

RV1S9091A / RV1S9092A

4 A OUTPUT CURRENT, HIGH CMTI
 IGBT, GaN FET, SiC FET and Si power MOSFET gate drive
 5-PIN SOP WITH 8 mm CREEPAGE DISTANCE (LSO5) PHOTOCOUPLER

R08DS0320EJ0100

Rev. 1.00

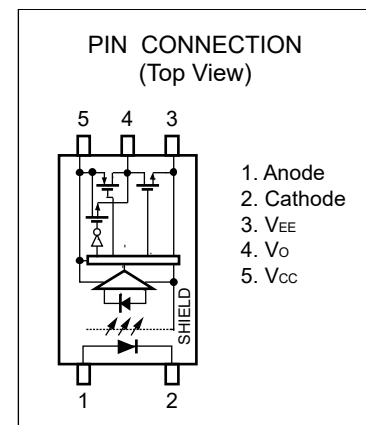
Dec. 03, 2025

DESCRIPTION

The RV1S9091A / RV1S9092A are optically coupled isolators containing an AlGaAs LED on the input side and a photodiode with a signal processing circuit and power MOSFETs built in one chip on the output side. The RV1S9091A / RV1S9092A are designed specifically for high common mode transient immunity (CMTI), high speed switching and high temperature operation up to $T_A = 125\text{ }^\circ\text{C}$. They are suitable for driving IGBT, GaN FET, SiC FET and Si power MOSFET gate drive.

FEATURES

- Product portfolio with two different UVLO (Under Voltage Lock Out) characteristics.
 - RV1S9091A: $V_{UVLO} = 9.6\text{ V MAX.}$
 - RV1S9092A: $V_{UVLO} = 13.4\text{ V MAX.}$
- Long creepage distance (8 mm MIN.)
- Peak output current (4 A MAX.)
- High speed switching ($t_{PLH}, t_{PHL} = 95\text{ ns MAX.}$)
- Pulse width distortion ($|t_{PHL} - t_{PLH}| = 35\text{ ns MAX.}$)
- High common mode transient immunity ($|CM_H|, |CM_L| = 100\text{ kV}/\mu\text{s MIN.}$)
- Operating ambient temperature ($125\text{ }^\circ\text{C MAX.}$)
- High isolation voltage ($BV = 5\text{ 000 Vr.m.s.}$)
- Embossed tape product:
 - RV1S9091ACCSP-10Yx#KC0: 3 000 pcs/reel
 - RV1S9092ACCSP-10Yx#KC0: 3 000 pcs/reel
- Pb-free product
- Safety standard
 - UL : UL1577, Double protection
 - CSA : CSA C22.2 No.62368-1, Reinforced insulation
 - VDE : DIN EN IEC 60747-5-5, DIN EN IEC 62368-1, Reinforced insulation (Option)



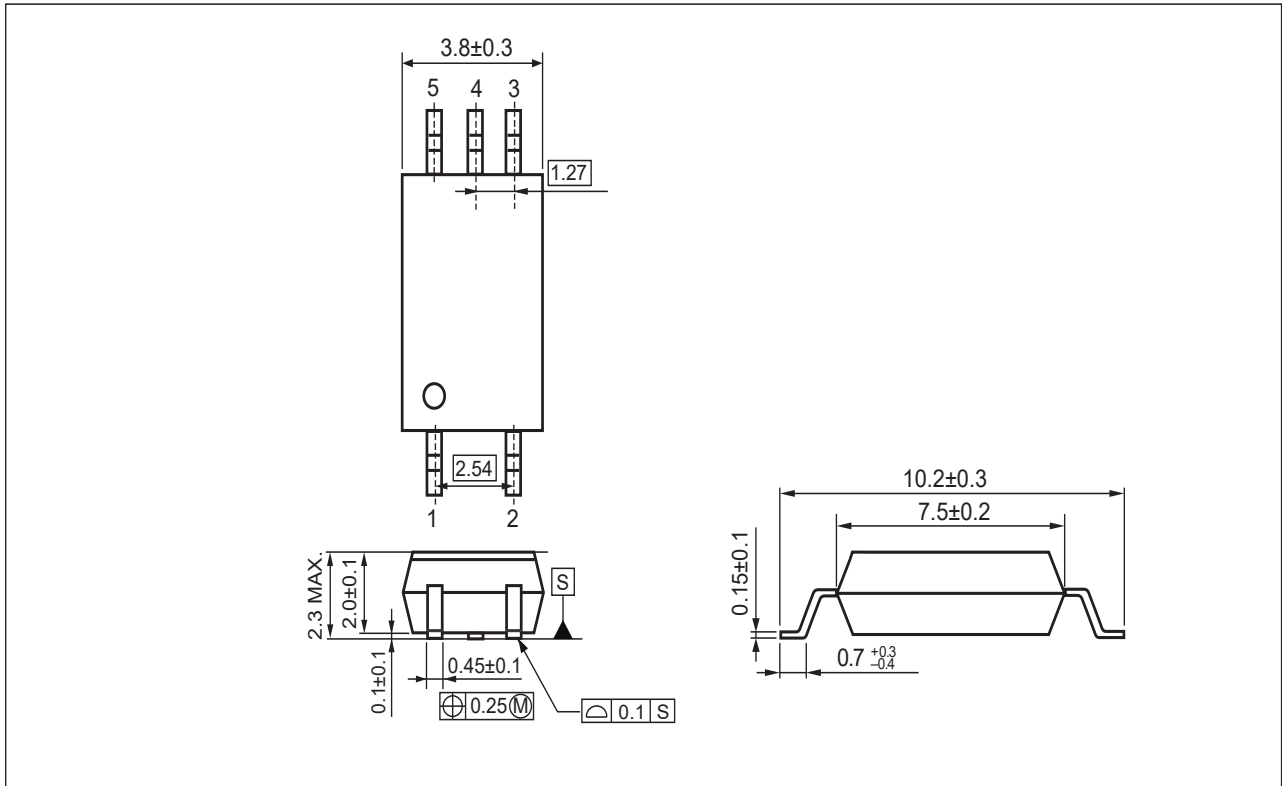
APPLICATIONS

- IGBT, GaN FET, SiC FET and Si power MOSFET gate drive
- Industrial inverter / AC Servo
- Solar and wind Power Conditioner

Start of mass production

Dec. 2025

PACKAGE DIMENSIONS (UNIT: mm)



Weight: 0.119 g (TYP.)

PHOTOCOUPLER CONSTRUCTION

Parameter	MIN.
Air Distance	8 mm
Creepage Distance	8 mm
Isolation Distance	0.15 mm

MARKING EXAMPLE

No. 1 pin Mark

R
909x
N131

← Company Initial
← Type Number *
← Assembly Lot

N 1 31

Rank Code
Year Assembled (Last 1 Digit)
Week Assembled

*) Applicable type numbers are listed below.

RV1S 9091 ACCSP-10Yx

RV1S 9092 ACCSP-10Yx

Marking type number. "RV1S" and "ACCSP-10Yx" are omitted from original type number.

