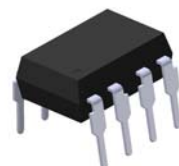


8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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

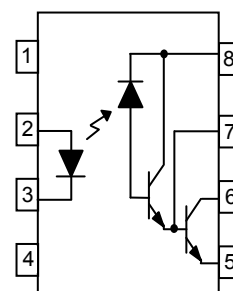
The 6N138 and 6N139 devices each consists of an infrared emitting diodes, optically coupled to a high gain split Darlington photo detectors.

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 ($T_a=25^{\circ}\text{C}$ 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 (≤1 μ 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

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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	$I_F = 1.6\text{mA}$
Reverse Voltage	V_R	5.0	-	-	V	$I_R = 10\mu\text{A}$, $T_A=25^\circ\text{C}$
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.8	-	mV/ $^\circ\text{C}$	$I_F=1.6\text{mA}$

Output

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

Transfer Characteristics ($T_a=0$ to 70°C unless specified otherwise, $V_{CC}=4.5\text{V}$)

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

* Typical values at $T_a = 25^\circ\text{C}$

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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Switching Characteristics (T_a=0 to 70°C unless specified otherwise, V_{cc}=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

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Typical Performance Curves

Fig.1 LED Forward Current vs. Forward Voltage

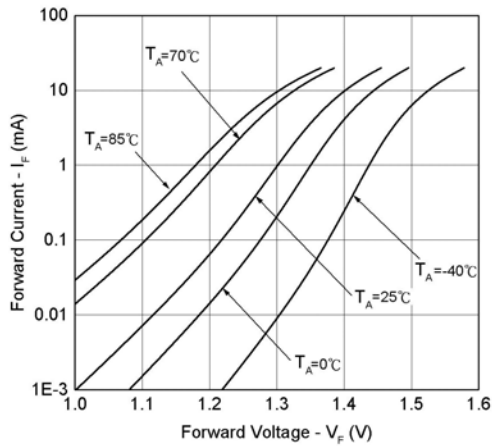


Fig.2 LED Forward Voltage vs. Temperature

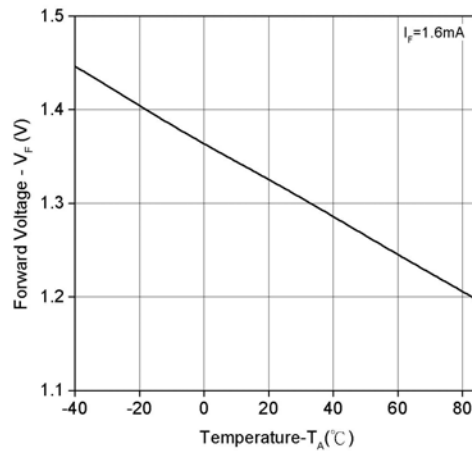


Fig.3 Output Current vs. Output Voltage

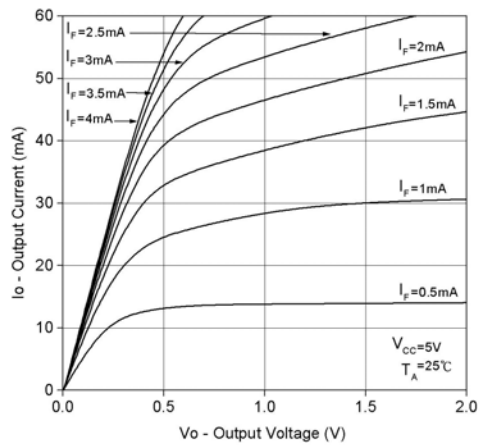
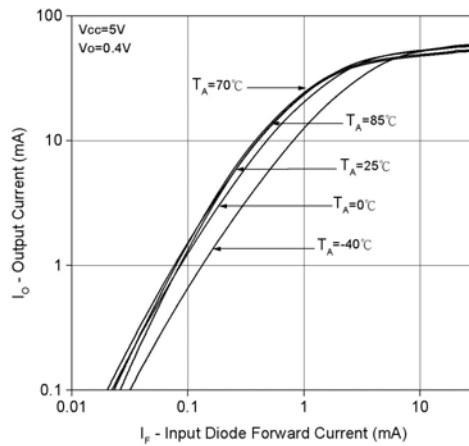


