



NEC's HIGH CMR, 10 Mbps TOTEM POLE OUTPUT TYPE 5-PIN SOP PHOTOCOUPLER

PS9115

FEATURES

- **HIGH COMMON MODE TRANSIENT IMMUNITY**
CMH, CML = ± 20 kV/ μ s TYP
- **SMALL PACKAGE**
5-pin SOP
- **HIGH SPEED**
10 Mbps
- **PULSE WIDTH DISTORTION**
 $|t_{PHL} - t_{PLH}| = 7$ ns TYP
- **HIGH ISOLATION VOLTAGE**
BV = 2500 Vr.m.s.
- **TOTEM POLE OUTPUT**
No pull-up resistor required
- **AVAILABLE IN TAPE AND REEL**
PS9115-F3, F4: 2500 pcs/reel

DESCRIPTION

NEC's PS9115 is an optically coupled, high-speed, totem pole output isolator. It contains a GaAlAs LED on the input side, a photodiode and a signal processing circuit on the output side.

APPLICATIONS

- **FACTORY AUTOMATION NETWORK**
- **MEASUREMENT EQUIPMENT**
- **MOTOR DRIVE / INVERTER**

ELECTRICAL CHARACTERISTICS (TA = 0 to +85°C, Unless otherwise specified)

PART NUMBER				PS9115		
SYMBOL		PARAMETERS	UNITS	MIN	TYP ¹	MAX
Diode	V _F	Forward Voltage, I _F = 10 mA, T _A = 25°C	V	1.4	1.65	1.9
	I _R	Reverse Current, V _R = 3 V, T _A = 25°C	μ A			10
	C _t	Terminal Capacitance, V = 0, f = 1 MHz, T _A = 25°C	pF		30	
Detector	I _{OH}	High Level Output Current ² V _{CC} = V _O = 5.5 V, V _F = 0.8 V	μ A		0.003	200
	V _{OH}	High Level Output Voltage V _{CC} = 4.5 V, V _F = 0.8 V, I _{OH} = -2 mA	V	2.4	3.0	
	V _{OL}	Low Level Output Voltage V _{CC} = 4.5 V, I _F = 7 mA, I _{OL} = 8 mA	V		0.25	0.6
	I _{CCH}	High Level Supply Current, V _{CC} = 5.5 V, I _F = 0 mA	mA		12	17
	I _{CCL}	Low Level Supply Current, V _{CC} = 5.5 V, I _F = 10 mA	mA		13	18
	I _{OSH}	High Level Output Short Circuit Current V _{CC} = 5.5 V, V _O = GND, I _F = 0 mA, 10 ms or less	mA		-26	
	I _{OSL}	Low Level Output Short Circuit Current V _{CC} = V _O = 5.5 V, I _F = 8 mA, 10 ms or less	mA		34	
Coupled	I _{FHL}	Threshold Input Current, High \rightarrow Low V _{CC} = 5 V	mA		2.3	5 6
	R _{I-O}	Isolation Resistance, V _{I-O} = 1 k V _{DC} , R _H = 40 to 60%, T _A = 25°C	Ω	10 ¹¹		
	C _{I-O}	Isolation Capacitance, V = 0, f = 1 MHz, T _A = 25°C	pF		0.4	
	t _{PHL}	Propagation Delay Time ³ , High \rightarrow Low V _{CC} = 5 V, I _F = 7.5 mA	ns	15 10	33	65 85
	t _{PLH}	Propagation Delay Time ³ , Low \rightarrow High V _{CC} = 5 V, I _F = 7.5 mA	ns	15 10	40	65 85

