

High Speed 10MBit/s Optocoupler

DESCRIPTION

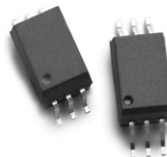
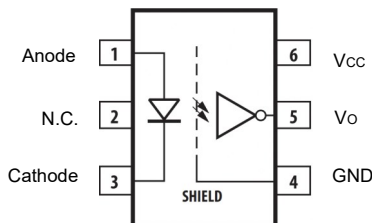
The SJS-611 is an optically coupled gate that combines a light emitting diode and an integrated high gain photo detector.

The output of the detector IC is an open collector Schottky clamped transistor. The internal shield provides a guaranteed common mode transient immunity specification of 10kV/μs for the SJS-611.

This unique design provides maximum AC and DC circuit isolation while achieving TTL compatibility. The optocoupler AC and DC operational parameters are guaranteed from -40°C to +110°C, allowing trouble-free system performance.

The SJS-611 is suitable for high-speed logic interfacing, input/output buffering, as line receivers in environments that conventional line receivers cannot tolerate and are recommended for use in extremely high ground or induced noise environments.

FUNCTIONAL SCHEMATIC



Pin #	Name	Description
1	Anode	LED Anode
2	N.C.	N.C.
3	Cathode	LED Cathode
4	GND	Ground
5	Vo	Output Voltage
6	Vcc	Positive Supply Voltage

FEATURES

- 10kV/μs minimum Common Mode Rejection (CMR) at V_{CM} = 1000V
- High speed : 10 MBd typical
- LSTTL/TTL compatible
- Low input current capability : 5 mA
- Guaranteed AC and DC performance over -40°C ~ +110°C

APPLICATIONS

- Isolated line receiver
- Computer-peripheral interfaces
- Microprocessor system interfaces
- Digital isolation for A/D, D/A conversion
- Switching power supply
- Instrument input/output isolation
- Ground loop elimination
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Isolation of high speed logic systems

SAFETY SPECIFICATION

- UL 1577
- VDE DIN EN/IEC 60747-5-5
- CQC GB4943.1-2011



ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Storage Temperature	T _{stg}	-55	125	°C
Operating Temperature	T _{opr}	-40	110	°C
Average Forward Input Current ⁽¹⁾	I _F	-	20	mA
Reverse Input Voltage	V _R	-	5	V
Input Power Dissipation	P _I	-	45	mW
Supply Voltage	V _{CC}	-	7	V
Output Collector Current	I _O	-	50	mA
Output Collector Voltage	V _O	-	7	V
Output Collector Power Dissipation	P _O	-	85	mW
Lead Solder Temperature	T _{sol}	-	260	°C

- Note (1): Peaking circuits may produce transient input currents up to 50 mA, 50-ns maximum pulse width, provided average current does not exceed 20 mA.

RECOMMENDED OPERATION CONDITIONS				
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T _A	-40	110	°C
Supply Voltage	V _{CC}	4.5	5.5	V
Input Current High Level	I _{FLH}	5	15	mA
Input Voltage Low Level	V _{FHL}	-3	0.8	V
Fan Out (at R _L = 1 kΩ)	N	-	5	TTL Loads
Output Pull-up Resistor	R _L	330	4K	Ω

Electrical Specifications (DC)

Over recommended operating conditions unless otherwise specified. All typicals at $V_{CC} = 5V$, $T_A = 25^\circ C$