Fig.4 Output Current vs. Input Diode Forward Current



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Fig.5 Current Transfer Ratio vs. Forward Current

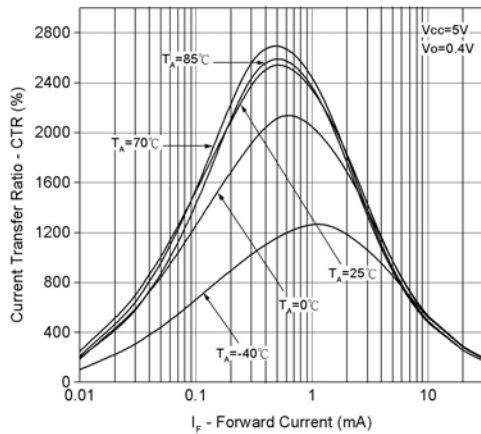


Fig.6 Current Transfer Ratio vs. Base-Emitter Resistance

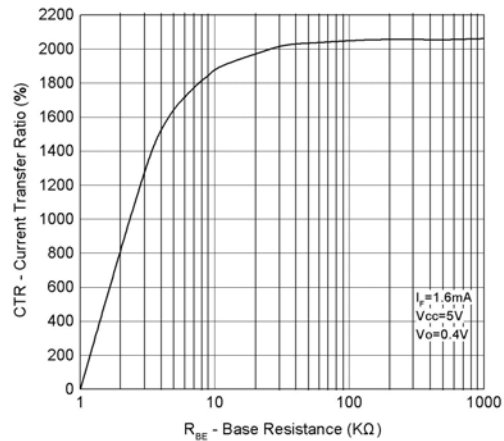


Fig.7 Non-saturated Rise and Fall Times vs. Load Resistance

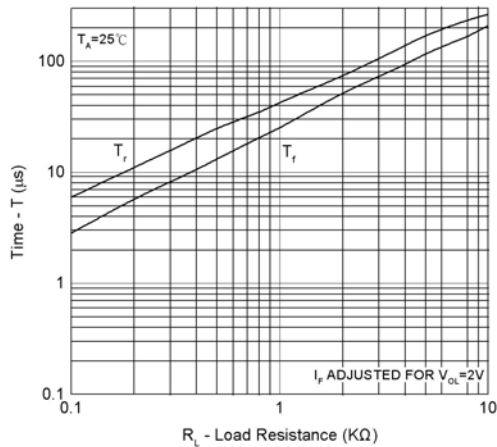
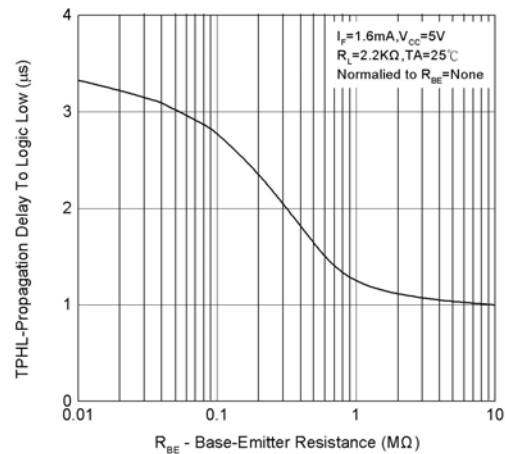


Fig.8 Propagation Delay To Logic Low vs. Base-Emitter Resistance



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Fig.9 Propagation Delay vs. Input Diode Forward Current

