Data Sheet

PS9031

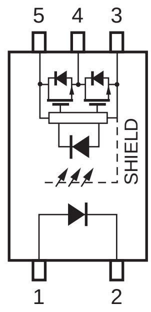
R08DS0131EJ0200
Rev.2.00
Mar 11, 2016

2.5 A OUTPUT CURRENT, HIGH CMR, IGBT GATE DRIVE,
5-PIN SOP (LSO5 WITH 8mm CREEPAGE DISTANCE) PHOTOCOUPLER

DESCRIPTION

The PS9031 is an optically coupled isolator containing a GaAlAs LED on the input side and a photodiode, a signal processing circuit and power MOSFETs on the output side on one chip.

PIN CONNECTION
(Top View)



1. Anode
2. Cathode
3. V_{EE}
4. V_O
5. V_{CC}

FEATURES

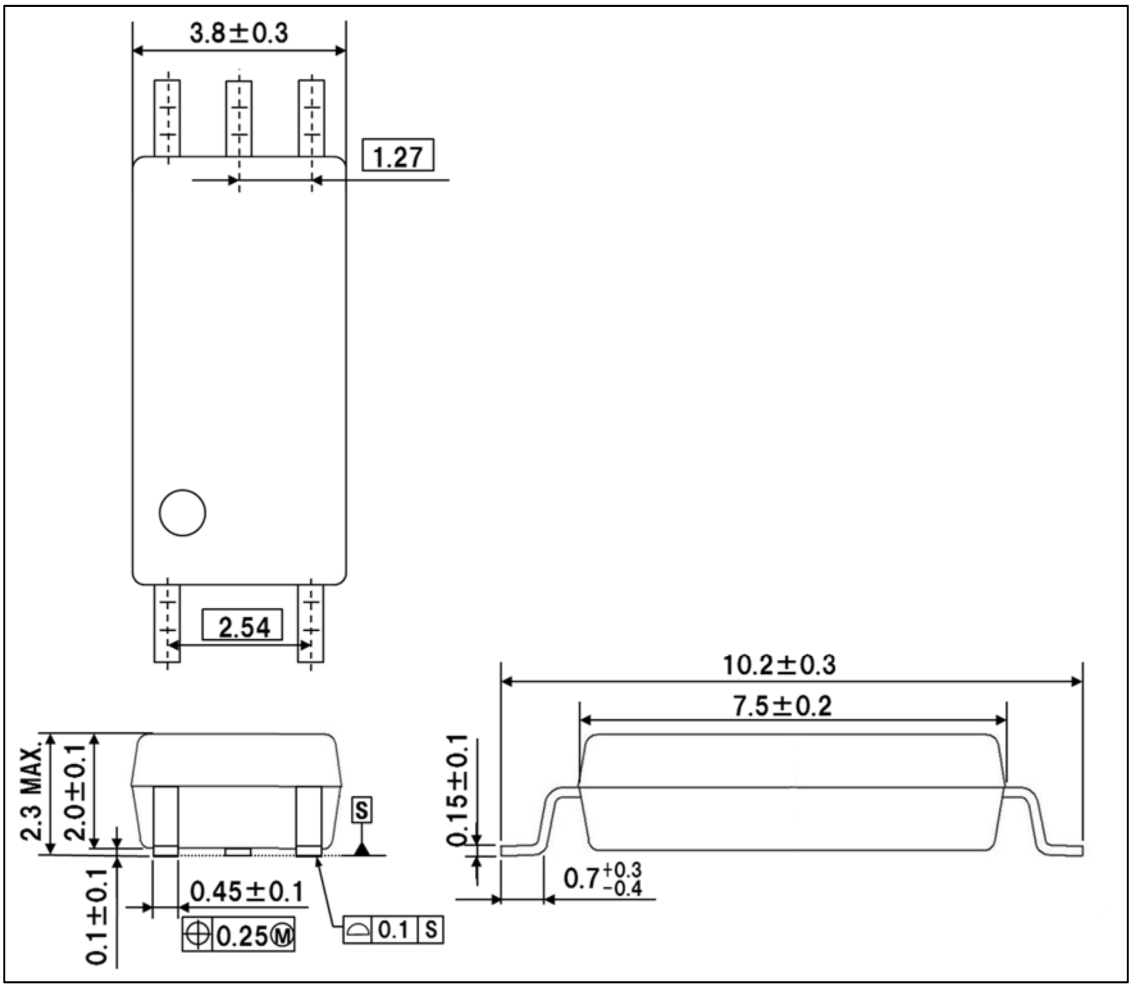
- Long creepage distance (8 mm MIN.)
- Large peak output current (2.5 A MAX., 2.0 A MIN.)
- High speed switching (t_{PLH}, t_{PHL} = 175 ns MAX.)
- UVLO (Under Voltage Lock Out) protection with hysteresis
- High common mode transient immunity (CM_H, CM_L = ±50 kV/μs MIN.)
- Operating Ambient Temperature (125 °C MAX.)
- Embossed tape product : PS9031-F3 : 3000 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: UL1577, Double protection
  - CSA approved: CA5A, CAN/CSA-C22.2 No.60065, CAN/CSA-C22.2 No.60950-1, Reinforced insulation
  - VDE approved: DIN EN 60747-5-5 (Option)

APPLICATIONS

- IGBT, Power MOS FET Gate Driver
- Industrial inverter
- AC Servo

Start of mass production
Oct.2015

PACKAGE DIMENSIONS (UNIT: mm)

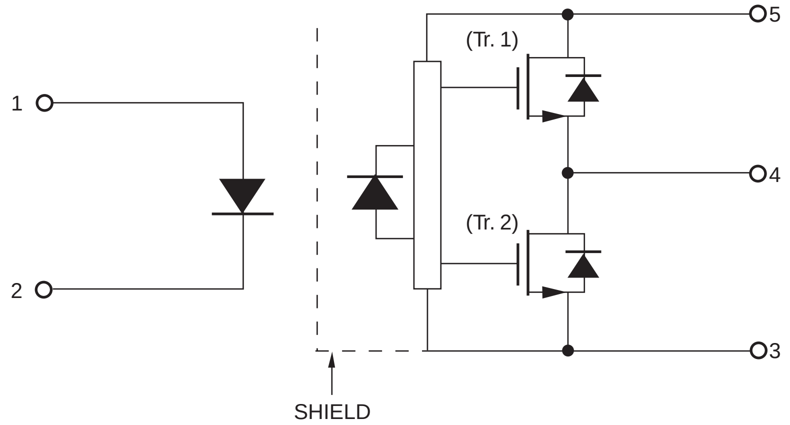


Weight: 0.119g (typ.)