ELECTRICAL OPTICAL CHARACTERISTICS						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
INPUT CHARACTERISTICS						
High Level Output Current	I_{OH}	-	0.35	100	μA	$V_{CC} = 5.5V$, $V_O = 5.5V$, $V_F = 0.8V$
Input Threshold Current	I_{TH}	-	1	5	mA	$V_{CC} = 5.5V$, $V_O = 0.6V$, $I_{OL} > 13\text{ mA}$
Low Level Output Voltage	V_{OL}	-	0.25	0.6	V	$V_{CC} = 5.5V$, $I_F = 5\text{ mA}$, $I_{OL}(\text{Sinking}) = 13\text{ mA}$
High Level Supply Current	I_{CCH}	-	5.6	7.5	mA	$V_{CC} = 5.5V$, $I_F = 0\text{ mA}$
Low Level Supply Current	I_{CCL}	-	5.2	10.5	mA	$V_{CC} = 5.5V$, $I_F = 10\text{ mA}$
Input Forward Voltage	V_F	1.6	2	2.4	V	$I_F = 10\text{ mA}$
Input Reverse Breakdown Voltage	BVR	5	-	-	V	$I_R = 10\text{ }\mu A$
Input Capacitance	C_{IN}	-	60	-	pF	$f = 1\text{ MHz}$, $V_F = 0V$

Switching Specifications (AC)

Over recommended operating conditions $T_A = -40^\circ C$ to $100^\circ C$, $V_{CC} = 5V$, $I_F = 7.5\text{ mA}$ unless otherwise specified.

All typicals at $V_{CC} = 5V$, $T_A = 25^\circ C$

SWITCHING SPECIFICATION						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
SWITCHING CHARACTERISTICS						
Propagation Delay Time to High Output Level	t_{PLH}	-	60	75	ns	$V_{CC} = 5V$, $I_F = 7.5\text{ mA}$, $R_L = 350\Omega$, $C_L = 15\text{ pF}$
Propagation Delay Time to Low Output Level	t_{PHL}	-	35	75	ns	
Pulse Width Distortion	$ t_{PHL} - t_{PLH} $	-	25	40	ns	
Propagation Delay Skew	t_{PSK}	-	-	50	ns	
Output Rise Time (10 to 90%)	t_r	-	30	-	ns	
Output Fall Time (90 to 10%)	t_f	-	3	-	ns	
Common Mode Transient Immunity at high level output ⁽¹⁾	$ CM_H $	10	15	-	kV/ μs	$V_{CC} = 5V$, $I_F = 0\text{ mA}$, $V_O(\text{MIN}) = 2V$, $R_L = 350\Omega$, $V_{CM} = 1000V$
Common Mode Transient Immunity at low level output ⁽²⁾	$ CM_L $	10	15	-	kV/ μs	$V_{CC} = 5V$, $I_F = 7.5\text{ mA}$, $V_O(\text{MAX}) = 0.8V$, $R_L = 350\Omega$, $V_{CM} = 1000V$

■ Note (1): CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (that is, $V_{OUT} > 2.0V$)

■ Note (2): CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (that is, $V_{OUT} > 0.8V$)

ISOLATION CHARACTERISTIC							
PARAMETER	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Withstand Insulation Test Voltage ^{(1) (2)}	V _{iso}	SJS-611P	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T _A = 25°C
		SJS-611W					
Input-Output Resistance ⁽¹⁾	R _{I-O}	-	-	10 ¹²	-	Ω	V _{I-O} = 500V DC

- Note (1): Device is considered at two terminal device: pins 1, 2, 3 are shorted together and pins 4, 5, 6 are shorted together.
- Note (2): According to UL 1577, each photocoupler is tested by applying an insulation test voltage 6000V_{RMS} for one second. This test is performed before the 100% production test for partial discharge.