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1	
RV1S9091ACCSP-10YC	RV1S9091ACCSP-10YC#SC0	Pb-Free and Halogen Free (Ni/Pd/Au)	Embossed Tape 20 pcs	UL, CSA Approved	RV1S9091A	
	RV1S9091ACCSP-10YC#KC0		Embossed Tape 3 000 pcs/reel			
RV1S9091ACCSP-10YV	RV1S9091ACCSP-10YV#SC0		Embossed Tape 20 pcs	UL, CSA, VDE Approved		
	RV1S9091ACCSP-10YV#KC0		Embossed Tape 3 000 pcs/reel			
RV1S9092ACCSP-10YC	RV1S9092ACCSP-10YC#SC0		Embossed Tape 20 pcs	UL, CSA Approved		RV1S9092A
	RV1S9092ACCSP-10YC#KC0		Embossed Tape 3 000 pcs/reel			
RV1S9092ACCSP-10YV	RV1S9092ACCSP-10YV#SC0	Embossed Tape 20 pcs	UL, CSA, VDE Approved			
	RV1S9092ACCSP-10YV#KC0	Embossed Tape 3 000 pcs/reel				

Notes: *1. For the application of the safety standard, the following part number should be used.

ABSOLUTE MAXIMUM RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	I_F	25	mA
	Peak Transient Forward Current (Pulse Width < $1\mu\text{s}$)	$I_{F(\text{TRAN})}$	1.0	A
	Reverse Voltage	V_R	5	V
	Power Dissipation *1	P_D	45	mW
Detector	High Level Peak Output Current *2	$I_{OH(\text{PEAK})}$	4.0	A
	Low Level Peak Output Current *2	$I_{OL(\text{PEAK})}$	4.0	A
	Supply Voltage	$(V_{CC} - V_{EE})$	-0.3 to 35	V
	Output Voltage	V_O	0 to V_{CC}	V
	Power Dissipation *3	P_C	250	mW
Isolation Voltage *4		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T_A	-40 to +125	$^\circ\text{C}$
Storage Temperature		T_{stg}	-40 to +150	$^\circ\text{C}$

Notes: *1. Reduced at a rate of $1.2\text{ mW}/^\circ\text{C}$ above $T_A = 110\text{ }^\circ\text{C}$.

*2. Maximum pulse width = $10\text{ }\mu\text{s}$, Maximum duty cycle = 0.2% .

*3. Reduced at a rate of $3.9\text{ mW}/^\circ\text{C}$ above $T_A = 90\text{ }^\circ\text{C}$.

*4. AC voltage for 1 minute at $T_A = 25\text{ }^\circ\text{C}$, RH = 60% between input and output.

Pins 1-2 shorted together, 3-5 shorted together.

RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	RV1S9091A	$(V_{CC} - V_{EE})$	10		30	V
	RV1S9092A		15		30	
Forward Current (ON)		$I_{F(\text{ON})}$	10	12	14	mA
Forward Voltage (OFF)		$V_{F(\text{OFF})}$	-2		0.8	V
Operating Ambient Temperature		T_A	-40		+125	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS

(at recommended operating conditions, $V_{EE} = \text{GND}$, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit	
Diode	Forward Voltage	V_F	$I_F = 12 \text{ mA}$, $T_A = 25 \text{ }^\circ\text{C}$	1.35	1.56	1.75	V	
	Reverse Current	I_R	$V_R = 3 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$			10	μA	
	Input Capacitance	C_t	$V_F = 0 \text{ V}$, $f = 1 \text{ MHz}$, $T_A = 25 \text{ }^\circ\text{C}$		30		pF	
Detector	High Level Output Current	I_{OH}	$V_O = (V_{CC} - 4 \text{ V})^{*2, *5}$		-2.8	-1.0	A	
			$V_O = (V_{CC} - 10 \text{ V})^{*3, *5}$			-3.6		
	Low Level Output Current	I_{OL}	$V_O = (V_{EE} + 2.5 \text{ V})^{*2, *5}$	1.0	2.5		A	
			$V_O = (V_{EE} + 10 \text{ V})^{*3, *5}$	3.6				
	High Level Output Voltage	V_{OH}	$I_O = -30 \text{ mA}^{*4}$	$V_{CC} - 0.3$	$V_{CC} - 0.1$		V	
	Low Level Output Voltage	V_{OL}	$I_O = 100 \text{ mA}$		0.1	0.2	V	
	High Level Supply Current	I_{CCH}	$V_O = \text{Open}$, $I_F = 12 \text{ mA}^{*5}$		2.6	4.0	mA	
	Low Level Supply Current	I_{CCL}	$V_O = \text{Open}$, $V_F = 0 \text{ to } 0.8 \text{ V}^{*5}$		2.9	4.0	mA	
	RV1S9091A	UVLO Threshold	V_{UVLO+}	$V_O > 5 \text{ V}$, $I_F = 12 \text{ mA}$	7.6	8.6	9.6	V
			V_{UVLO-}		6.6	7.6	8.6	V
		UVLO Hysteresis	$UVLO_{HYS}$		0.3	1.0		V
	RV1S9092A	UVLO Threshold	V_{UVLO+}	$V_O > 5 \text{ V}$, $I_F = 12 \text{ mA}$	10.8	12.0	13.4	V
V_{UVLO-}			9.5		11.0	12.5	V	
UVLO Hysteresis		$UVLO_{HYS}$	0.4		1.0		V	
Coupled	Threshold Input Current (L \rightarrow H)	I_{FLH}	$I_O = 0 \text{ mA}$, $V_O > 5 \text{ V}^{*5}$		1.4	6.0	mA	
	Threshold Input Voltage (H \rightarrow L)	V_{FHL}	$I_O = 0 \text{ mA}$, $V_O < 5 \text{ V}$	0.8			V	

Notes: *1. Typical values at $T_A = 25 \text{ }^\circ\text{C}$, $V_{CC} - V_{EE} = 30 \text{ V}$ *2. Maximum pulse width = 50 μs , Maximum duty cycle = 0.5 %.*3. Maximum pulse width = 10 μs , Maximum duty cycle = 0.2 %.*4. V_{OH} is measured with the DC load current in this testing (Maximum pulse width = 2 ms, Maximum duty cycle = 20 %).

*5. The polarity of the current flowing from the external circuit to the RV1S9091A / RV1S9092A is positive.

