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6 2016

FOD410、FOD4108、FOD4116、FOD4118 6 引脚 DIP 无缓冲过零 Triac 驱动器

产品特性

- 300 mA 通态电流
- 过零电压
- 高阻断电压
 - 600 V (FOD410, FOD4116)
 - 800 V (FOD4108, FOD4118)
- 高触发灵敏度
 - 1.3 mA (FOD4116、FOD4118)
 - 2 mA (FOD410、FOD4108)
- 高静态 dv/dt (10,000V/μs)
- 安全和法规认证:
 - UL1577, 5,000 VAC_{RMS} (1 分钟)
 - DIN-EN/IEC60747-5-5

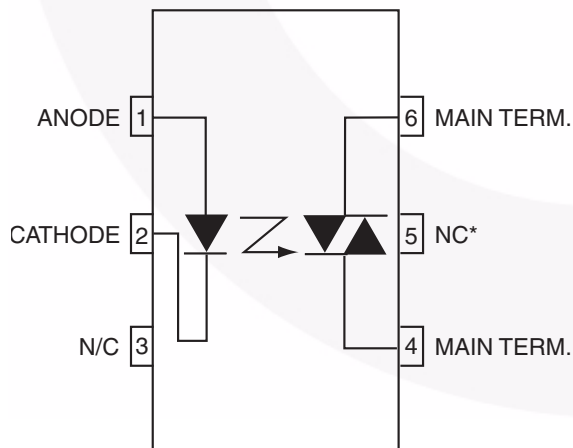
说明

FOD410、FOD4108、FOD4116 和 FOD4118 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。FOD4116 和 FOD4118 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。

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

功能示意图



*DO NOT CONNECT
(TRIAC SUBSTRATE)

Figure 1. Schematic

封装外形

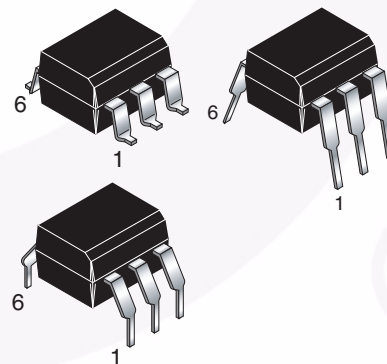


Figure 2. Package Outlines

FOD410、FOD4108、FOD4116、FOD4118 — 6 引脚 DIP 无缓冲过零 Triac 驱动器

安全性和绝缘标准

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。

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 _{RMS}	I-IV
	< 300 V _{RMS}	I-IV
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 _{PR}	输入至输出测试电压, 方法 A, V _{IORM} × 1.6 = V _{PR} , 型式和样品测试, t _m = 10 s, 局部放电 < 5 pC	1360	V _{peak}
	输入至输出测试电压, 方法 B, V _{IORM} × 1.875 = V _{PR} , 100% 生产测试, t _m = 1 s, 局部放电 < 5 pC	1594	V _{peak}
V _{IORM}	最大工作绝缘电压	850	V _{peak}
V _{IOTM}	最高允许过电压	6000	V _{peak}
	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 _S	壳温 ⁽¹⁾	175	°C
I _{S,INPUT}	输入电流 ⁽¹⁾	400	mA
P _{S,OUTPUT}	输出功率 ⁽¹⁾	700	mW
R _{IO}	T _S 、V _{IO} = 500 V ⁽¹⁾ 时的绝缘阻抗	> 10 ⁹	Ω

注意:

- 安全极限值 – 发生故障时允许的最大值。

绝对最大额定值

应力超过绝对最大额定值，可能会损坏设备。在超出推荐的工作条件的情况下，该器件可能无法正常运行或操作，所以不建议让器件在这些条件下长期工作。此外，过度暴露在高于推荐的工作条件下，会影响器件的可靠性。绝对最大额定值仅是额定应力值。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 to +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/ $^\circ\text{C}$
发射极				
I_F	连续正向电流	所有	30	A
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/ $^\circ\text{C}$
检测器				
V_{DRM}	断态输出端电压	FOD410, FOD4116	600	V
		FOD4108, FOD4118	800	
I_{TSM}	峰值非重复浪涌电流 (单循环 60 Hz 正弦波)	所有	3	A
I_{TM}	峰值通态电流	所有	300	mA
P_D (检测器)	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/ $^\circ\text{C}$