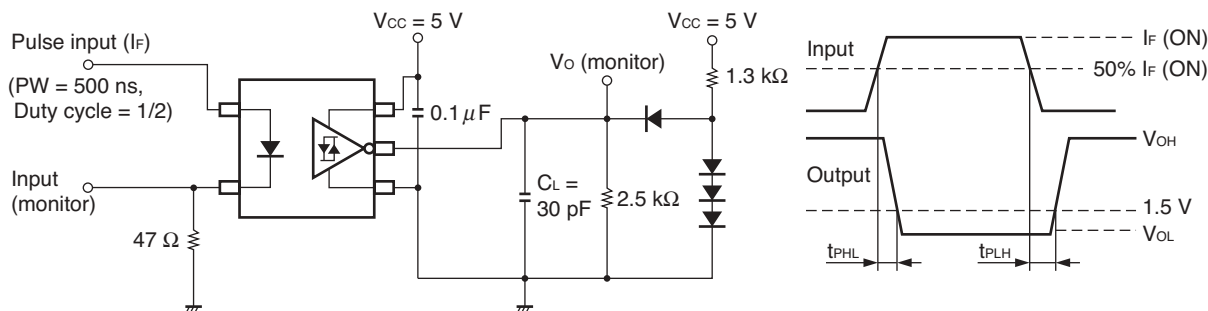
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ELECTRICAL CHARACTERISTICS ($T_A = 0$ to $+85^\circ\text{C}$, Unless otherwise specified), Continued

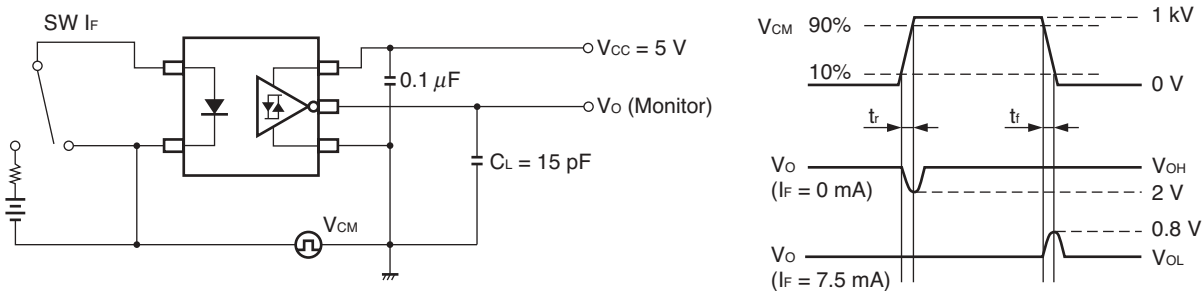
		PART NUMBER	PS9115			
SYMBOL		PARAMETERS	UNITS	MIN	TYP	MAX
Coupled	$ t_{PHL} - t_{PLH} $	Pulse Width Distortion, (PWD) ³ , $V_{CC} = 5\text{ V}$, $I_F = 7.5\text{ mA}$	ns		7	50
	CMH	Common Mode Transient Immunity at High Level Output ⁴ , $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $I_F = 0\text{ mA}$, $V_O(\text{MIN}) = 2\text{ V}$, $V_{CM} = 1\text{ kV}$	$\text{kV}/\mu\text{s}$	10	20	
	CML	Common Mode Transient Immunity at Low Level Output ⁴ , $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $I_F = 7.5\text{ mA}$, $V_O(\text{MAX}) = 0.8\text{ V}$, $V_{CM} = 1\text{ kV}$	$\text{kV}/\mu\text{s}$	10	20	

Notes:

1. Typical values at $T_A = 25^\circ\text{C}$.
2. A high-level output current (I_{OH}) of $300\ \mu\text{A}$ or more may be output when the temperature is 0°C or less and when V_{CC} is between 3 and 4 V, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.
3. Test Circuit for Propagation delay time



4. Test Circuit for common mode transient immunity



Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

1. This device is ESD sensitive.
2. Bypass capacitor of more than $0.1\ \mu\text{F}$ must be used between V_{CC} and GND within 10 mm of the device.

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
Diode			
I _F	Forward Current ²	mA	30
V _R	Reverse Voltage	V	5
Detector			
V _{CC}	Supply Voltage	V	7
V _O	Output Voltage	V	7
I _{OH}	High Level Output Current	mA	-5
I _{OL}	Low Level Output Current	mA	13
P _C	Power Dissipation ³	mW	130
Coupled			
BV	Isolation Voltage ⁴	V _{r.m.s.}	2500
T _A	Operating Ambient Temp.	°C	-40 to +85
T _{STG}	Storage Temperature	°C	-55 to +125

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. Reduced to 0.33 mA/°C at T_A = 25 °C or more.
3. T_A = -40 to +85°C, Applies to output pin V_O and power supply pin V_{CC}.
4. AC voltage for 1 minute at T_A = 25 °C, RH = 60% between input and output.

