

# 6 引脚 DIP 无缓冲随机相位 Triac 驱动器

## FOD420, FOD4208, FOD4216, FOD4218

### 说明

FOD420、FOD4208、FOD4216 和 FOD4218 器件包含一个红外线发光二极管，该二极管耦合至采用两个反向并联 SCR 形成的混合随机相位三端双向可控硅开关，形成能够驱动分立式三端双向可控硅开关的三端双向可控硅开关功能。FOD4216 和 FOD4218 采用一个高效红外线发光二极管提供增强的触发灵敏度。这些器件采用标准 6 引脚双列直插 (DIP) 封装。

### 产品特性

- 300 mA<sub>peak</sub> 通态电流
- 高阻断电压
  - ◆ 600 V (FOD420, FOD4216)
  - ◆ 800 V (FOD4208, FOD4218)
- 高触发灵敏度
  - ◆ 1.3 mA (FOD4216, FOD4218)
  - ◆ 2 mA (FOD420, FOD4208)
- 高静态 dv/dt dv/dt (10,000 V/μs)
- 安全和法规认证:
  - ◆ UL1577, 5,000 VAC<sub>RMS</sub> (1 分钟)
  - ◆ DIN-EN/IEC60747-5-5
- 器件不含铅, 满足 RoHS 标准

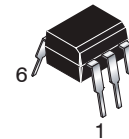
### 应用

- 固态继电器
- 工业控制
- 照明控制
- 静态功率开关
- AC 电机启动器

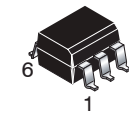


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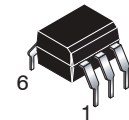
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PDIP6 GW  
CASE 709AG

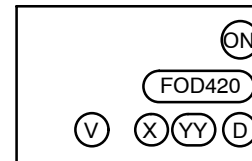


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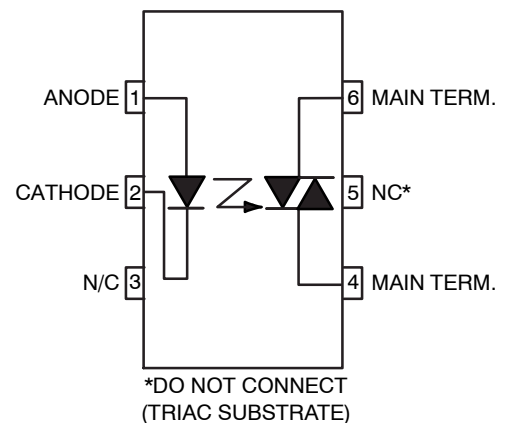
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### MARKING DIAGRAM



- ON = ON Semiconductor Logo
- FOD420 = Device Number
- V = VDE mark. DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
- X = One-Digit Year Code
- YY = Digit Work Week
- D = Assembly Package Code

### 功能示意图



### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

# FOD420, FOD4208, FOD4216, FOD4218

## 安全性和绝缘标准

参数	特性
基于 0110/1.89 表 1 的安装分类, 提供额定电源电压	< 150 V <sub>RMS</sub>
	< 300 V <sub>RMS</sub>
气候分类	55/100/21
污染等级(DIN VDE 0110/1.89)	2
相比漏电起痕指数	175

符号	参数	数值	单位
V <sub>PR</sub>	输入至输出测试电压, 方法 A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , 型式和样品测试, t <sub>m</sub> = 10 s, 局部放电 < 5 pC	1360	V <sub>peak</sub>
	输入至输出测试电压, 方法 B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% 生产测试, t <sub>m</sub> = 1 s, 局部放电 < 5 pC	1594	V <sub>peak</sub>
V <sub>IORM</sub>	最大工作绝缘电压	850	V <sub>peak</sub>
V <sub>IOTM</sub>	最高允许过电压	6000	V <sub>peak</sub>
	外部爬电距离	≥7	mm
	外部绝缘间隙	≥7	mm
DTI	绝缘穿透距离 (绝缘厚度)	≥0.4	mm
T <sub>S</sub>	壳温 (注意 1)	175	°C
I <sub>S,INPUT</sub>	输入电流 (注意 1)	400	mA
P <sub>S,OUTPUT</sub>	输出功率 (注意 1)	700	mW
R <sub>IO</sub>	T <sub>S</sub> 、V <sub>IO</sub> = 500 V (注意 1) 时的绝缘阻抗	>10 <sup>9</sup>	Ω