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

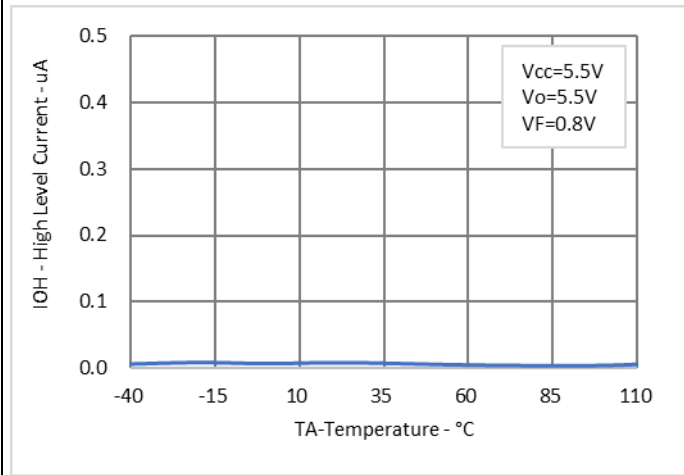


Fig.1 High Level Output Current vs. Temp

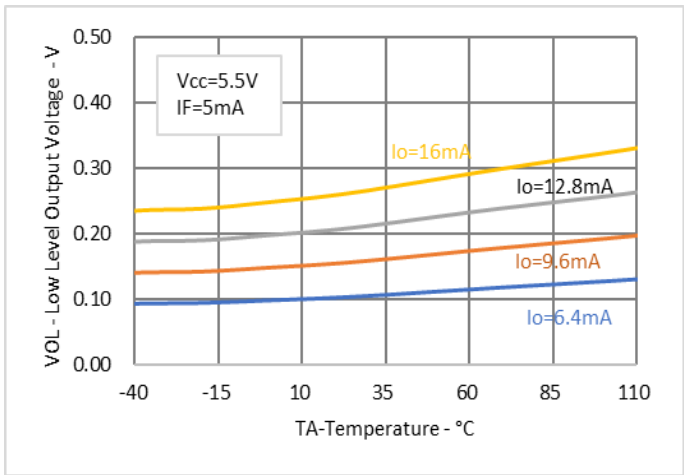


Fig.2 Low Level Output Voltage vs. Temp

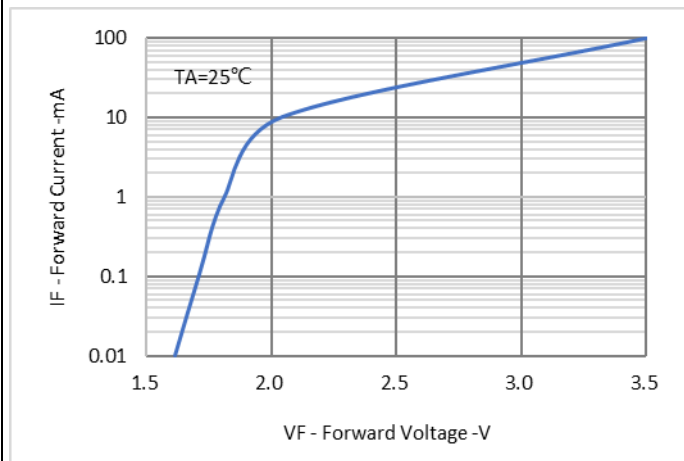


Fig.3 Input Diode Forward Characteristic

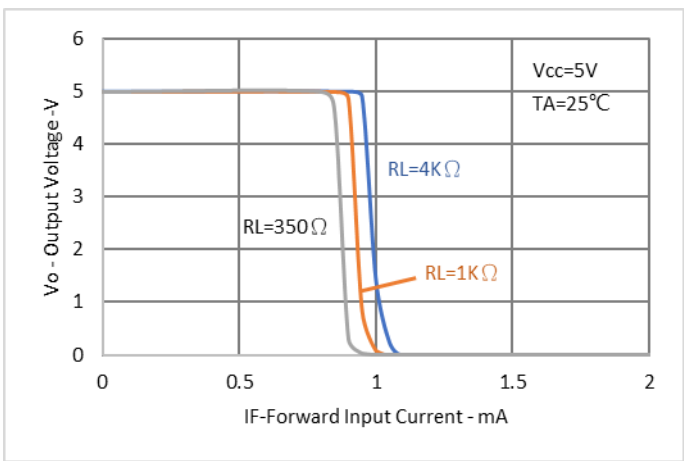


