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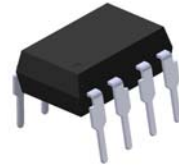


8 PIN DIP HIGH SPEED SPLIT DARLINGTON PHOTOCOUPLER

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.



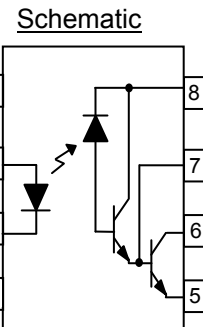
Description

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



6N138/6N139

Pin Configuration

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

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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 ($\leq 1 \mu\text{s}$ 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	$^\circ\text{C}$	
Storage temperature		T_{STG}	-55 ~ +125	$^\circ\text{C}$	
Soldering temperature ^{*2}		T_{SOL}	260	$^\circ\text{C}$	

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.

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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 = 1.6mA
Reverse Voltage	V _R	5.0	-	-	V	I _R = 10µA, T _A =25°C
Temperature coefficient of forward voltage	ΔV _F /ΔT _A	-	-1.8	-	mV/°C	I _F =1.6mA

Output

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition	
Logic High Output Current	6N139	-	-	100	µA	I _F =0mA, V _O =V _{CC} =18V	
	6N138	-	-	250			
Logic Low Supply Current	6N138 6N139	I _{CC} L	-	-	1.5	mA	I _F =1.6mA, V _O =Open, V _{CC} =18V
Logic High Supply Current	6N138 6N139	I _{CC} H	-	-	10	µA	I _F =0mA, V _O =Open, V _{CC} =18V

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

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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	-	-	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
	6N138	-	-	2		I _F = 12mA , R _L =270Ω
		-	-	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	-	-	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
	6N138	-	-	10		I _F = 12mA , R _L =270Ω
		-	-	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