根据 DIN EN/IEC 60747-5-5, 此光电耦合器仅适用于安全极限数据之内的“安全电气绝缘”。通过保护性电路确保各项安全标准达标。  
 1. 安全极限值 - 发生故障时允许的最大值。

# FOD420, FOD4208, FOD4216, FOD4218

绝对最大额定值 (除非另有说明,  $T_A = 25^\circ\text{C}$ )

符号	参数	器件	数值	单位
$T_{STG}$	存储温度	所有	-55 至 +150	$^\circ\text{C}$
$T_{OPR}$	工作温度	所有	-55 至 +100	$^\circ\text{C}$
$T_J$	结温的关系	所有	-55 至 +125	$^\circ\text{C}$
$T_{SOL}$	引脚焊接温度	所有	10 秒 260	$^\circ\text{C}$
$P_{D(TOTAL)}$	器件总功耗(25 $^\circ\text{C}$ 时)	所有	500	mW
	超过 25 $^\circ\text{C}$ 时降额	所有	6.6	mW/ $^\circ\text{C}$

## EMITTER

$I_F$	连续正向电流	所有	30	mA
$V_R$	反向电压的关系	所有	6	V
$P_{D(EMITTER)}$	总功耗 (25 $^\circ\text{C}$ 环境温度时)	所有	50	mW
	超过 25 $^\circ\text{C}$ 时降额	所有	0.71	mW/ $^\circ\text{C}$

## DETECTOR

$V_{DRM}$	断态输出端电压	FOD420, FOD4216	600	V
		FOD4208, FOD4218	800	
$I_{TSM}$	峰值非重复浪涌电流 (单循环 60 Hz 正弦波)	所有	3	$A_{peak}$
$I_{TM}$	峰值通态电流	所有	300	$mA_{peak}$
$P_{D(DETECTOR)}$	总功耗 (25 $^\circ\text{C}$ 环境温度时)	所有	450	mW
	超过 25 $^\circ\text{C}$ 时降额	所有	5.9	mW/ $^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

(参考译文)

如果电压超过最大额定值表中列出的值范围, 器件可能会损坏。如果超过任何这些限值, 将无法保证器件功能, 可能会导致器件损坏, 影响可靠性。

# FOD420, FOD4208, FOD4216, FOD4218

电气特性 (除非另有说明,  $T_A = 25^\circ\text{C}$ )

符号	参数	测试条件	器件	最小值	典型值	最大值	单位
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## 独立元器件特性

发射极								
$V_F$	输入正向电压	$I_F = 20\text{ mA}$	所有	-	1.28	1.50	V	
$I_R$	反向漏电流	$V_R = 6\text{ V}$	所有	-	0.01	10	$\mu\text{A}$	
检测器								
$I_{D(RMS)}$	峰值阻断电流, 任一方向	$I_F = 0,$ $T_A = 100^\circ\text{C}$ (注意 2)	$V_D = 600\text{ V}$	FOD420, FOD4216	-	3	100	$\mu\text{A}$
			$V_D = 800\text{ V}$	FOD4208, FOD4218				
$I_{R(RMS)}$	反向电流	$T_A = 100^\circ\text{C}$	$V_D = 600\text{ V}$	FOD420, FOD4216	-	3	100	$\mu\text{A}$
			$V_D = 800\text{ V}$	FOD4208, FOD4218				
dv/dt	关断电压 上升临界值	$I_F = 0\text{ A}$ (注意 3)	$V_D = V_{DRM}$	所有	10,000	-	-	V/ $\mu\text{s}$

## TRANSFER CHARACTERISTICS

$I_{FT}$	LED 触发电流	主端电压 = 5 V (注意 4)	$V_{RM} = V_{DM} = 424\text{ VAC}$	FOD420, FOD4208	-	0.75	2.0	mA
			$V_{RM} = V_{DM} = 565\text{ VAC}$	FOD4216, FOD4218				
$V_{TM}$	峰值通态电压, 任一方向	$I_{TM} = 300\text{ mA}$ (峰值), $I_F = \text{额定值 } I_{FT}$	所有	-	2.2	3	V	
$I_H$	维持电流, 任一方向	$V_T = 3\text{ V}$	所有	-	200	500	$\mu\text{A}$	
$I_L$	门锁电流	$V_T = 2.2\text{ V}$	所有	-	5	-	mA	
$t_{ON}$	导通时间	PF = 1.0, $I_T = 300\text{ mA}$	$V_{RM} = V_{DM} = 424\text{ VAC}$	FOD420, FOD4216, FOD4218	-	60	-	$\mu\text{s}$
$t_{OFF}$	关断时间		$V_{RM} = V_{DM} = 424\text{ VAC}$	FOD420, FOD4216, FOD4218				
			$V_{RM} = V_{DM} = 565\text{ VAC}$	FOD4208				
dv/dt <sub>C</sub>	换流时的电压临界上升率	$V_D = 230\text{ V}_{RMS}, I_D = 300\text{ mA}_{PK}$	所有	-	10	-	V/ $\mu\text{s}$	
di/dt <sub>C</sub>	通态电流临界上升率	$V_D = 230\text{ V}_{RMS}, I_D = 300\text{ mA}_{PK}$	所有	-	9	-	A/ms	
dv(i <sub>O</sub> )/dt	耦合输入 / 输出电压上升临界值	$I_T = 0\text{ A}, V_{RM} = V_{DM} = 424\text{ VAC}$	所有	10,000	-	-	V/ $\mu\text{s}$	