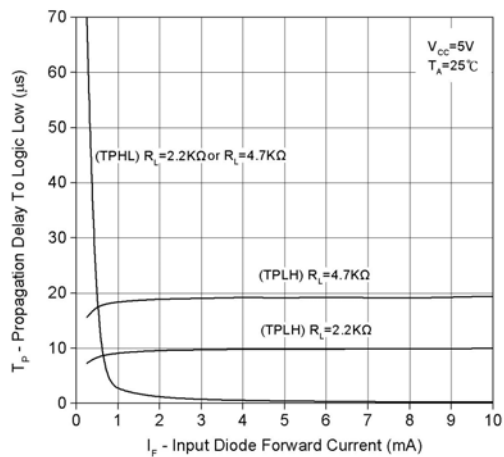


Fig.10 Propagation Delay to Logic Low vs. Pulse Period

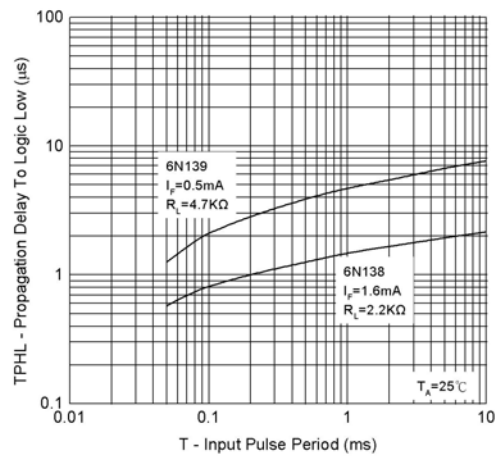


Fig.11 Propagation Delay vs. Temperature

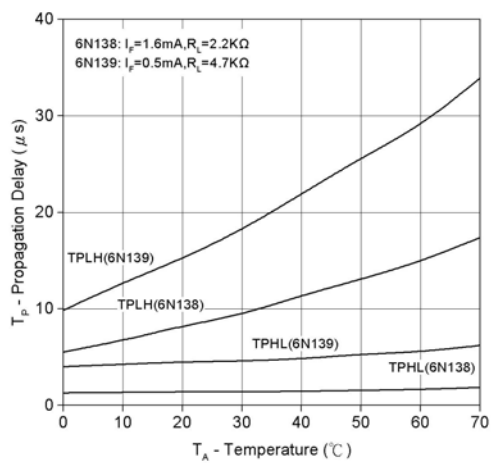
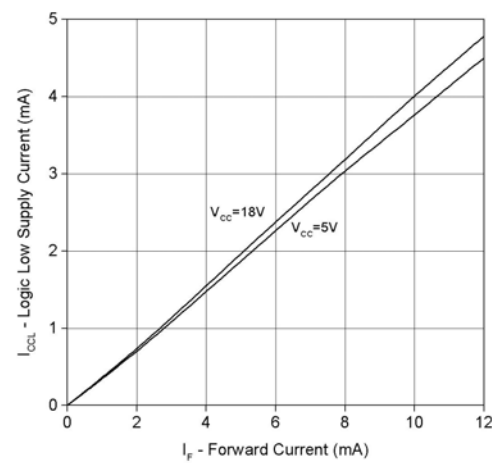