Fig.4 Output Voltage vs. Input Current

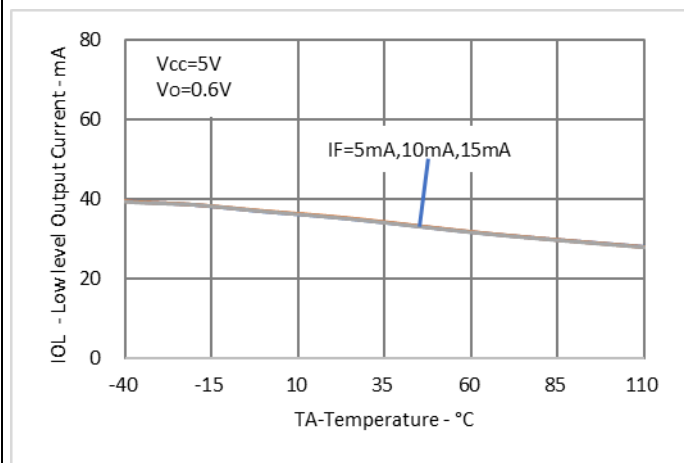


Fig.5 Low Level Output Current vs. Temp

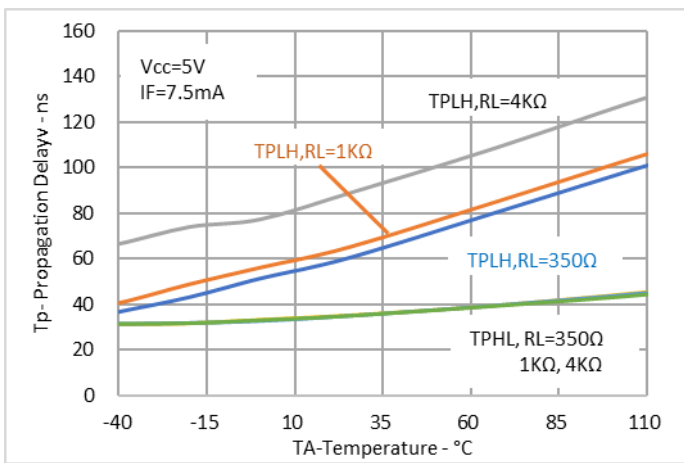
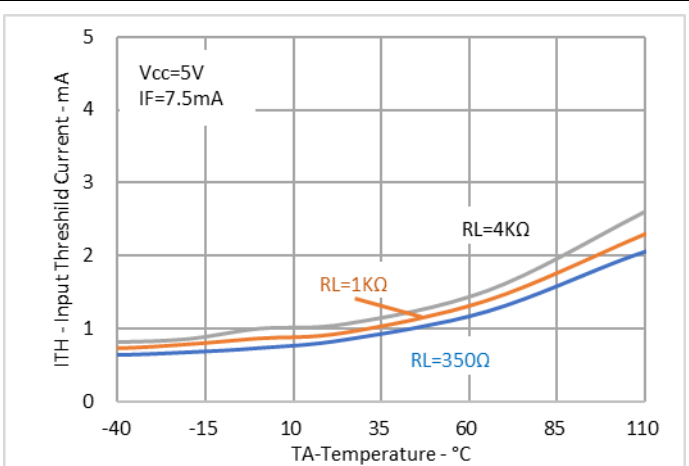
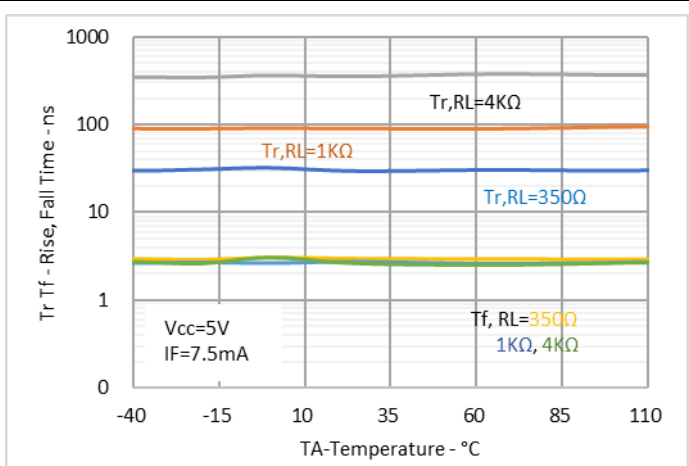
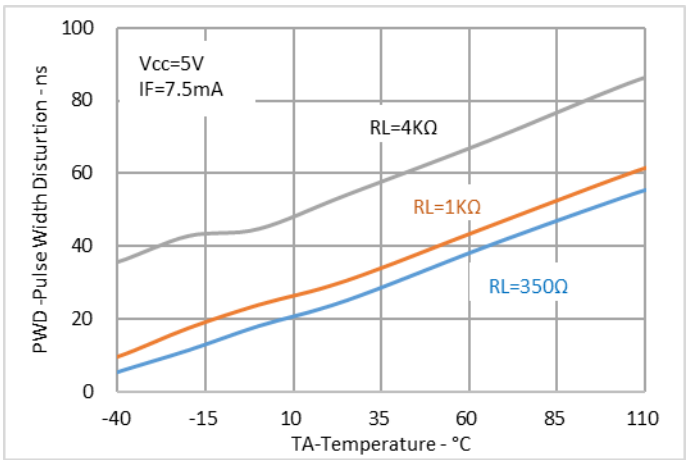
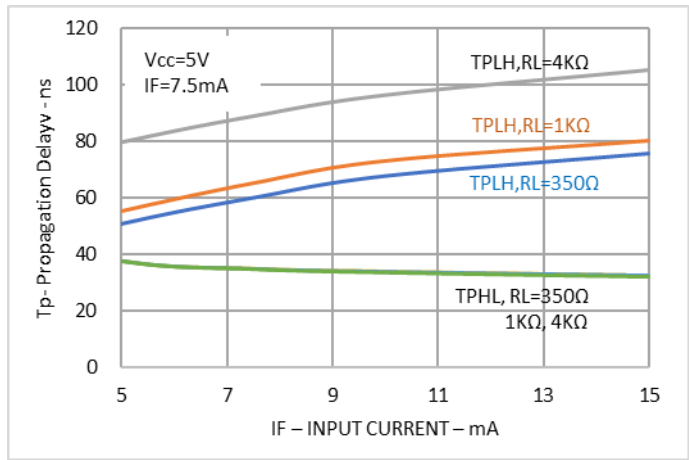