## ISOLATION CHARACTERISTICS

$V_{ISO}$	稳态隔离电压	f = 60 Hz, t = 1 分钟 (注意 5)	所有	5,000	-	-	VAC <sub>RMS</sub>
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

(参考译文)

除非另有说明, “电气特性”表格中列出的是所列测试条件下的产品性能参数。如果在不同条件下运行, 产品性能可能与“电气特性”表格中所列性能参数不一致。

2. 必须在 dv/dt 额定值范围内施加测试电压。

3. 这就是静态 dv/dt。换向dv/dt 只与负载驱动晶闸管有关。

4. 保证所有器件都能在  $I_F$  值小于或等于最大  $I_{FT}$  时触发。因此, 推荐的工作  $I_F$  介于最大  $I_{FT}$  (对于 FOD420 和 FOD4208 为 2 mA, 对于 FOD4216 和 FOD4218 为 1.3 mA) 与绝对最大  $I_F$  (60 mA) 之间。

5. 隔离电压  $V_{ISO}$  是内部器件介质击穿额定电压。对于该测试, 引脚 1、2 和 3 共用, 引脚 4、5 和 6 共用。5,000 VAC<sub>RMS</sub> 持续 1 分钟相当于 6,000 VAC<sub>RMS</sub> 持续 1 秒钟。

# FOD420, FOD4208, FOD4216, FOD4218

## 典型应用

Figure 1 shows a typical circuit for when hot line switching is required. In this circuit the “hot” side of the line is switched and the load connected to the cold or neutral side. The load may be connected to either the neutral or hot line.

$R_{in}$  is calculated so that IF is equal to the rated IFT of the

part, 2 mA for FOD420 and FOD4208, 1.3 mA for FOD4216 and FOD4218. The  $39\ \Omega$  resistor and  $0.01\ \mu\text{F}$  capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load use.



Figure 1. Hot-Line Switching Application Circuit

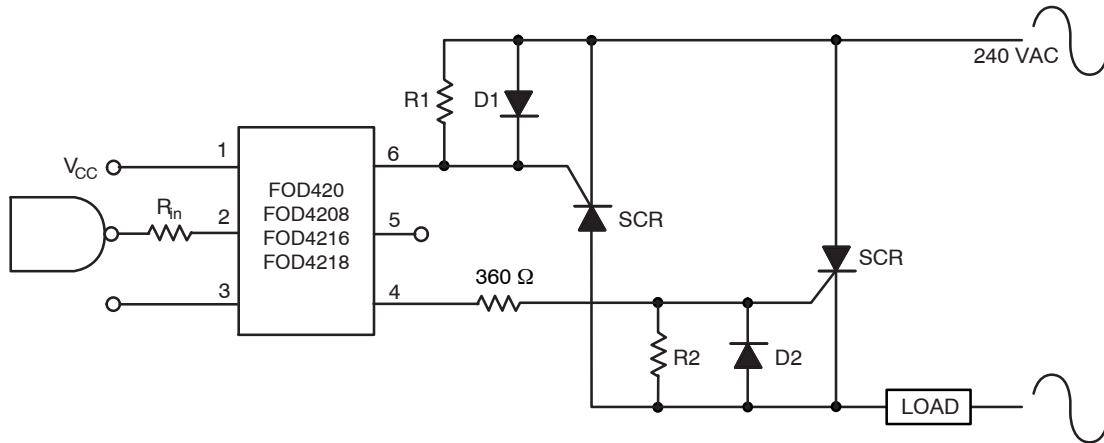


Figure 2. Inverse-Parallel SCR Driver Circuit

Suggested method of firing two, back-to-back SCR's with On Semiconductor triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional  $330\ \Omega$ .

