

## 概述 Description

1019 产品由一个红外发光二极管和一个光电晶体管组成；光耦器件可实现不同电路之间的电气隔离和信号传输，产品广泛应用于电源设备上，例如手机充电器，家电产品电源供应器等。

1019 photocoupler consist of an infrared light-emitting diode and a phototransistor. The devices can realize electrical isolation and signal transmission between different circuits, The products are widely used in power supply equipment, such as mobile phone charger, home appliance product power supply device, etc.

## 特性 Features

电流转换比(CTR:200% -400% @ $I_F=5mA$ ,  $V_{CE}=5V$ )

Current transfer ratio (CTR:200% -400% @ $I_F=5mA$ ,  $V_{CE}=5V$ )

输入-输出隔离电压：( $V_{ISO}=5,000V_{rms}$ )

High isolation voltage between input and output( $V_{ISO}=5,000V_{rms}$ )

爬电距离>8mm

Creepage distance > 8mm

工作温度最高可达+ 110℃

Operating temperature up to +110 °C

集电极-发射极击穿电压  $BV_{CEO} \geq 80V$

Collector-Emitter voltage  $BV_{CEO} \geq 80V$

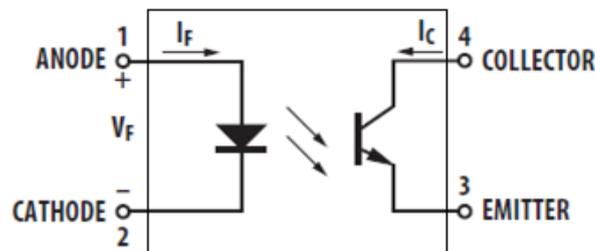
产品符合RoHS、REACH及HF等环保法规要求；

The products comply with RoHS, REACH and HF;

## 框架结构



### Schematic



### 引脚排列 Pin Configuration

1. 正极 Anode
2. 负极 Cathode
3. 发射极 Emitter
4. 集电极 Collector

## 电性参数 Electrical Characteristics

最大绝对额定值 (常温=25℃)

Absolute Maximum Ratings (Temperature=25℃)

参数名称 Parameter		符号 Symbol	数值 Rating	单位 Unit
输入 Input	正向电流 Forward Current	$I_F$	50	mA
	反向电压 Reverse Voltage	$V_R$	6	V
	功耗 Power Dissipation	$P_D$	90	mW
输出 Output	集电极-发射极电压 Collector-Emitter voltage	$V_{CEO}$	80	V
	发射极-集电极电压 Emitter-Collector voltage	$V_{ECO}$	6	
	集电极电流 Collector current	$I_C$	50	mA
	功耗 Power Dissipation	$P_C$	180	mW
总功率消耗 Total Power Dissipation		$P_{tot}$	270	mW
*1 隔离电压 *1 Isolation Voltage		$V_{iso}$	5,000	Vrms
工作温度 Operating Temperature		$T_{opr}$	-55 to + 110	℃
贮存温度 Storage Temperature		$T_{stg}$	-55 to + 125	
*2 焊锡温度 *2 Soldering Temperature		$T_{sol}$	260	

\* 注:

\*1.交流测试, 时间 1 分钟, 湿度. =40~60%;

\*1.AC For 1 Minute, R.H. = 40 ~ 60%;

隔离电压测试的方法如下:

Isolation voltage shall be measured using the following method:

(1) 将产品的两端短路;

(1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side;

(2) 测试隔离电压时无电流通过;

(2) The isolation voltage tester with zero-cross circuit shall be used;

(3) 测试时加正弦波形电压。

(3) The waveform of applied voltage shall be a sine wave.