PHOTOCOUPLER CONSTRUCTION

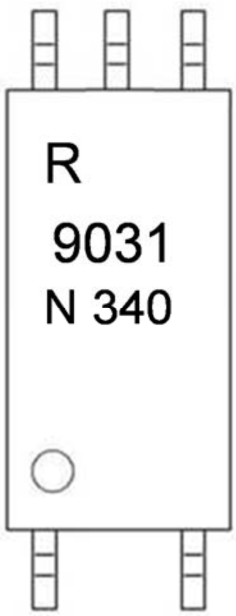
Parameter	MIN.
Air Distance	8.0 mm
Outer Creepage Distance	8.0 mm
Isolation Distance	0.15 mm

BLOCK DIAGRAM



Input	LED	Tr. 1	Tr. 2	Output
H	ON	ON	OFF	H
L	OFF	OFF	ON	L

MARKING EXAMPLE



R		An initial of “Renesas”	
9031		Product Part Number	
○		No.1 pin Mark, Anode Mark	
N340	N	Rank Code	
	340	Assembly Lot	
		3	Last one-digit of Assembly Year
		40	Weekly Serial Code

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number[*1]
PS9031	PS9031-Y-AX	Pb-Free and Halogen Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL,CSA approved)	PS9031
PS9031-F3	PS9031-Y-F3-AX		Embossed Tape 3 000 pcs/reel		
PS9031-V	PS9031-Y-V-AX		20 pcs (Tape 20 pcs cut)	UL,CSA approved DIN EN 60747-5-5 (VDE 0884-5): 2011-11 approved (Option)	
PS9031-V-F3	PS9031-Y-V-F3-AX		Embossed Tape 3 000 pcs/reel		

Note: *1. For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	I_F	25	mA
	Peak Transient Forward Current (Pulse Width < 1 μs)	$I_{F\ (TRAN)}$	1.0	A
	Reverse Voltage	V_R	5	V
	Power Dissipation *1	P_D	45	mW
Detector	High Level Peak Output Current *2	$I_{OH\ (PEAK)}$	2.5	A
	Low Level Peak Output Current *2	$I_{OL\ (PEAK)}$	2.5	A
	Supply Voltage	$(V_{CC} - V_{EE})$	0 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 Frequency		f	200	kHz
Operating Ambient Temperature		T_A	–40 to +125	°C
Storage Temperature		T_{stg}	–55 to +150	°C

Notes: *1. Reduced to 1.2 mW/°C at T_A = 110°C or more.

*2. Maximum pulse width = 10 μs, Maximum duty cycle = 0.2%

*3. Reduced to 3.9 mW/°C at T_A = 90°C or more.

*4. AC voltage for 1 minute at T_A = 25°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	$(V_{CC} - V_{EE})$	15		30	V
Forward Current (ON)	$I_{F\ (ON)}$	8	10	12	mA
Forward Voltage (OFF)	$V_{F\ (OFF)}$	–2		0.8	V
Operating Ambient Temperature	T_A	–40		125	°C

ELECTRICAL CHARACTERISTICS

(at RECOMMENDED OPERATING CONDITIONS, V_{EE}=GND, unless otherwise Specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA, T_A = 25°C	1.35	1.56	1.75	V
	Reverse Current	I_R	V_R = 3 V, T_A = 25°C			10	μA
	Input Capacitance	C_{IN}	f = 1 MHz, V_F = 0 V		30		pF
Detector	High Level Output Current	I_{OH}	V_O = (V_{CC} – 4 V) *2	0.5	2.2		A
			V_O = (V_{CC} – 15 V) *3	2.0			
	Low Level Output Current	I_{OL}	V_O = (V_{EE} + 2.5 V) *2	0.5	2.4		A
			V_O = (V_{EE} + 15 V) *3	2.0			
	High Level Output Voltage	V_{OH}	I_O = –100 mA *4	V_{CC} – 3.0	V_{CC} – 1.3		V
	Low Level Output Voltage	V_{OL}	I_O = 100 mA		0.2	0.5	V
	High Level Supply Current	I_{CCH}	V_O = Open, I_F = 10 mA		1.7	2.2	mA
	Low Level Supply Current	I_{CCL}	V_O = Open, V_F = 0 to 0.8V		1.7	2.2	mA
	UVLO Threshold	V_{UVLO+}	V_O > 5 V, I_F = 10 mA	10.8	12.3	13.4	V
		V_{UVLO-}		9.5	11.0	12.5	
	UVLO Hysteresis	$UVLO_{HYS}$	V_O > 5 V, I_F = 10 mA	0.4	1.3		V
Coupled	Threshold Input Current (L → H)	I_{FLH}	I_O = 0 mA, V_O > 5 V		1.7	4.0	mA
	Threshold Input Voltage (H → L)	V_{FHL}	I_O = 0 mA, V_O < 5 V	0.8			V

Notes: *1. Typical values at T_A = 25°C, V_{CC} – V_{EE} = 30 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%).

SWITCHING CHARACTERISTICS

(at RECOMMENDED OPERATING CONDITIONS, V_{EE}=GND, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Propagation Delay Time (L → H)	t_{PLH}	R_g = 10 Ω, C_g = 10 nF, f = 10 kHz, Duty Cycle = 50%, I_F = 10 mA		80	175	ns
Propagation Delay Time (H → L)	t_{PHL}			105	175	ns
Pulse Width Distortion (PWD)	$\|t_{PHL}–t_{PLH}\|$			25	75	ns
Propagation Delay Time (Difference Between Any Two Products)	$t_{PHL}–t_{PLH}$		–90		90	ns
Rise Time	t_r			40		ns
Fall Time	t_f			40		ns
Common Mode Transient Immunity at High Level Output	$\|CM_H\|$	T_A = 25°C, I_F = 10 mA, V_{CC} = 30 V, V_{CM} = 1.5 kV	50			kV/μs
Common Mode Transient Immunity at Low Level Output	$\|CM_L\|$	T_A = 25°C, I_F = 0 mA, V_{CC} = 30 V, V_{CM} = 1.5 kV	50			kV/μs

Notes: *1. Typical values at T_A = 25°C, V_{CC}–V_{EE} = 30 V.