SWITCHING CHARACTERISTICS

(at recommended operating conditions, $V_{EE} = \text{GND}$, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit	
Propagation Delay Time (L → H)	t_{PLH}	$R_g = 10 \Omega$, $C_g = 10 \text{ nF}$, $f = 10 \text{ kHz}$, Duty Cycle = 50 %, $I_F = 12 \text{ mA}$, $C_{IN} = 60 \text{ pF}$, $R_{IN} = 300 \Omega$		39	95	ns	
Propagation Delay Time (H → L)	t_{PHL}			39	95	ns	
Pulse Width Distortion	$\text{PWD} = t_{PHL} - t_{PLH} $				0	35	ns
Propagation Delay Difference Between Any Two Parts	$\text{PDD} = t_{PHL} - t_{PLH}$			-35		35	ns
Rise Time	t_r				10		ns
Fall Time	t_f				10		ns
Common Mode Transient Immunity at High Level Output	$ CM_H $	$T_A = 25 \text{ }^\circ\text{C}$, $I_F = 12 \text{ mA}$, $V_{CC} = 30 \text{ V}$, $V_{O(\text{MIN.})} = 26 \text{ V}$, $V_{CM} = 1.5 \text{ kV}$	100			$\text{kV}/\mu\text{s}$	
Common Mode Transient Immunity at Low Level Output	$ CM_L $	$T_A = 25 \text{ }^\circ\text{C}$, $I_F = 0 \text{ mA}$, $V_{CC} = 30 \text{ V}$, $V_{O(\text{MAX.})} = 1 \text{ V}$, $V_{CM} = 1.5 \text{ kV}$	100			$\text{kV}/\mu\text{s}$	

Notes: *1. Typical values at $T_A = 25 \text{ }^\circ\text{C}$, $V_{CC} - V_{EE} = 30 \text{ V}$