NOTE: This optoisolator should not be used to drive a load directly. It is intended to be a discrete triac driver device only.

典型性能特征

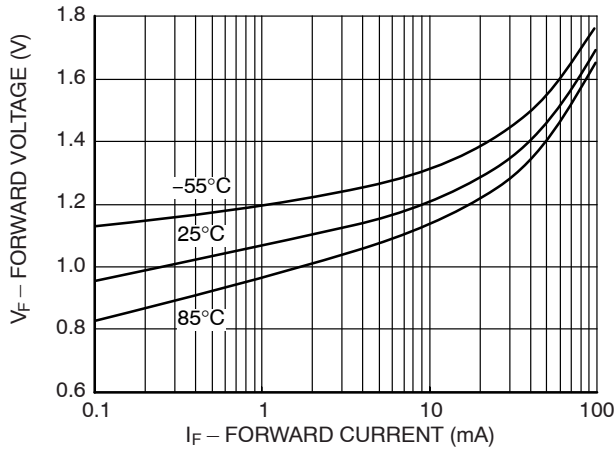


Figure 3. Forward Voltage ( $V_F$ ) vs. Forward Current ( $I_F$ )

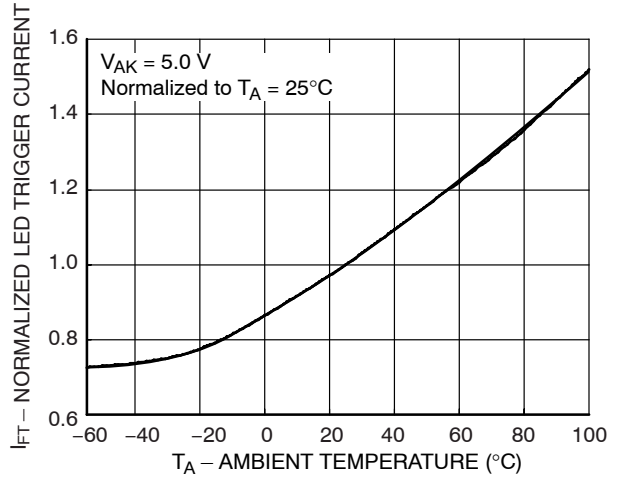


Figure 4. Normalized LED Trigger Current ( $I_{FT}$ ) vs. Ambient Temperature ( $T_A$ )