Fig.12 Logic Low Supply Current vs. Input Diode Forward Current



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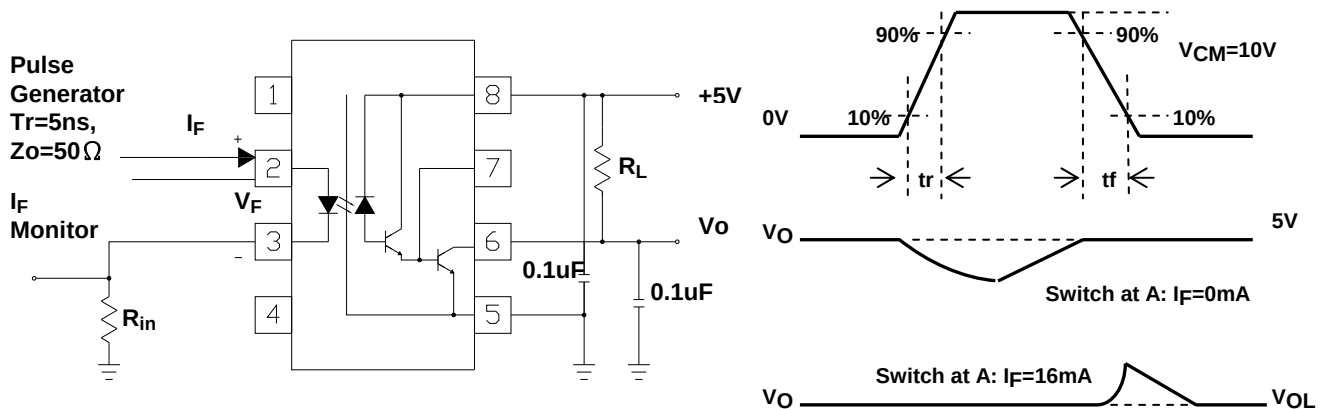


Fig. 13 Switching Time Test Circuit

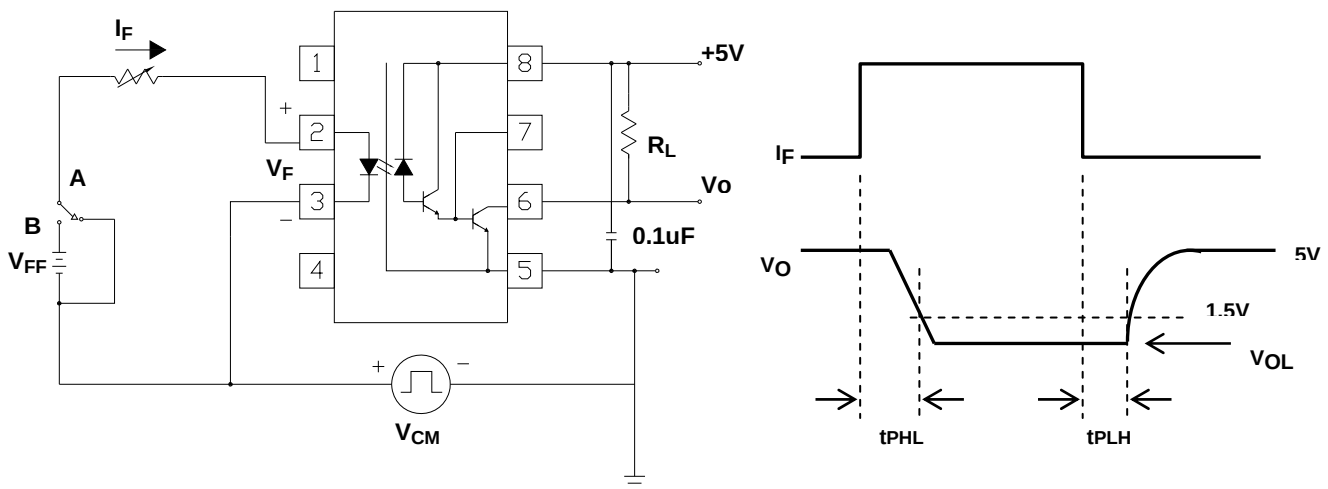


Fig. 14 Common Mode Transient Immunity Test Circuit

8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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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