TEST CIRCUIT

Fig. 1 I_{OH} Test Circuit

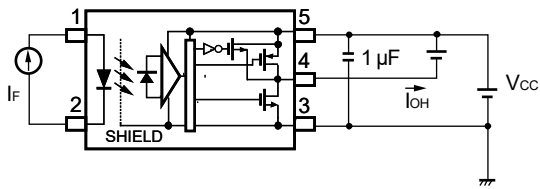


Fig. 2 I_{OL} Test Circuit

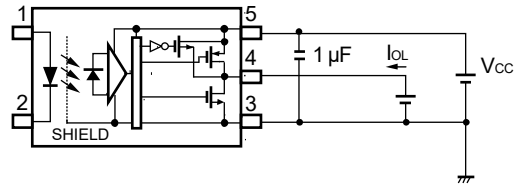


Fig. 3 V_{OH} Test Circuit

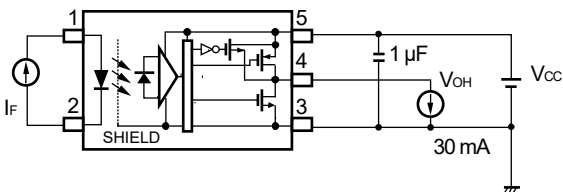


Fig. 4 V_{OL} Test Circuit

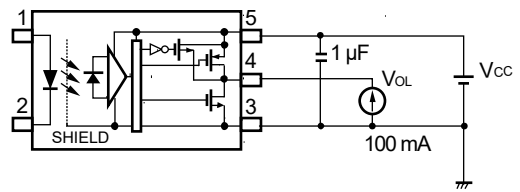


Fig. 5 I_{CCH} Test Circuit

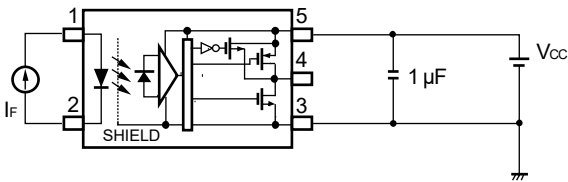


Fig. 6 I_{CCL} Test Circuit

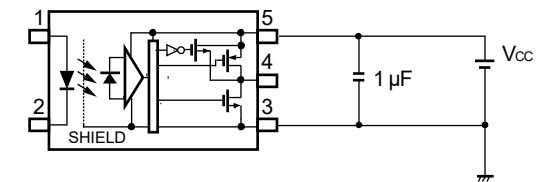


Fig. 7 V_{UVLO} Test Circuit

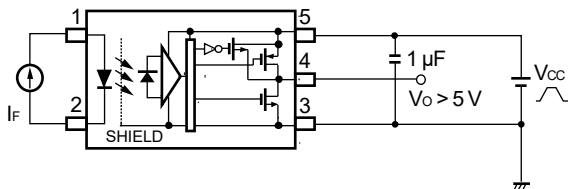


Fig. 8 I_{FLH} Test Circuit

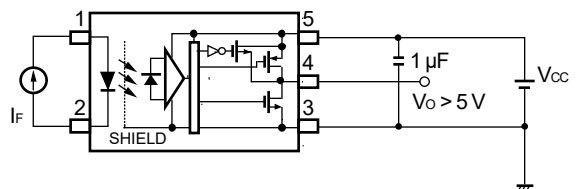


Fig. 9 t_{PLH} , t_{PHL} , t_r , t_f Test Circuit and Wave Forms

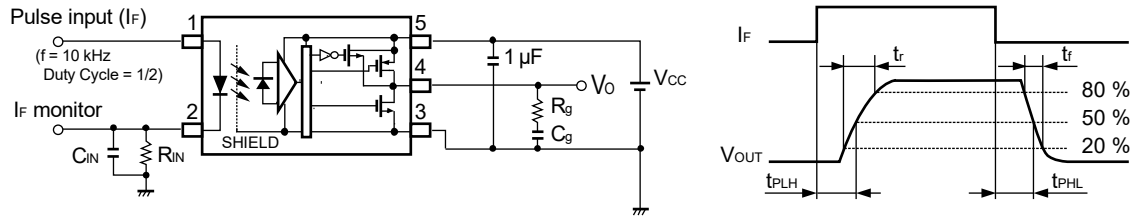
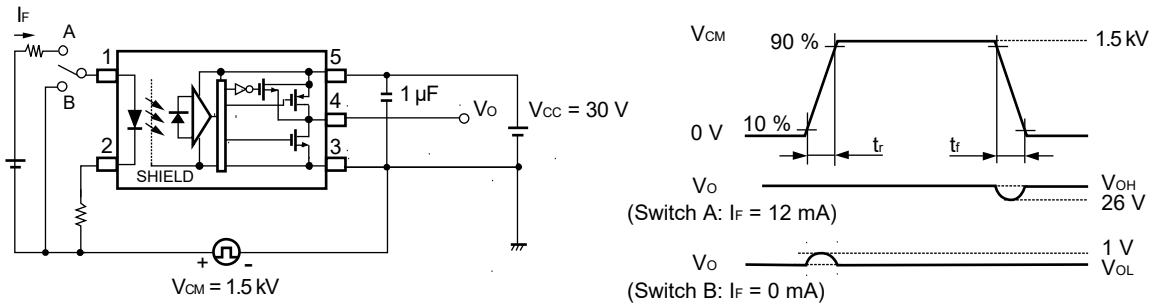
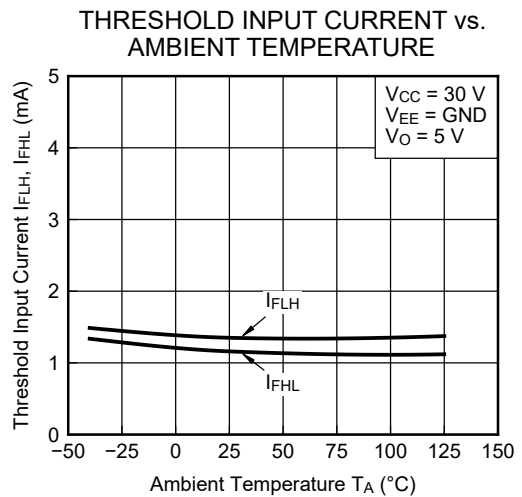
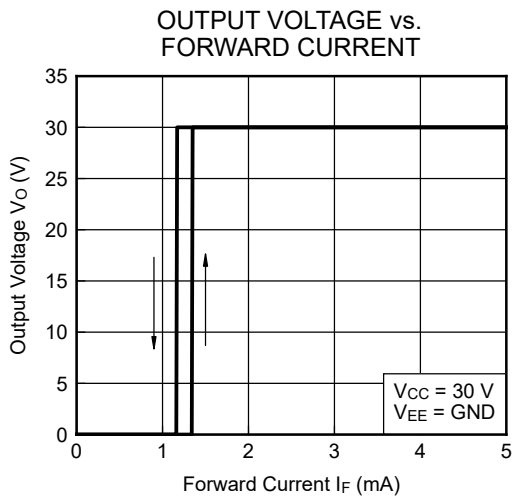
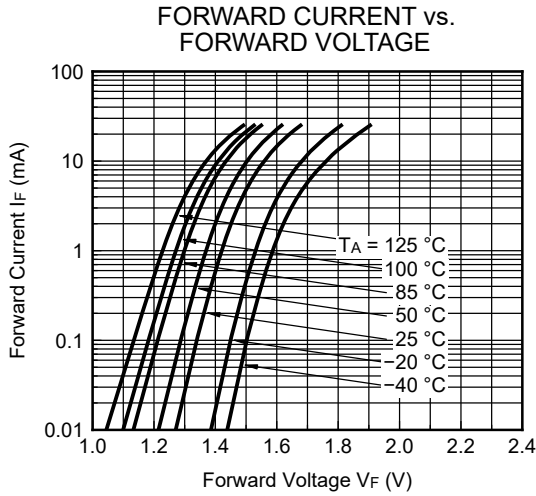
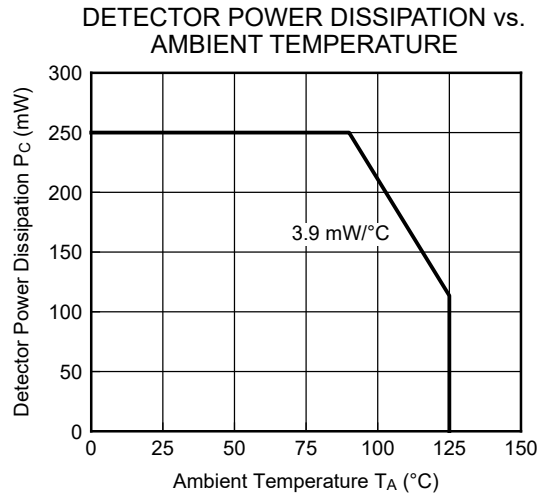
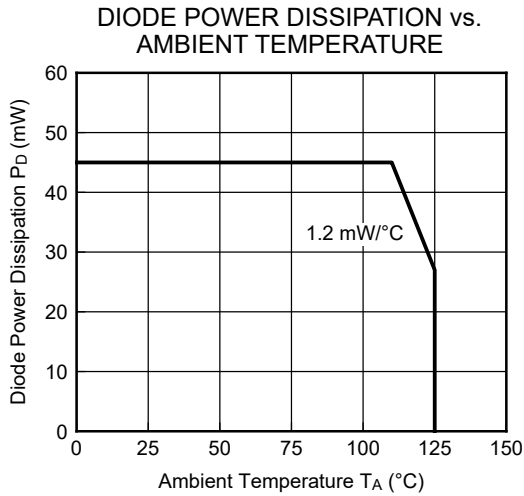


Fig. 10 Test circuit for common mode transient immunity and Wave Forms



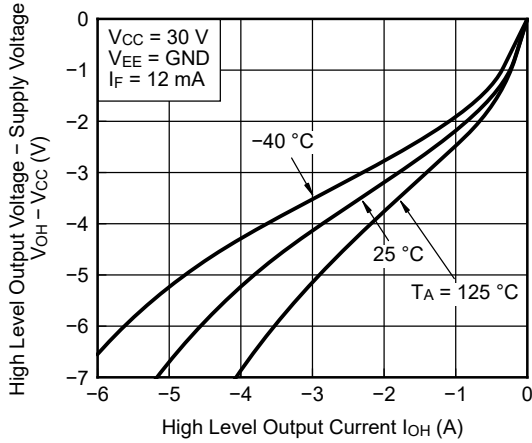
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)



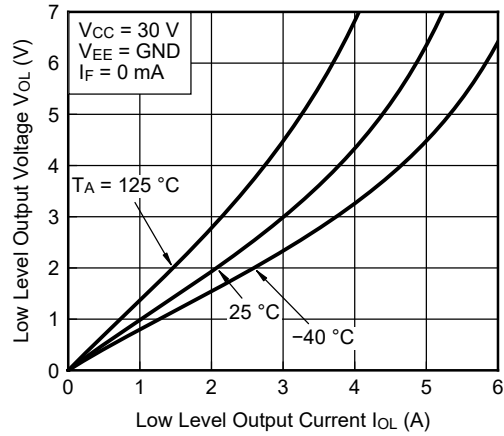
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

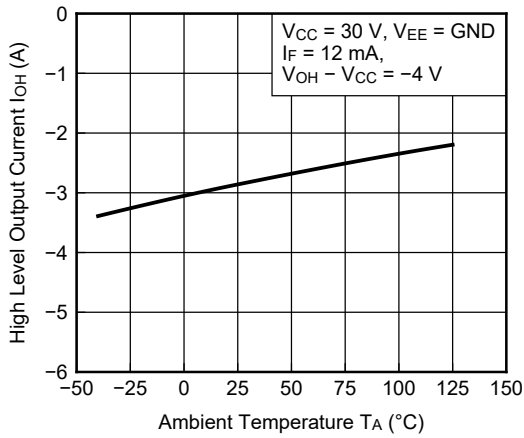
HIGH LEVEL OUTPUT VOLTAGE - SUPPLY VOLTAGE vs. HIGH LEVEL OUTPUT CURRENT



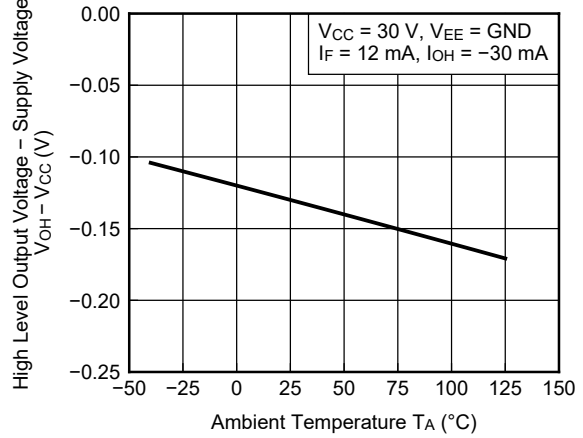
LOW LEVEL OUTPUT VOLTAGE vs. LOW LEVEL OUTPUT CURRENT



