ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-6N138/6N139

Customer: _____

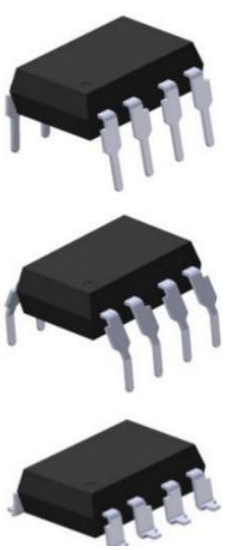
Date: _____

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



(1) High current transfer ratio : 2000%typical.
(2) Low input current requirements : 0.5mA
(3) High output current : 60mA
(4) CTR guarantee : 0~70℃.
(5) Instantaneous common mode rejection : 10KV/μsec
(6) Safety approval
UL approved (No.E323844)
VDE approved (No.40029733)
CQC approved (No.CQC19001231254)
(7) In compliance with RoHS, REACH standards
(8) MSL Class I

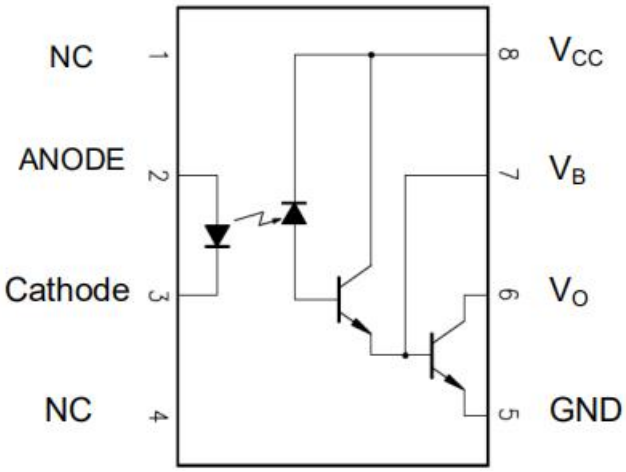
2. Instructions

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

(1) Digital logic ground isolation
(2) Low input current line receiver
(3) Telephone ring detector
(4) EIA-RS-232C line receiver
(5) Current loop receiver
(6) 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℃)*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	℃
Storage Temperature			T_{stg}	-55 ~ + 125	
*2	Soldering Temperature		T_{sol}	260	

*1. Room temperature = 25 ℃. 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	℃
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 RL=1kΩ per channel)	N	—	5	TTL Loads

7. Opto-electronic Characteristics

Parameter			Symbol	Min	Typ	Max	Unit	Condition
INPUT	Forward voltage		V_F	—	1.1	1.7	V	I_F= 1.6mA
	Temperature Coefficient OF Forward Voltage		$\Delta V_F/\Delta T$	—	-1.9	—	mV/℃	I_F= 1.6mA
	Reverse Voltage		BV_R	5	—	—	V	I_R = 10μA
OUTPUT	High Level Supply Current	OR-6N138	I_{CCH}	—	0.05	10	mA	V_O= OPEN, V_{CC}=18V,IF=0mA
		OR-6N139						
	Low Level Supply Current	OR-6N138	I_{CCL}	—	0.6	1.5	mA	V_O= OPEN, V_{CC}=18V,I_F=1.6mA
		OR-6N139						
	High Level Output Current	OR-6N138	I_{OH}	—	0.01	100	μA	V_{CC}=V_O=18V, I_F=0μA
		OR-6N139		—	—	250		
	Logic Low Output Voltage	OR-6N138	V_{OL}	—	0.1	0.4	V	I_F=1.6mA;V_{CC}=4.5V I_O=4.8mA
		OR-6N139		—	0.1	0.4		I_F=0.5mA;V_{CC}=4.5V I_O=2mA
								I_F=1.6mA;V_{CC}=4.5V I_O=8mA
								I_F=5mA;V_{CC}=4.5V I_O=15mA
				—	0.2			I_F=12mA;V_{CC}=4.5V I_O=24mA
	Current transfer ratio	OR-6N138	CTR	300	1600	2600	%	I_F=1.6mA;V_O=0.4V; V_{CC}=4.5V
		OR-6N139		400	2000	5000		I_F=0.5mA;V_O=0.4V; V_{CC}=4.5V
				500	1600	2600		I_F=1.6mA;V_O=0.4V; V_{CC}=4.5V

Recommended temperature range (T_A= -40℃—+85℃,4.5V≤V_{CC}≤5.5V),I_F= 7.5mA Unless otherwise stated. Typical values,T_A =25℃,V_{CC} =5.0 V.

