

# FPF1007-FPF1009 IntelliMAX™ Advanced Load Products

## Features

- 1.2 to 5.5V Input Voltage Range
- Typical  $R_{ON} = 30\text{ m}\Omega$  @  $V_{IN} = 5.5\text{V}$
- Typical  $R_{ON} = 40\text{ m}\Omega$  @  $V_{IN} = 3.3\text{V}$
- Fixed Three Different Turn-on Rise-time 10 $\mu\text{s}$ /80 $\mu\text{s}$ /1ms
- Low < 10 $\mu\text{A}$  @  $V_{IN} = 3.3\text{V}$  Quiescent Current
- Internal ON Pin Pull Down
- Output Discharge Function
- ESD Protection above 8000V HBM and 2000V CDM
- RoHS Compliant

## Applications

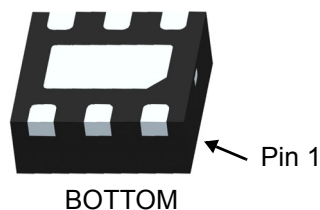
- PDAs
- Cell Phones
- GPS Devices
- MP3 Players
- Digital Cameras
- Peripheral Ports
- Hot Swap Supplies
- Notebook Computer



## General Description

The FPF1007/8/9 are low RDS P-Channel MOSFET load switches offered in a selection of 10 $\mu\text{s}$ , 80 $\mu\text{s}$ , and 1ms slew rate turn-on options for transient/in-rush current control. To support trends in mobile application requirements the minimum operating input voltage has been reduced down to 1.2V, the input current leakage has been minimized to extend battery life, and the ESD-protection has been designed to withstand a minimum of 8KV (HBM) and 2KV(CDM).

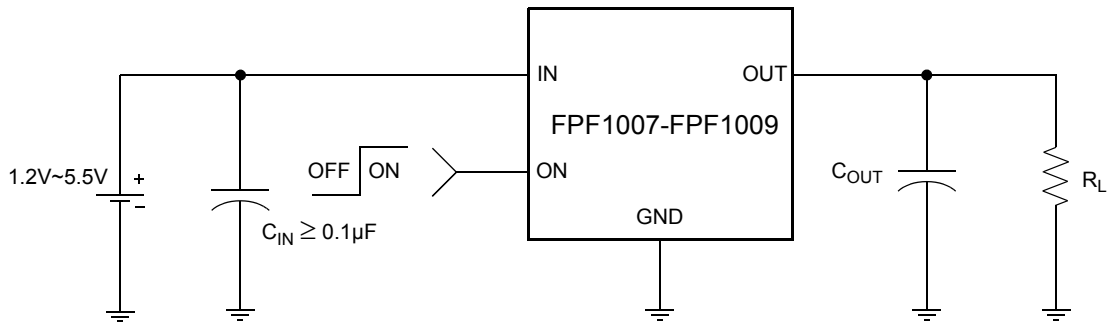
The switch is controlled by an active-high logic input (ON pin) allowing it to interface directly with a low voltage control signal. An internal ON pin pull down resistor protects against an unintentional device turn-on while in the initial state. An On-chip pull-down resistor on the output is enabled when the switch is turned-off and provides a quick and robust discharge of the output load.