电气特性除非另有说明， $T_A = 25^\circ\text{C}$ **独立元器件特性**

符号	参数	测试条件	器件	最小值	典型值	最大值	单位
发射极							
V_F	输入正向电压	$I_F = 20\text{ mA}$	所有		1.25	1.50	V
I_R	反向漏电流	$V_R = 6\text{ V}$	所有		0.0001	10	μA
检测器							
$I_{D(RMS)}$	峰值阻断电流，任一方向	$I_F = 0,$ $T_A = 100^\circ\text{C}^{(2)}$	$V_D = 600\text{ V}$	FOD410, FOD4116	3	100	μA
			$V_D = 800\text{ V}$	FOD4108, FOD4118			
$I_{R(RMS)}$	反向电流	$T_A = 100^\circ\text{C}$	$V_D = 600\text{ V}$	FOD410, FOD4116	3	100	μA
			$V_D = 800\text{ V}$	FOD4108, FOD4118			
dv/dt	关断电压上升临界值	$I_F = 0^{(3)}$ (图 15)	所有	10,000			V/ μs

注意：

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。测试电路见图 15。换向 dv/dt 只与负载驱动晶闸管有关。

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

符号	参数	测试条件		器件	最小值	典型值	最大值	单位
I_{FT}	LED 触发电流	主端电压 = 5 V ⁽⁴⁾		FOD410, FOD4108		0.65	2.0	mA
				FOD4116, FOD4118		0.65	1.3	
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	μA
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, $I_T = 300\text{ mA}$	$V_{RM} = V_{DM} = 424\text{ VAC}$	FOD410, FOD4116, FOD4118		60		μs
			$V_{RM} = V_{DM} = 565\text{ VAC}$	FOD4108				
t_{OFF}	关断时间	PF = 1.0, $I_T = 300\text{ mA}$	$V_{RM} = V_{DM} = 424\text{ VAC}$	FOD410, FOD4116, FOD4118		52		μs
			$V_{RM} = V_{DM} = 565\text{ VAC}$	FOD4108				
dv/dt_{crq}	换流时的电压临界上升率	$V_D = 0.67 V_{DRM}$, $di/dt_{crq} \leq 15\text{ A/ms}$	$T_J = 25^\circ\text{C}$	所有	10,000			$\text{V}/\mu\text{s}$
			$T_J = 80^\circ\text{C}$		5,000			$\text{V}/\mu\text{s}$
di/dt_{cr}	通态电流临界上升率			所有			8	$\text{A}/\mu\text{s}$
$dv(\text{IO})/dt$	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		$\text{V}/\mu\text{s}$

注意:

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 FOD410 和 FOD4108 为 2 mA, 而对于 FOD4116 和 FOD4118 为 1.3 mA) 和绝对最大 I_F (60 mA) 之间。

过零特性

符号	参数	测试条件	器件	最小值	典型值	最大值	单位
V_{INH}	抑制电压 (超过后器件无法触发的 MT1-MT2 电压)	$I_F = \text{额定 } I_{FT}$	所有		8	25	V
I_{DRM2}	抑制状态下的漏电流	$I_F = \text{额定 } I_{FT}$ 、额定 V_{DRM} 、关断状态	所有		20	200	μA

绝缘特性

符号	参数	测试条件	器件	最小值	典型值	最大值	单位
V_{ISO}	稳态隔离电压	$f = 60\text{ Hz}$, $t = 1\text{ Minute}^{(5)}$	所有	5,000			VAC_{RMS}

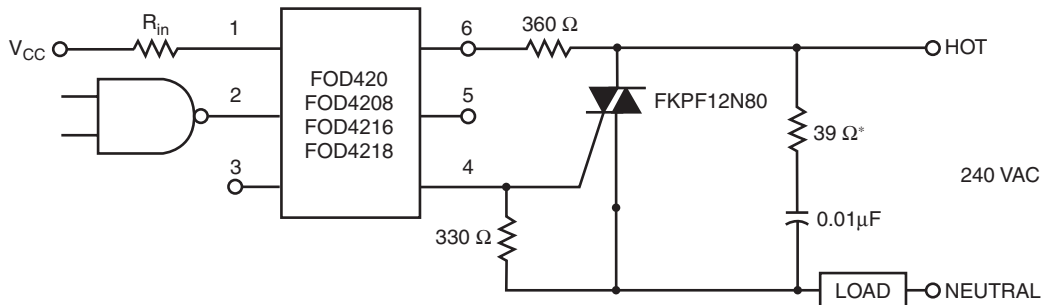
注意:

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_{RMS} 持续 1 分钟相当于 6,000 VAC_{RMS} 持续 1 秒钟。

典型应用

Figure 3 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 I_F is equal to the rated I_{FT} of the part, 2 mA for FOD420 and FOD4208, 1.3 mA for FOD4216 and FOD4218. The 39 Ω resistor and 0.01 μF capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load use.



* For highly inductive loads (power factor < 0.5), change this value to 360 ohms.

