



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-6N138/6N139

Customer: _____

Date: _____

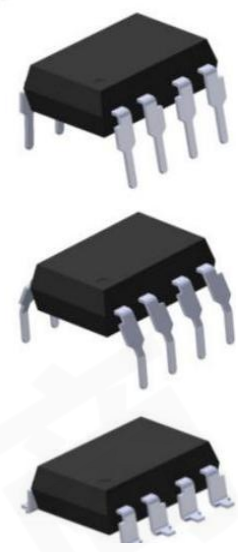
SHENZHEN ORIENT COMPONENTS CO., LTD

Block A 3rd Floor No.4 Building, Tian'an Cyber Park, Huangge Rd, LongGang Dist, Shenzhen, GD

TEL: 0755-29681816
FAX: 0755-29681200
www.orient-opto.com

1. Features

- High current transfer ratio – 2000% typical.
- Low input current requirements – 0.5mA
- High output current – 60mA
- CTR guarantee – 0~70°C.
- Instantaneous common mode rejection 10KV/μsec
- MSL Class I



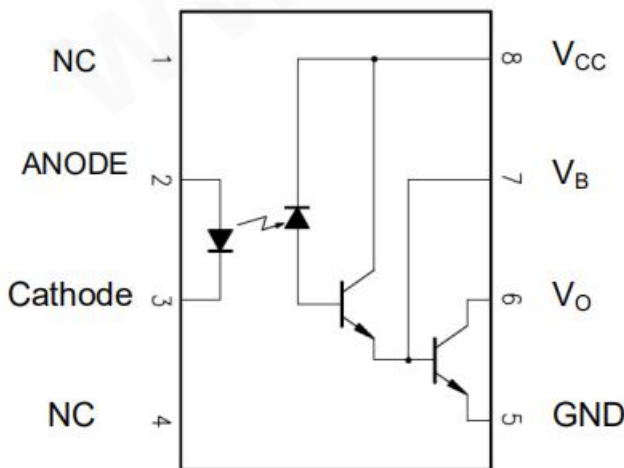
2. Instructions

The 6N138/6N139 devices each consists of an infrared emitting diode, optically coupled to a high gain split Darlington photo detector. They provide extremely high current transfer ratio between input and output, with access to a base terminal to adjust the gain bandwidth. These devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD options.

3. Application Range

- Digital logic ground isolation
- Low input current line receiver
- Telephone ring detector
- EIA-RS-232C line receiver
- Current loop receiver
- High common mode noise line receiver

4. Functional Diagram



Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

A 0.1μF bypass Capacitor must be connected between Pin8 and Pin5

5. Absolute Maximum Ratings (Ta=25°C)*1

Parameter		Symbol	Rated Value	Unit	
Input	Average Forward Input Current	I_F	20	mA	
	Reverse Input Voltage	V_R	5	V	
	Power Dissipation	P_I	40	mW	
	Enable Input Voltage	V_B	VCC+0.5	V	
	Enable Input current	I_E	5	mA	
Output	Output Collector Current	I_O	50	mA	
	Output Collector Voltage	OR-6N138	V_O	-0.5~7	V
		OR-6N139		-0.5~18	
	Supply Voltage	OR-6N138	V_{CC}	-0.5~7	V
OR-6N139			-0.5~18		
	Output Collector Power Dissipation	P_O	100	mW	
	Insulation Voltage	V_{iso}	5000	Vrms	
	Working Temperature	T_{opr}	-40 ~ + 85	°C	
	Storage Temperature	T_{stg}	-55 ~ + 125		
*2	Soldering Temperature	T_{sol}	260		

*1. Room temperature = 25 °C. Exceeding the maximum absolute rating can permanently damage the device.

Working long hours at the maximum absolute rating can affect reliability.

*2. soldering time is 10 seconds.

6. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-40	110°C	°C
Supply Voltage	V_{CC}	2.7	3.6	V
		4.5	5.5	
Low Level Input Current	I_{FL}	0	250	μA
High Level Input Current	I_{FH}	5	15	mA
Low Level Enable Voltage	V_{EL}	0	0.8	V
High Level Enable Voltage	V_{EH}	2	V_{CC}	V
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (at $R_L=1k\Omega$ per channel)	N	—	5	TTL Loads

7. Opto-electronic Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Input							
Forward voltage	V_F	$I_F = 1.6\text{mA}$	—	1.1	1.7	V	
Temperature Coefficient OF Forward Voltage	$\Delta V_F / \Delta T$	$I_F = 1.6\text{mA}$	—	-1.9	—	mV/°C	
Reverse Voltage	BV_R	$I_R = 10\mu\text{A}$	5	—	—	V	
Output							
High Level Supply Current	OR-6N138	I_{CCH}	$V_O = \text{OPEN}, V_{CC} = 18\text{V}, I_F = 0\text{mA}$	—	0.05	10	mA
	OR-6N139						
Low Level Supply Current	OR-6N138	I_{CCL}	$V_O = \text{OPEN}, V_{CC} = 18\text{V}, I_F = 1.6\text{mA}$	—	0.6	1.5	mA
	OR-6N139						
High Level Output Current	OR-6N138	I_{OH}	$V_{CC} = V_O = 18\text{V}, I_F = 0\mu\text{A}$	—	0.01	100	μA
	OR-6N139						
Logic low output voltage	OR-6N138	V_{OL}	$I_F = 1.6\text{mA}; V_{CC} = 4.5\text{V}$ $I_O = 4.8\text{mA}$	—	0.1	0.4	V
	OR-6N139		$I_F = 0.5\text{mA}; V_{CC} = 4.5\text{V}$ $I_O = 2\text{mA}$				
			$I_F = 1.6\text{mA}; V_{CC} = 4.5\text{V}$ $I_O = 8\text{mA}$				
			$I_F = 5\text{mA}; V_{CC} = 4.5\text{V}$ $I_O = 15\text{mA}$				
	OR-6N139		$I_F = 12\text{mA}; V_{CC} = 4.5\text{V}$ $I_O = 24\text{mA}$				
Current transfer ratio	OR-6N138	CTR	$I_F = 1.6\text{mA}; V_{CC} = 0.4\text{V}; V_{CC} = 4.5\text{V}$	300	1600	2600	%
	OR-6N139		$I_F = 0.5\text{mA}; V_O = 0.4\text{V}; V_{CC} = 4.5\text{V}$	400	2000	5000	
			$I_F = 1.6\text{mA}; V_{CC} = 0.4\text{V}; V_{CC} = 4.5\text{V}$	500	1600	2600	