TEST CIRCUIT

Fig. 1 I_{OH} Test Circuit

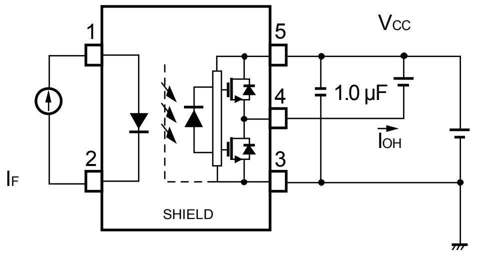


Fig. 2 I_{OL} Test Circuit

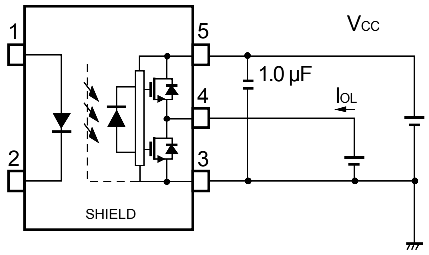


Fig. 3 V_{OH} Test Circuit

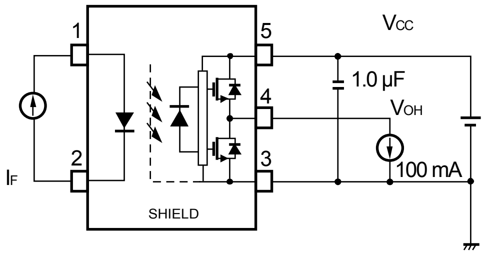


Fig. 4 V_{OL} Test Circuit

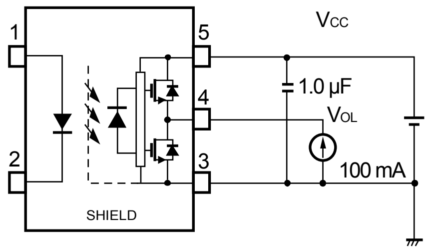


Fig. 5 I_{CCH}/I_{CCL} Test Circuit

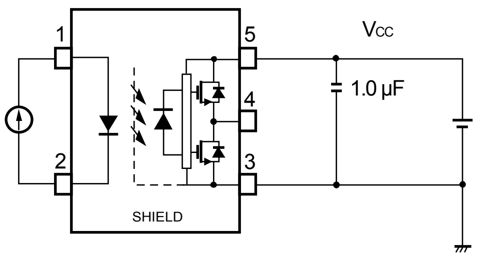


Fig. 6 UVLO Test Circuit

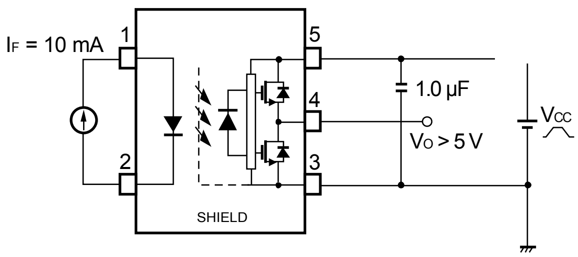


Fig. 7 IFLH Test Circuit

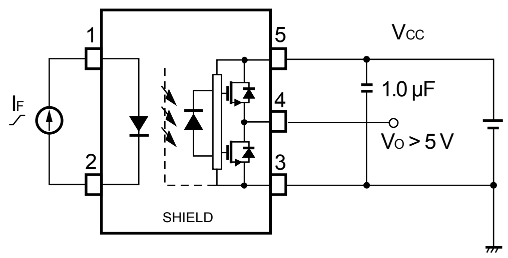


Fig. 8 tPLH, tPHL, tr, tf Test Circuit and Wave Forms

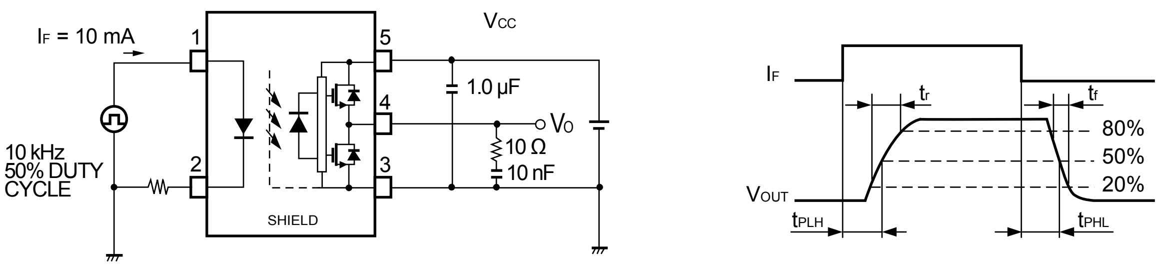
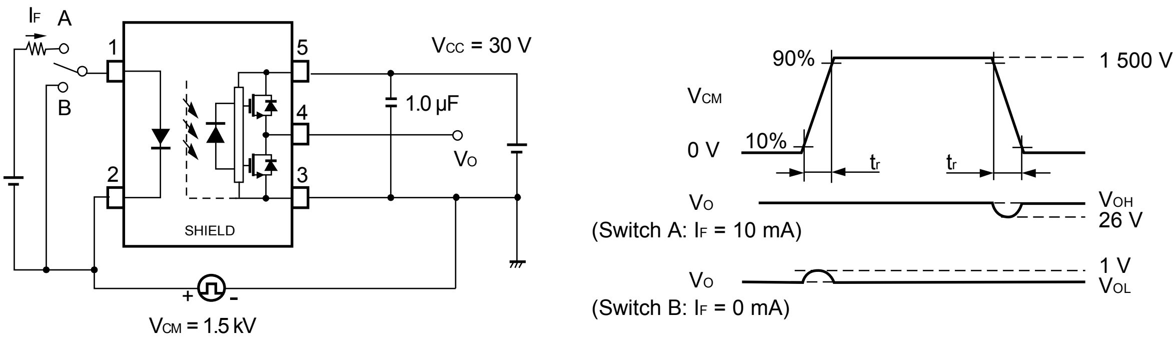
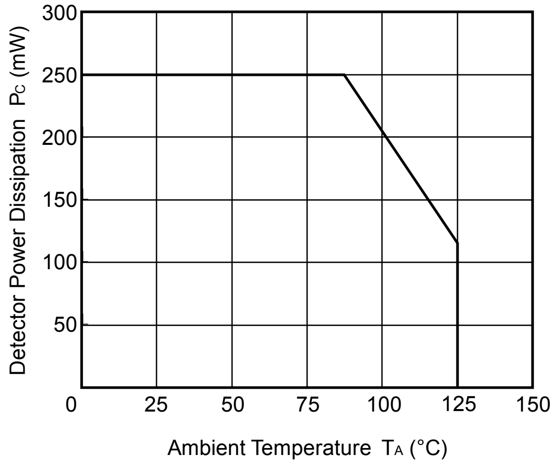