Fig.6 Propagation Delay vs. Temperature

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS



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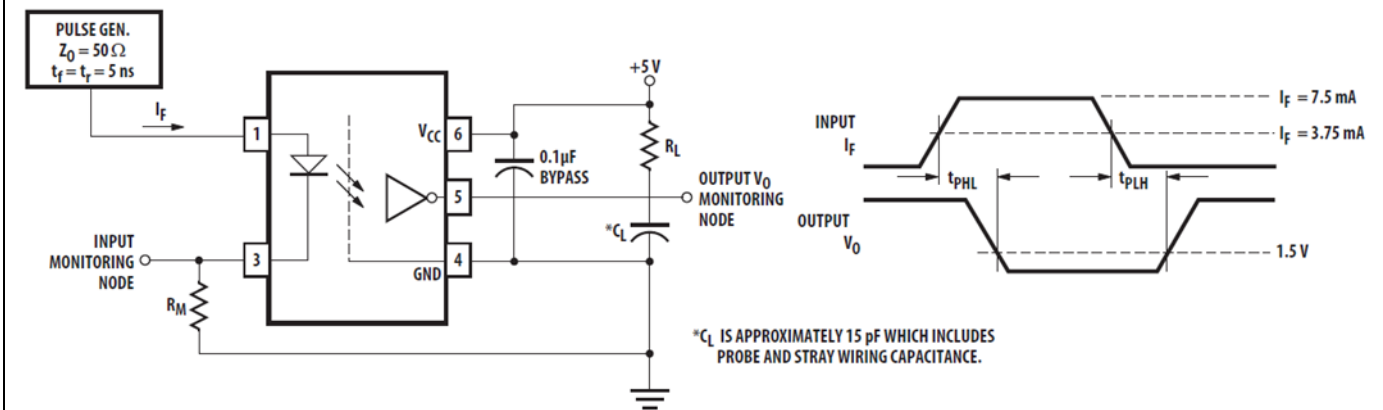