8. Switching Characteristics (T_A=25℃)

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

9. Order Information

Part Number

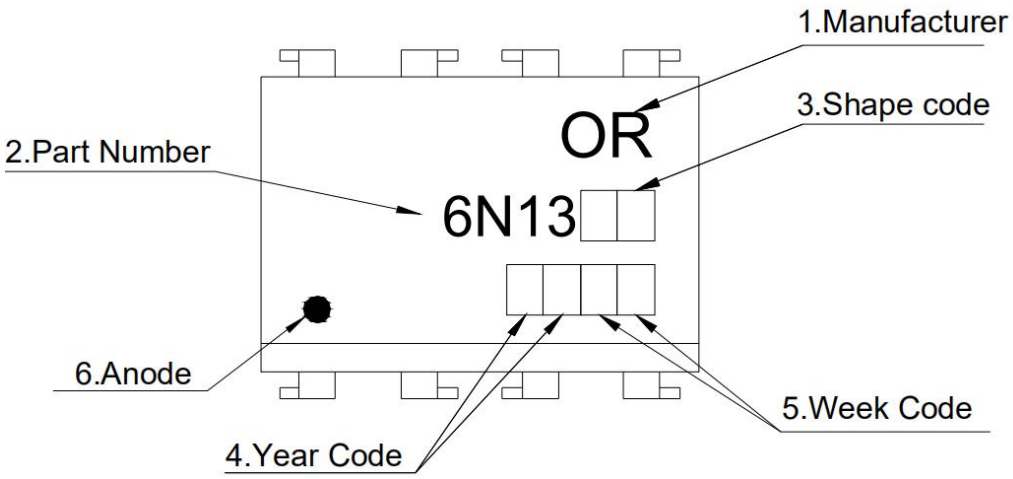
OR-6N138Y-Z
Or OR-6N139Y-Z

Note

Y = Lead form option (S, M or none)
Z = Tape and reel option (TA,TA1 or none).

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

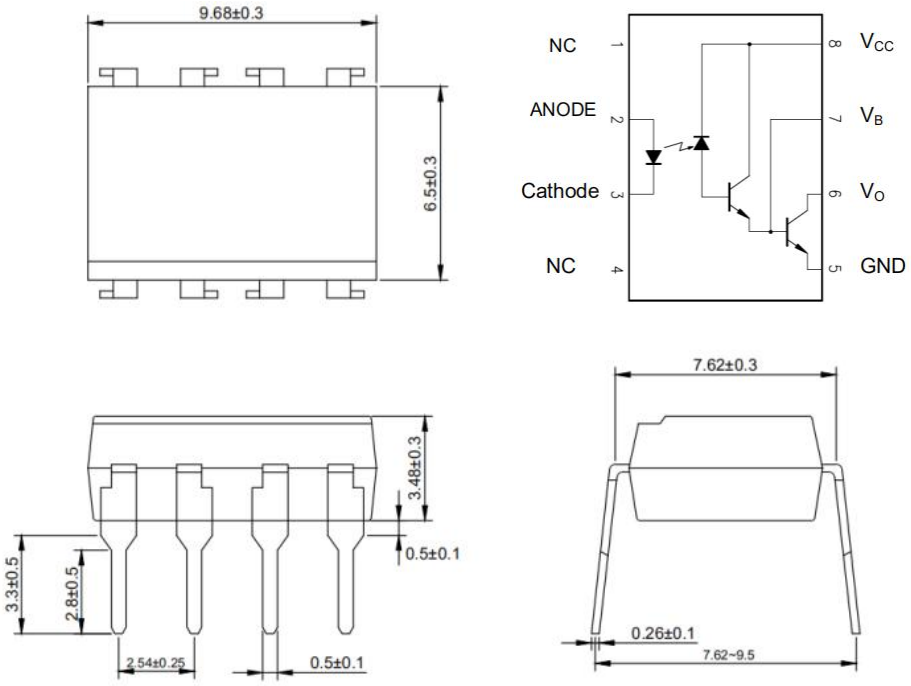
10. Naming Rule



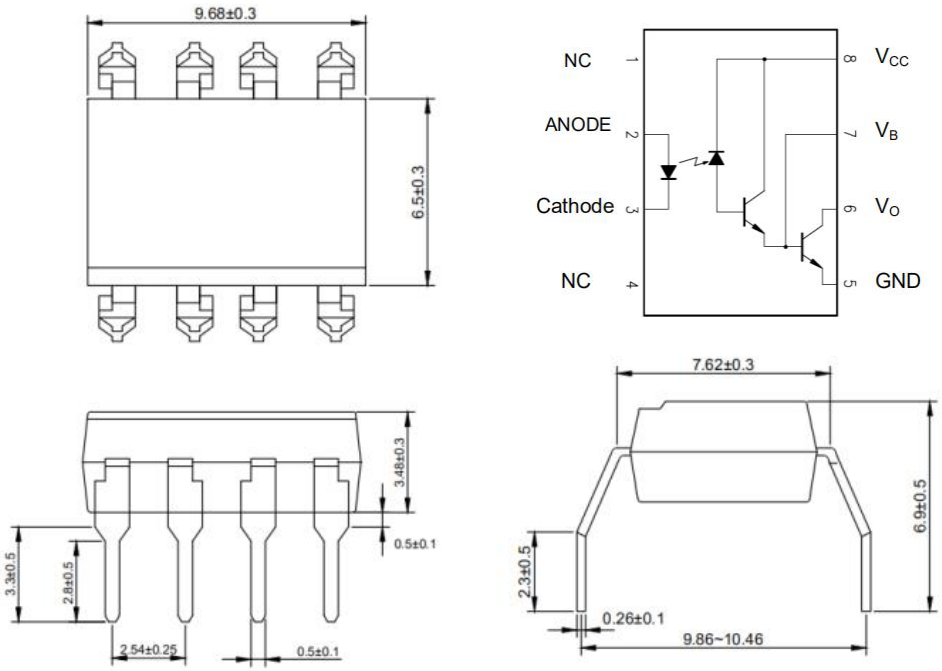
1. Manufacturer : ORIENT.
2. Part Number : 6N138 or 6N139.
3. Shape Code □.
4. Year Code □□ ： '21' means '2021' and so on.
5. Week Code □□： 01 means the first week, 02 means the second week and so on.
6. Anode.