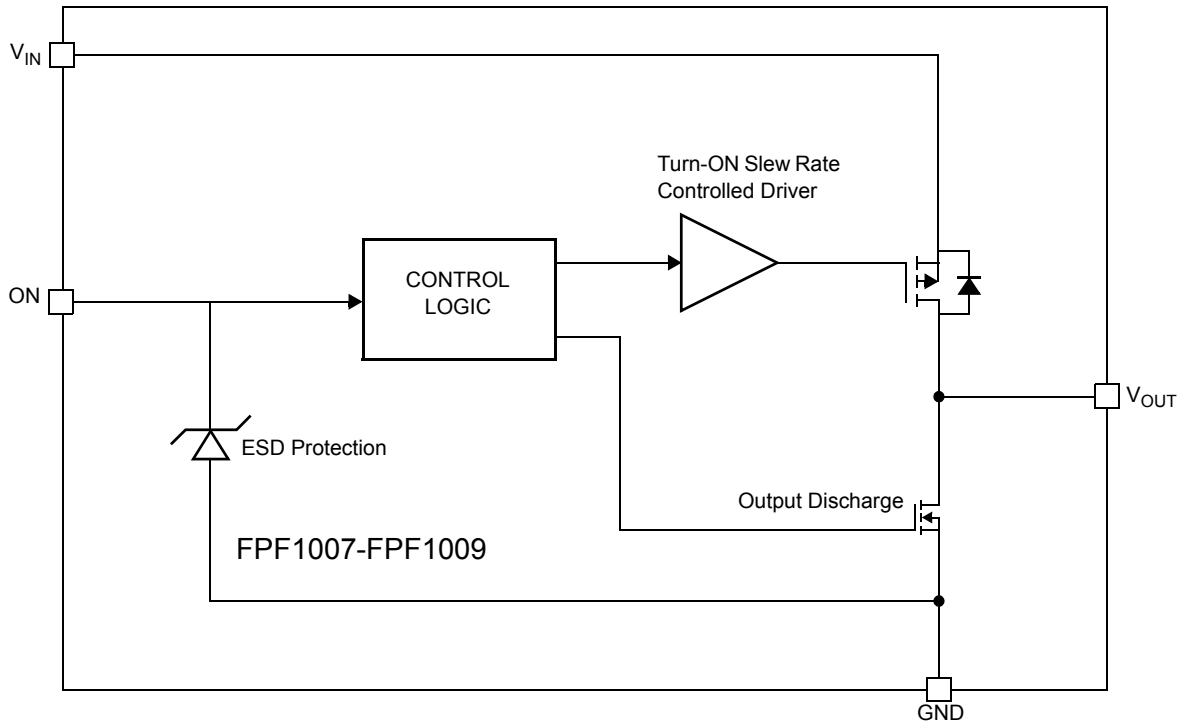
## Ordering Information

Part	Switch $R_{ON}$ @ 5.5V [Typ.]	Rise Time [Typ.]	Output Discharge [Typ.]	ON Pin Activity
FPF1007	30m $\Omega$ , PMOS	10 $\mu\text{s}$	60 $\Omega$	Active HI
FPF1008	30m $\Omega$ , PMOS	80 $\mu\text{s}$	60 $\Omega$	Active HI
FPF1009	30m $\Omega$ , PMOS	1ms	60 $\Omega$	Active HI

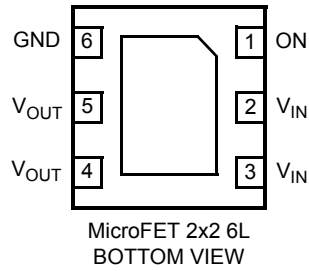
### Typical Application Circuit



### Functional Block Diagram



## Pin Configuration



## Pin Description

Pin	Name	Function
4, 5	$V_{OUT}$	Switch Output: Output of the power switch
2, 3	$V_{IN}$	Supply Input: Input to the power switch and the supply voltage for the IC
6	GND	Ground
1	ON	ON/OFF Control Input

## Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
$V_{IN}$ , $V_{OUT}$ , ON to GND	-0.3	6	V
Maximum Continuous Switch Current		1.5	A
Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1)		1.2	W
Storage Junction Temperature	-65	150	$^\circ\text{C}$
Operating Temperature Range	-40	85	$^\circ\text{C}$
Thermal Resistance, Junction to Ambient		86	$^\circ\text{C}/\text{W}$
Electrostatic Discharge Protection	HBM	8000	V
	CDM	2000	V

## Recommended Operating Range

Parameter	Min.	Max.	Unit
$V_{IN}$	1.2	5.5	V
Ambient Operating Temperature, $T_A$	-40	85	$^\circ\text{C}$

## Electrical Characteristics

$V_{IN} = 1.2$  to  $5.5\text{V}$ ,  $T_A = -40$  to  $+85^\circ\text{C}$  unless otherwise noted. Typical values are at  $V_{IN} = 3.3\text{V}$  and  $T_A = 25^\circ\text{C}$ .

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
<b>Basic Operation</b>						
Operating Voltage	$V_{IN}$		1.2		5.5	V
Quiescent Current	$I_Q$	$I_{OUT} = 0\text{mA}$ , $V_{IN} = 3.3\text{V}$ , $V_{ON} = \text{Enabled}$		8		$\mu\text{A}$
		$I_{OUT} = 0\text{mA}$ , $V_{IN} = 5.5\text{V}$ , $V_{ON} = \text{Enabled}$			15	$\mu\text{A}$
Off Supply Current	$I_{Q(\text{off})}$	$V_{ON} = \text{GND}$ , $V_{OUT} = \text{OPEN}$			1	$\mu\text{A}$
Off Switch Current	$I_{SD(\text{off})}$	$V_{ON} = \text{GND}$ , $V_{OUT} = \text{GND}$		0.1	1	$\mu\text{A}$

## Electrical Characteristics Cont.

$V_{IN} = 1.2$  to  $5.5V$ ,  $T_A = -40$  to  $+85^\circ C$  unless otherwise noted. Typical values are at  $V_{IN} = 3.3V$  and  $T_A = 25^\circ C$ .