**RECOMMENDED
OPERATING CONDITIONS**

PART NUMBER			PS9115		
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{FL}	Low Level Input Voltage	mA	0		0.8
I _{FH}	High Level Input Current	mA	7.5		12.5
V _{CC}	Supply Voltage	V	4.5	5.0	5.5
N	TTL(R _L = 1kΩ loads)				3
T _A	Operating Ambient Temperature	°C	0		+85

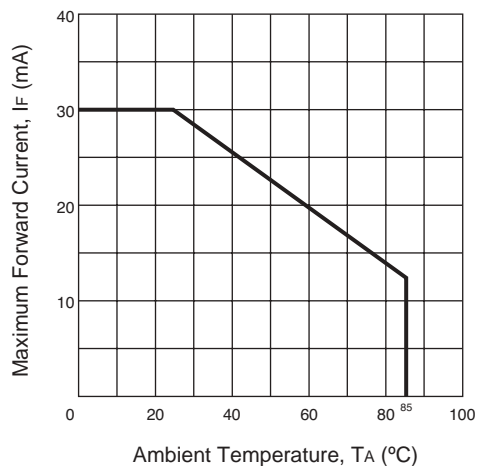
ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKAGE STYLE	APPLICATION PART NUMBER*
PS9115	5-pin SOP	Magazine case 100 pcs	PS9115
PS9115-F3		Embossed Tape 2500 pcs/reel	
PS9115-F4			

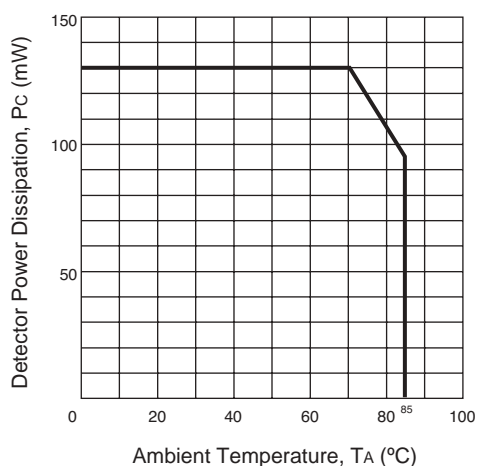
* Safety Standards are registered under following part number.

TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)

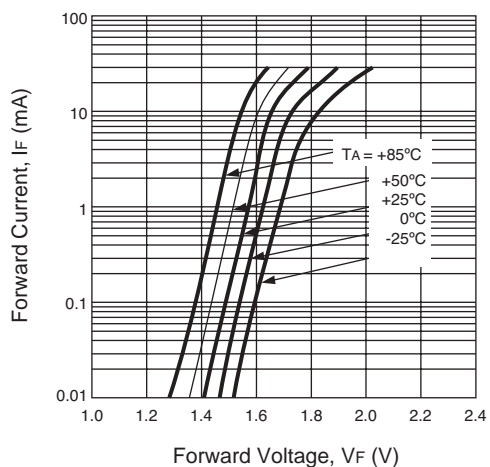
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



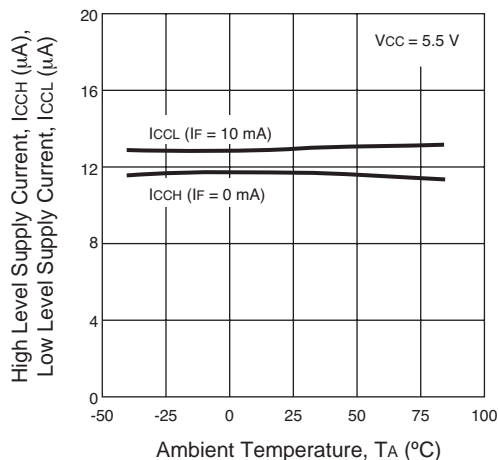
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