Figure 3. Hot-Line Switching Application Circuit

典型性能特征

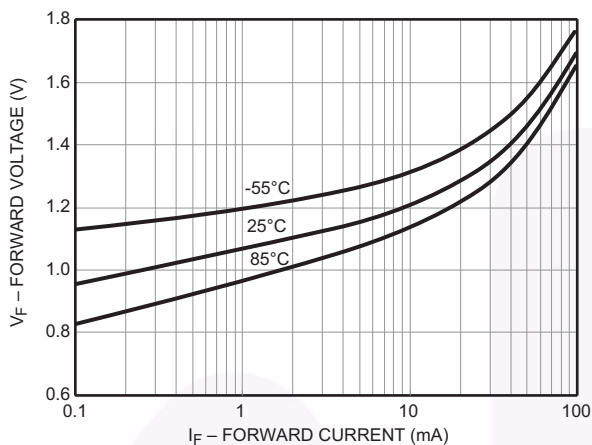


Figure 4. Forward Voltage (V_F) vs. Forward Current (I_F)

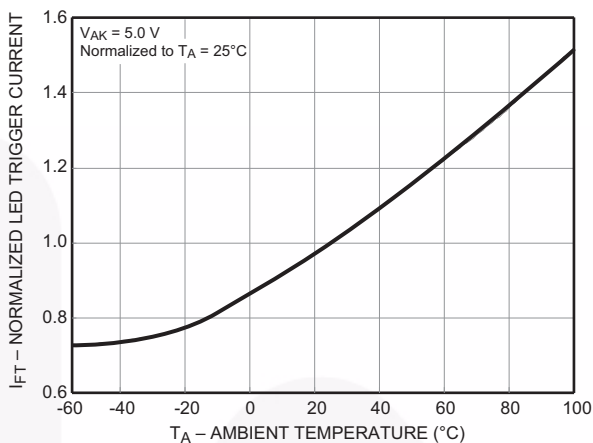


Figure 5. Normalized LED Trigger Current (I_{FT}) vs. Ambient Temperature (T_A)

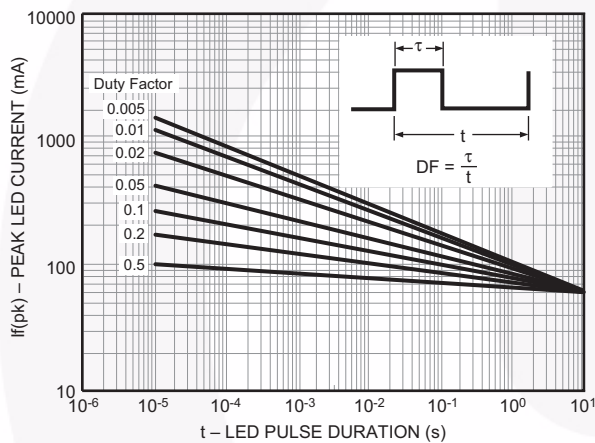


Figure 6. Peak LED Current vs. Duty Factor, Tau

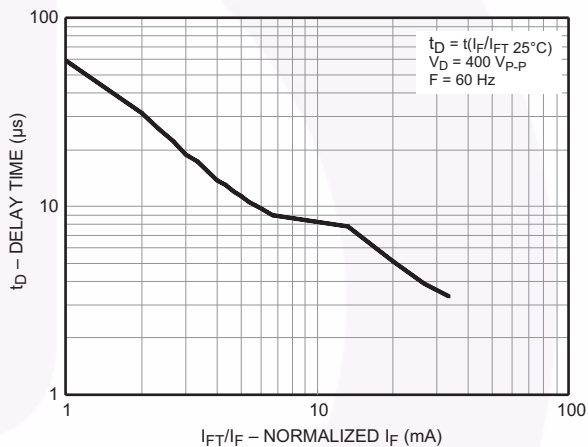


Figure 7. Trigger Delay Time

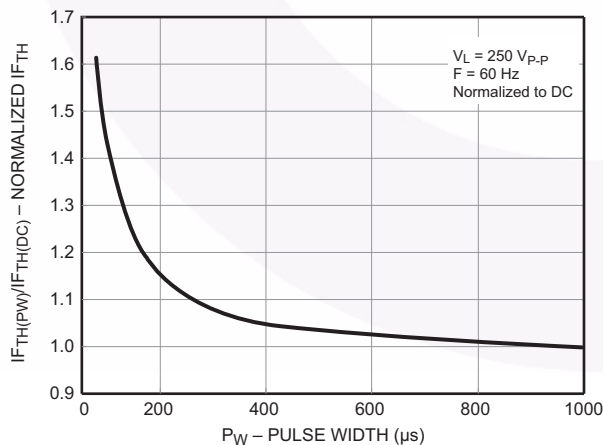


Figure 8. Pulse Trigger Current

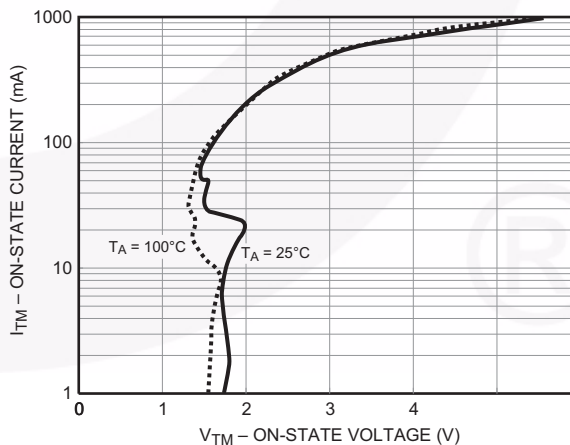


Figure 9. On-State Voltage (V_{TM}) vs. On-State Current (I_{TM})