Fig. 9 CMR Test Circuit and Wave Forms

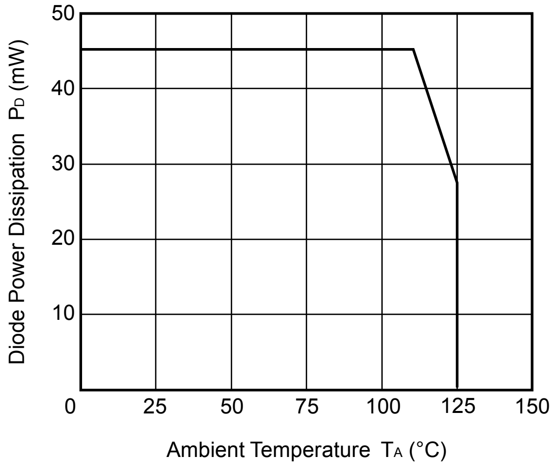


TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

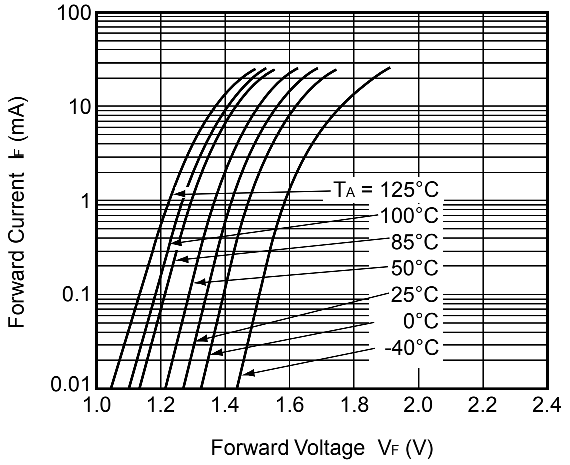
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



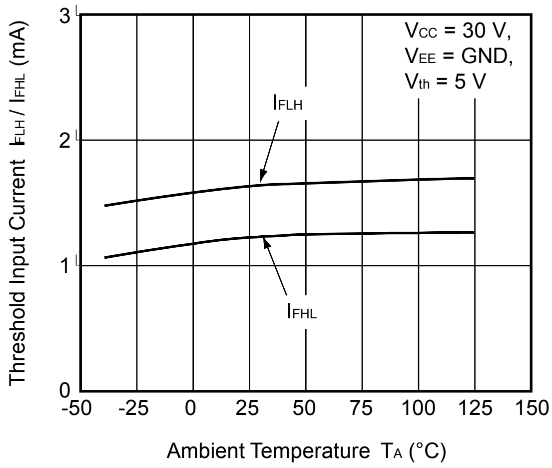
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



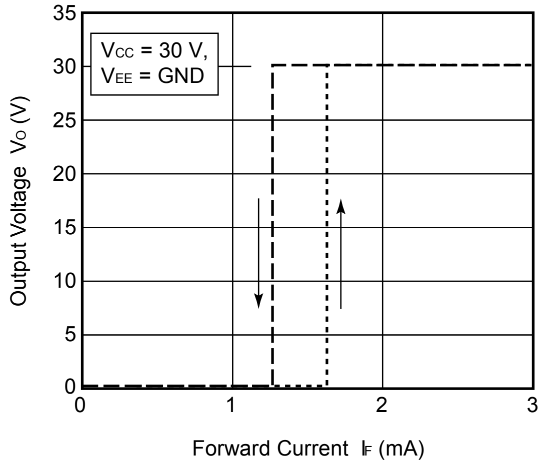
FORWARD CURRENT vs. FORWARD VOLTAGE



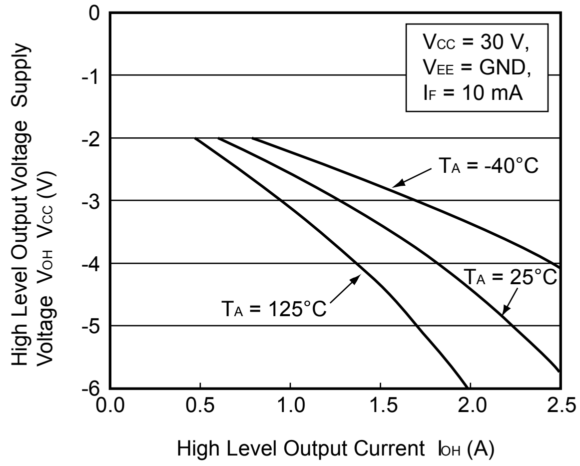
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