11. Outer Dimension

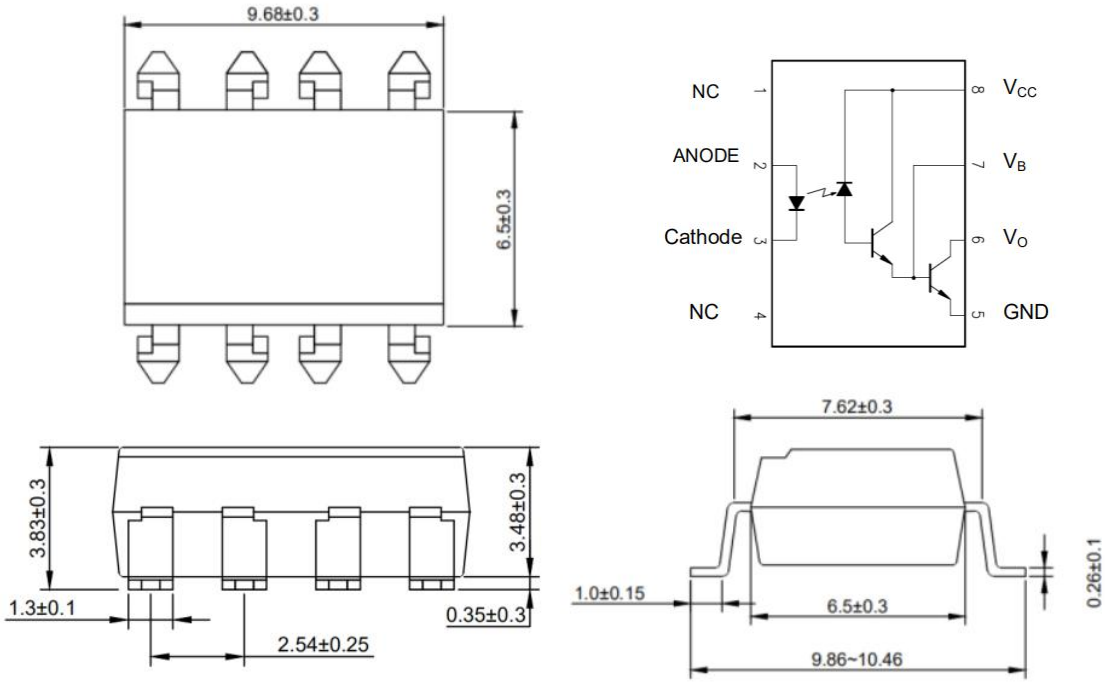
(1) OR-6N13X



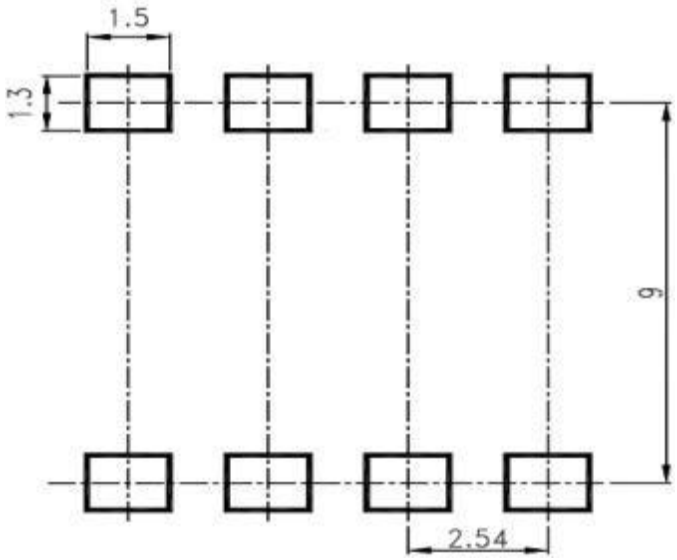
(2) OR-6N13XM



(3) OR-6N13XS



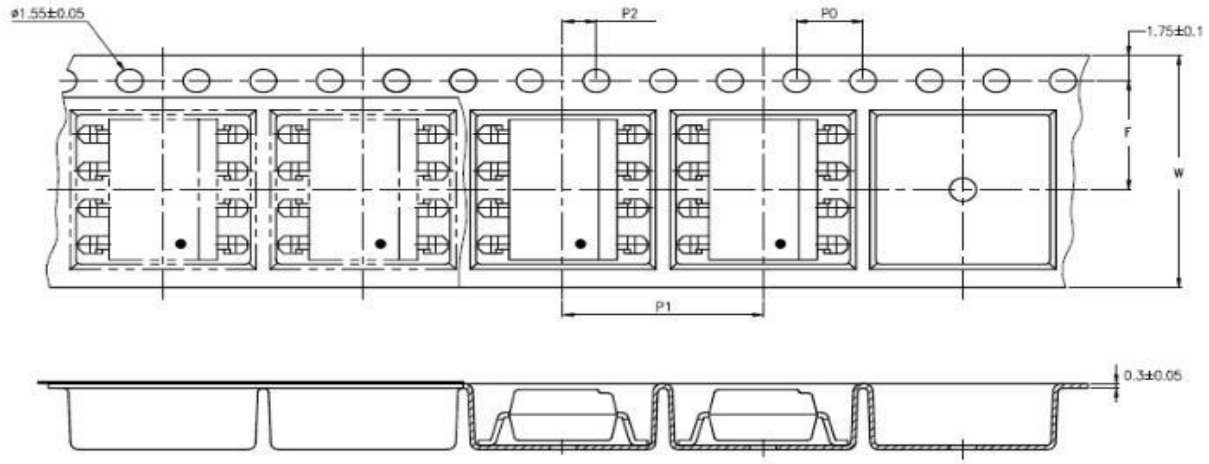
12. Recommended Foot Print Patterns (Mount Pad)



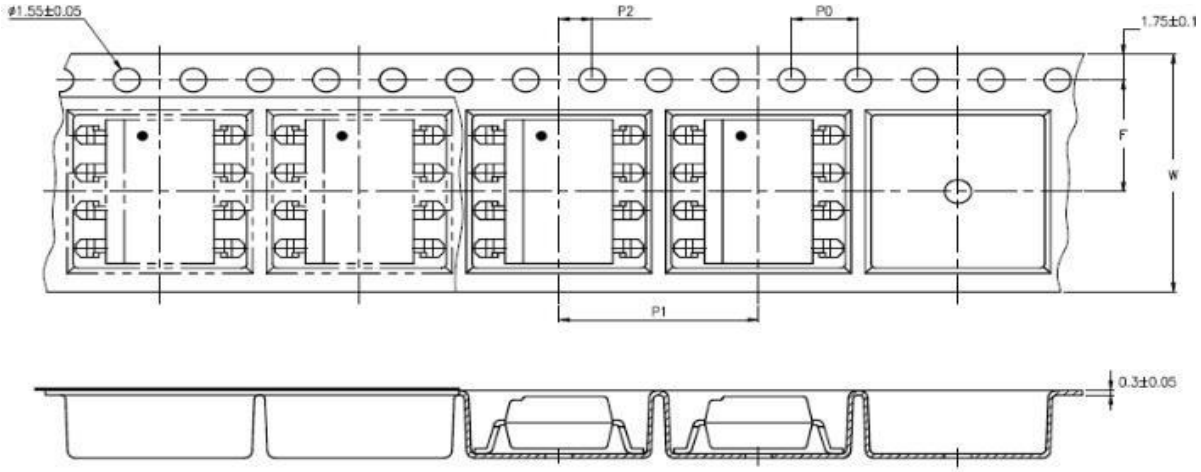
(unit：mm)

13. Taping Dimensions

(1) OR-6N13XS-TA



(2) OR-6N13XS-TA1



type	symbol	Size: mm （inches）
bandwidth	W	16±0.3 (0.63)
pitch	P0	4±0.1 (0.15)