Recommended temperature range ($T_A = -40^\circ\text{C} \sim +85^\circ\text{C}, 4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values, $T_A = 25^\circ\text{C}, V_{CC} = 5.0\text{V}$.

8. Switching Characteristics

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Propagation Delay Time to Low Output Level	OR-6N138	t_{PHL}	IF=1.6mA; RL=2.2KΩ	-	1.6	10	μs
	OR-6N139		IF=0.5mA; RL=4.7KΩ	-	5	25	
			IF=12mA; RL=270Ω	-	0.1	1	
Propagation Delay Time to High Output Level	OR-6N138	t_{PLH}	IF=1.6mA; RL=2.2KΩ	-	10	35	μs
	OR-6N139		IF=0.5mA; RL=4.7KΩ	-	18	60	
			IF=12mA; RL=270Ω	-	2	7	
Logic High Common Mode Transient Immunity		$ C_{MH} $	IF=0mA; VCM =10V RL=2.2KΩ	1	10	-	KV/μs
Logic Low Common Mode Transient Immunity		$ C_{ML} $	IF=1.6mA; VCM =10V RL=2.2KΩ	1	10	-	KV/μs

*All Typical at $T_A = 25^\circ\text{C}$

9. Order Information

Part Number

OR-6N138X-W-Y-Z
 Or **OR-6N139X-W-Y-Z**

Note

X = Lead form option (S, M or none)

W = Tape and reel option (TA,TA1 or none).

Y = 'V' code for VDE safety (This options is not necessary).

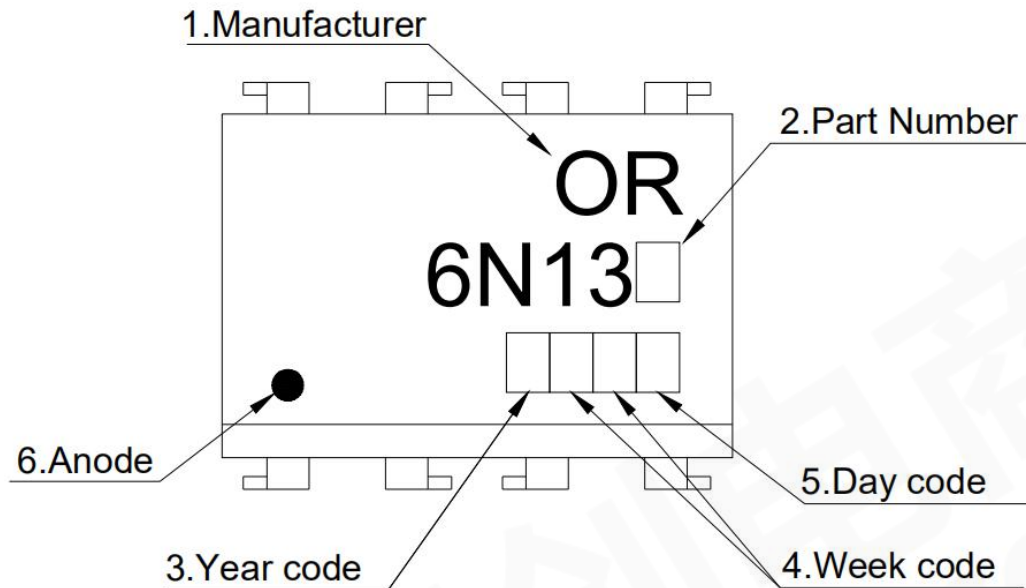
Z = 'G' code for Halogen free (This options is not necessary).

* VDE Code can be selected.

* Halogen Free can be selected.