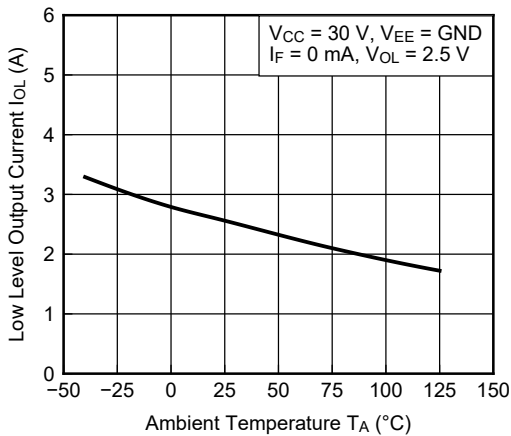
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



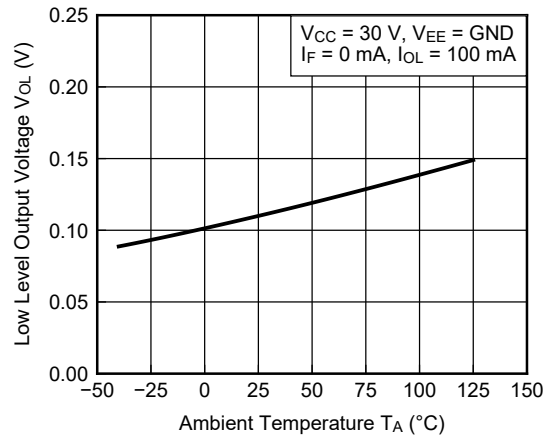
HIGH LEVEL OUTPUT VOLTAGE - SUPPLY VOLTAGE vs. AMBIENT TEMPERATURE



LOW LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE

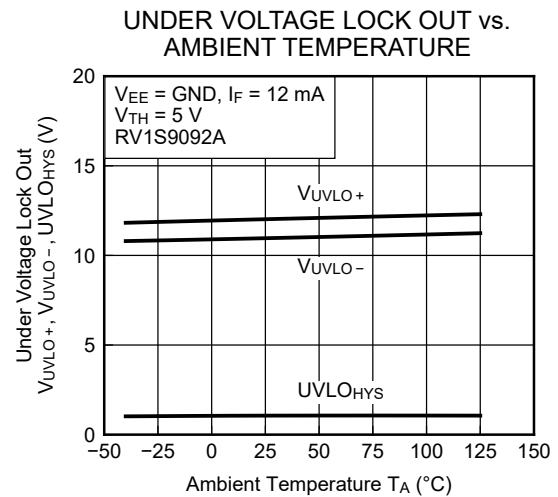
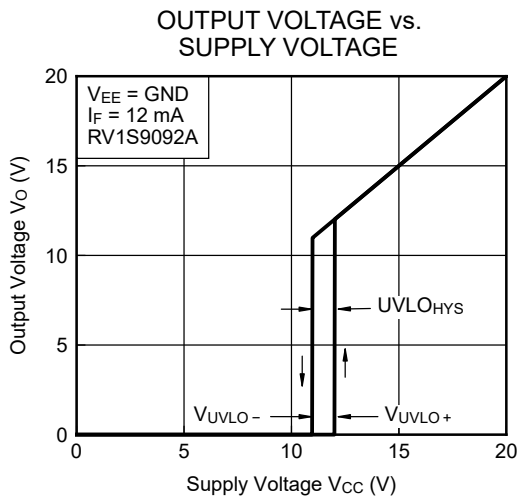
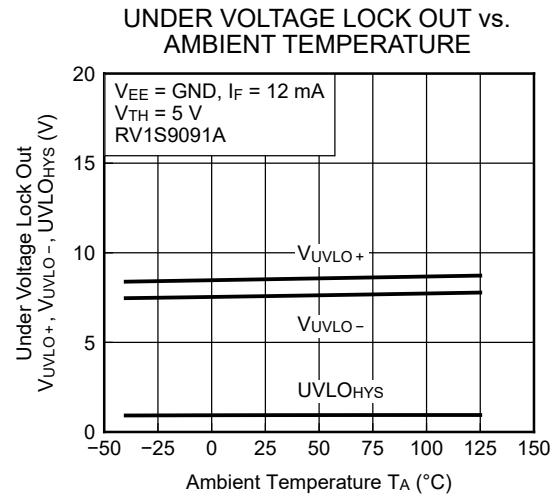
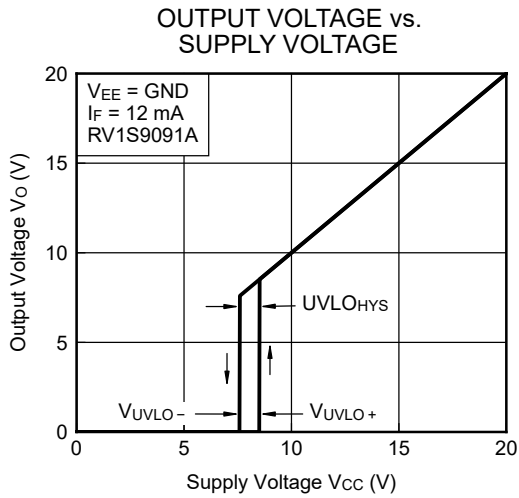
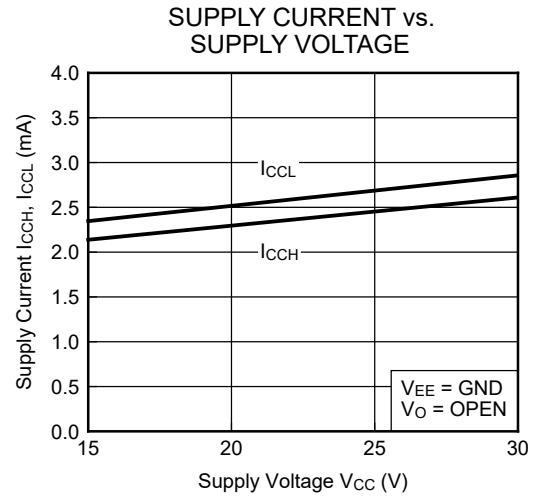
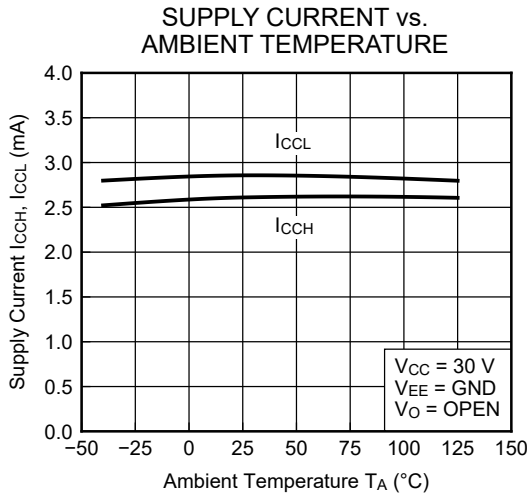


LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



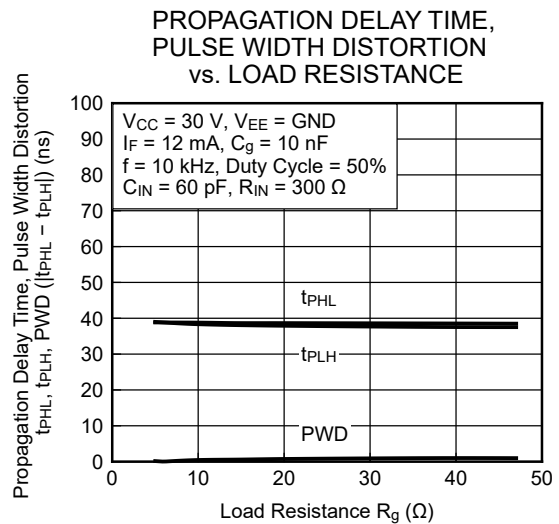
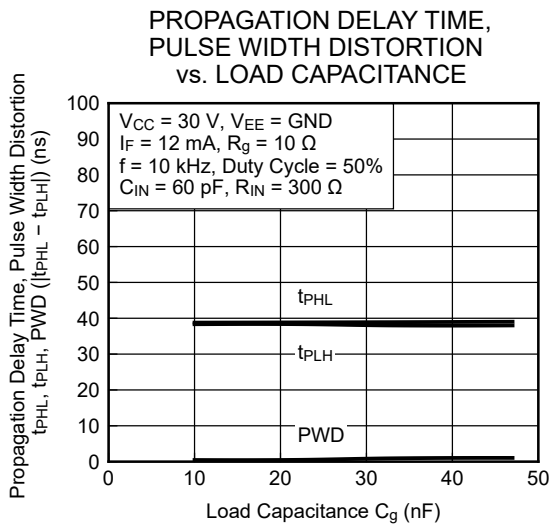
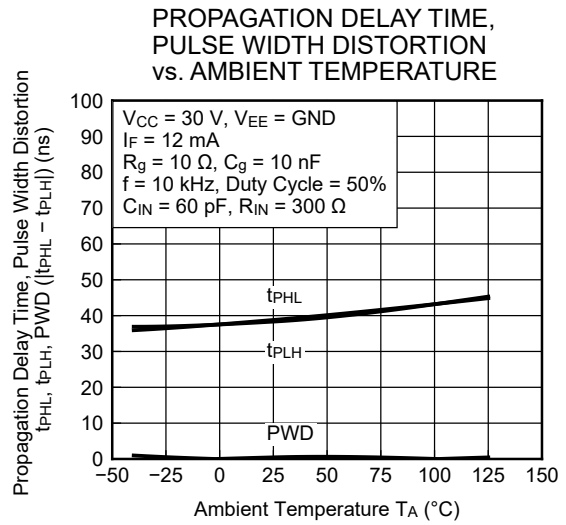
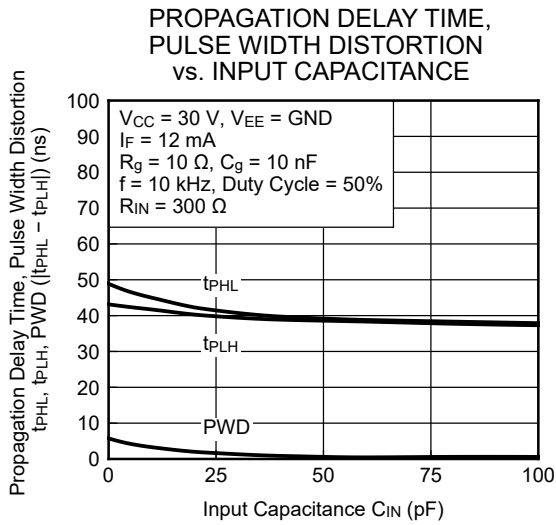
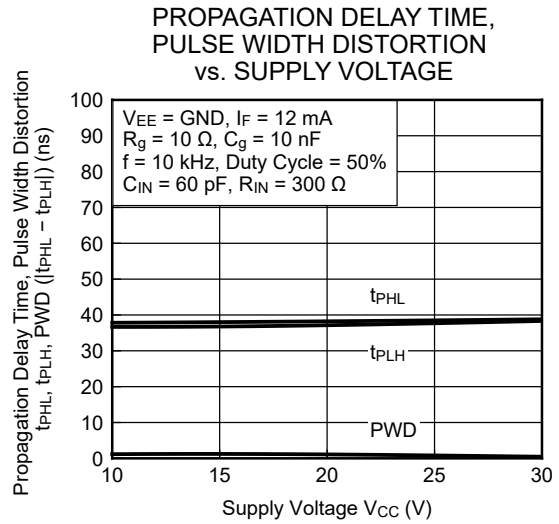
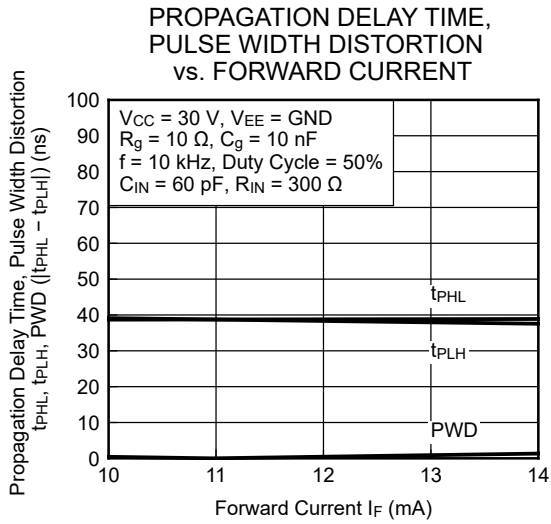
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)



Remark The graphs indicate nominal characteristics.

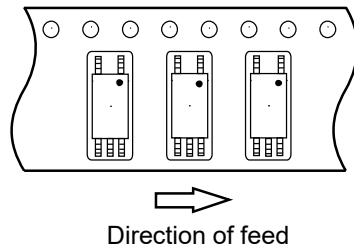
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)



Remark The graphs indicate nominal characteristics.

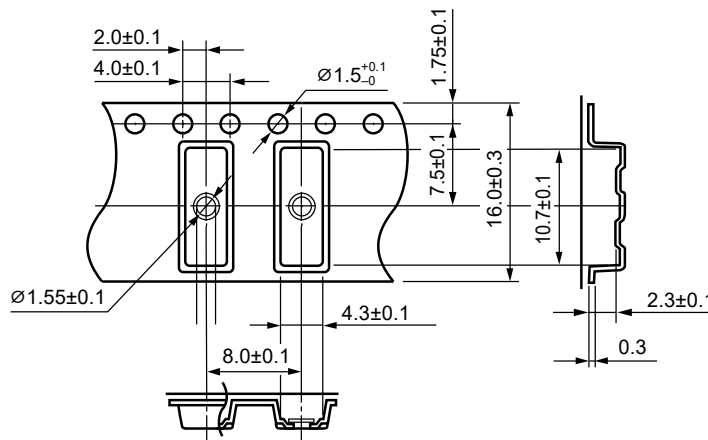
TAPING SPECIFICATIONS (UNIT: mm)