pitch	F	7.5±0.1 (0.295)
	P2	2±0.1 (0.079)
interval	P1	12±0.1 (0.472)

Encapsulation type	TA/TA1
amount (pcs)	1000

14. Package Dimension

(1) package dimension

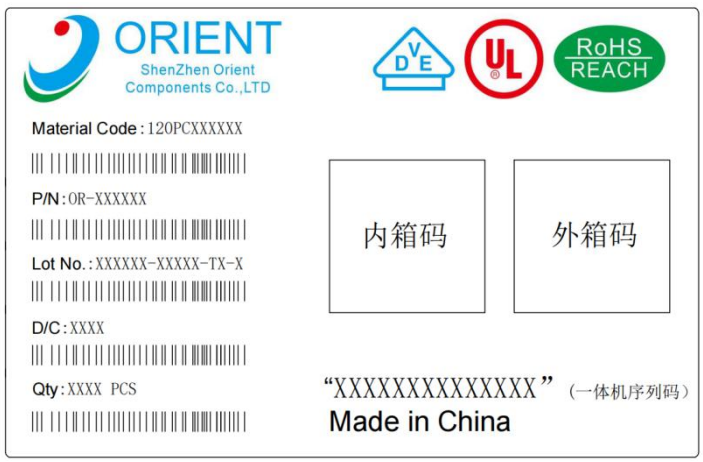
DIP Type

Packing Information	
Packing type	Tube
Qty per Tube	45pcs
Small box (Inner) Dimension	525*128*60mm
Large box (Outer) Dimension	545*290*335mm
The Amount per Inner Box	2,250pcs
The Amount per Outer Box	22,500pcs