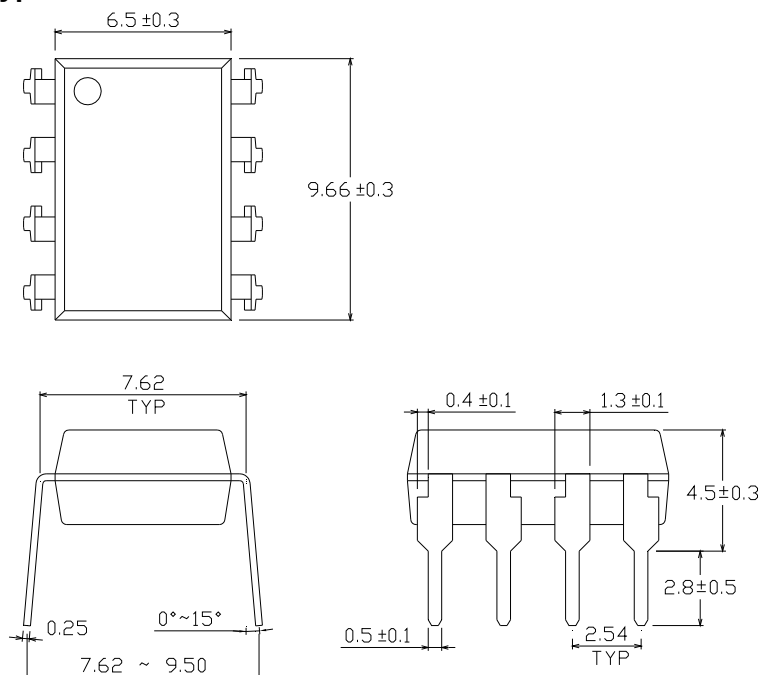
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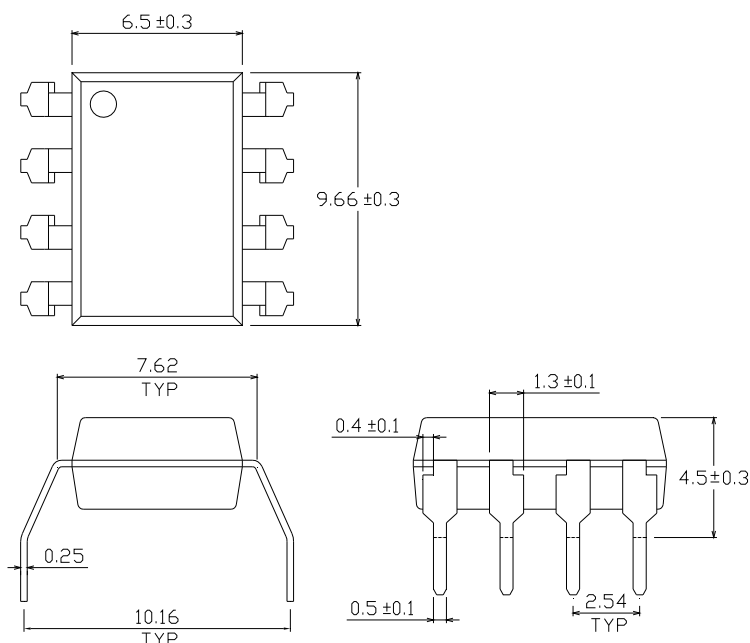
Package Drawing

(Dimensions in mm)