Option	Description	Packing quantity
None	Standard SMD Option	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
TA	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
TA1	Surface mount lead form (low profile) + TA1 tape & reel option	1000 units per reel

10. Naming Rule



NOTE:

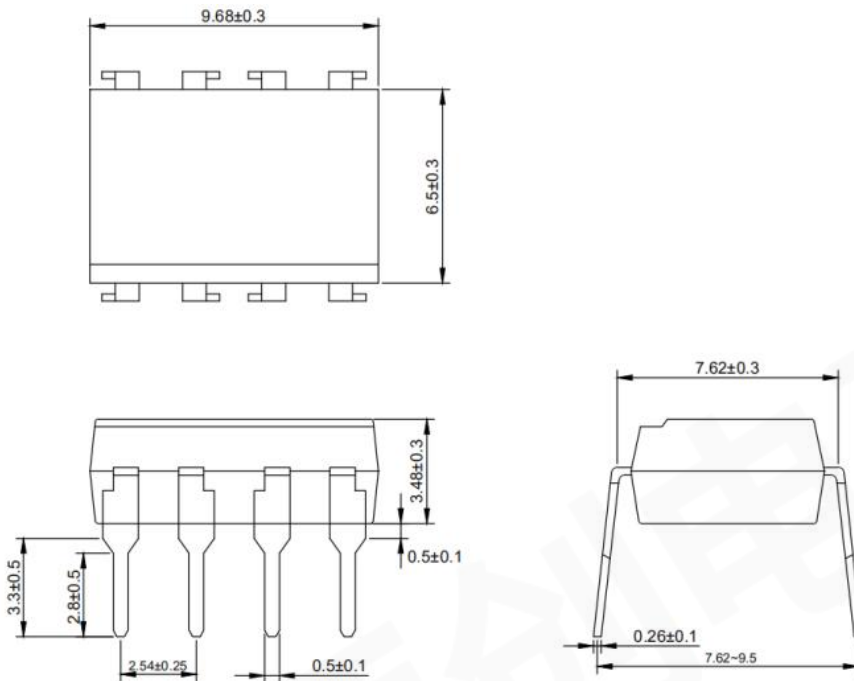
1. ORIENT.
2. Part Number.
3. Year Code: '9' means '2019' and so on.
4. Week Code: 01 represents the first week, 02 represents the second week, and so on.
5. Day Code: 'A to F' means 'Monday to Sunday'.
6. Anode.

* Halogen Free Mark can be selected.

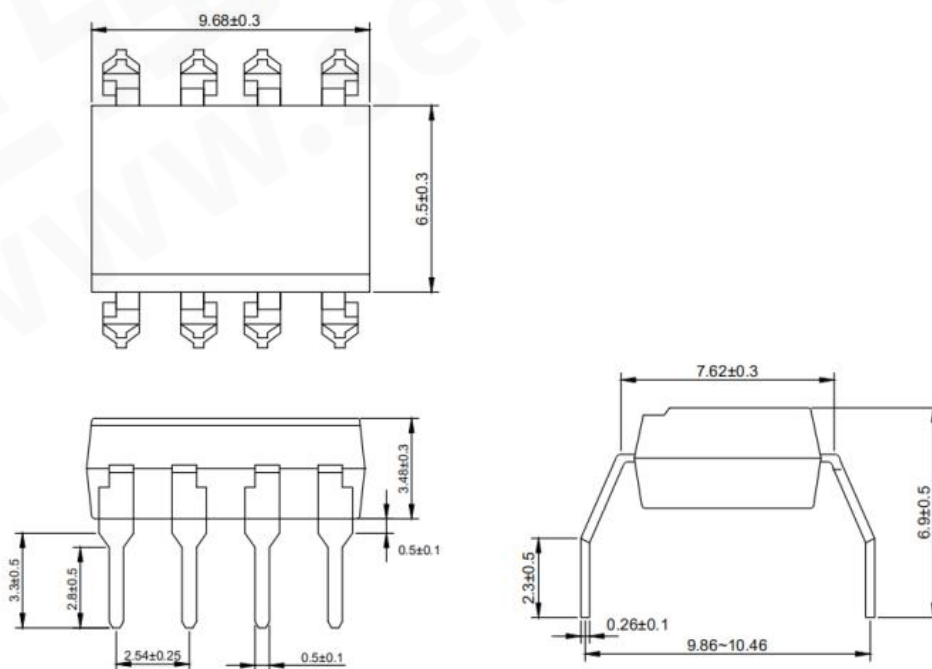
* VDE Mark can be selected.