Tape Direction



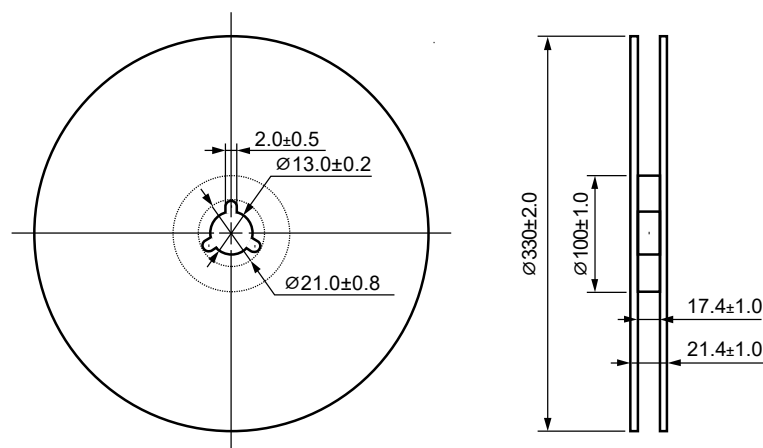
Outline and Dimensions (Tape)

(Unit : mm)



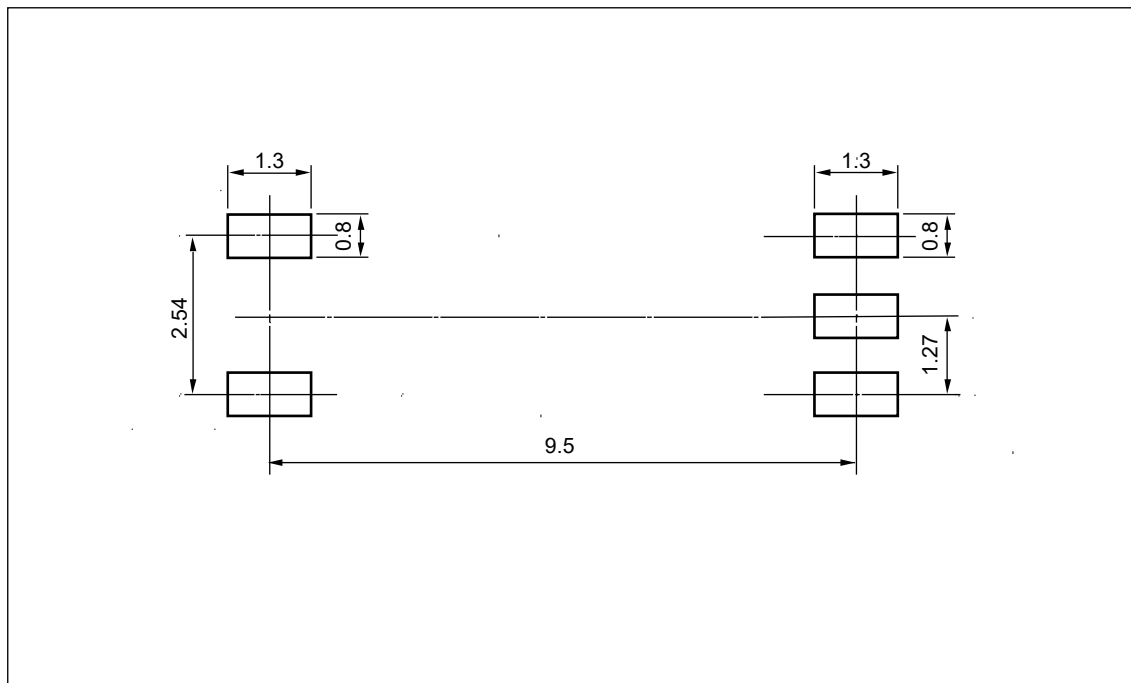
Outline and Dimensions (Reel)

(Unit : mm)



Packing: 3 000 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



Remark All dimensions in this figure must be evaluated before use.

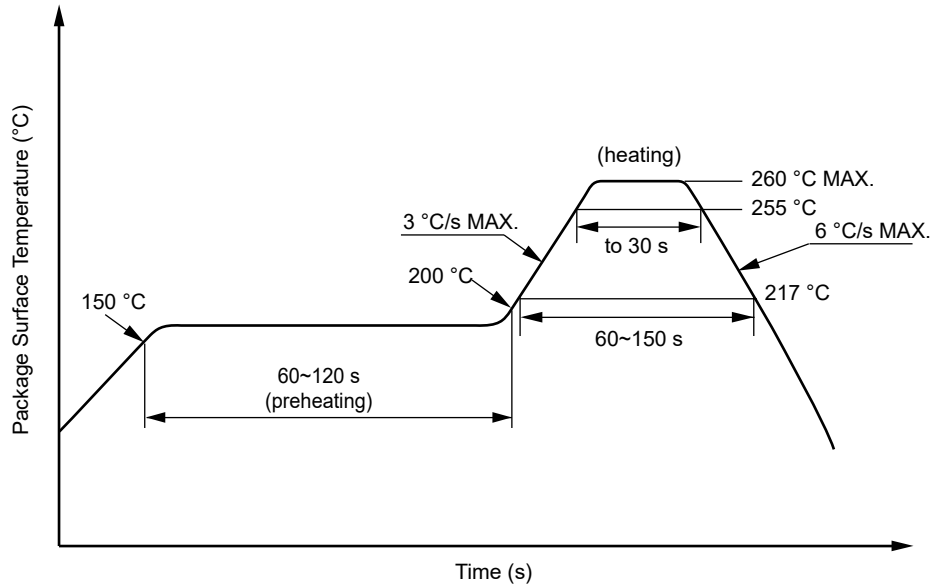
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature 260 °C or below (package surface temperature)
- Time of peak reflow temperature –5 °C (255 °C) 30 s or less
- Time of temperature higher than 217 °C 60 to 150 seconds
- Time to preheat temperature from 150 to 200 °C 60 to 120 seconds
- Number of reflows Three
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



JEDEC J-STD-020F compliant soldering conditions

(2) Wave soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 s or less
- Preheating conditions 120 °C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(3) Soldering by Soldering Iron

- Peak temperature (lead part temperature) 350 °C or below
- Time (per one side) 3 s or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)
- Place 1.5 to 2.0 mm or more away from the root of the lead

(4) Cautions

- Flux cleaning Avoid cleaning with Freon- or halogen-based (chlorinated etc.) solvents.
- Fixing/Coating Do not use fixing agents or coatings containing halogen-based substances.

2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

USAGE CAUTIONS

1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. Board designing
 - (1) A 1 μ F ceramic capacitor is required between V_{CC} and GND as a bypass capacitor.

Since the circuit operates with high current and high-speed switching, place the photocoupler and the bypass capacitor as close together as possible to reduce parasitic inductance and minimize noise effects.

It is recommended to make the GND pattern as wide as possible and to mount the photocoupler and the bypass capacitor on the same side of the board.
 - (2) In the board artwork, ensure that the patterns of the IGBT collector/emitter or the MOSFET source/drain do not come close to the input of this product.