\*2.锡焊时间为 10 秒

\*2. Soldering time is 10 seconds

电性参数 (温度=25℃):

Electrical Characteristics (Temperature=25 °C)

参数名称 Parameter		符号 Symbol	条件 Condition	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
输入 Input	正向电压 Forward Voltage	$V_F$	$I_F=50\text{mA}$	---	1.35	1.6	V
	反向电流 Reverse Current	$I_R$	$V_R=4\text{V}$	---	---	10	$\mu\text{A}$
	终端电容 Terminal Capacitance	$C_t$	$V=0, f=1\text{MHz}$	---	30	250	pF
输出 Output	集电极暗电流 Collector dark current	$I_{CEO}$	$V_{CE}=20\text{V}, I_F=0$	---	---	100	nA
	集电极-发射极击穿电压 Collector-Emitter breakdown voltage	$BV_{CEO}$	$I_C=0.1\text{mA}$ $I_F=0$	80	---	---	V
	发射极-集电极击穿电压 Emitter-Collector breakdown voltage	$BV_{ECO}$	$I_E=0.1\text{mA}$ $I_F=0$	6	---	---	V
传输特性 transfer characteristic	集电极电流 Collector Current	$I_C$	$I_F=5\text{mA}$	2.5	---	30	mA
	*1 电流传输比 *1 Current Transfer Ratio	CTR	$V_{CE}=5\text{V}$	50	---	600	%
	集电极-发射极饱和电压 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F=20\text{mA}$ $I_C=1\text{mA}$	---	0.1	0.2	V
	绝缘电阻 Isolation resistance	$R_{iso}$	DC500V 40~60%R.H.	$5 \times 10^{10}$	---	---	$\Omega$
	隔离电容 Floating Capacitance	$C_f$	$V=0, f=1\text{MHz}$	---	0.6	1	pF
	转换频率 Cut-off Frequency	$f_c$	$V_{CE}=5\text{V}, I_C=2\text{mA}$ $R_L=100\Omega, -3\text{dB}$	---	80	---	kHz
	上升时间 Rise time	$t_r$	$V_{CE}=2\text{V}, I_C=2\text{mA}$ $R_L=100\Omega$	---	4	18	$\mu\text{s}$
下降时间 Fall time	$t_f$	---		3	18	$\mu\text{s}$	

注: \*1 电流传输比=  $I_C / I_F \times 100\%$ , 公差  $\pm 3\%$ 。

\*1 Current Transfer Ratio =  $I_C / I_F \times 100\%$ , Tolerance:  $\pm 3\%$ .

电流传输比等级表(温度=25℃):

Rank Table of Current Transfer Ratio(Temperature=25 °C)

CTR 等级 CTR Rank	最小.Min (%)	最大.Max (%)	条件 Condition
1019	200	400	$I_F=5\text{mA}, V_{CE}=5\text{V}$