11. Outer Dimension

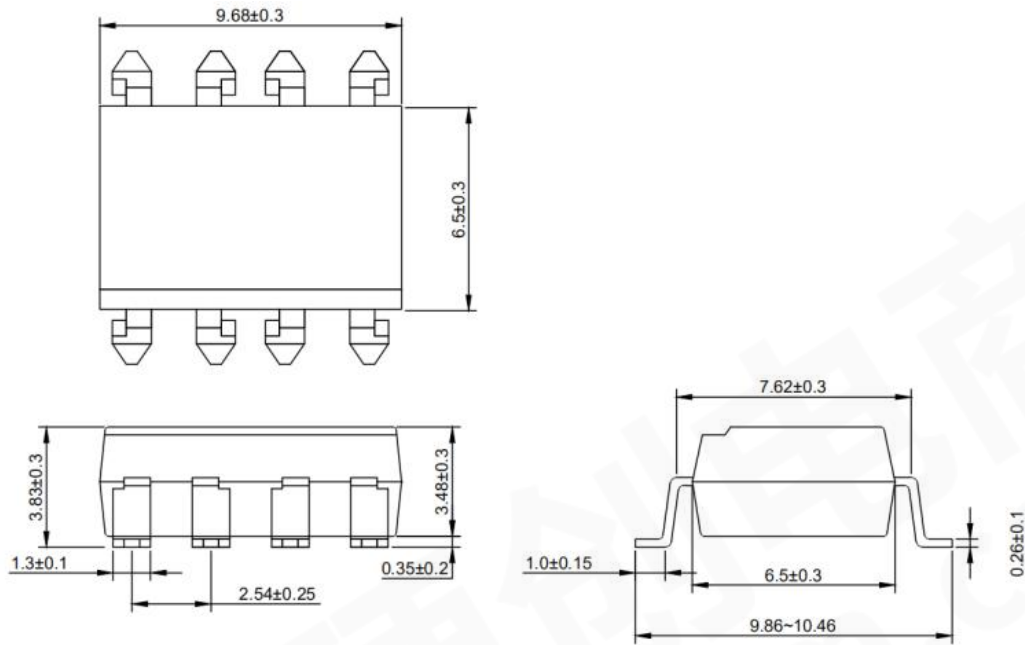
(1) OR-6N13X



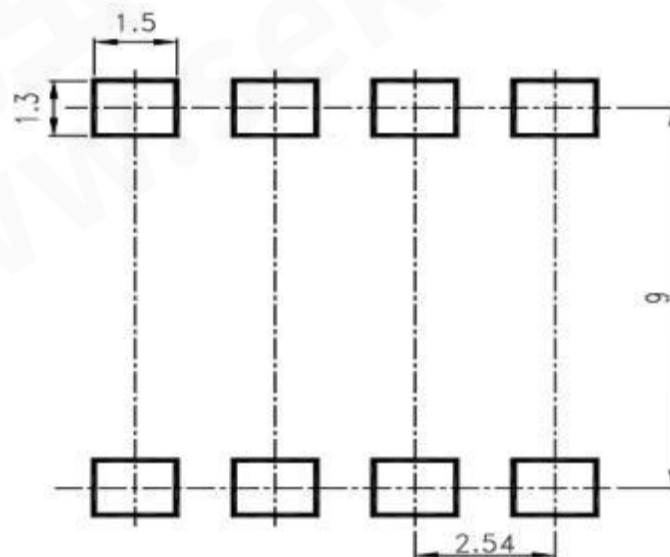
(2) OR-6N13XM



(3) OR-6N13XS



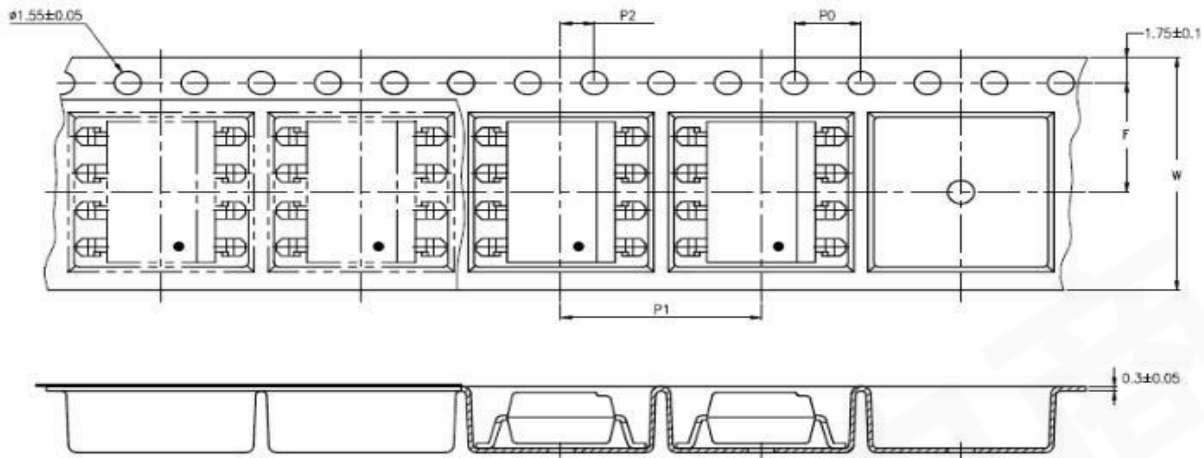
12. Recommended Foot Print Patterns (Mount Pad)



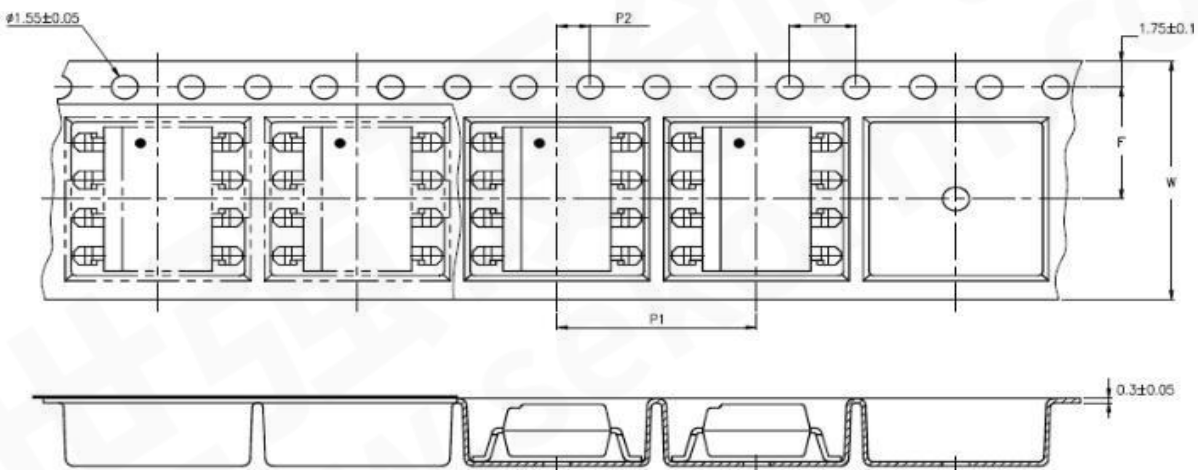
(unit: mm)