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Typical Performance Curves

Fig.1 LED Forward Current vs. Forward Voltage

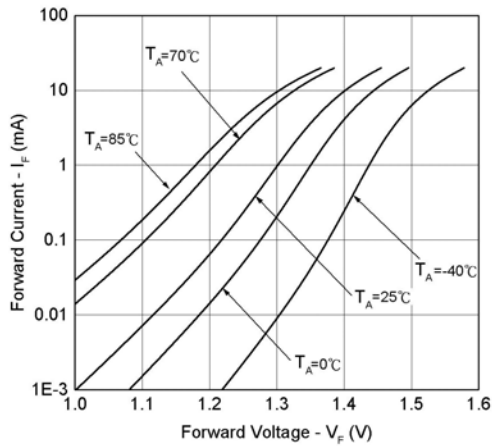


Fig.2 LED Forward Voltage vs. Temperature

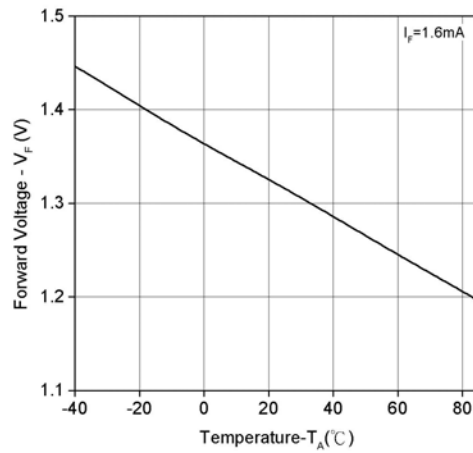


Fig.3 Output Current vs. Output Voltage

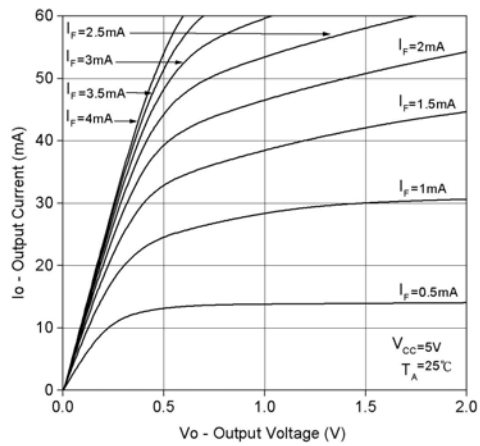
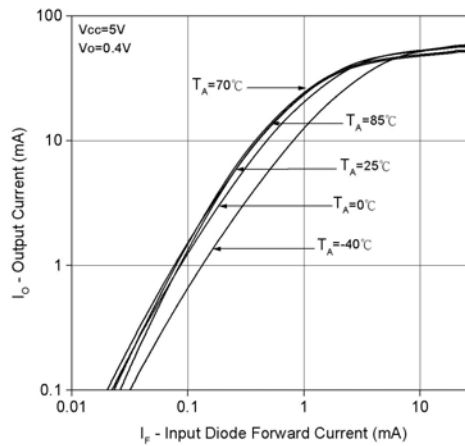


Fig.4 Output Current vs. Input Diode Forward Current



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Fig.5 Current Transfer Ratio vs. Forward Current

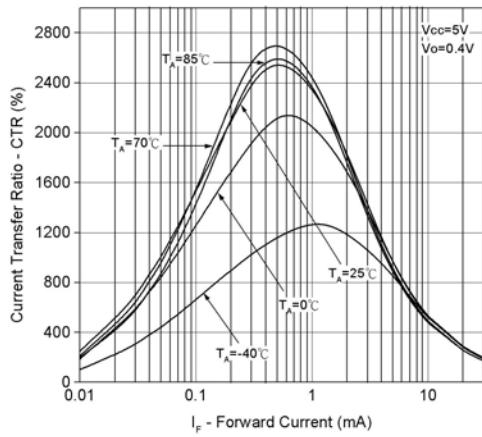


Fig.6 Current Transfer Ratio vs. Base-Emitter Resistance

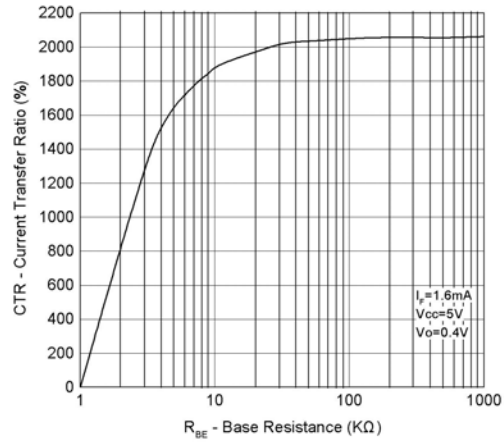


Fig.7 Non-saturated Rise and Fall Times vs. Load Resistance

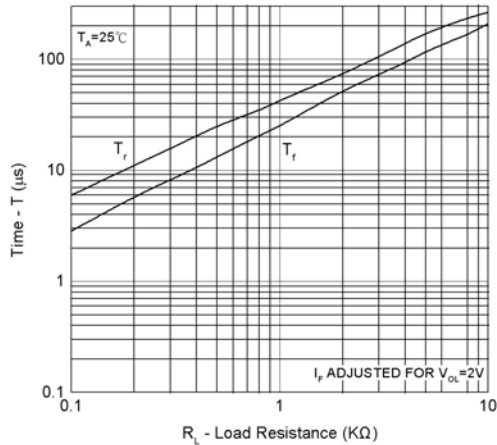
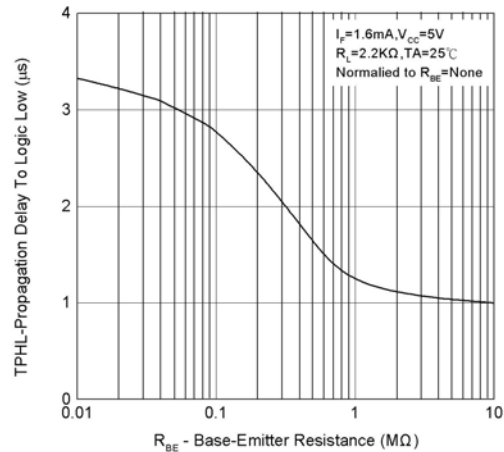


Fig.8 Propagation Delay To Logic Low vs. Base-Emitter Resistance



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Fig.9 Propagation Delay vs. Input Diode Forward Current