典型性能特性 (接上页)

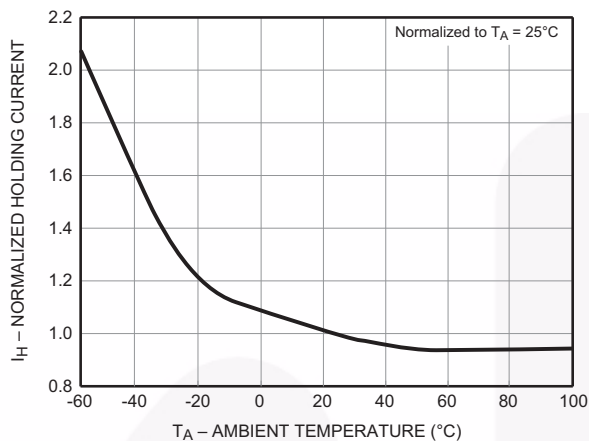


Figure 10. Normalized Holding Current (I_H) vs. Ambient Temperature (T_A)

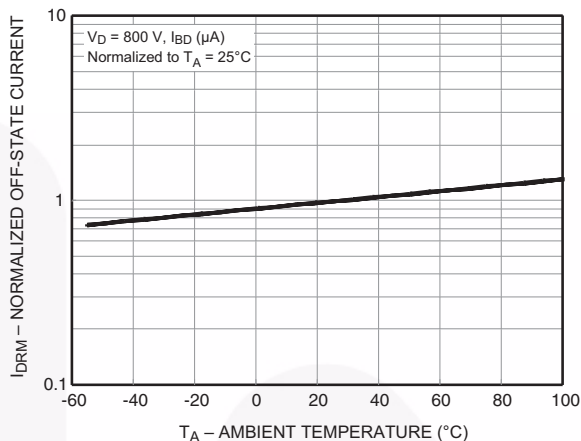


Figure 11. Normalized Off-State Current (I_{DRM}) vs. Ambient Temperature (T_A)

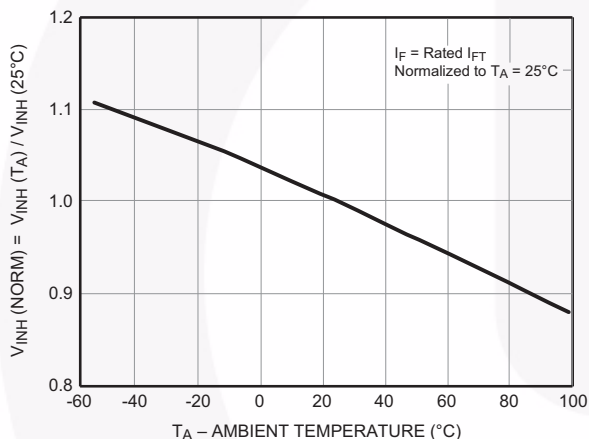


Figure 12. Normalized Inhibit Voltage (V_{INH}) vs. Ambient Temperature (T_A)

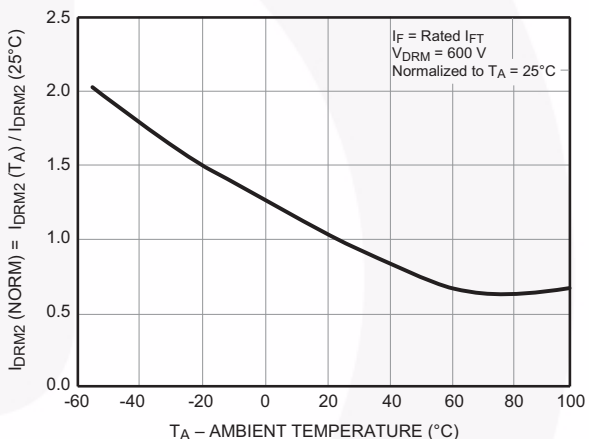


Figure 13. Normalized Leakage in Inhibit State (I_{DRM2}) vs. Ambient Temperature (T_A)