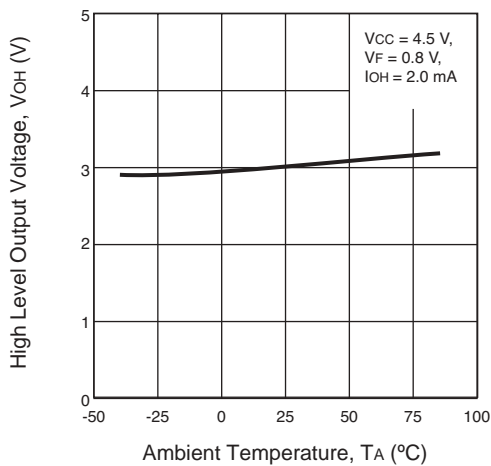
FORWARD CURRENT vs. FORWARD VOLTAGE



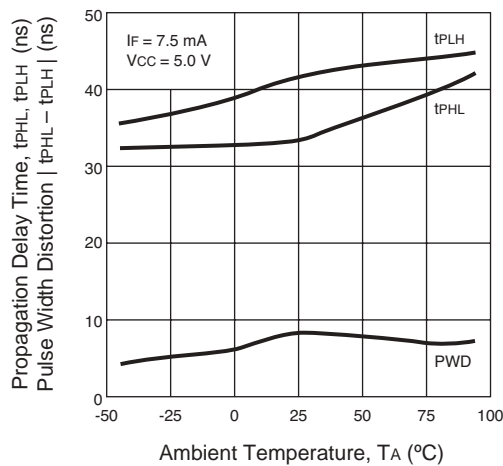
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



HIGH LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE

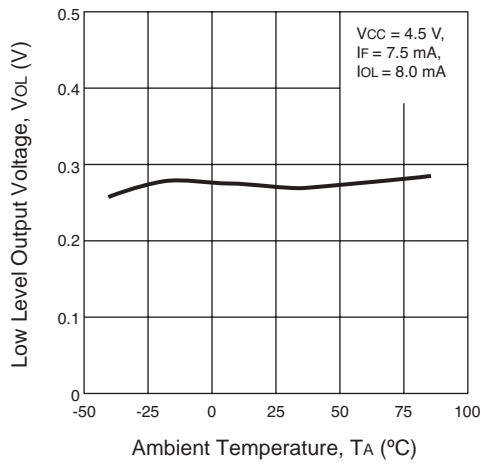


PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE

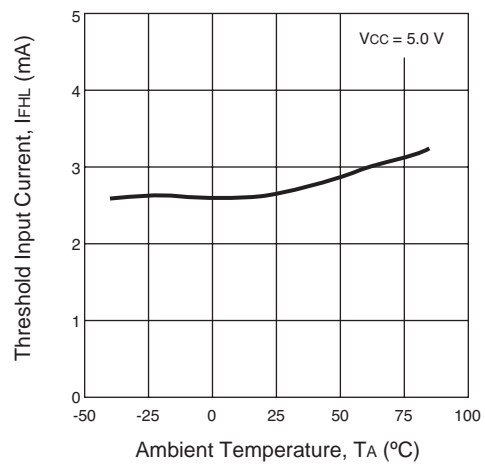


TYPICAL PERFORMANCE CURVES (TA = 25°C)

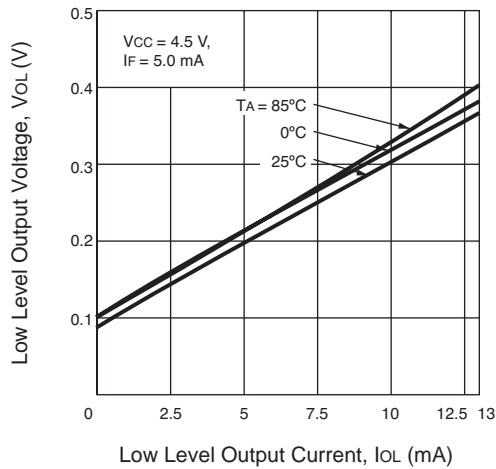
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



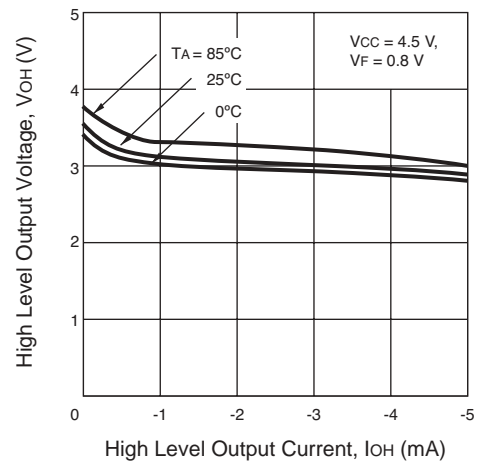
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