Fig.11 Test Circuit for t_{PHL} and t_{PLH}

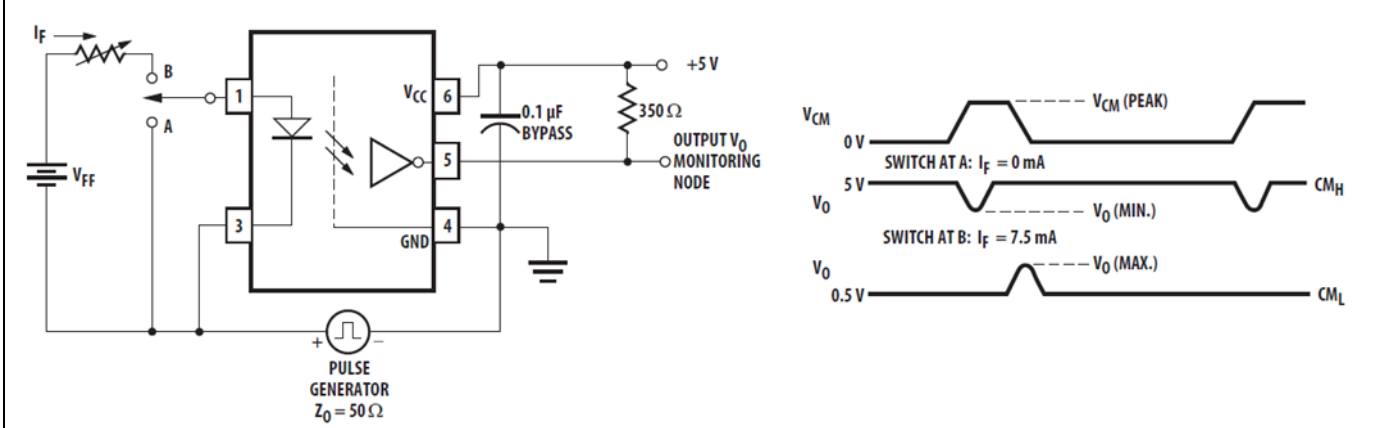
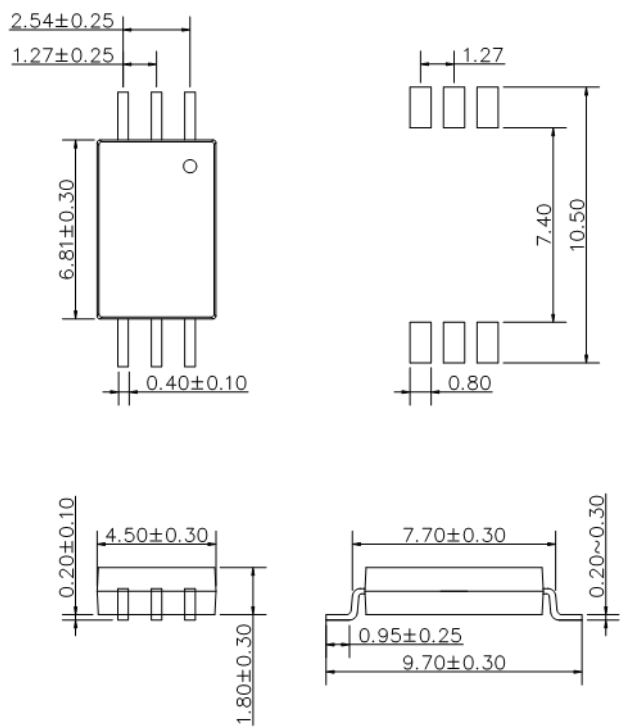
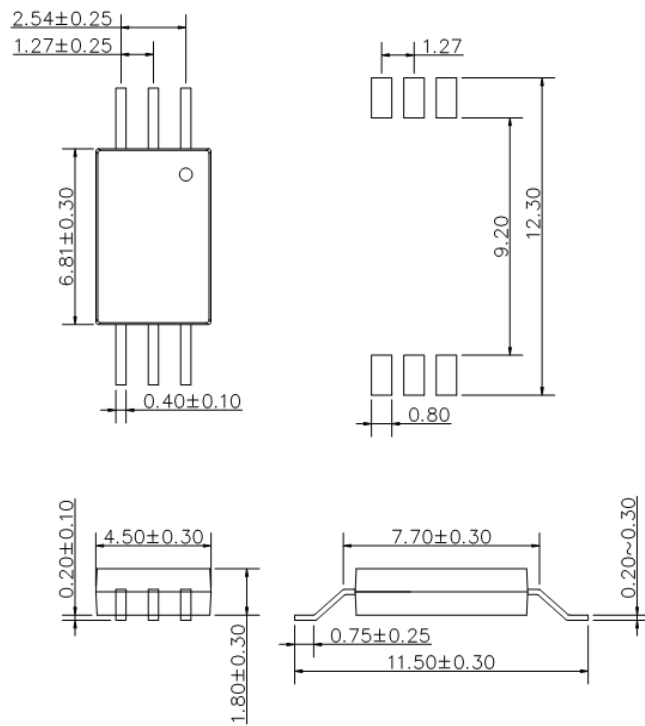