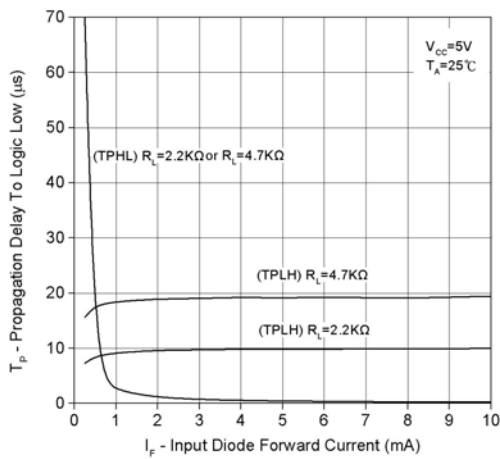


Fig.10 Propagation Delay to Logic Low vs. Pulse Period

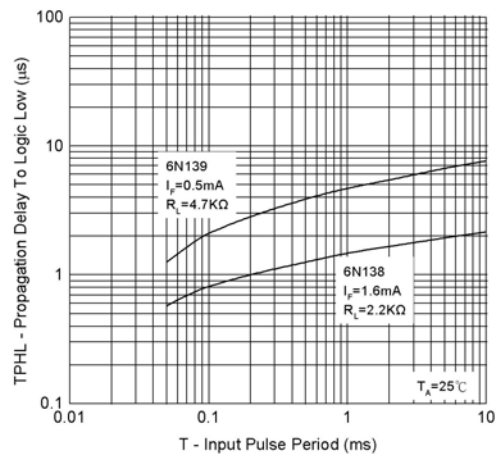


Fig.11 Propagation Delay vs. Temperature

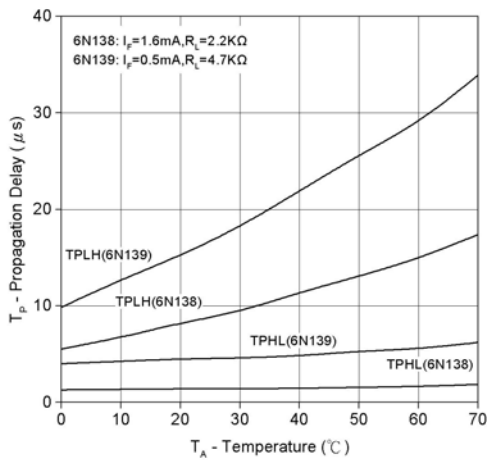
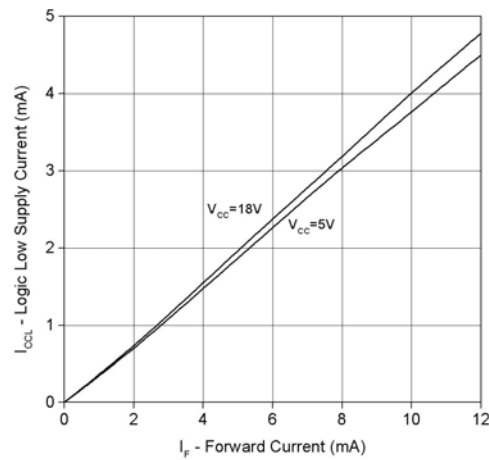