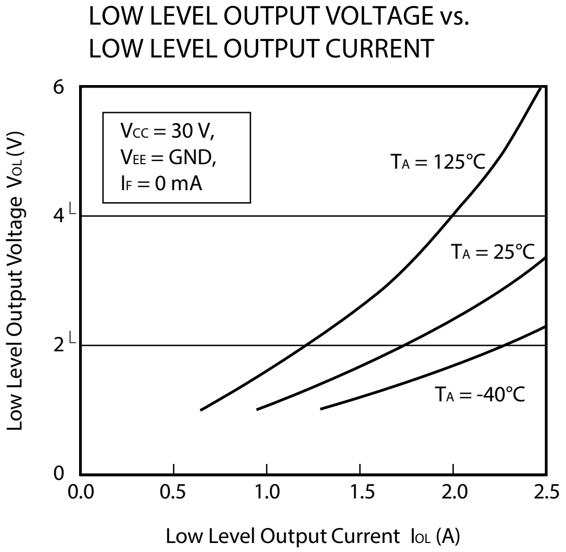
OUTPUT VOLTAGE vs. FORWARD CURRENT

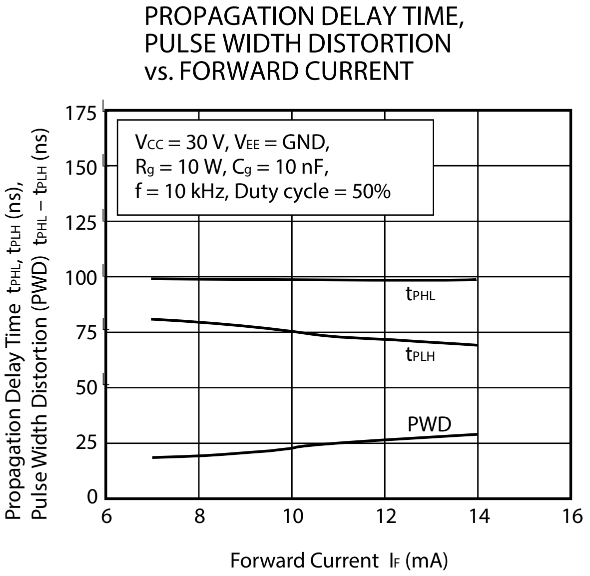


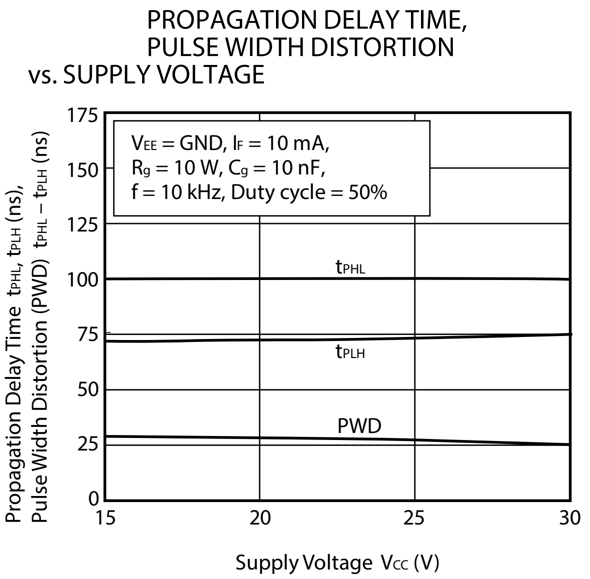
HIGH LEVEL OUTPUT VOLTAGE SUPPLY VOLTAGE vs. HIGH LEVEL OUTPUT CURRENT

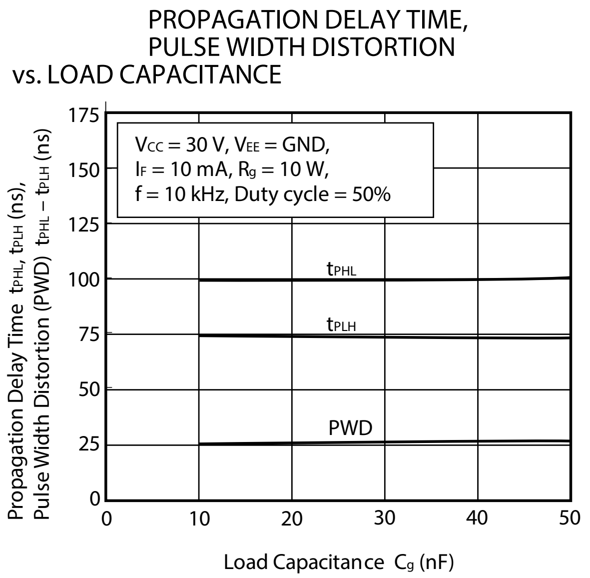


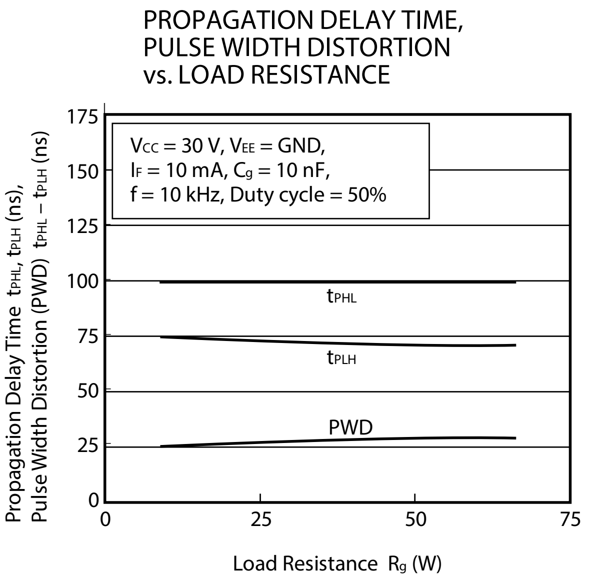
Remark The graphs indicate nominal characteristics.

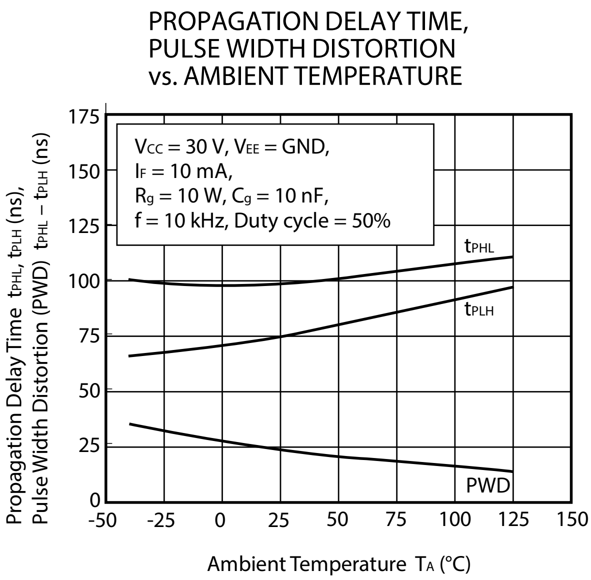






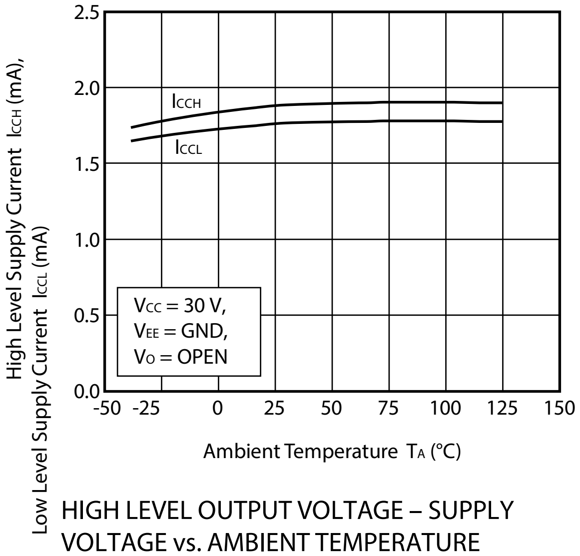




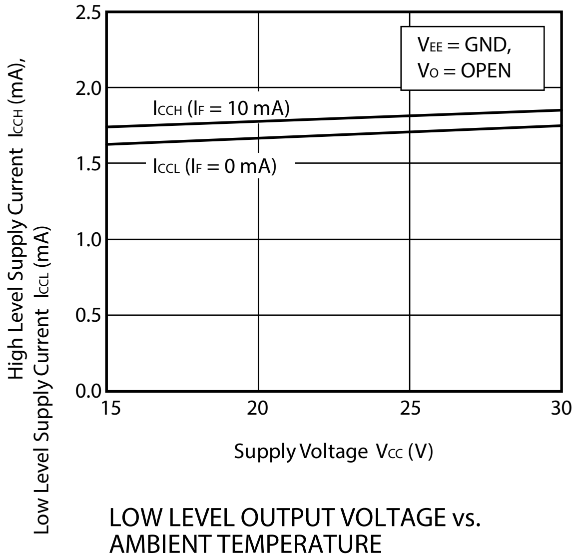


Remark The graphs indicate nominal characteristics.