SOP Type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1,000pcs
Small box (inner) Dimension	345*345*58.5mm
Large box (Outer) Dimension	620x360x360mm
Max qty per small box	2,000pcs
Max qty per large box	20,000pcs

(2)Packing Label Sample



Note:

1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

15. Reliability Test

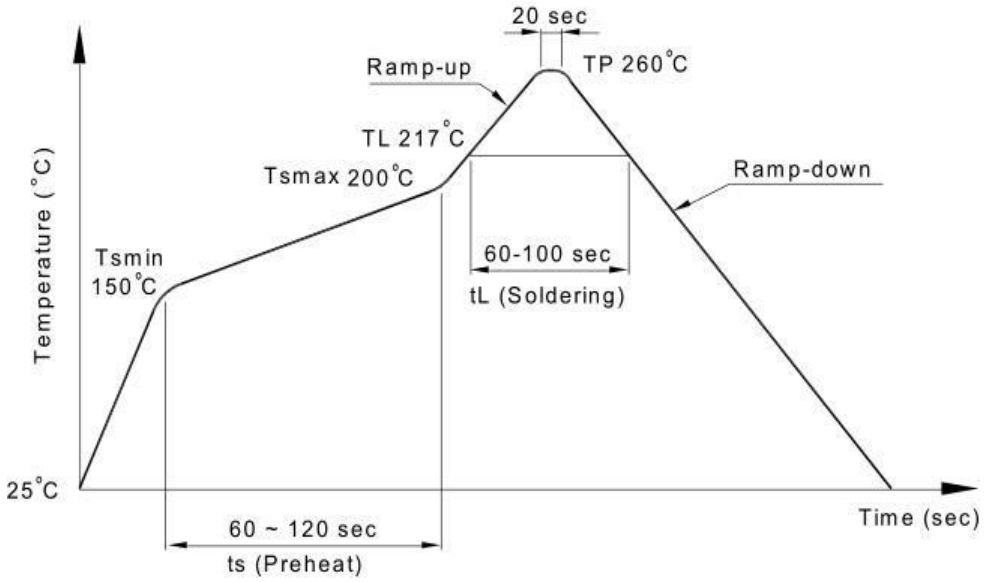
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5℃	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125℃	168 hrs 500 hrs 1000 hrs	高温烤箱测试仪	JESD22-A103
3	LTSL 低温存储	77	-40℃	168 hrs 500 hrs 1000 hrs	低温箱测试仪	JESD22-A119
4	TC 温度循环	77	H:125℃ 15min ∫5min L:-55℃ 15min	300 cycle	冷热冲击机	JESD22-A104
5	TS 温度冲击	77	H:100℃ 5min ∫15s L:-40℃ 5min	300 cycle	冷热冲击机	JESD22-A106
6	HTOL 高温操作	77	100℃ IF=10mA Vcc=5V	168 hrs 500 hrs 1000 hrs	高温烤箱测试仪、老化电路板	JESD22-A108
7	ESD-HBM 人体模式	22	≥8KV 1Cycle	1次	ESD静电测试仪	JESD22-A114
8	SD 可焊性	22	Pb-free 245±5℃	5s/1次	锡炉	JESD22-B102
9	HTHB 温湿寿命试验	77	85℃,85%RH IF=10mA,Vcc=5V	168 hrs 500 hrs 1000 hrs	恒温恒湿机，测试仪	JESD22-A101
10	Autoclave 压力锅	77	Ta=121 ℃,100%RH,2atm	96hrs	压力锅	JESD22-A102

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.

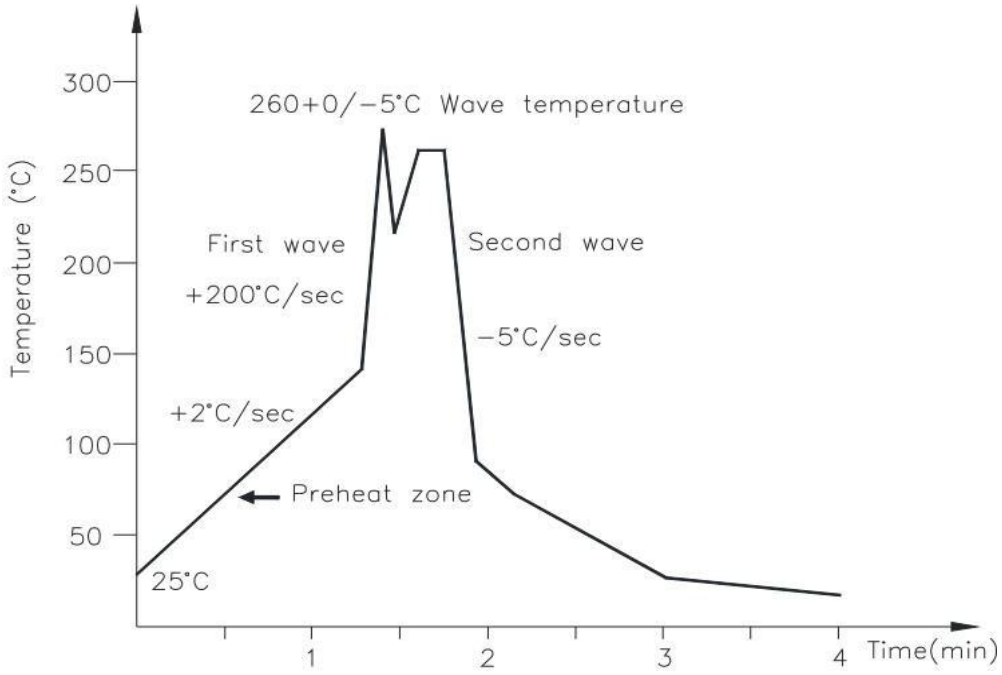
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	 217˚C 60 sec
Peak Temperature	260˚C
Peak Temperature time	20 sec
Ramp-up rate	3˚C / sec max.
Ramp-down rate from peak temperature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