Standard DIP Type



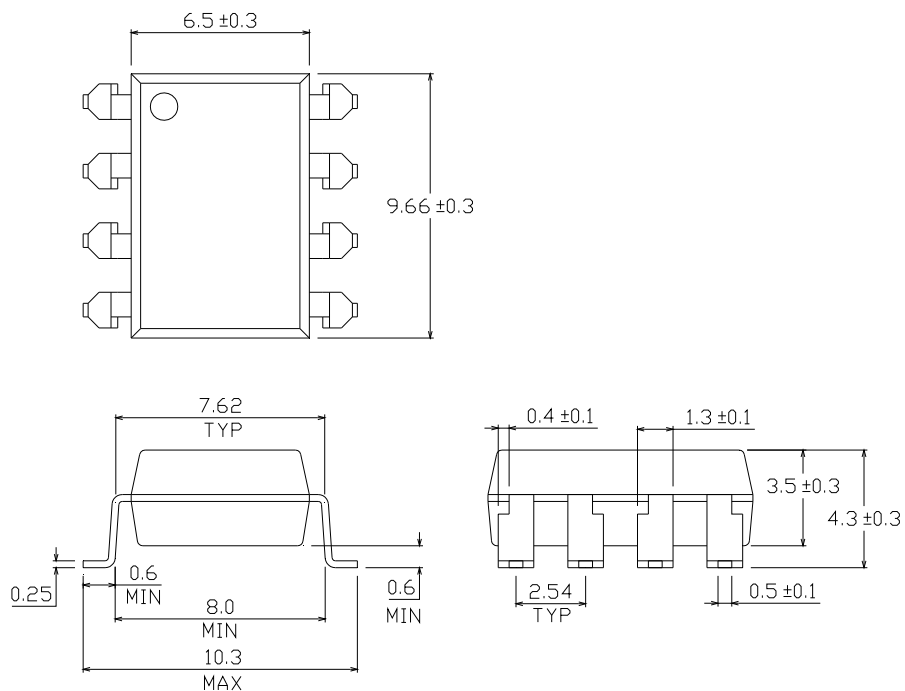
Option G Type



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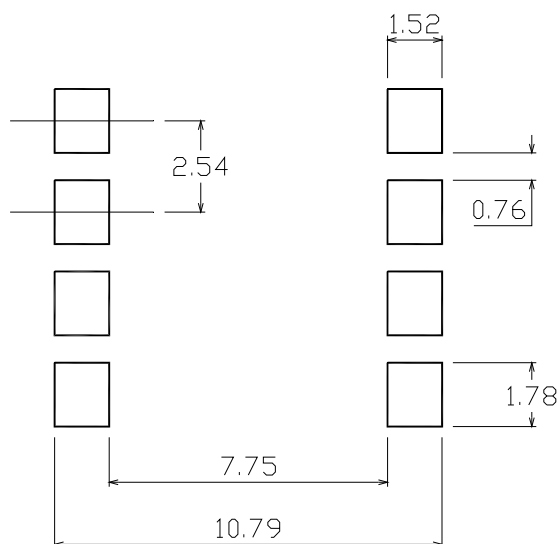
Option SM Type



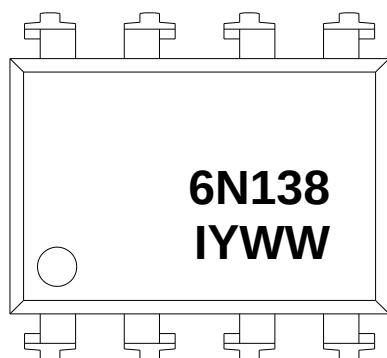
8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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Recommended pad layout for surface mount leadform



Device Marking



Notes

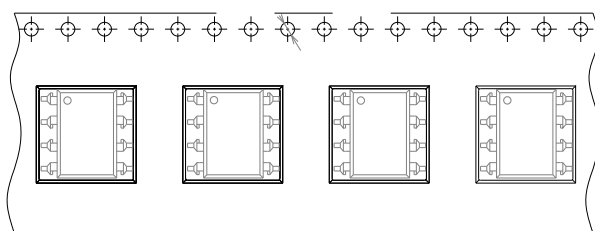
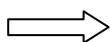
6N138 denotes Device Number
Y denotes 1 digit Year code
WW denotes 2 digit Week code
I denotes Isocom

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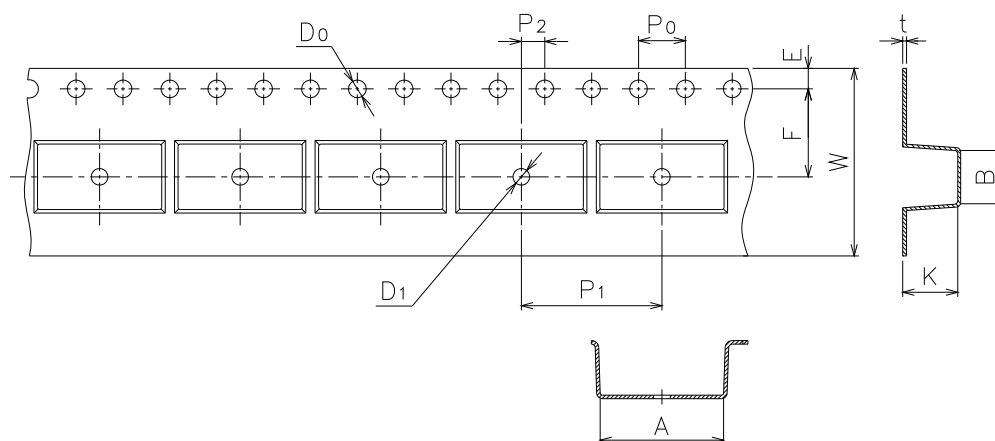
Tape & Reel Packing Specifications