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
On-Resistance	$R_{ON}$	$V_{IN} = 5.5V, I_{OUT} = 200mA, T_A = 25^\circ C$		30	40	m $\Omega$
		$V_{IN} = 3.3V, I_{OUT} = 200mA, T_A = 25^\circ C$		40	55	
		$V_{IN} = 1.5V, I_{OUT} = 200mA, T_A = 25^\circ C$		100	130	
		$V_{IN} = 1.2V, I_{OUT} = 200mA, T_A = 25^\circ C$		175	250	
		$V_{IN} = 3.3V, I_{OUT} = 200mA, T_A = -40^\circ C$ to $+85^\circ C$	20		65	
Output Pull Down Resistance	$R_{PD}$	$V_{IN} = 3.3V, V_{ON} = 0V, T_A = 25^\circ C$		60		$\Omega$
ON Input Logic Low Voltage	$V_{IL}$	$V_{IN} = 1.2V$ to $5.5V$			0.4	V
ON Input Logic High Voltage	$V_{IH}$	$V_{IN} = 1.2V$ to $5.5V$	1			V
ON Input Leakage (On)		$V_{ON} = V_{IN} = 5.5V$	-1		10	$\mu A$
ON Input Leakage (Off)		$V_{ON} = GND$	-1		1	$\mu A$
<b>Dynamic</b>						
<b>FPF1007</b>						
Turn On	$t_{ON}$	$V_{IN} = 3.3V, R_L = 500\Omega, R_{L\_CHIP} = 60\Omega,$ $C_{OUT} = 0.1\mu F, T_A = 25^\circ C$		12		$\mu s$
Rise Time	$t_R$			10		$\mu s$
Turn Off	$t_{OFF}$			40		$\mu s$
Fall Time	$t_F$			15		$\mu s$
<b>FPF1008</b>						
Turn On	$t_{ON}$	$V_{IN} = 3.3V, R_L = 500\Omega, R_{L\_CHIP} = 60\Omega,$ $C_{OUT} = 0.1\mu F, T_A = 25^\circ C$		125		$\mu s$
Rise Time	$t_R$			80		$\mu s$
Turn Off	$t_{OFF}$			40		$\mu s$
Fall Time	$t_F$			15		$\mu s$
<b>FPF1009</b>						
Turn On	$t_{ON}$	$V_{IN} = 3.3V, R_L = 500\Omega, R_{L\_CHIP} = 60\Omega,$ $C_{OUT} = 0.1\mu F, T_A = 25^\circ C$		2		ms
Rise Time	$t_R$			1		ms
Turn Off	$t_{OFF}$			40		$\mu s$
Fall Time	$t_F$			15		$\mu s$