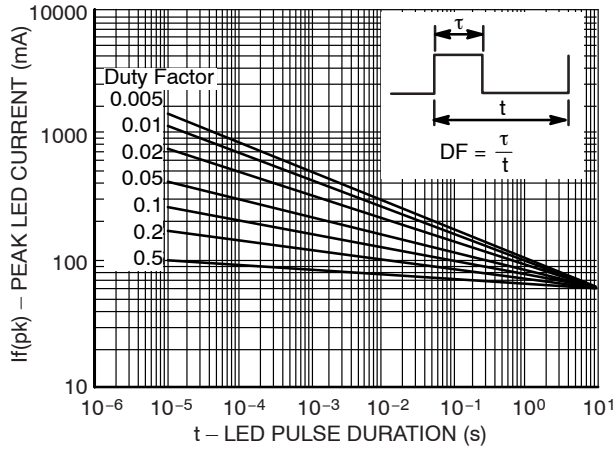


Figure 5. Peak LED Current vs. Duty Factor, Tau

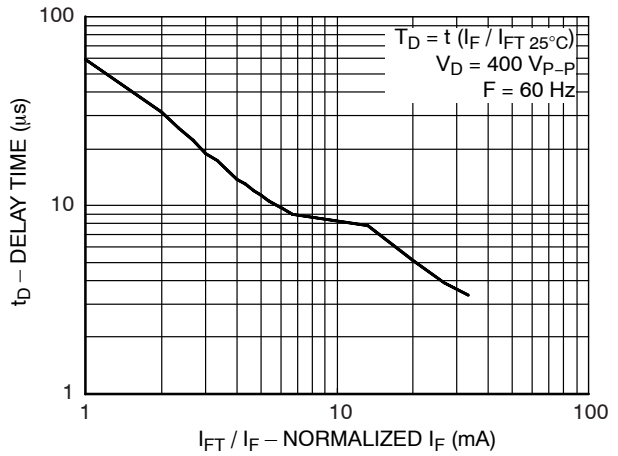


Figure 6. Trigger Delay Time

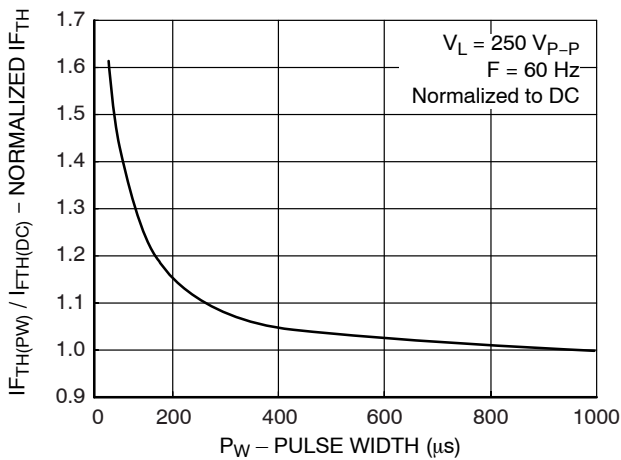


Figure 7. Pulse Trigger Current

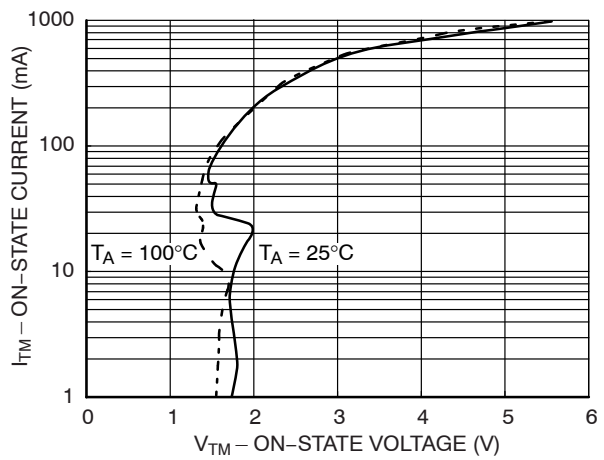


Figure 8. On-State Voltage ( $V_{TM}$ ) vs. On-State Current ( $I_{TM}$ )

典型性能特性 (接上页)

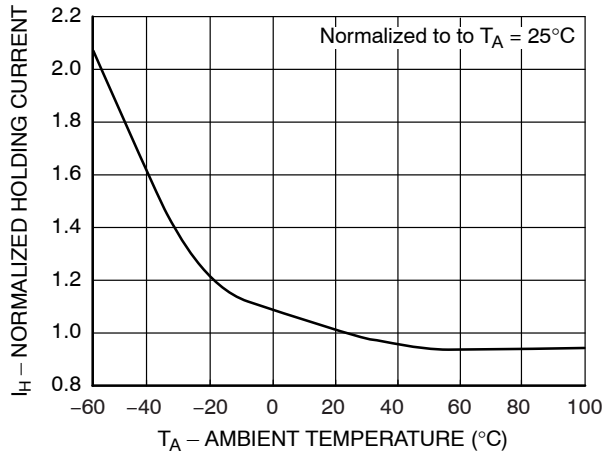


Figure 9. Normalized Holding Current ( $I_H$ ) vs. Ambient Temperature ( $T_A$ )

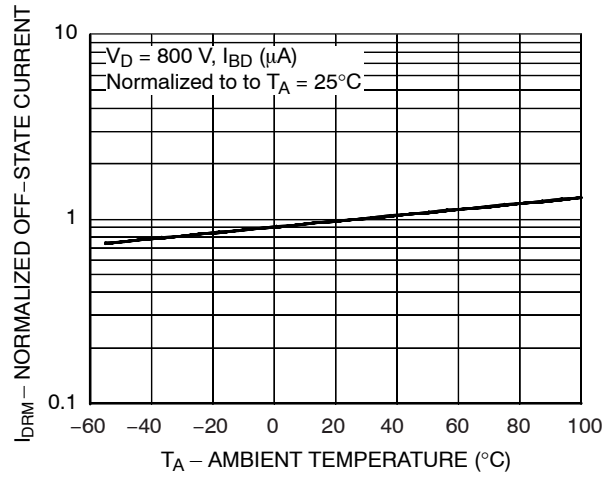


Figure 10. Normalized Off-State Current ( $I_{DRM}$ ) vs. Ambient Temperature ( $T_A$ )