Option TA



Direction of feed from reel

Tape dimensions

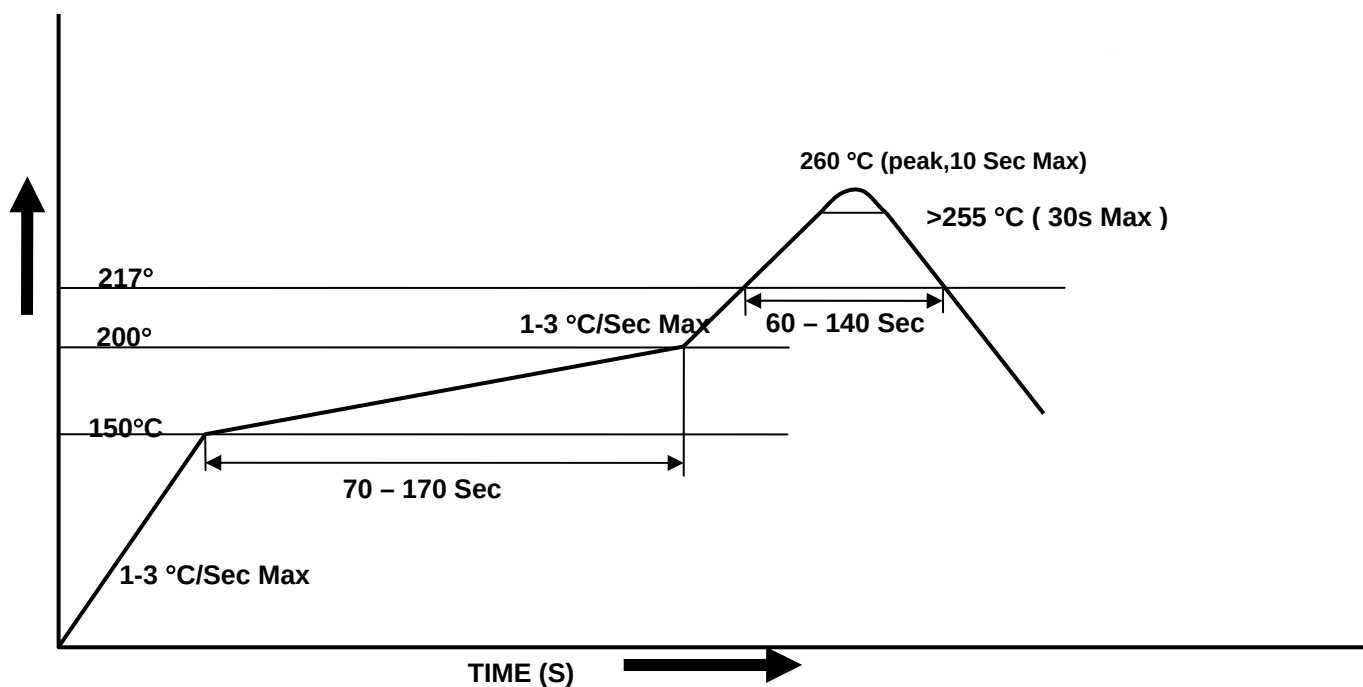


Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

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Solder Reflow Temperature Profile





8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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