Fig.12 Logic Low Supply Current vs. Input Diode Forward Current



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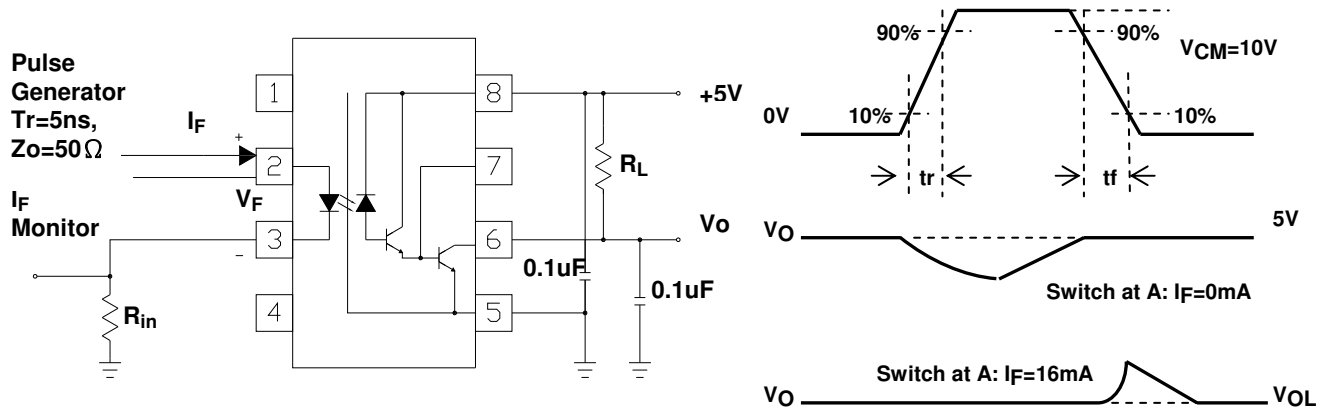


Fig. 13 Switching Time Test Circuit

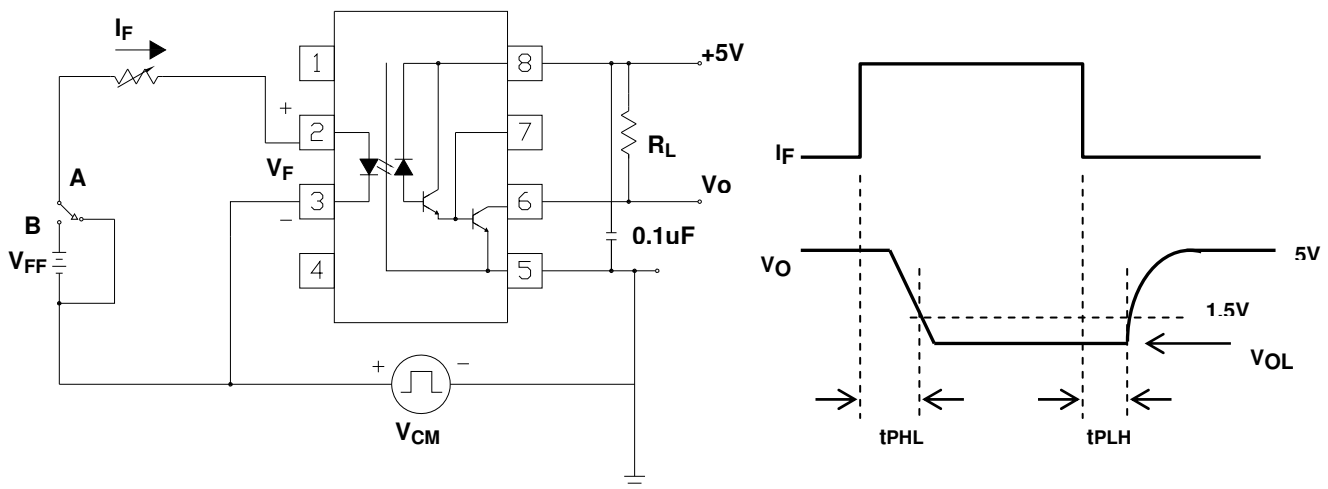
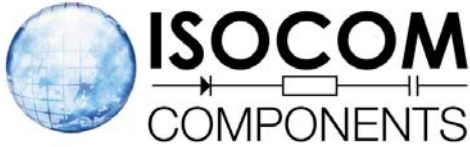


Fig. 14 Common Mode Transient Immunity Test Circuit



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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)