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

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



(3) Hand soldering by soldering iron

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

Temperature Time	380+0/-5˚C 3 sec max

17. Switching time test circuit

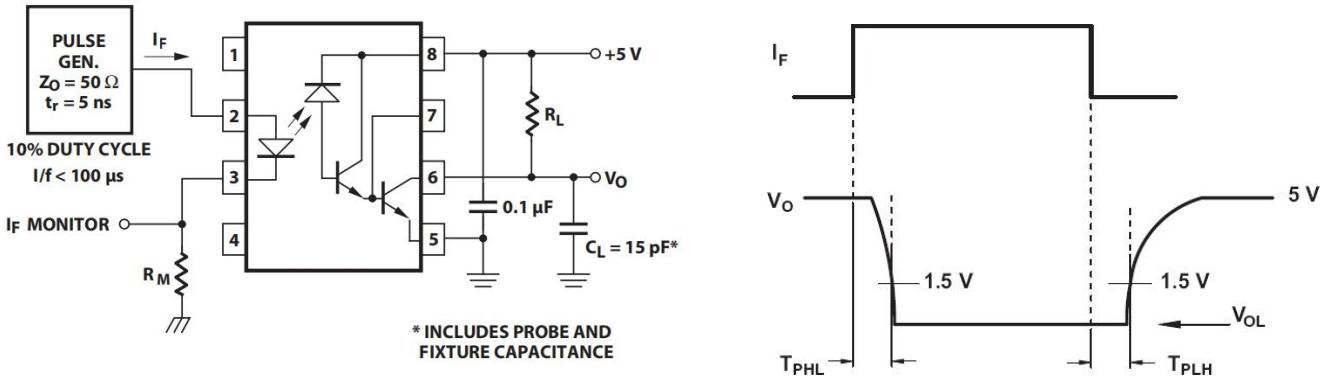


Figure 1: Switching test circuit

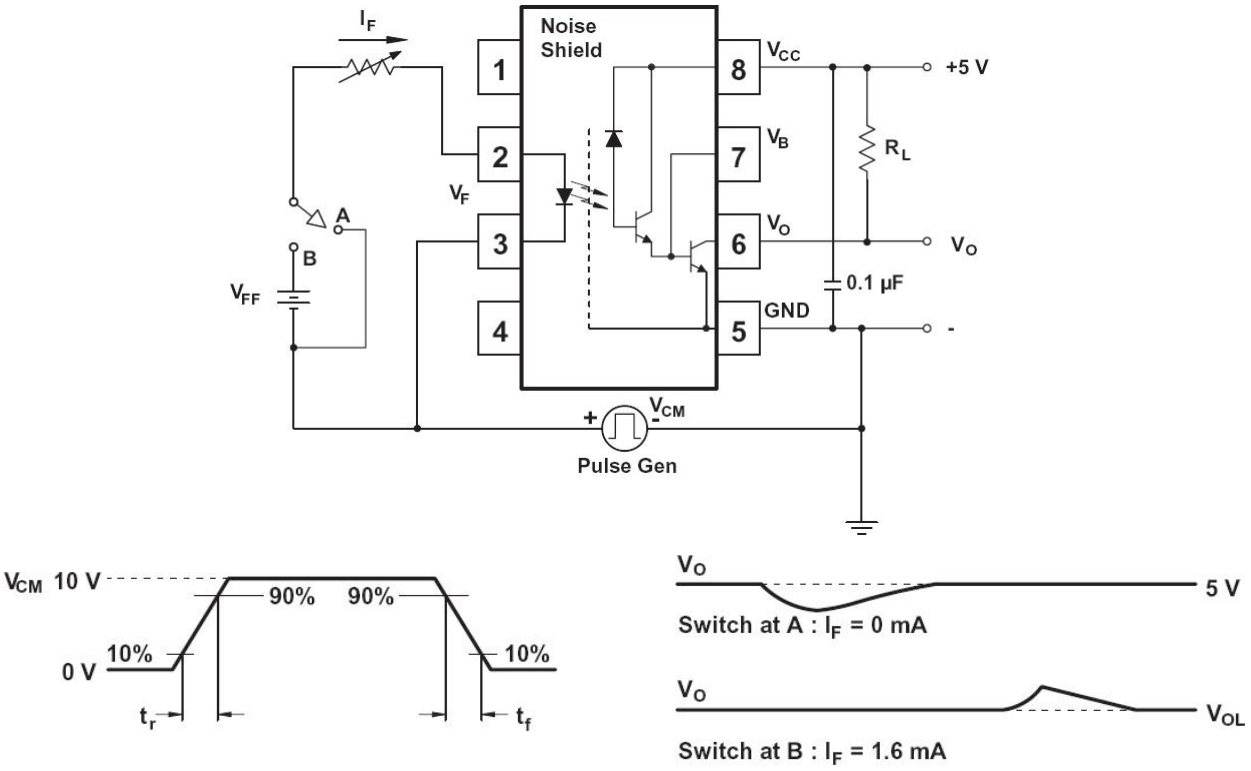


Figure 2: Test circuit for transient immunity and typical waveforms