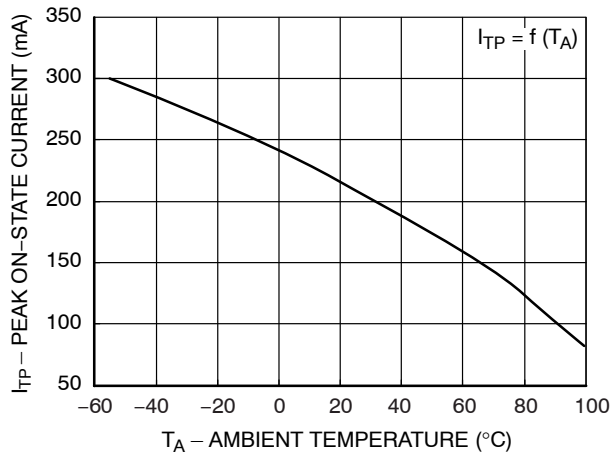
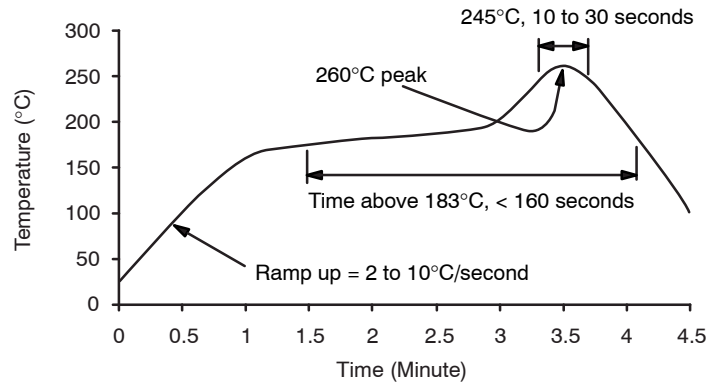


Figure 11. Current Reduction

REFLOW PROFILE



- Peak reflow temperature: 262°C (package surface temperature)
- Time of temperature higher than 183°C for 160 seconds or less
- One time soldering reflow is recommended

Figure 12. Reflow Profile

订购信息

部件编号	封装	封装方法†
FOD420	DIP 6-Pin	管状包装 (50 单位)
FOD420S	SMT 6 引脚(引脚弯曲)	管状包装 (50 单位)
FOD420SD	SMT 6 引脚(引脚弯曲)	卷带包装 (1000 单位)
FOD420V	DIP 6 引脚、DIN EN/IEC 60747-5-5 选项	管状包装 (50 单位)
FOD420SV	SMT 6 引脚 (弯曲引线)、DIN EN/IEC 60747-5-5 选项	管状包装 (50 单位)
FOD420SDV	SMT 6 引脚 (弯曲引线)、DIN EN/IEC 60747-5-5 选项	卷带包装 (1000 单位)
FOD420TV	DIP 6 引脚、0.4" 引脚间距、DIN EN/IEC 60747-5-5 选项	管状包装 (50 单位)

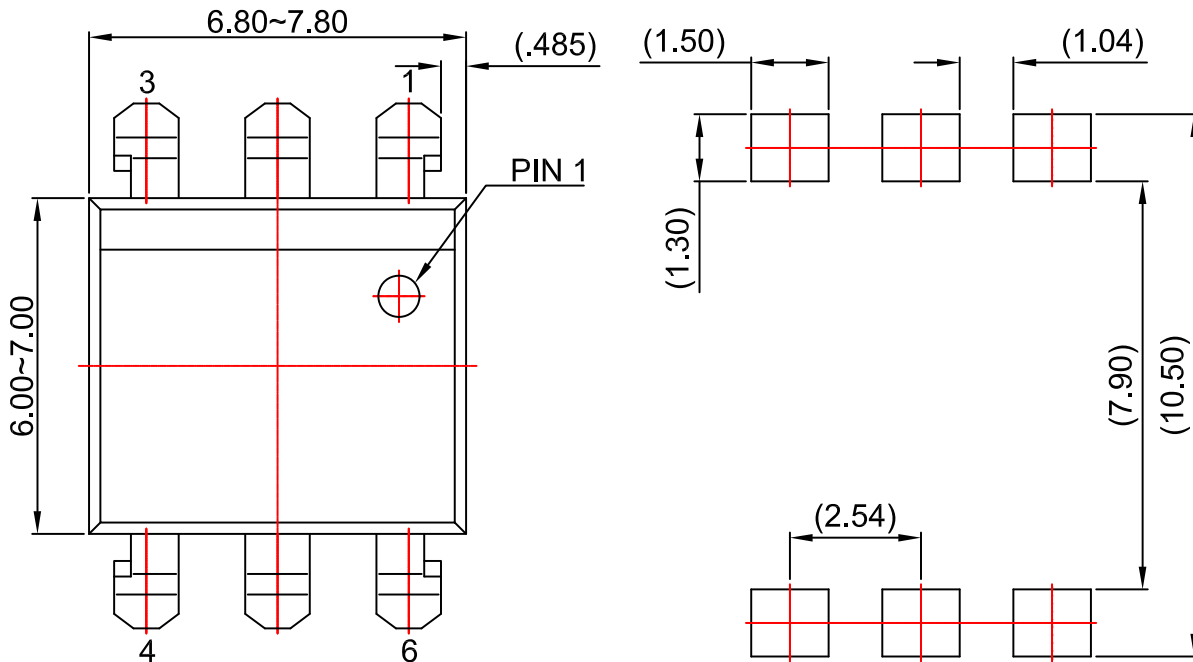
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