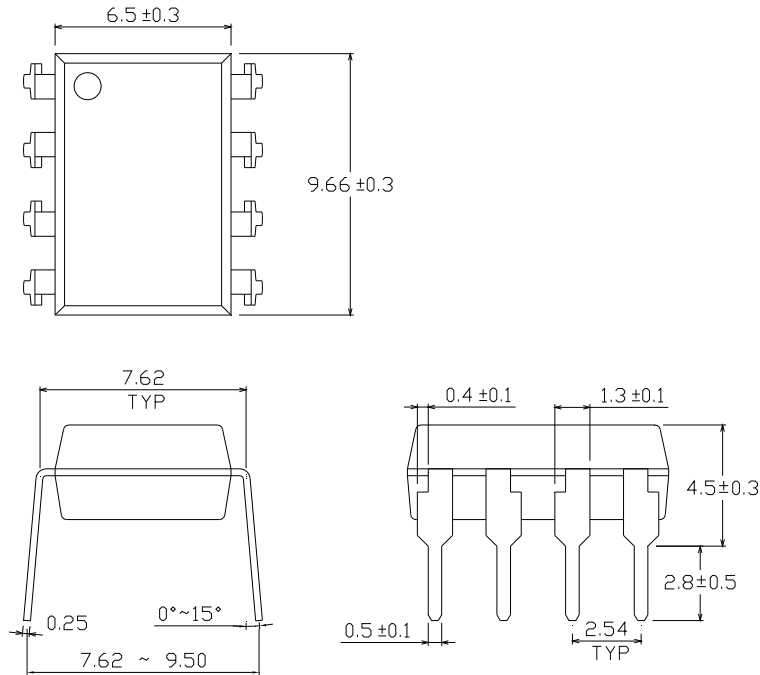
Option	Description	Packing quantity
None	Standard DIP-8	45 units per tube
G	Wide lead bend (0.4 inch spacing)	45 units per tube
SM	Surface mount lead form	45 units per tube
SM T+R	Surface mount lead form + tape & reel	1000 units per reel

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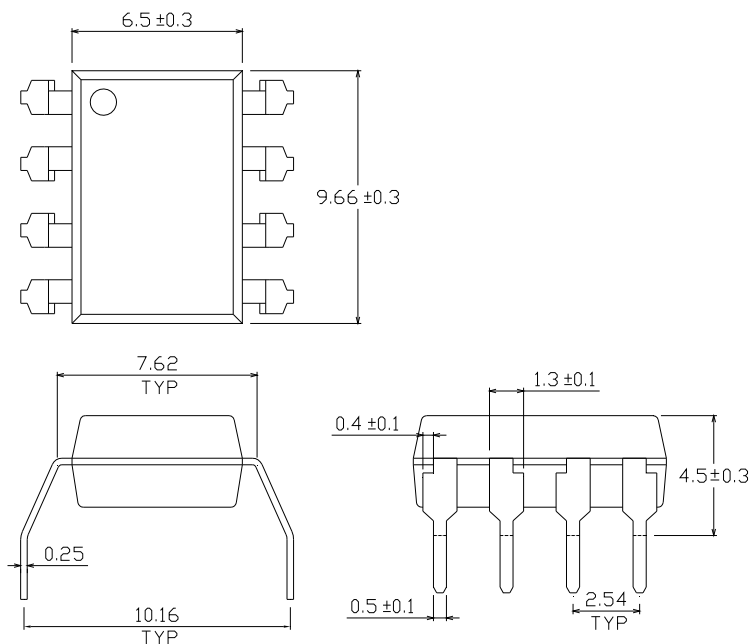
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Package Drawing (Dimensions in mm)