18. Characteristics Curve

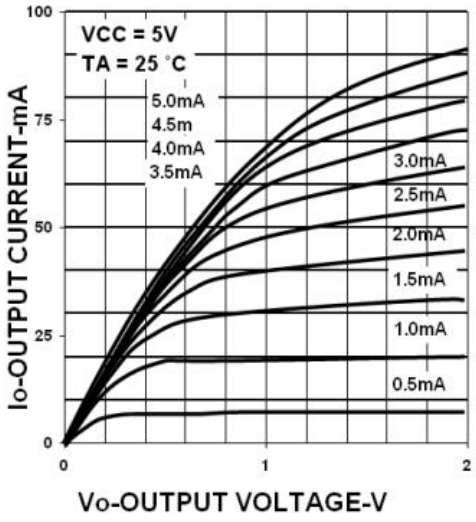


Figure 3: DC transfer characteristics

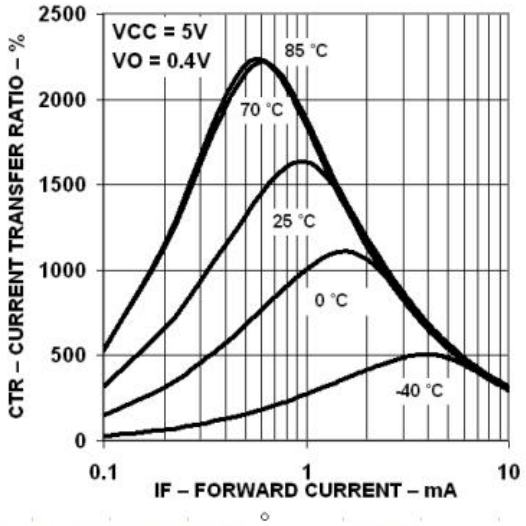


Figure 4: current transfer ratio vs. forward current

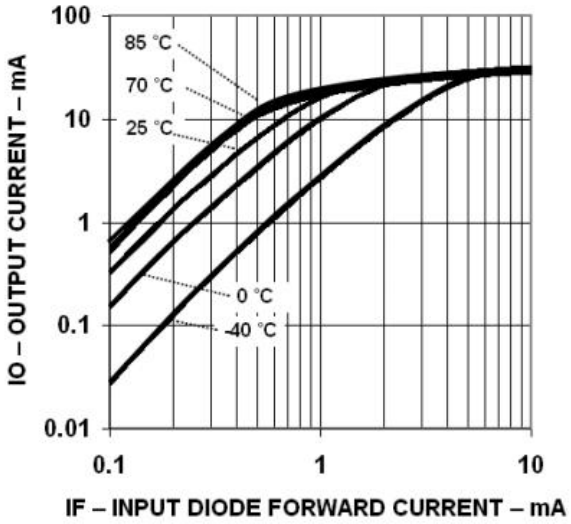


Figure 5: output current vs. input diode forward current

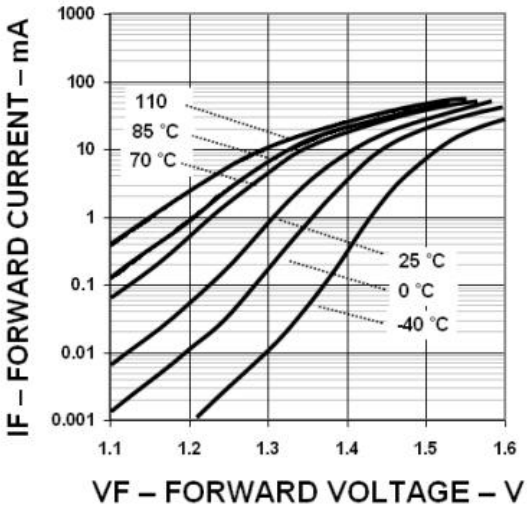


Figure 6: Input diode forward current vs. forward voltage

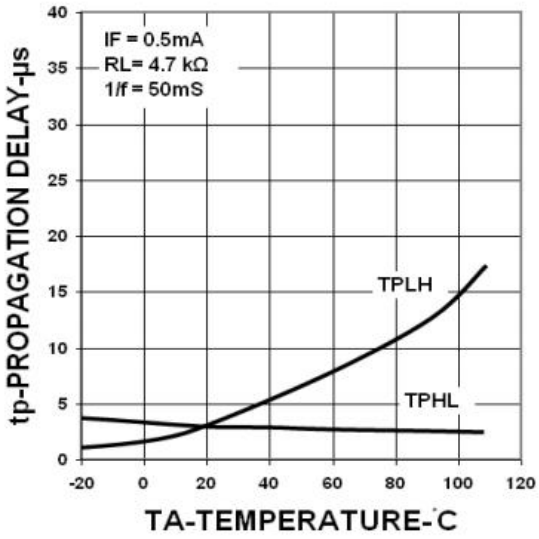