13. Taping Dimensions

(1) OR-6N13X-TA



(2) OR-6N13X-TA1



type	symbol	Size: mm (inches)
bandwidth	W	16 ± 0.3 (0.63)
pitch	P_0	4 ± 0.1 (0.15)
pitch	F	7.5 ± 0.1 (0.295)
	P_2	2 ± 0.1 (0.079)
interval	P_1	12 ± 0.1 (0.472)

Encapsulation type	TA/TA1
amount (pcs)	1000

14. Package Dimension

(1) package dimension

DIP/M type

Packing Information	
Packing type	Tube(Plug)
Qty per Tube	45
Small box (inner) Dimenaion	525*132*60mm
Max qty per small box	2250
Large box (Outer) Dimenaion	530*290*335mm
Max qty per large box	22500

SOP type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1000
Small box (inner) Dimenaion	345*345*60mm
Max qty per small box	2000
Large box (Outer) Dimenaion	620x360x360mm
Max qty per large box	20000

(2)Packing Label Sample



1. MTL NO:Contents with "Order Information" in the specification.
2. LOT NO:The production cycle of the product.
3. BATCH:The CTR RANK of the product.
4. Quantity:Product packaging quantity.
5. Product Data: The data when product be made.

15. Reliability Test

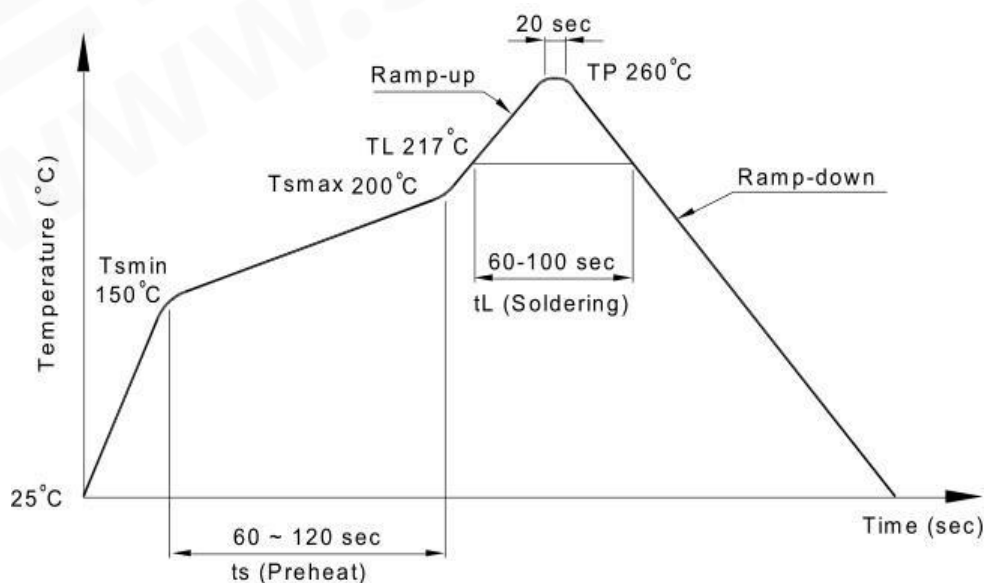
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C,20s/cycle	22	3 cycles	JESC22A-106
2	SD, Solderability	260±5°C, 10s/cycle	22	1 cycle	JESD22-B102
3	TC, Temperature Cycle	H: 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 5min ∫ 15s L:-10°C 5min	77	300cysles	JESC22A-106
5	LTSL, Low Temperature Storage	T:-55°C	77	1000h	JESD22-A119
6	HTSL, High Temperature Storage	T:125°C	77	1000h	JESC22A-103
7	THB, High Temperature High Humidity	T:85°C RH: 85%	77	1000h	JESC22A-101
8	HTOL DC Operating Life	T: 110°C IF=10mA VCC=5V	77	1000h	MIL-STD-750 Method 1037
9	ESD-HBM Human Body Model ESD	Ta=25° C, Reference JESD22-A114	6	1 cycle	JESD22-A114

16. Temperature Profile Of Soldering

(1) IR Reflow soldering (JEDEC-STD-020C compliant)

Note: one solder backflow is recommended under the conditions described below in the temperature and time profile. Do not weld more than three times.