Standard DIP Type



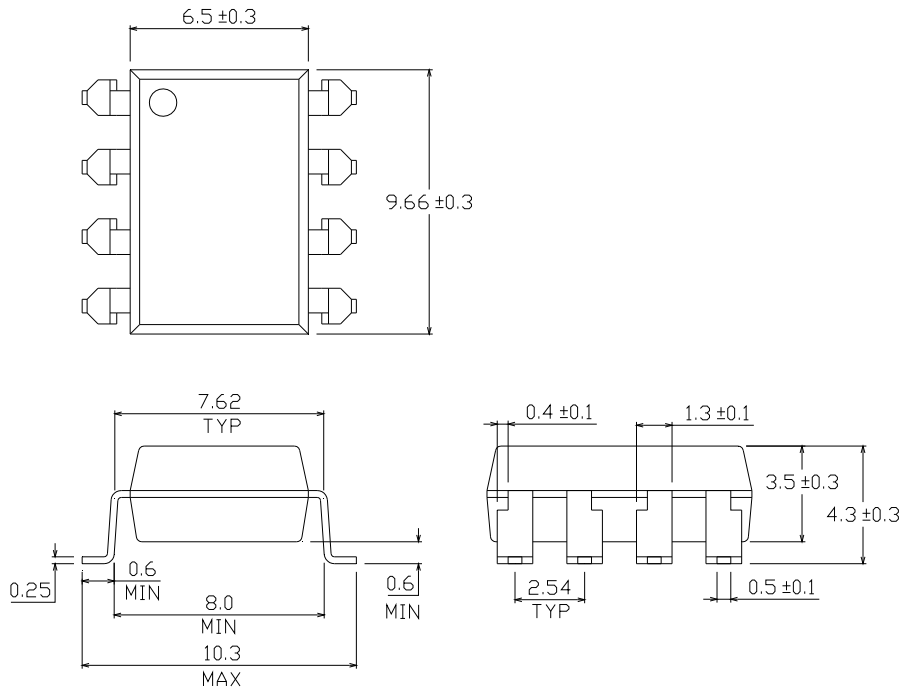
Option G Type



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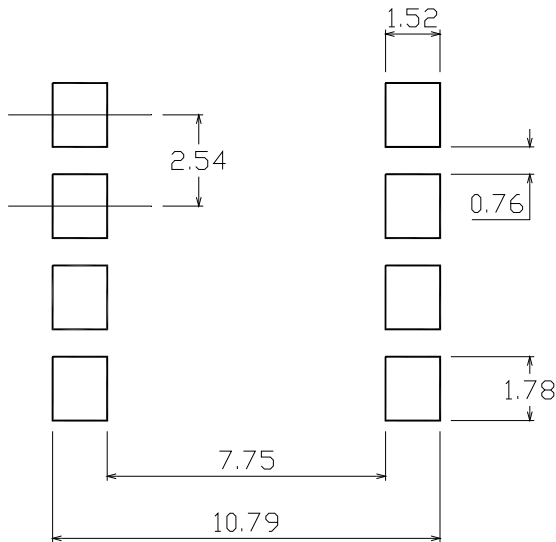
Option SM Type



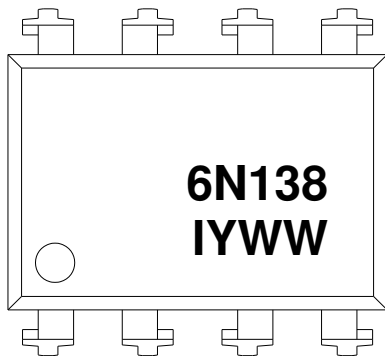
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Recommended pad layout for surface mount leadform



Device Marking



Notes

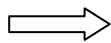
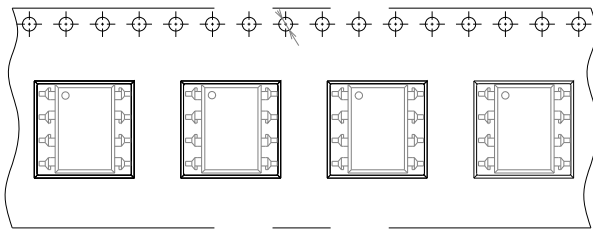
6N138 denotes Device Number
 Y denotes 1 digit Year code
 WW denotes 2 digit Week code
 I denotes Isocom

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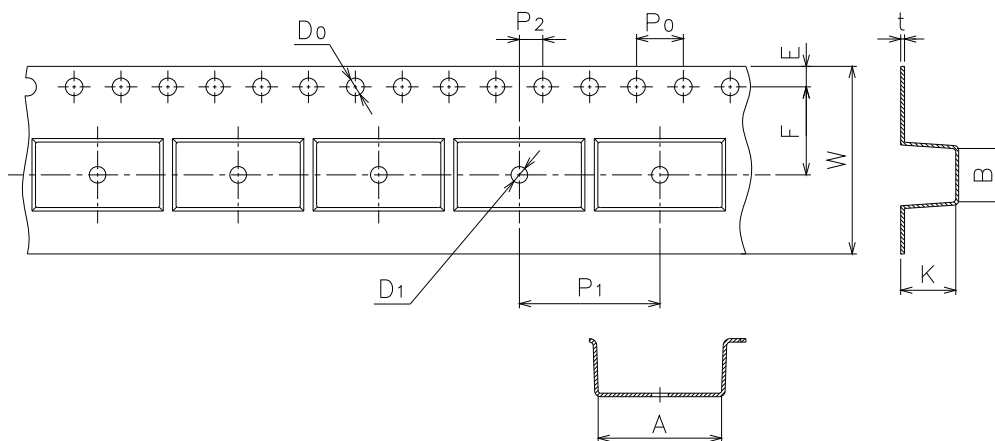
Tape & Reel Packing Specifications