Fig.12 Test Circuit for Common Mode Transient Immunity and Typical Waveforms

PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

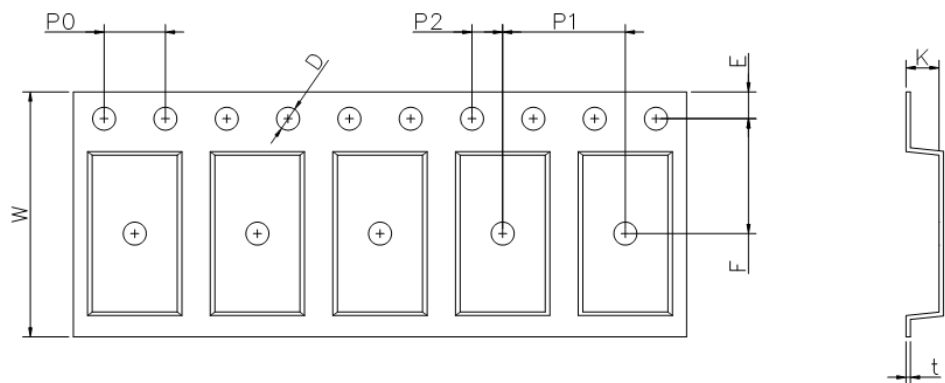


P type Dimension



W type Dimension

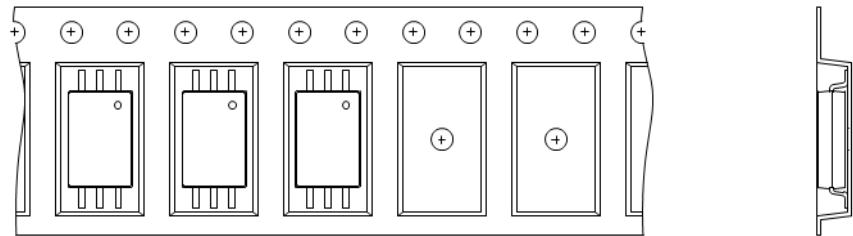
TAPING DIMENSIONS (Dimensions in mm unless otherwise stated)



