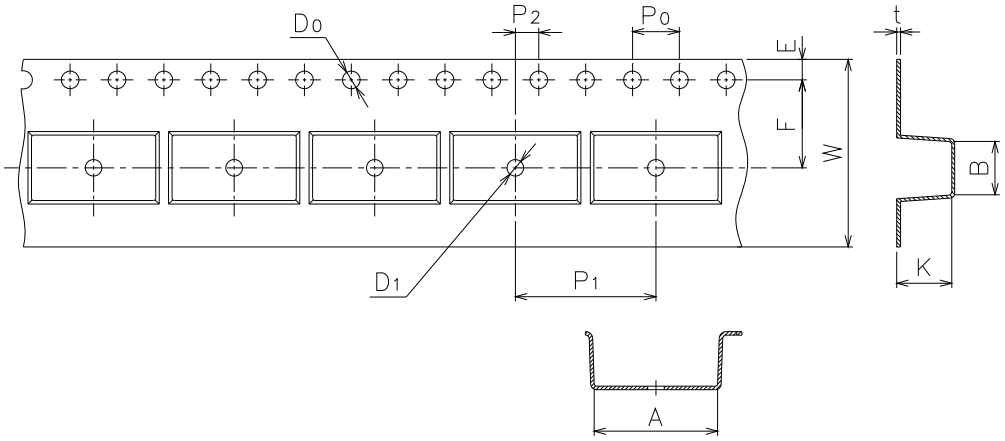
Tape & Reel Packing Specifications

Option TA



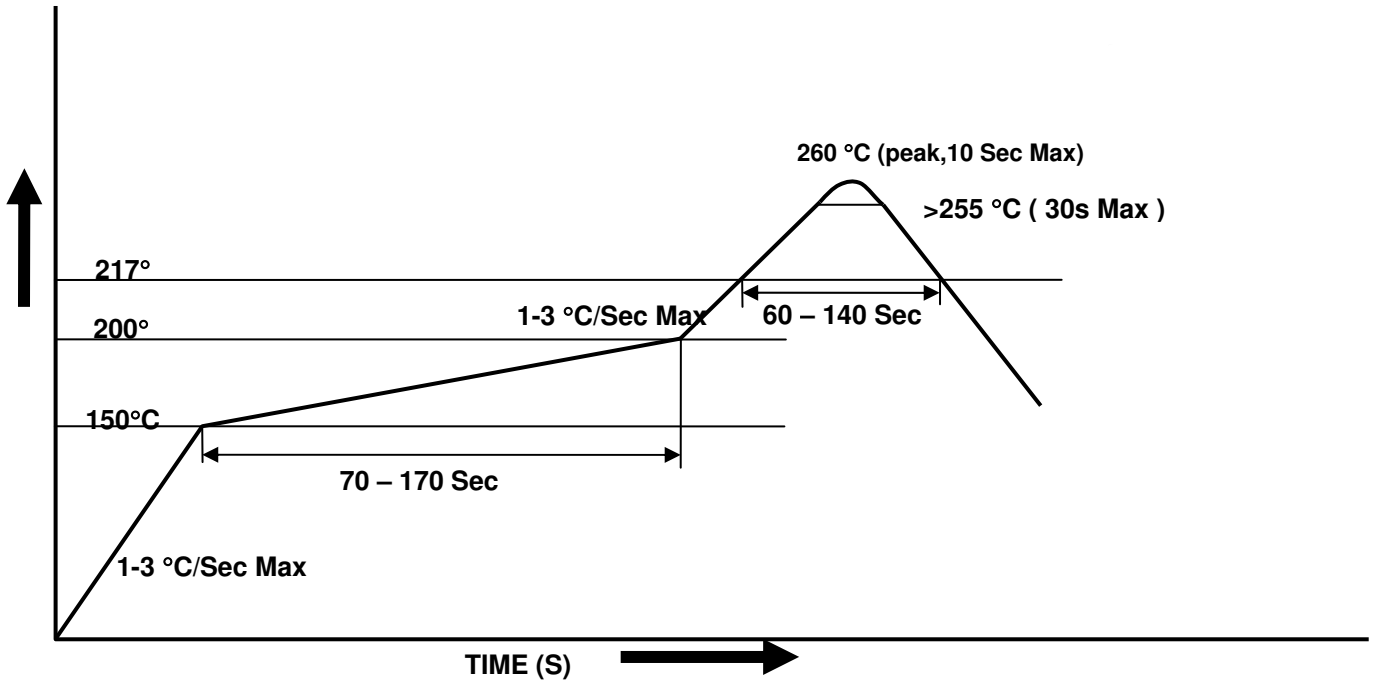
Direction of feed from reel

Tape dimensions



Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

Solder Reflow Temperature Profile



DISCLAIMER

1. Above specification may be changed without notice. Isocom will reserve authority on material change for above specification.
2. When using this product, please observe the absolute maximum ratings and the instructions for using outlined in these specification sheets. Isocom assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
3. These specification sheets include materials protected under copyright of Isocom. Please don't reproduce or cause anyone to reproduce them without Isocom's consent.