Figure 7: 6N139 propagation delay vs. temperature

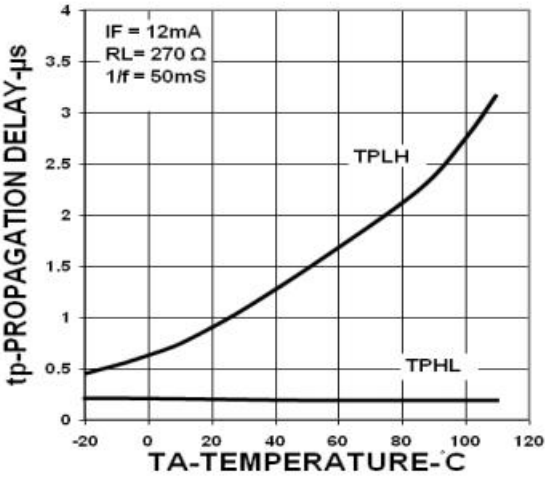


Figure 9: 6N139 propagation delay vs. temperature

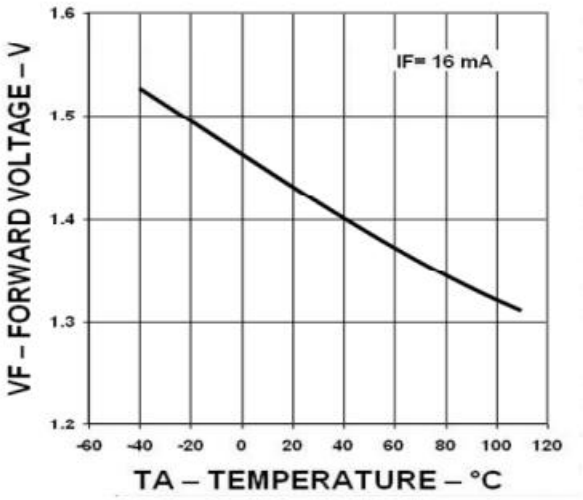


Figure 10: Forward voltage vs. temperature

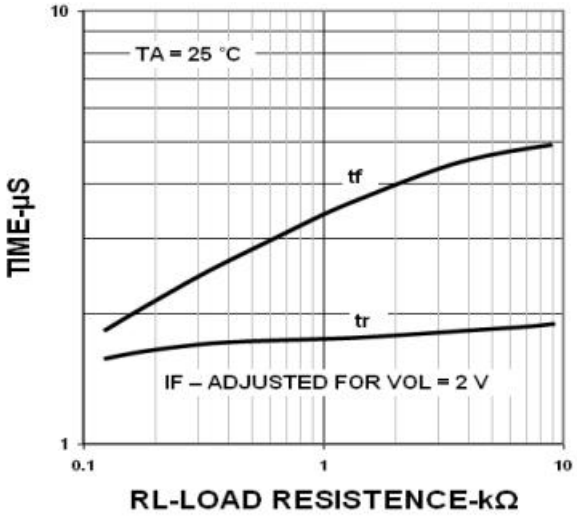


Figure 11: Non-saturated rise and fall time vs. load resistance

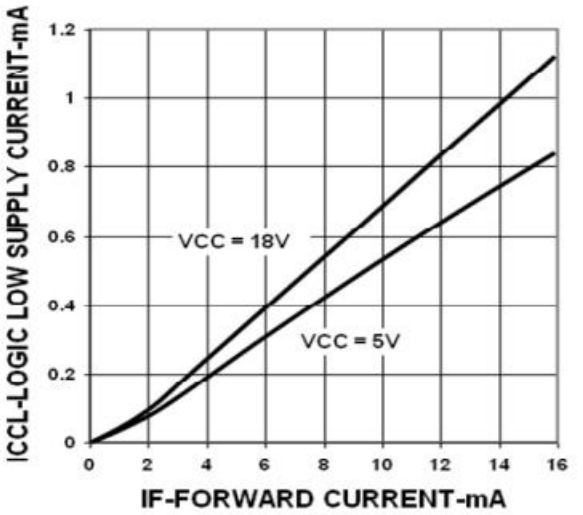


Figure 12: Logic low supply current vs. forward current