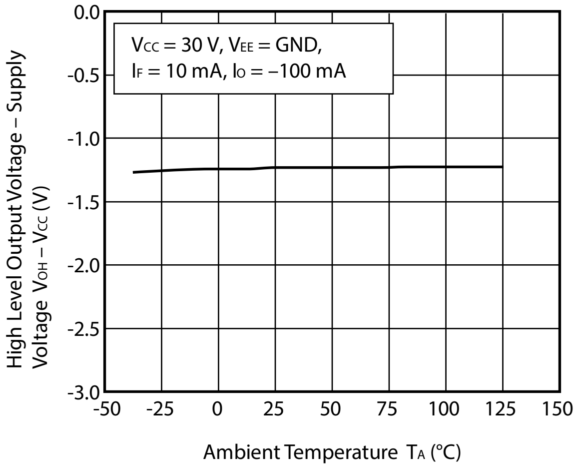
SUPPLY CURRENT vs.
AMBIENT TEMPERATURE



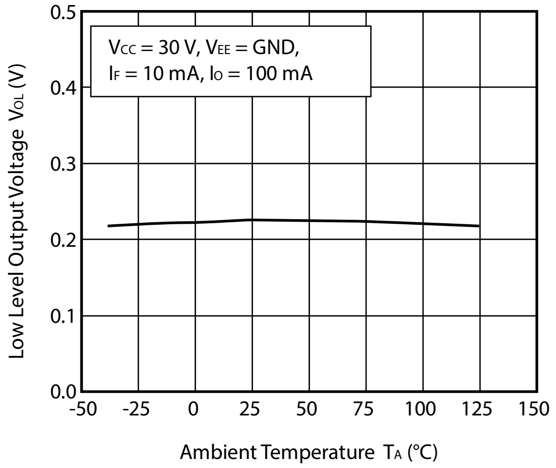
SUPPLY CURRENT vs.
SUPPLY VOLTAGE



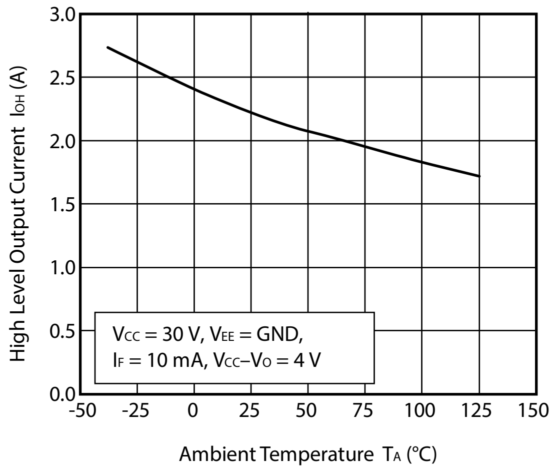
HIGH LEVEL OUTPUT VOLTAGE – SUPPLY
VOLTAGE vs. AMBIENT TEMPERATURE



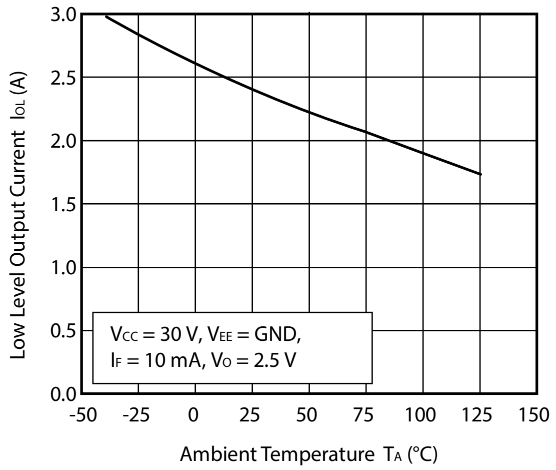
LOW LEVEL OUTPUT VOLTAGE vs.
AMBIENT TEMPERATURE



HIGH LEVEL OUTPUT CURRENT vs.
AMBIENT TEMPERATURE

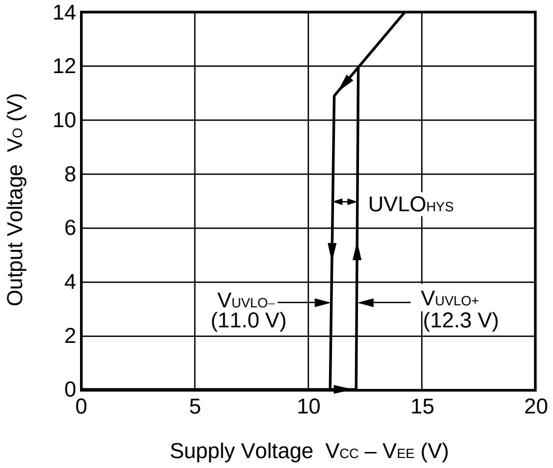


LOW LEVEL OUTPUT CURRENT vs.
AMBIENT TEMPERATURE



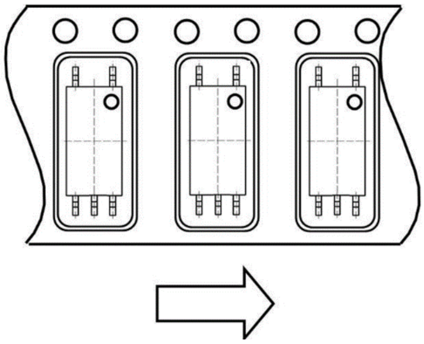
Remark The graphs indicate nominal characteristics.

OUTPUT VOLTAGE vs. SUPPLY VOLTAGE



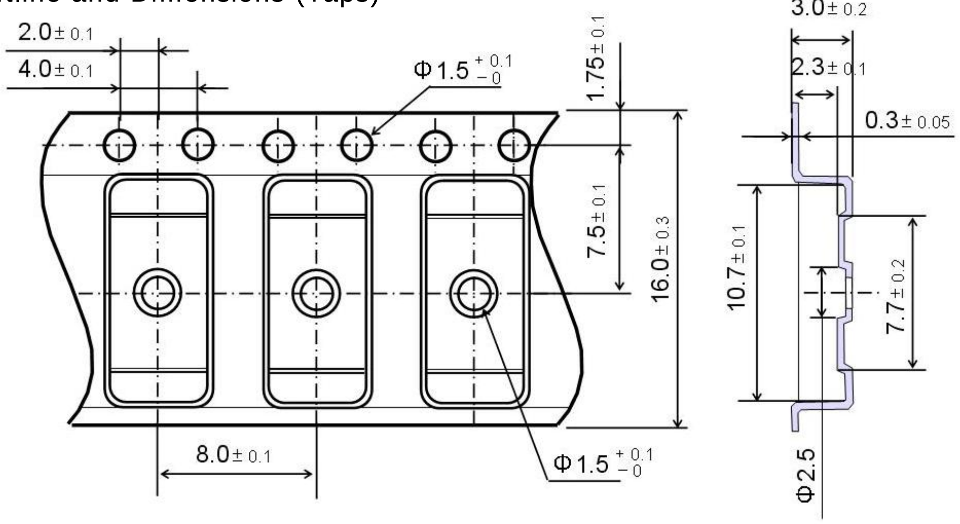
Remark The graphs indicate nominal characteristics.