RATING AND CHARACTERISTIC CURVES

图1.正向电流VS正向电压

Figure1. Forward Current vs. Forward Voltage

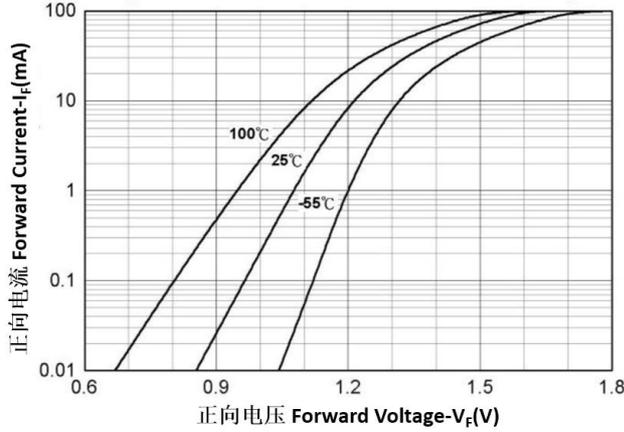


图2.集电极暗电流VS环境温度

Figure2. Collector Dark Current vs. Ambient Temperature

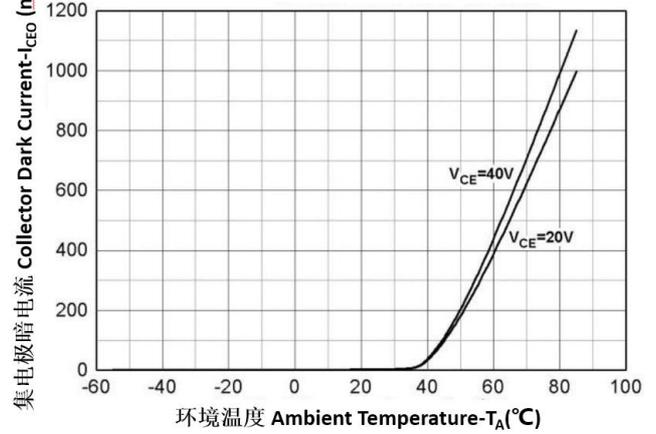


图3.集电极电流VS集电极发射极电压

Figure3. Collector Current vs. Collector Emitter Voltage

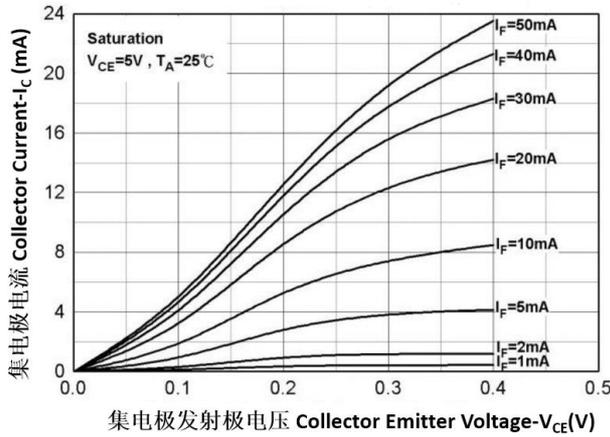


图4.集电极电流VS集电极发射极电压

Figure4. Collector Current vs. Collector Emitter Voltage

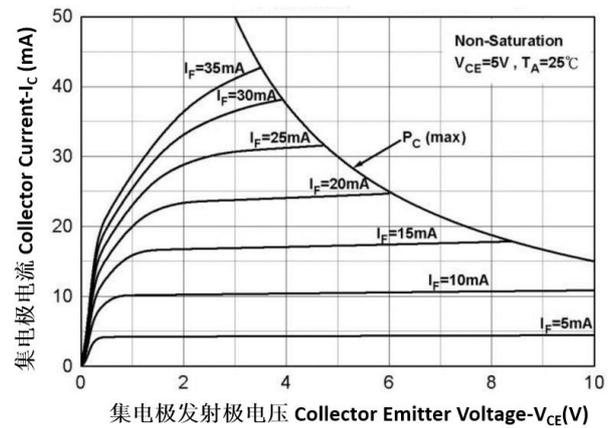


图5.归一化集电极电流VS正向电流

Figure5. Normalized Collector Current vs. Forward Current

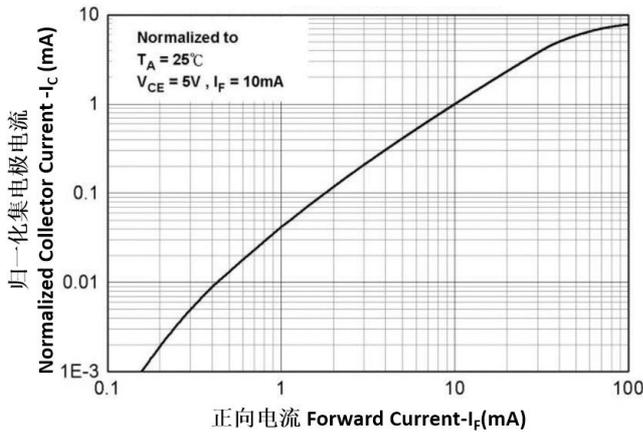
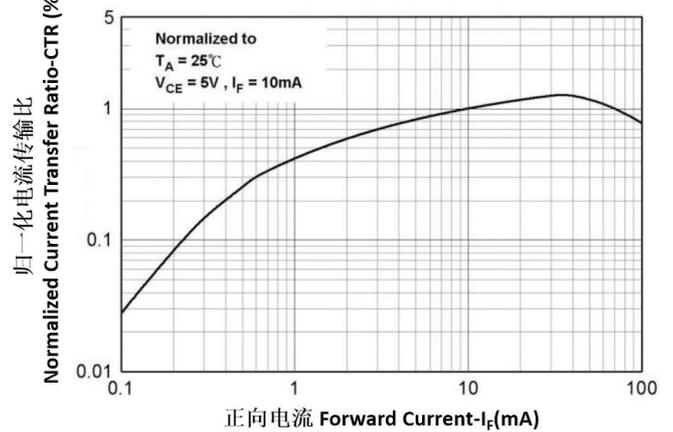