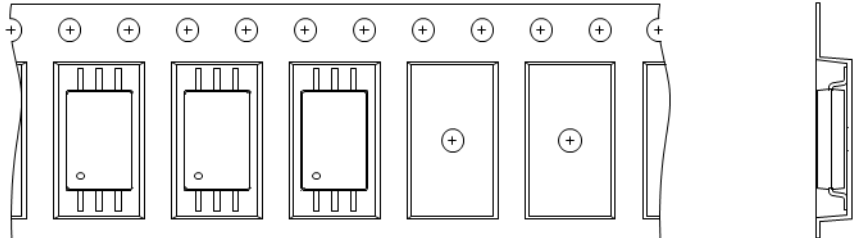
Symbol	D	E	F	P0	P1	P2	t	W	K
Dimension (mm)	1.5 ±0.1	1.75 ±0.1	7.5 ±0.1	4.0 ±0.1	8.0 ±0.1	2.0 ±0.1	0.3 ±0.1	16.0 ±0.3	2.15 ±0.1

TAPE & REEL PACKING SPECIFICATIONS

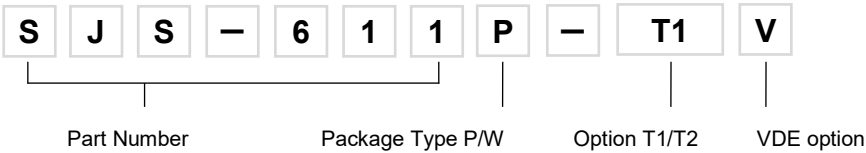
Option T1



Option T2

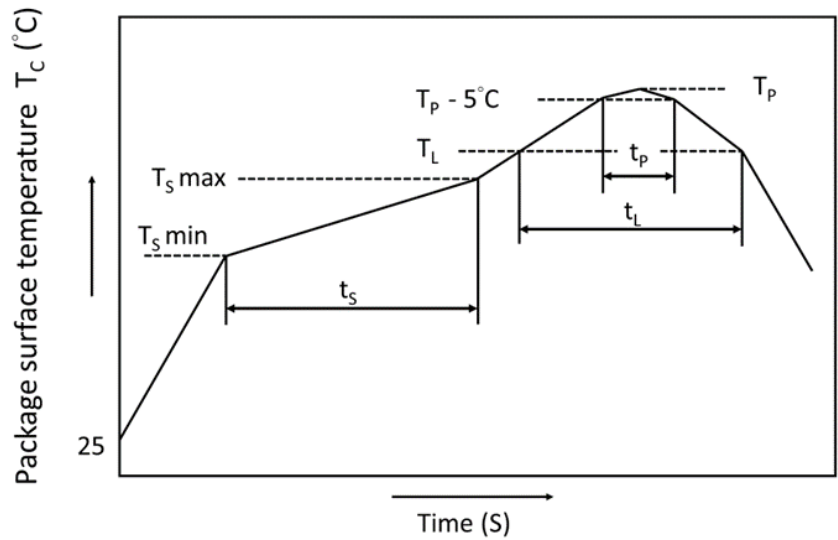


ORDERING AND MARKING INFORMATION



Marking Symbol	Description
SJS	Part Number
611	
P	Package Type Option (P or W)
YY	Year Date Code
WW	Two Digit Work Week
V	VDE Option (V or None)

PRECAUTIONS FOR IR REFLOW SOLDERING



- One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

DESCRIPTION	SYMBOL	MIN.	MAX.	UNIT
Preheat temperature	T_s	150	200	$^\circ\text{C}$
Preheat time	t_s	60	120	s
Ramp-up rate (T_L to T_P)			3	$^\circ\text{C/s}$
Liquidus temperature	T_L	217		$^\circ\text{C}$
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	$^\circ\text{C}$
Time during which T_c is between (T_P-5) and T_P	t_P		20	s
Ramp-down rate			6	$^\circ\text{C/s}$

DISCLAIMER

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- Our company makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Our company disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular.
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- This product is not intended to be used for military, aircraft, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact our company or sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify our company's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.