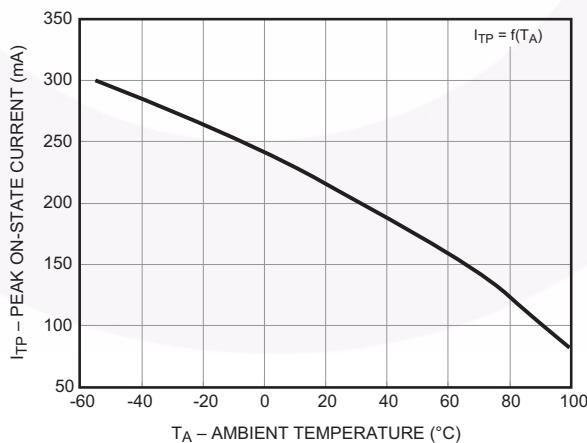
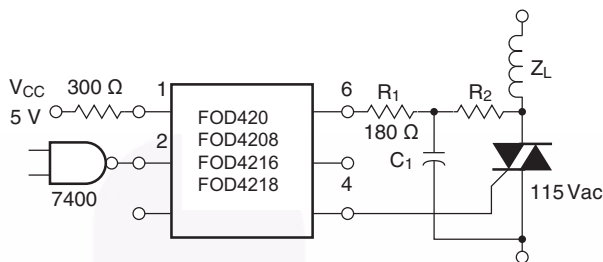
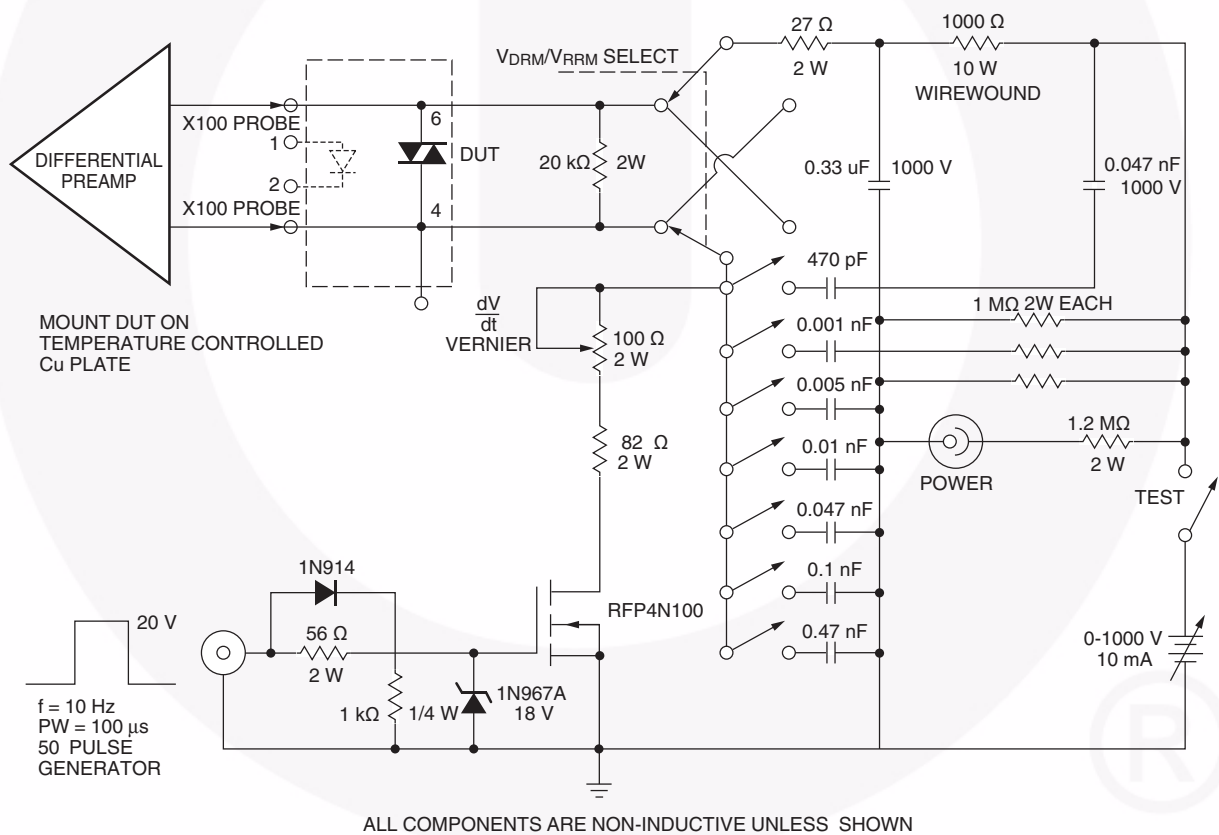


Figure 14. Current Reduction



NOTE: Circuit supplies 25 mA drive to gate of triac at $V_{in} = 25\text{ V}$ and $T_A < 70^\circ\text{C}$