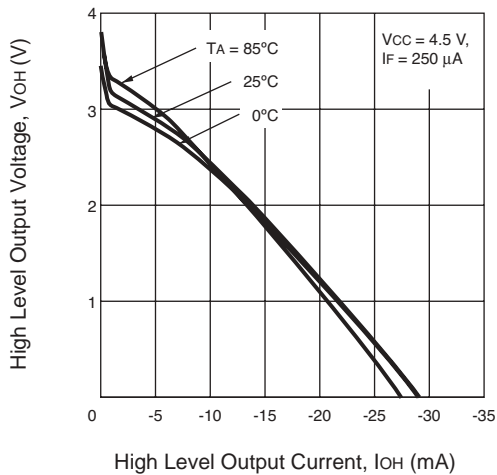
LOW LEVEL OUTPUT VOLTAGE vs. LOW LEVEL OUTPUT CURRENT



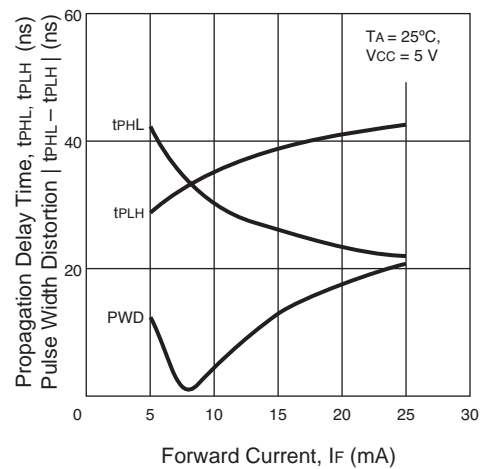
HIGH LEVEL OUTPUT VOLTAGE vs. HIGH LEVEL OUTPUT CURRENT



HIGH LEVEL OUTPUT VOLTAGE vs. HIGH LEVEL OUTPUT CURRENT



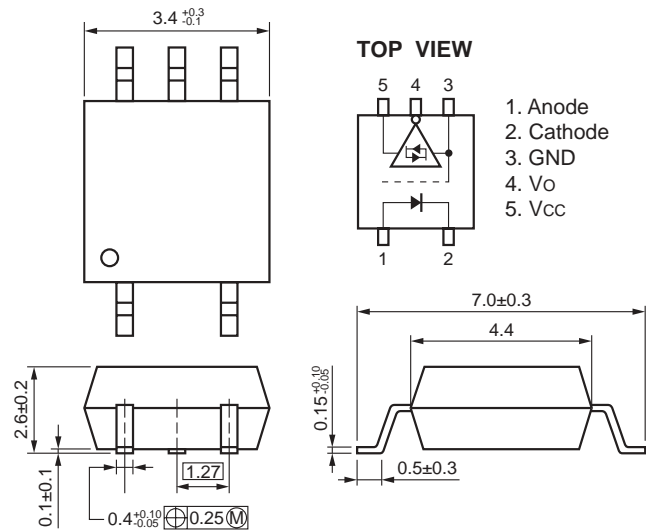
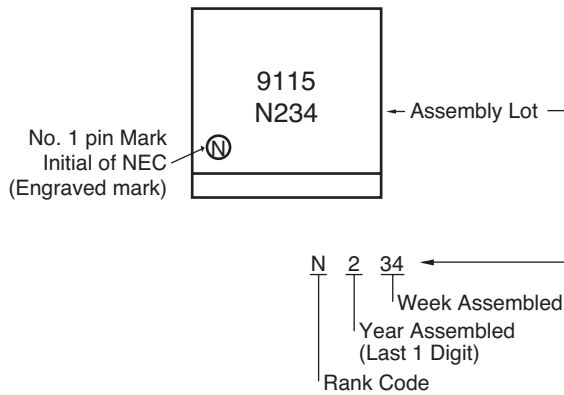
PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. FORWARD CURRENT



MARKING

OUTLINE DIMENSIONS (Units in mm)

PS9115



Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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