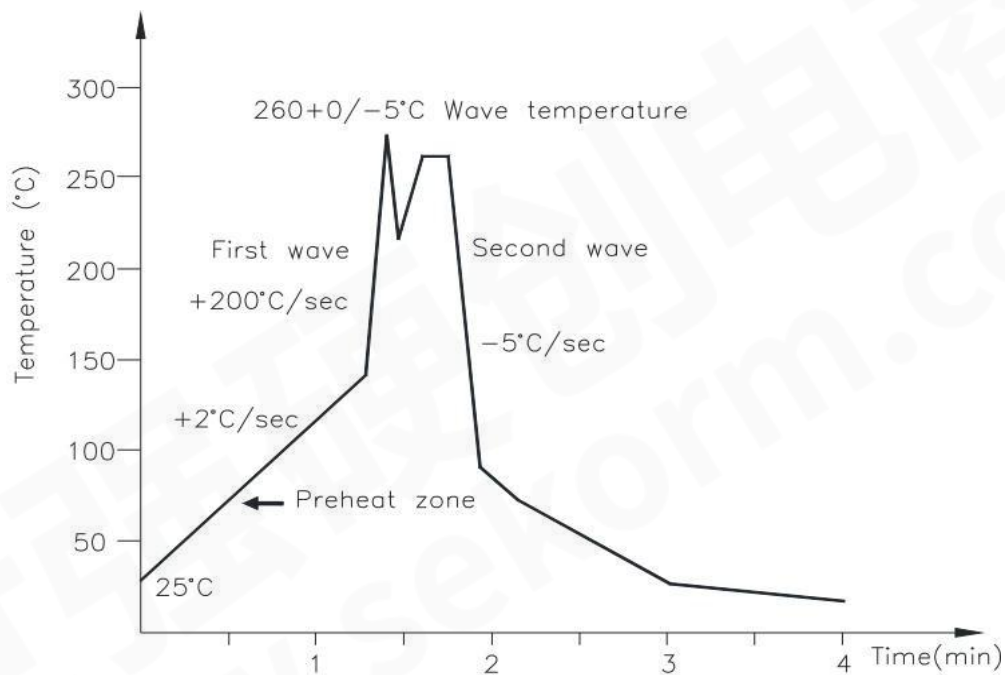
Profile item	Conditions
Preheat	
- Temperature Min (T Smin)	150°C
- Temperature Max (T Smax)	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL)	217°C
- Time (t L)	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature	3~6°C / sec
Reflow times	≤3



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature	260+0/-5°C
Time	10 sec
Preheat temperature	5 to 140°C
Preheat time	30 to 80sec



(3) Hand soldering by soldering iron

Single lead welding is allowed in each process and one-time welding is recommended.