6. 该表中所列的可订购产品部件编号系统同样适用于 FOD4208、FOD4216 和 FOD4218 产品系列。

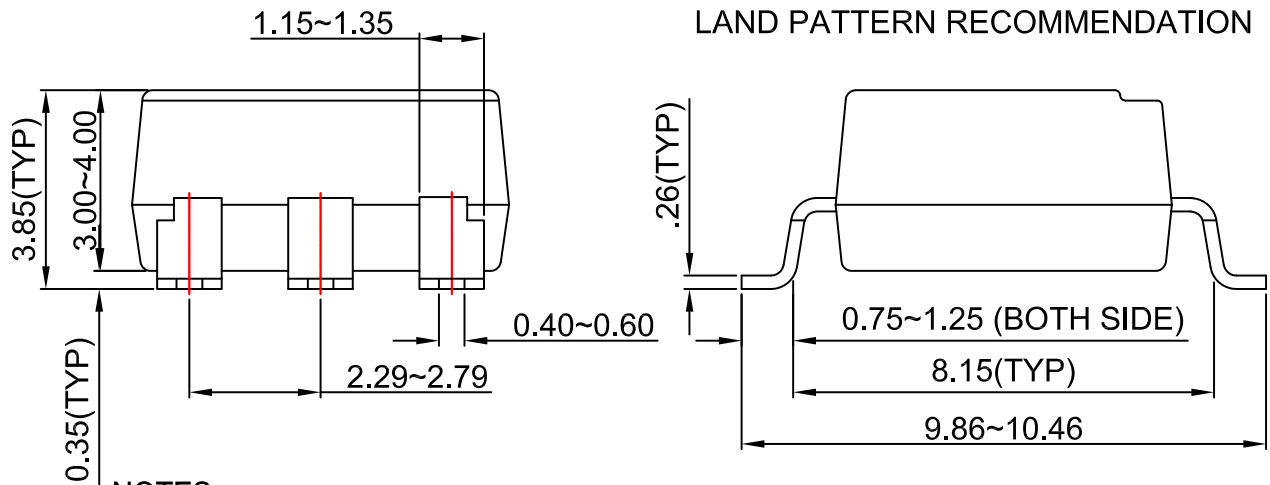


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**LAND PATTERN RECOMMENDATION**