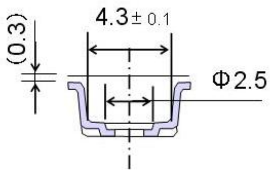
TAPING SPECIFICATIONS (UNIT: mm)



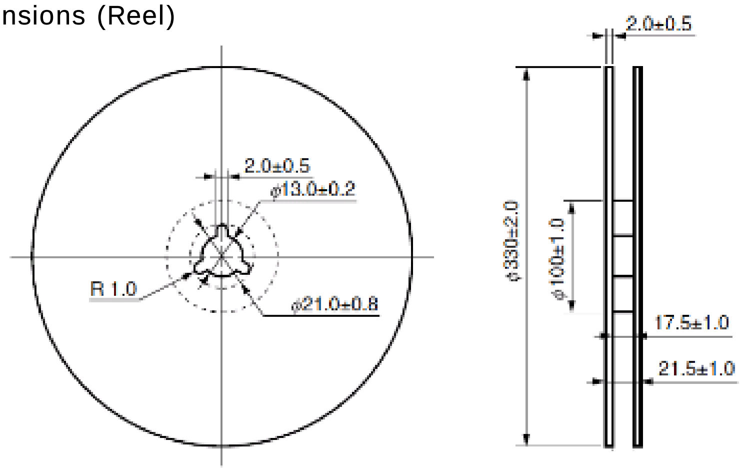
Tape Direction

Outline and Dimensions (Taps)



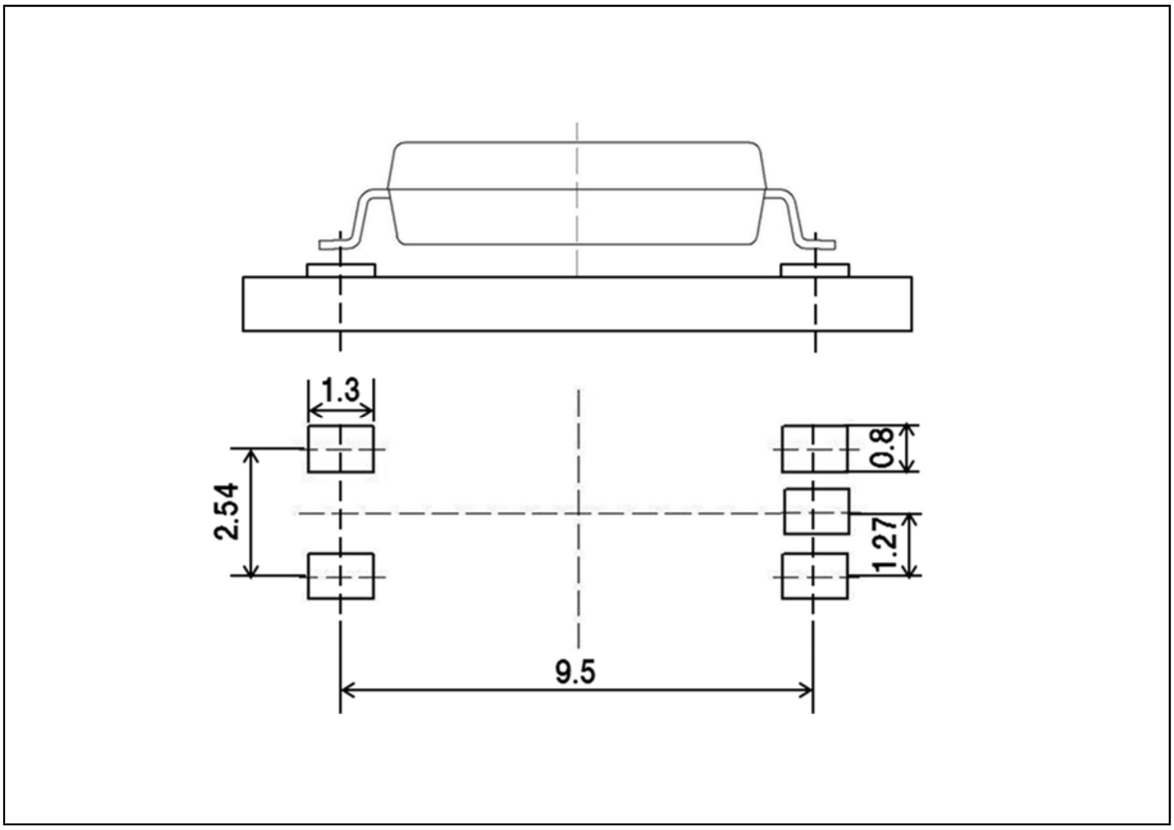


Outline and Dimensions (Reel)



Packing:3000 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

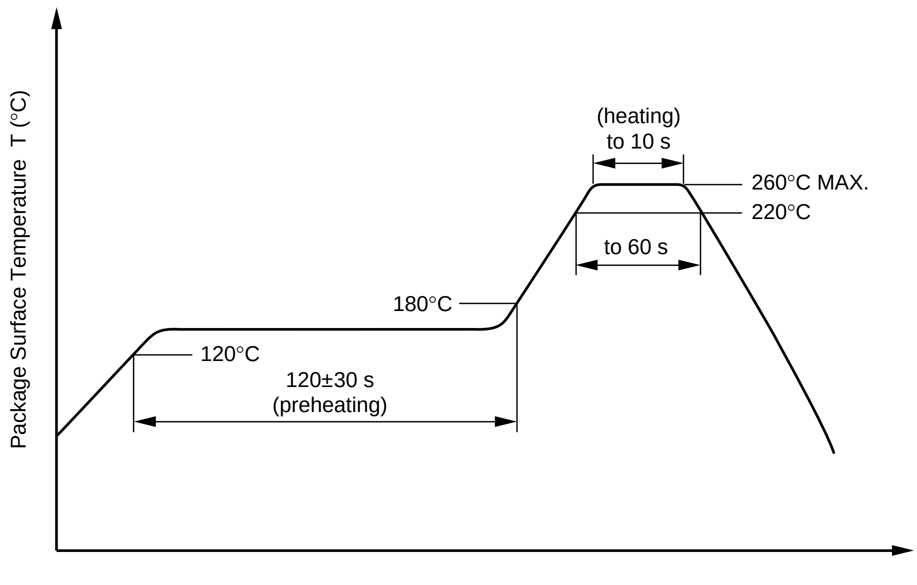
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature — 260°C or below (package surface temperature)
- Time of peak reflow temperature — 10 seconds or less
- Time of temperature higher than 220°C — 60 seconds or less
- Time to preheat temperature from 120 to 180°C — 120±30 s
- 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



(2) Wave soldering

- Temperature — 260°C or below (molten solder temperature)
- Time — 10 seconds 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 (each pins) — 3 seconds or less
- Flux — Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead

(4) Cautions

- Fluxes — Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

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.