Option TA



Direction of feed from reel

Tape dimensions

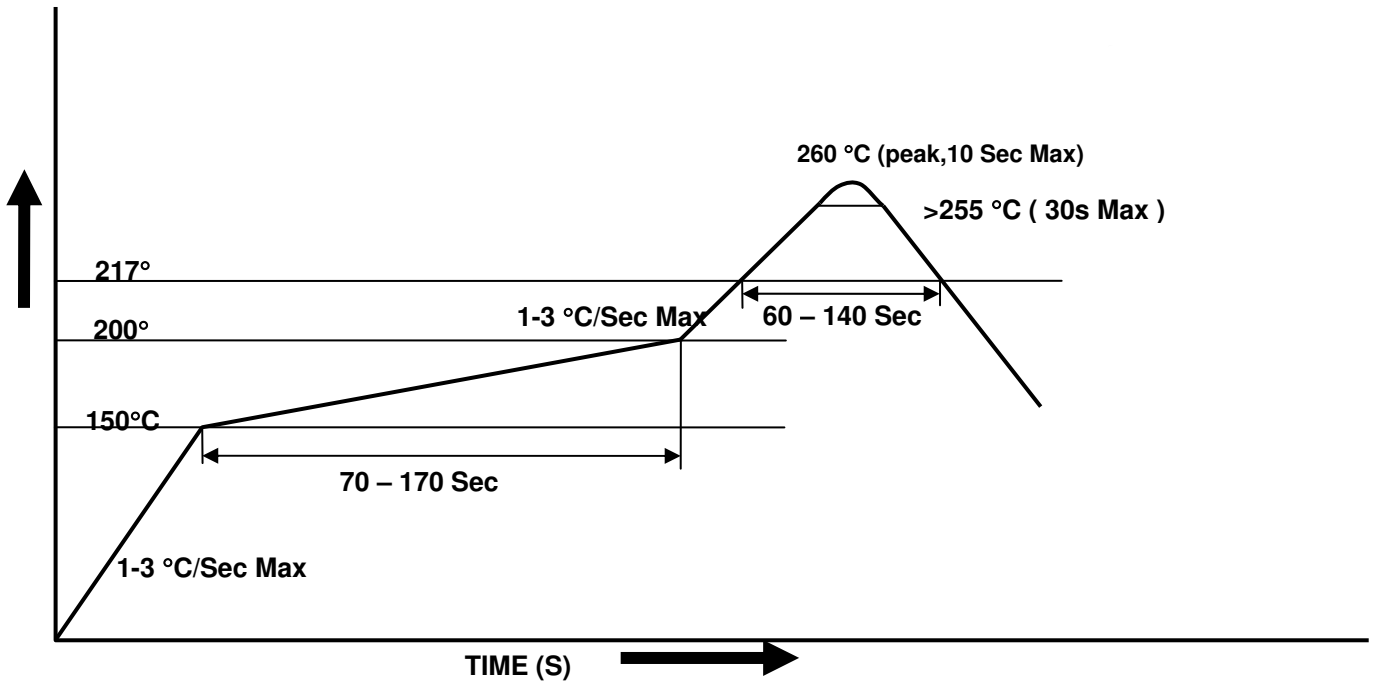


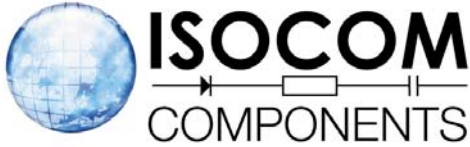
Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/ -0.1	4.5±0.1

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Solder Reflow Temperature Profile





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