Temperature	380+0/-5°C
Time	3 sec max

17. Switching time test circuit

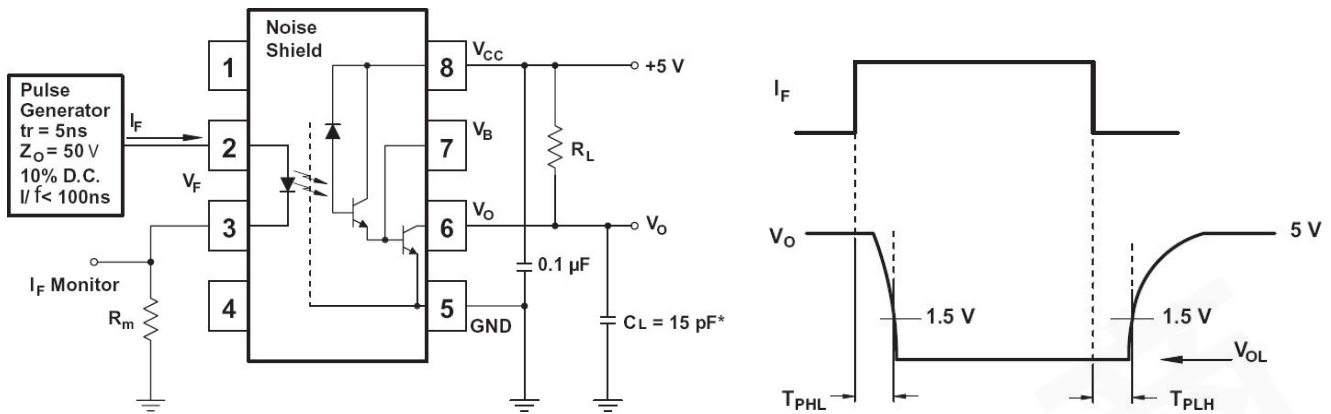


Figure 1: Single Channel Test Circuit for t_{PHL} and t_{PLH}

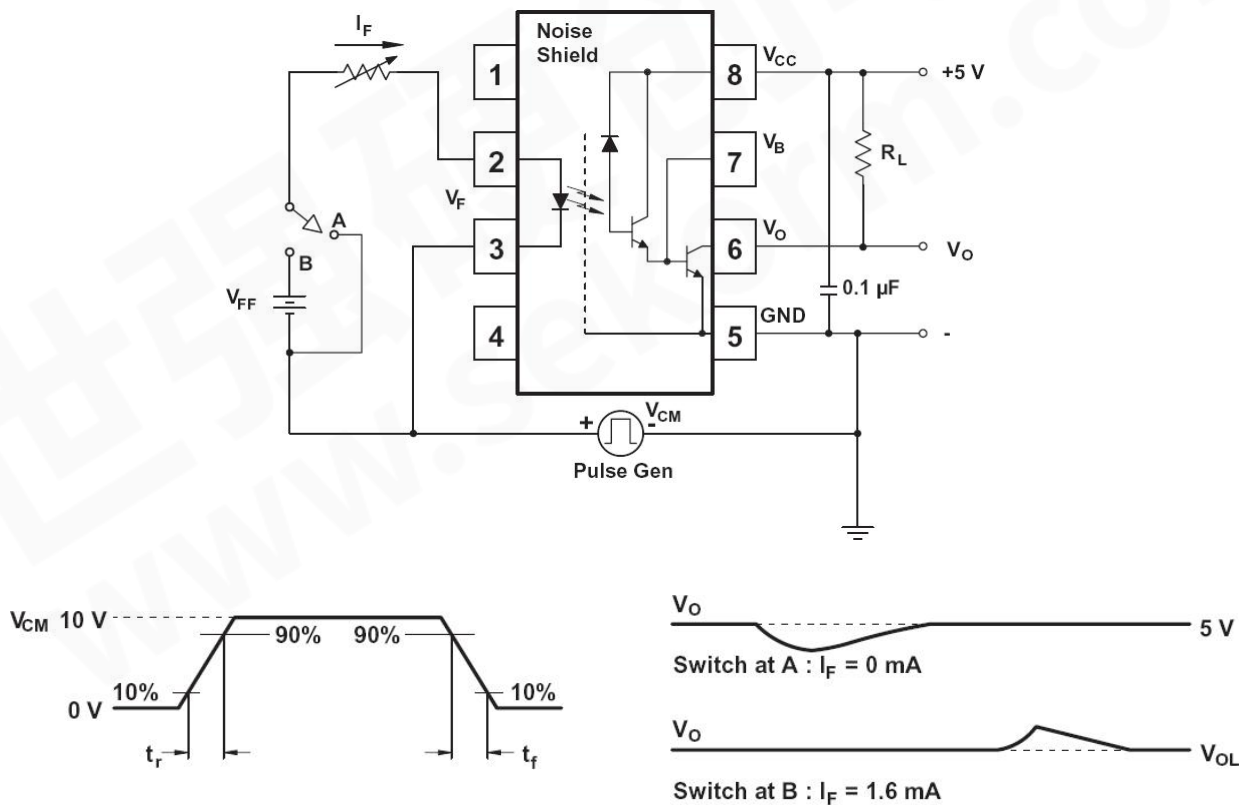


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

18. Characteristics Curve

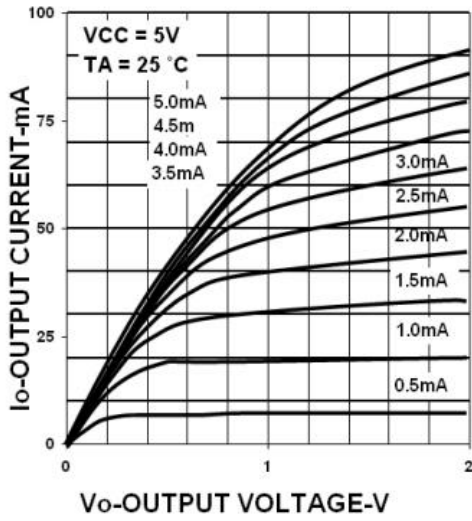


Figure 3: DC transfer characteristics

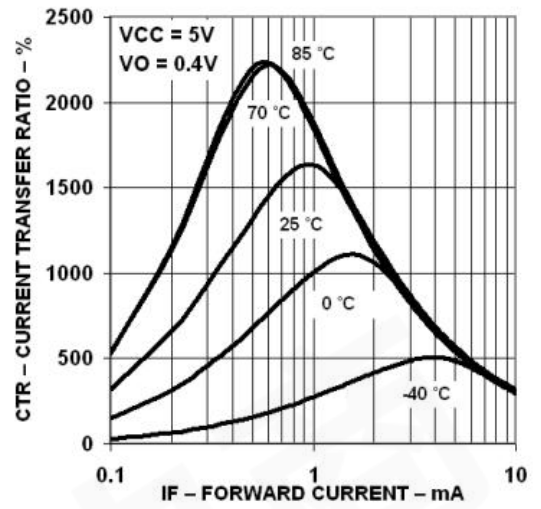


Figure 4: current transfer ratio vs. forward current

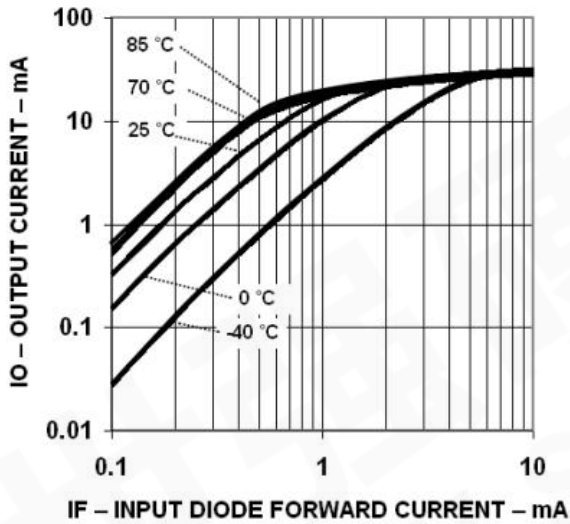


Figure 5: output current vs. input diode forward current