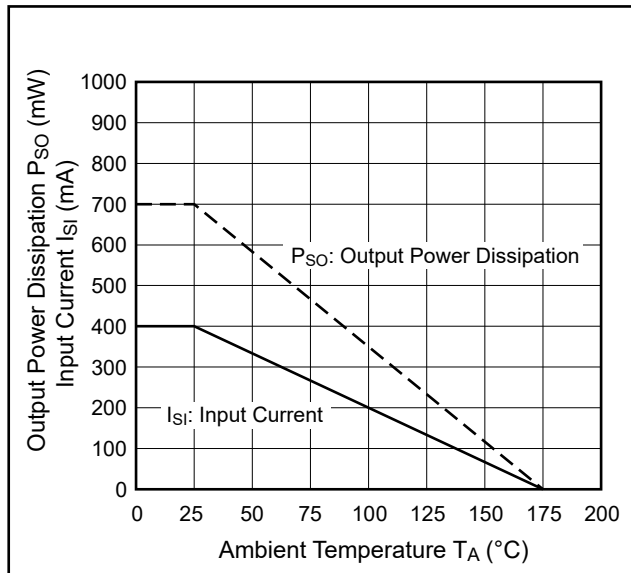
Coupling between the above patterns may allow transients from the IGBT/MOSFET side to enter the LED input of this product, which could cause malfunction or performance degradation.

(If it is necessary to route the patterns close to each other, design the input drive circuit so that the LED remains reverse-biased when off, preventing the LED from turning on due to transient coupling.)
3. Make sure the rise/fall time of the forward current is 0.5 μ s or less.
4. In order to avoid malfunctions, make sure the rise/fall slope of the supply voltage is 3 V/ μ s or less.
5. Avoid storage at a high temperature and high humidity.

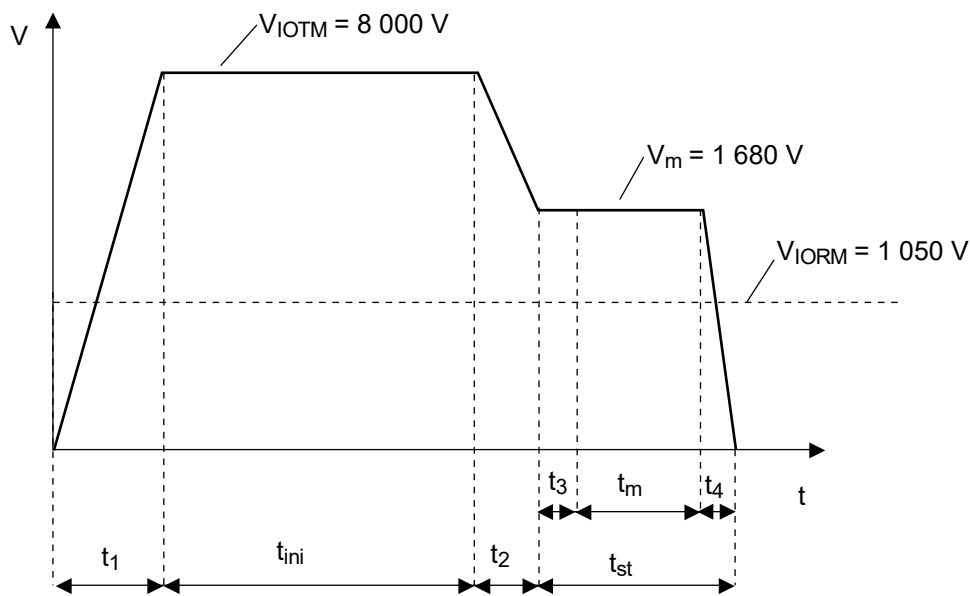
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/125/21	
Dielectric strength			
maximum operating isolation voltage	V_{IORM}	1 050	V_{peak}
Test voltage (partial discharge test, procedure a for type test and random test) $V_m = 1.6 \times V_{IORM.}, q_{pd} < 5 \text{ pC}$	V_m	1 680	V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $V_m = 1.875 \times V_{IORM.}, q_{pd} < 5 \text{ pC}$	V_m	1 969	V_{peak}
Highest permissible overvoltage	V_{IOTM}	8 000	V_{peak}
Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11))	CTI	400	
Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))		II	
Storage temperature range	T_{stg}	-40 to +150	°C
Operating temperature range	T_A	-40 to +125	°C
Isolation resistance, minimum value $V_{I-O} = 500 \text{ V dc}, T_A = 25 \text{ °C}$	$R_{I-O \text{ MIN.}}$	10^{12}	Ω
$V_{I-O} = 500 \text{ V dc}, T_A = \text{maximum temperature of rating, at least } 100 \text{ °C}$	$R_{I-O \text{ MIN.}}$	10^{11}	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Maximum ambient temperature	T_S	175	°C
Maximum input current	I_{SI}	400	mA
Maximum output power dissipation	P_{SO}	700	mW
Isolation resistance, minimum value at $V_{I-O} = 500 \text{ V dc}, T_A = T_S$	$R_{I-O \text{ MIN.}}$	10^9	Ω

Dependence of maximum safety ratings on ambient temperature

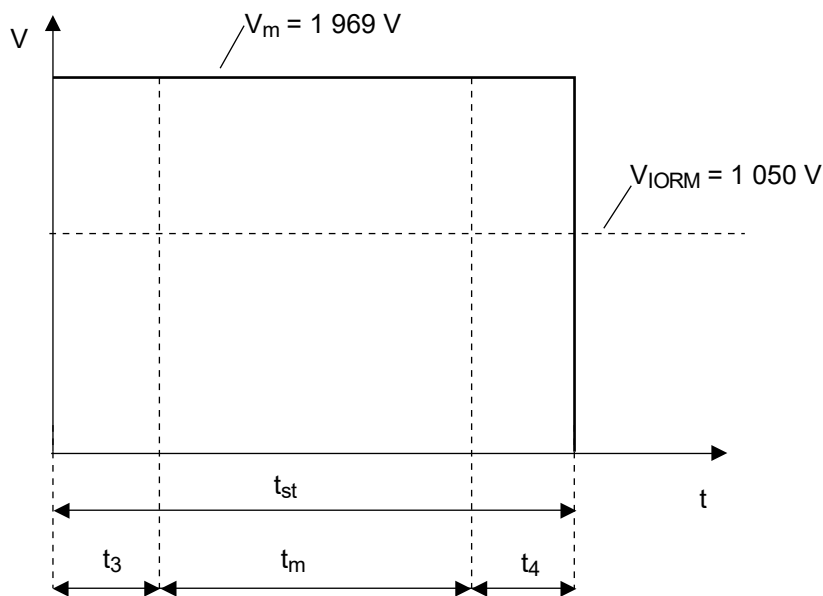


Method a) Destructive Test, Type and Sample Test



$t_1, t_2 = 1 \text{ to } 10 \text{ sec}$
 $t_3, t_4 = 1 \text{ sec}$
 $t_m = 10 \text{ sec}$
 $t_{st} = 12 \text{ sec}$
 $t_{ini} = 60 \text{ sec}$

Method b) Non-destructive Test, 100% Production Test



$t_3, t_4 = 0.1 \text{ sec}$
 $t_m = 1.0 \text{ sec}$
 $t_{st} = 1.2 \text{ sec}$

Caution	GaAs Products	<p>This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none">• Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.<ol style="list-style-type: none">1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.• Do not burn, destroy, cut, crush, or chemically dissolve the product.• Do not lick the product or in any way allow it to enter the mouth.
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