TRIAC		
I_{GT} (mA)	R_2 (Ω)	C_1 (μF)
15	2400	0.1
30	1200	0.2
50	800	0.3



ALL COMPONENTS ARE NON-INDUCTIVE UNLESS SHOWN

Figure 13. Circuit for Static $\frac{dv}{dt}$ Measurement of Power Thyristors

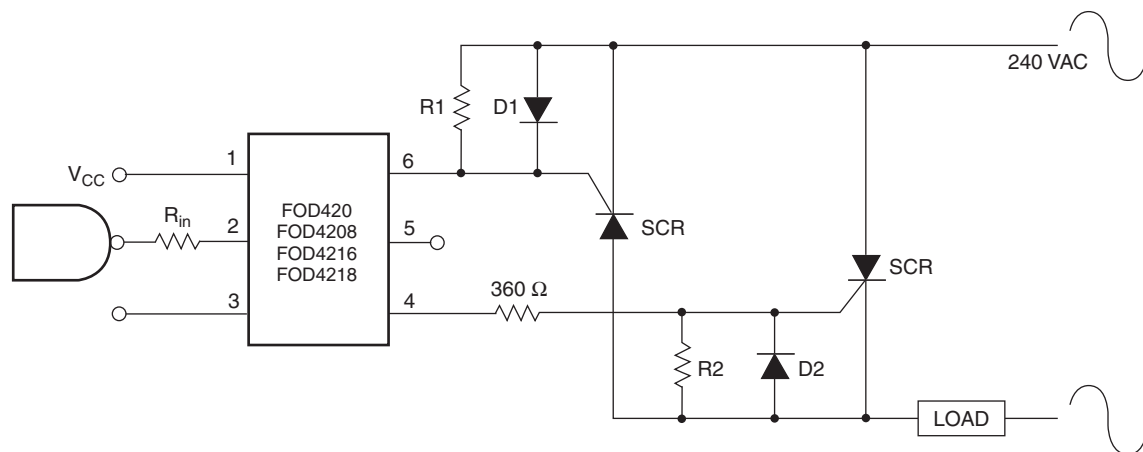
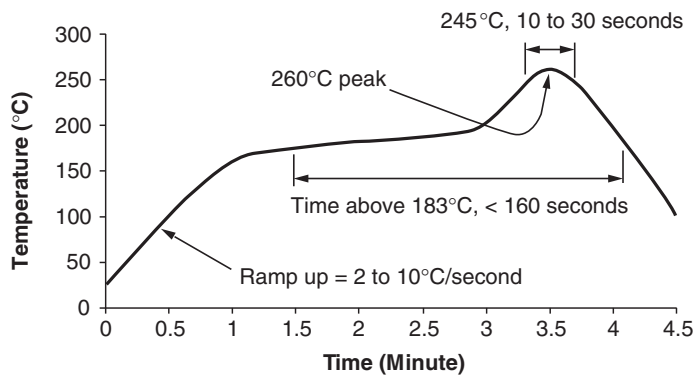


Figure 14. Inverse-Parallel SCR Driver Circuit

Suggested method of firing two, back-to-back SCR's with a Fairchild triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 330 Ω .

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

Reflow Profile



- Peak reflow temperature: 260°C (package surface temperature)
- Time of temperature higher than 183°C for 160 seconds or less
- One time soldering reflow is recommended

Figure 15. Reflow Profile

订购信息

部件编号	封装	封装方法
FOD410	DIP 6 引脚	管状包装 (50 单位)
FOD410S	SMT 6 引脚 (引脚弯曲)	管状包装 (50 单位)
FOD410SD	SMT 6 引脚 (引脚弯曲)	卷带包装 (1000 单位)
FOD410V	DIP 6 引脚、DIN EN/IEC 60747-5-5 选项	管状包装 (50 单位)
FOD410SV	SMT 6 引脚 (弯曲引线)、DIN EN/IEC 60747-5-5 选项	管状包装 (50 单位)
FOD410SDV	SMT 6 引脚 (弯曲引线)、DIN EN/IEC 60747-5-5 选项	卷带包装 (1000 单位)
FOD410TV	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)

注意:

6. 该表中所列的可订购产品部件编号系统同样适用于 FOD4108、FOD4116 和 FOD4118 产品系列。

标识信息

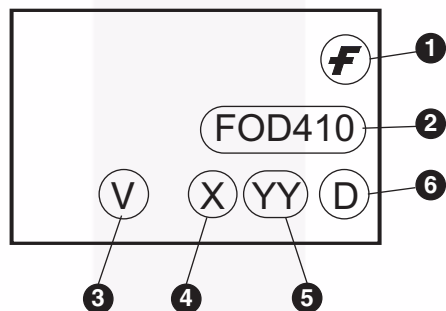
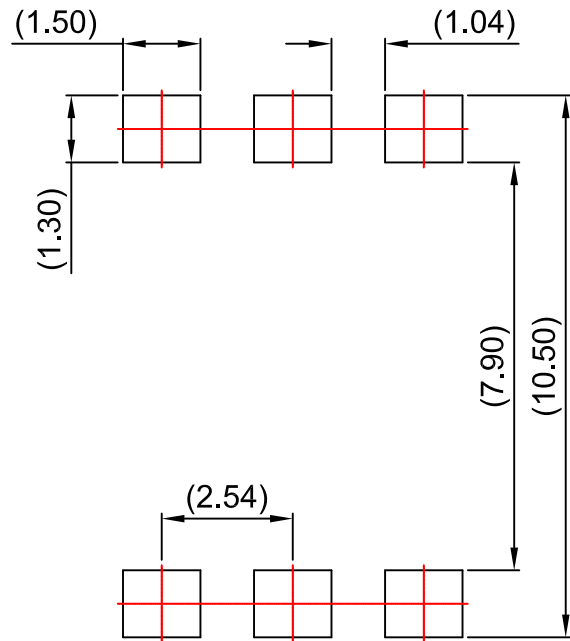
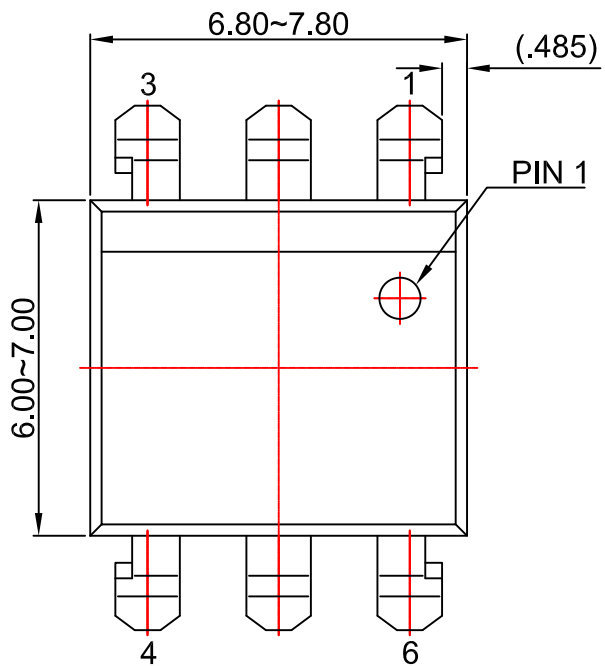


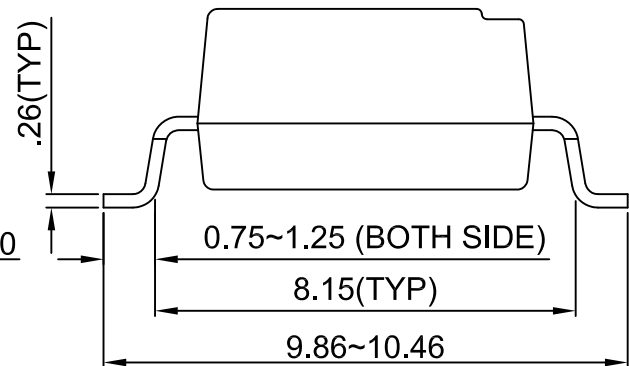
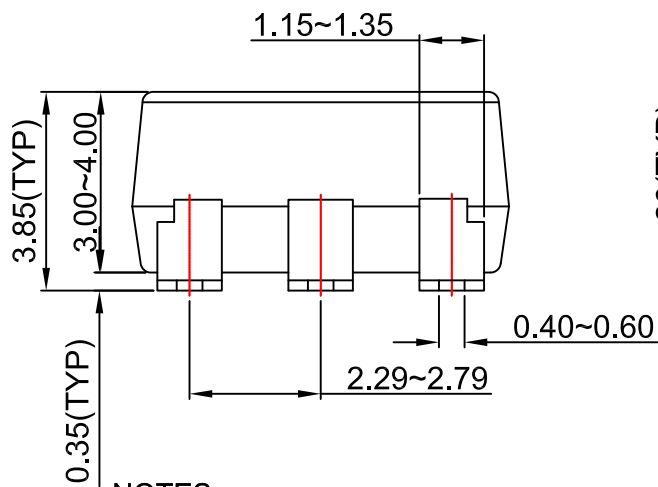
图 18. 顶标

表 1. 顶标定义

1	飞兆徽标
2	器件编号
3	VDE 标记 DIN EN/IEC60747-5-5 选项 (只有组件订购附带此选项时出现)
4	一位数年份代码, 如“6”
5	工作周数, 范围从“01”至“53”
6	装配封装码



LAND PATTERN RECOMMENDATION



NOTES:

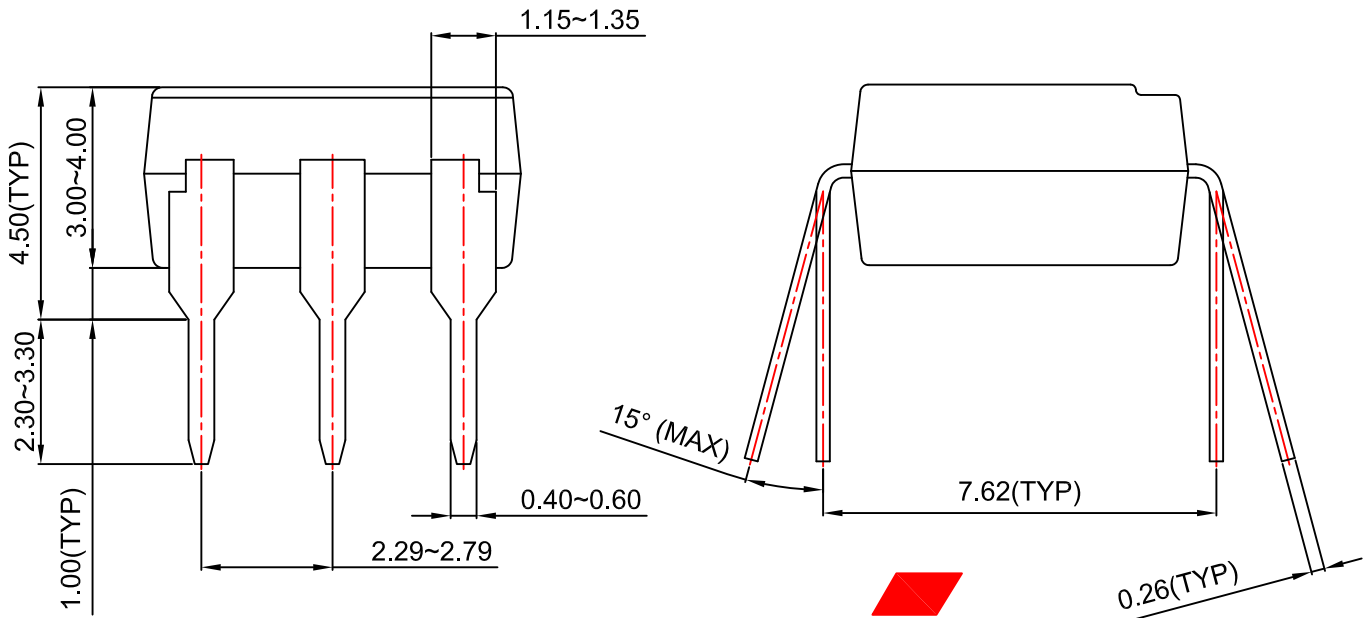
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NOTES:

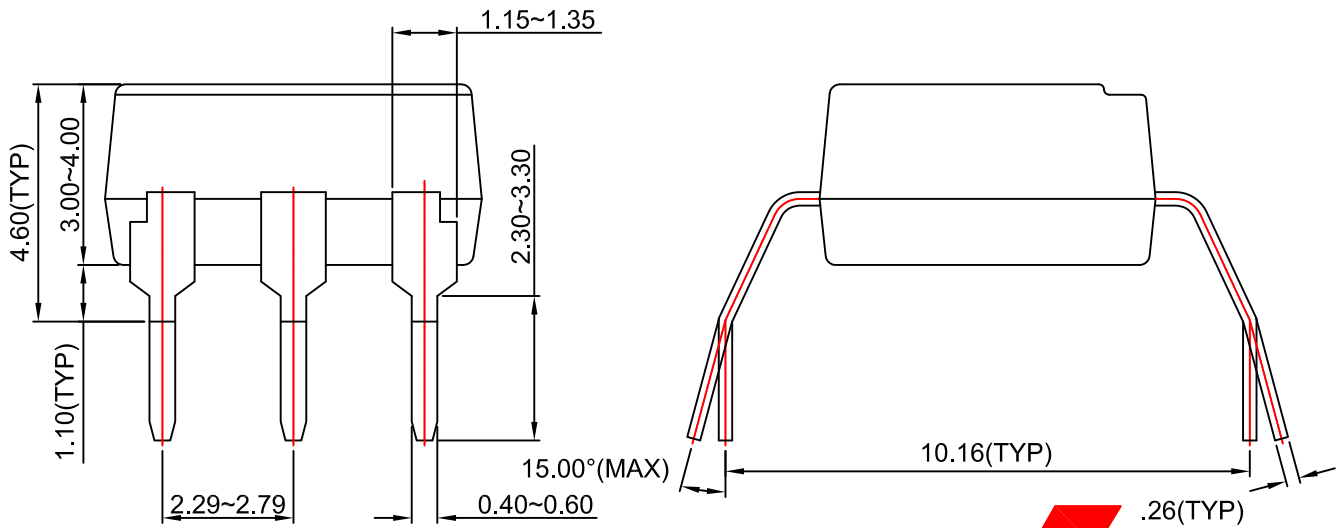
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