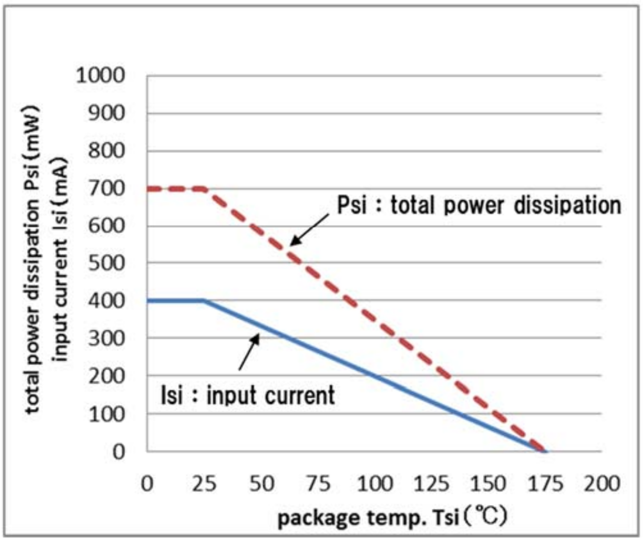
USAGE CAUTIONS

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) By-pass capacitor of more than 1.0 μF is used between VCC and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
   (2) When designing the printed wiring board, ensure that the pattern of the IGBT collectors/emitters is not too close to the input block pattern of the photocoupler.
   If the pattern is too close to the input block and coupling occurs, a sudden fluctuation in the voltage on the IGBT output side might affect the photocoupler's LED input, leading to malfunction or degradation of characteristics.
   (If the pattern needs to be close to the input block, to prevent the LED from lighting during the off state due to the abovementioned coupling, design the input-side circuit so that the bias of the LED is reversed, within the range of the recommended operating conditions, and be sure to thoroughly evaluate operation.)
3. Make sure the rise/fall time of the forward current is 0.5 μs or less.
4. In order to avoid malfunctions, make sure the rise/fall slope of the supply voltage is 3 V/μs or less.
5. Avoid storage at a high temperature and high humidity.

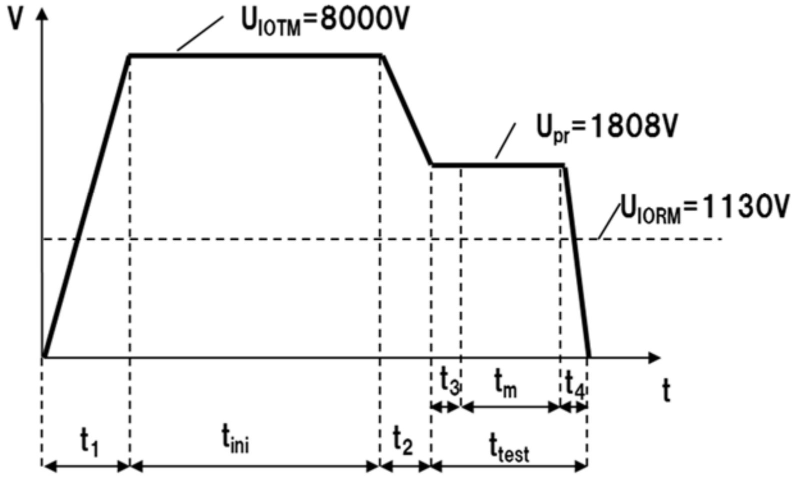
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/125/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ pC	 U_{IORM} U_{pr}	 1 130 1 808	 V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5$ pC	U_{pr}	2 119	V_{peak}
Highest permissible overvoltage	U_{IOTM}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	CTI	400	
Material group (DIN EN 60664-1 VDE0110 Part 1)		II	
Storage temperature range	T_{stg}	–55 to +150	°C
Operating temperature range	T_A	–40 to +125	°C
Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25$°C $V_{IO} = 500$ V dc at T_A MAX. at least 100°C	 Ris MIN. Ris MIN.	 10^{12} 10^{11}	 Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F, Psi = 0) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at T_A = Tsi	 Tsi Isi Psi Ris MIN.	 175 400 700 10^9	 °C mA mW Ω

Dependence of maximum safety ratings with package temperature

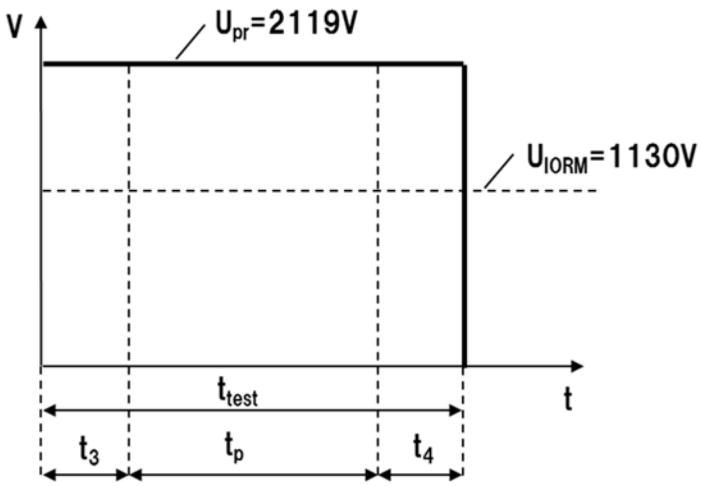


Method A Destructive Test, Type and Sample test



t_1,t_2=1 to 10 sec
t_3,t_4=1 sec
$t_{m\ (PARTIAL\ DISCHARGE)}$ =10 sec
t_{test}=12 sec
t_{ini}=60 sec

Method b Non-destructive Test, 100% Production Test



t_3,t_4=0.1 sec
$t_{p\ (PARTIAL\ DISCHARGE)}$ =1.0 sec
t_{test}=1.2 sec

Caution GaAs Products	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. • 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. 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.

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

California Eastern Laboratories, Inc.
4590 Patrick Henry Drive, Santa Clara, California 95054-1817, U.S.A.
Tel: +1-408-919-2500, Fax: +1-408-988-0279

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

Colophon 5.0

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9