**NOTES:**

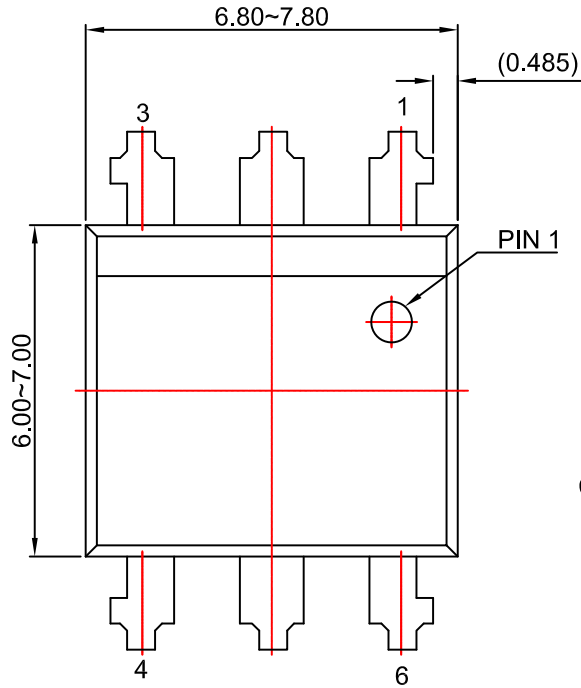
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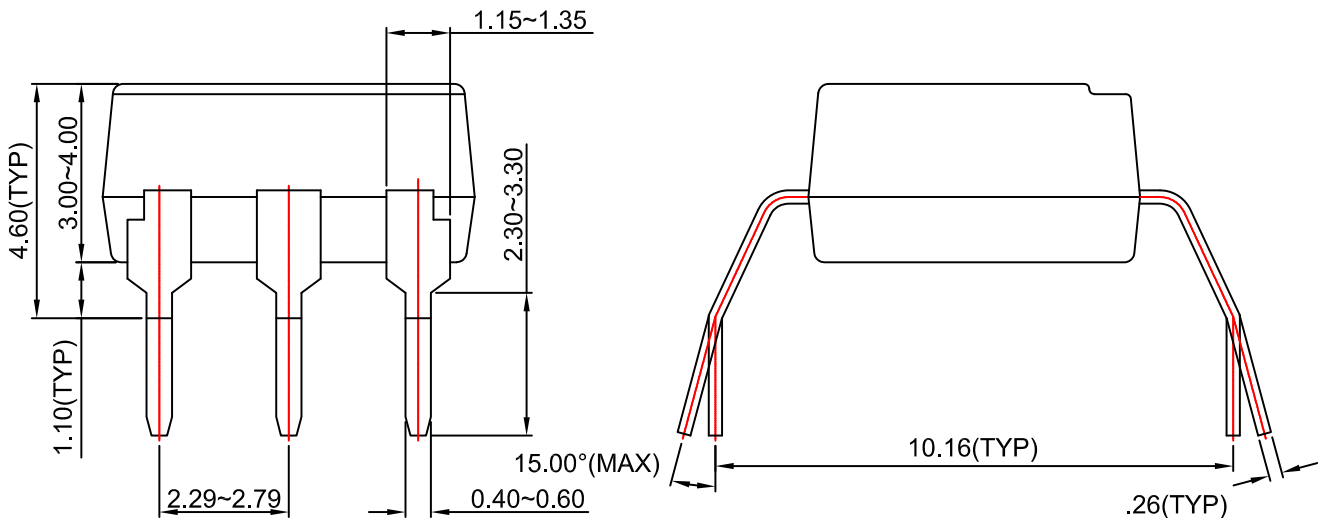
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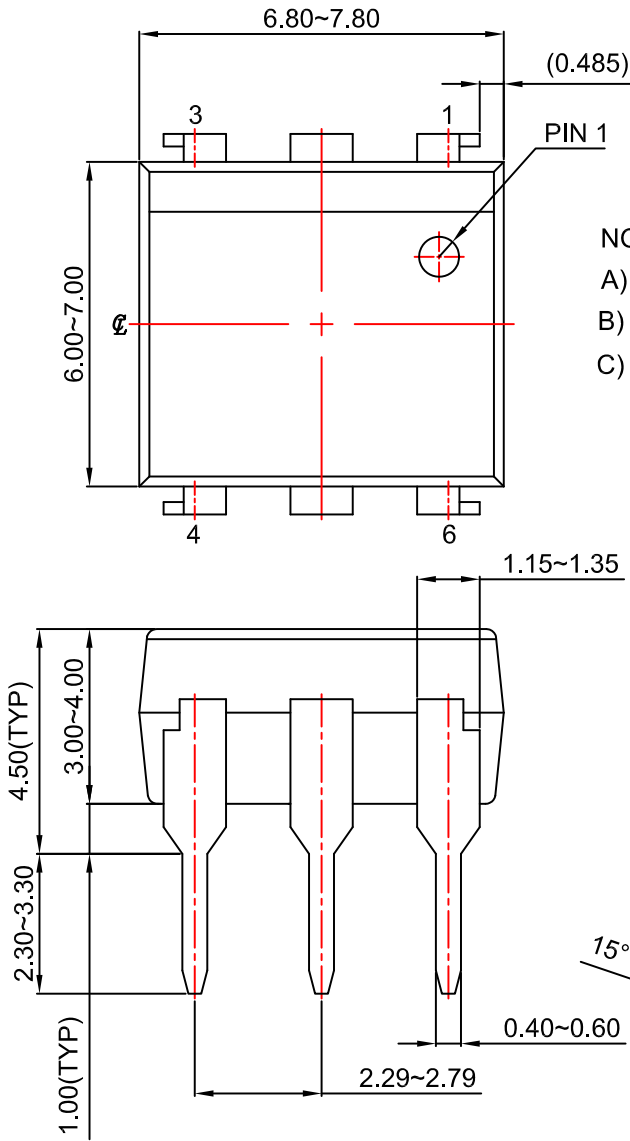


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