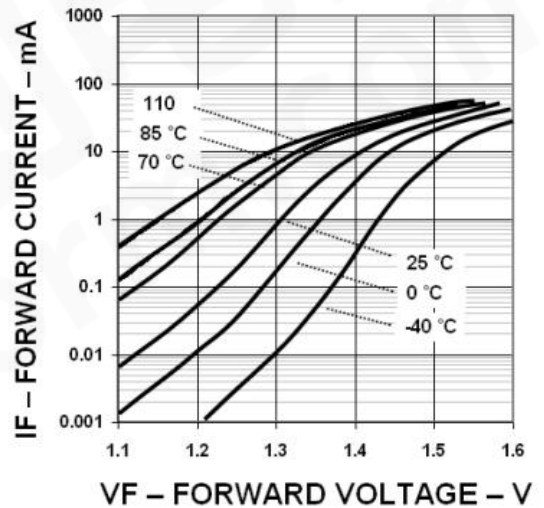


Figure 6: Input diode forward current vs. forward voltage

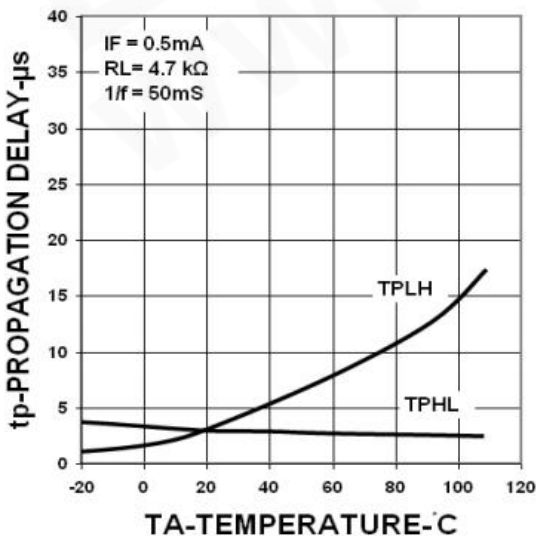


Figure 7: 6N139 propagation delay vs. temperature

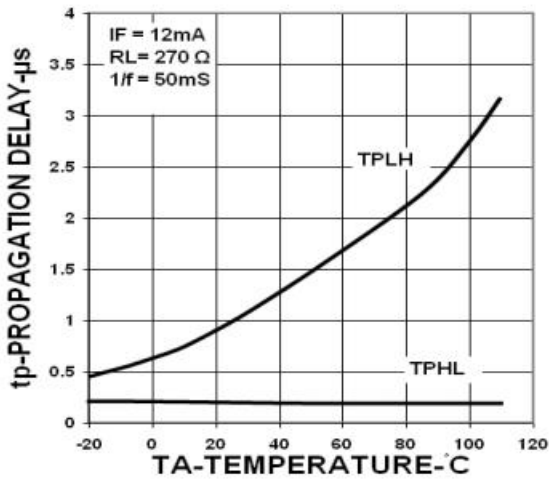


Figure 9: 6N139 propagation delay vs. temperature

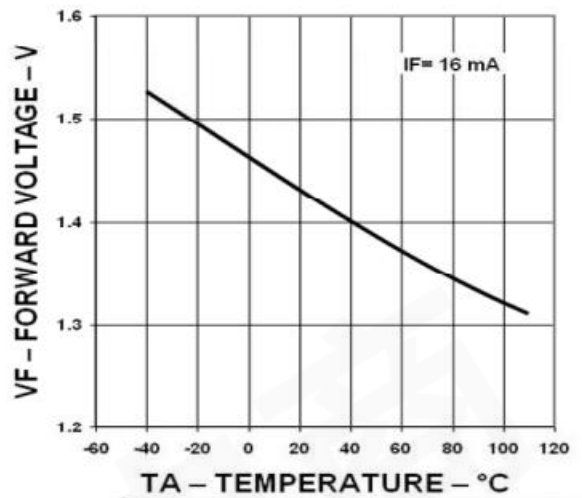


Figure 10: Forward voltage vs. temperature

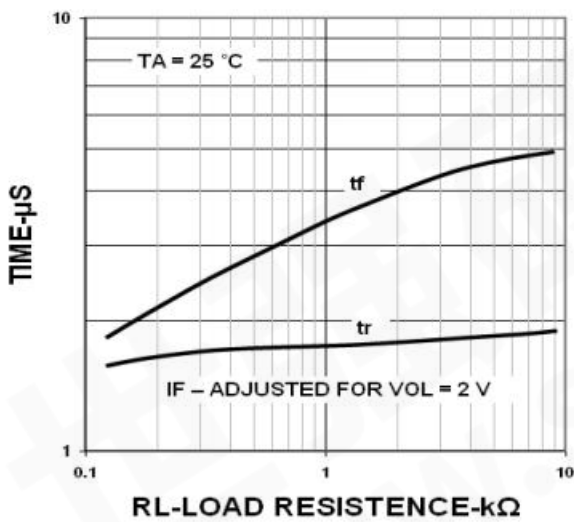


Figure 11: Non-saturated rise and fall time vs. load resistance

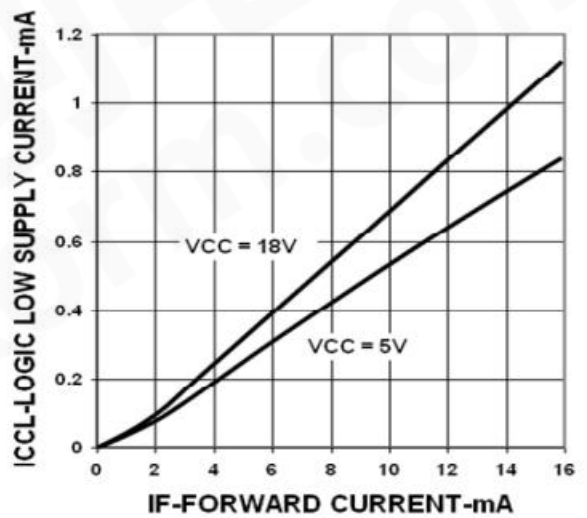


Figure 12: Logic low supply current vs. forward current