图6.归一化电流传输比VS正向电流

Figure6. Normalized Current Transfer Ratio vs. Forward Current



RATING AND CHARACTERISTIC CURVES

图7. 归一化电流传输比 vs 环境温度

Figure7. Normalized Current Transfer Ratio vs. Ambient Temperature

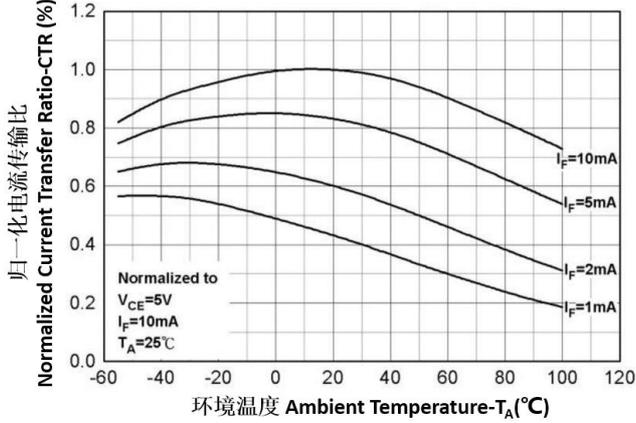


图8. 归一化电流传输比 vs 环境温度

Figure8. Normalized Current Transfer Ratio vs. Ambient Temperature

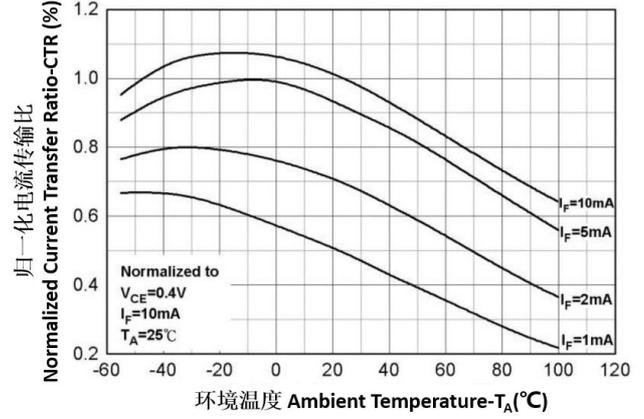


图9. 开关时间 vs 集电极电流

Figure9. Turn on/off Time vs. Collector Current

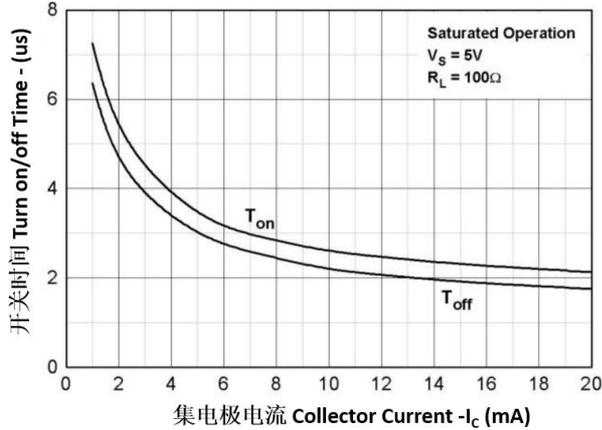


图10. 开关时间 vs 正向电流

Figure10. Turn on/off Time vs. Forward Current

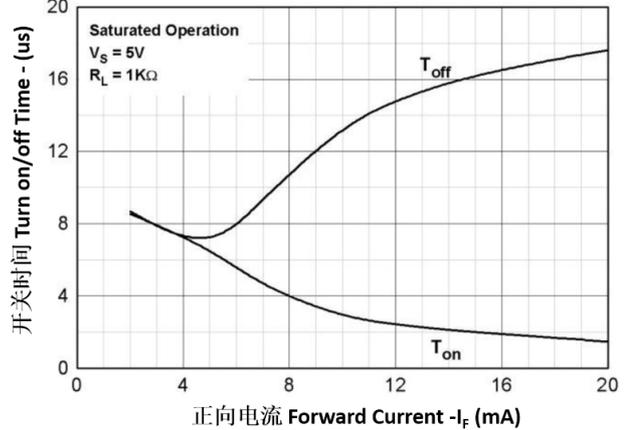
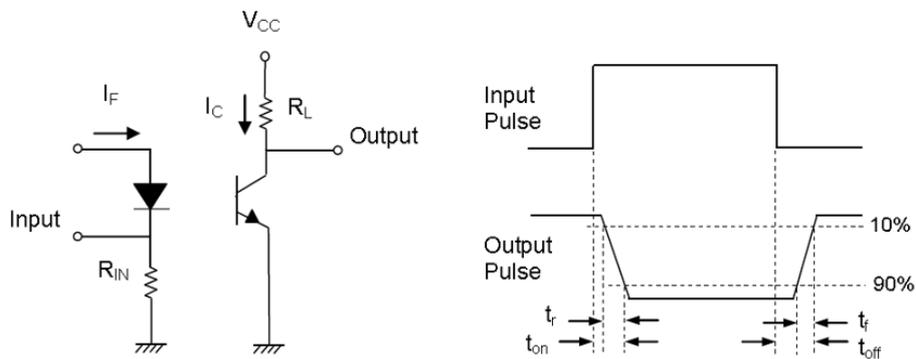


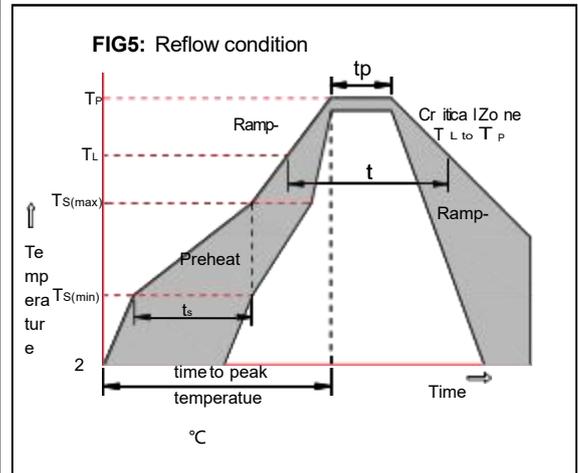
图11. 开关时间测试电路和波形

Figure11. Switching Time Test Circuit & Waveforms

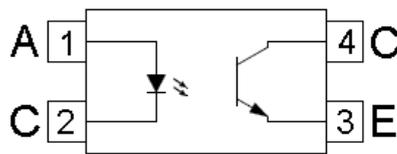
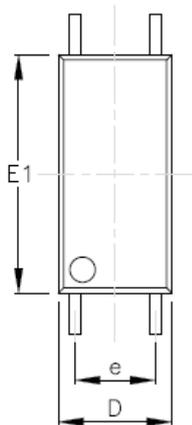


Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ( $T_{s(min)}$ )	+150°C
	-Temperature Max( $T_{s(max)}$ )	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp ( $T_L$ ) to peak)		3°C/sec. Max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature( $T_L$ )(Liquid us)	+217°C
	-Temperature( $t_L$ )	60-150 secs.
Peak Temp ( $T_P$ )		+260(+0/-5)°C
Time within 5°C of actual Peak Temp ( $t_p$ )		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp ( $T_P$ )		8 min. Max
Do not exceed		+260°C



Package Dimensions & Suggested Pad Layout



Symbol	Max	Min	Typ.
E1	7.92	7.32	7.62
D	3.90	3.30	3.60
E	10.50	9.90	10.20
$H_F$	8.95	8.35	8.65
A2	2.35	1.75	2.05
e	--	--	2.54
A1	0.20	0	0.10
b	0.50	0.30	0.40
C	0.30	0.10	0.20
L	--	0.4	--
aaa	0.10	0	--