**Note 1:** Package power dissipation on 1square inch pad, 2 oz. copper board.

### Typical Characteristics

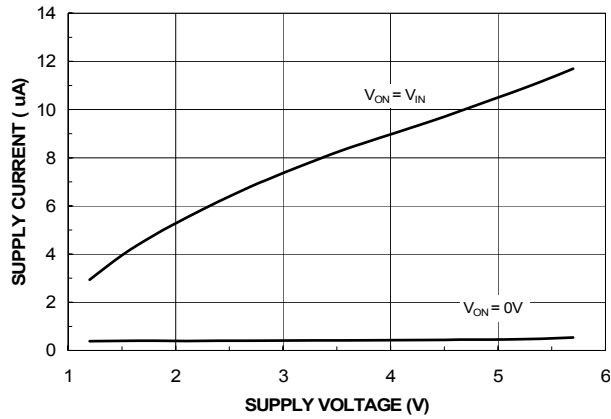


Figure 1. Quiescent Current vs. Input Voltage

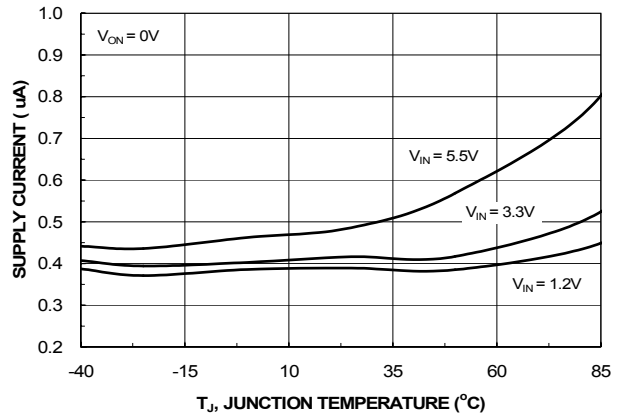


Figure 2. Quiescent Current vs. Temperature

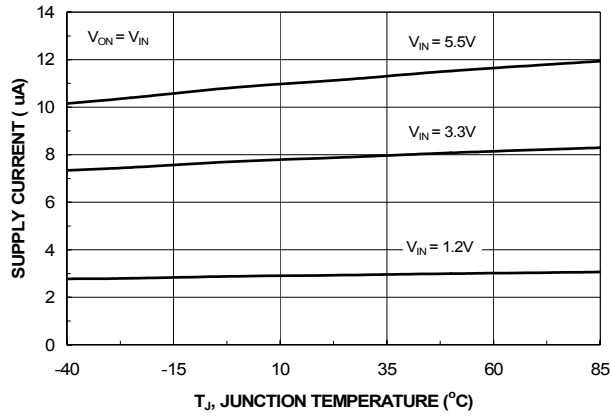


Figure 3. Quiescent Current vs. Temperature

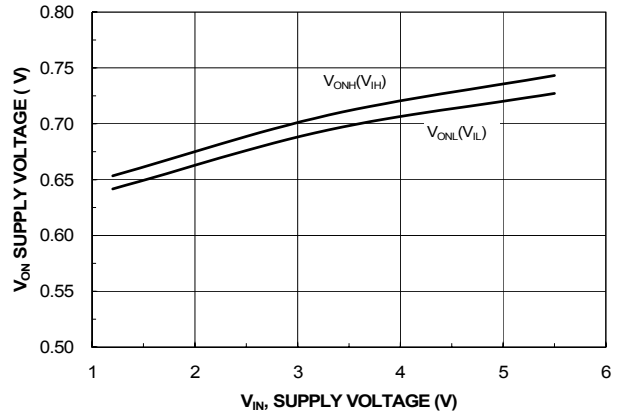


Figure 4.  $V_{ON}$  Voltage vs. Input Voltage

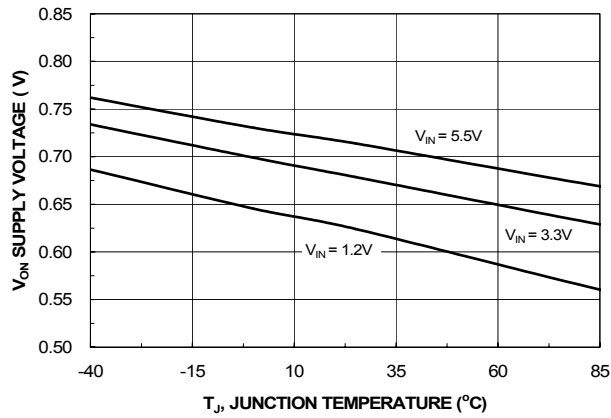


Figure 5.  $V_{ON}$  Low Voltage vs. Temperature

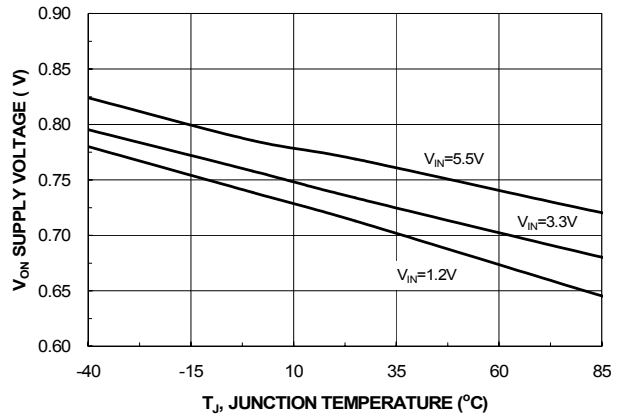


Figure 6.  $V_{ON}$  High Voltage vs. Temperature

### Typical Characteristics

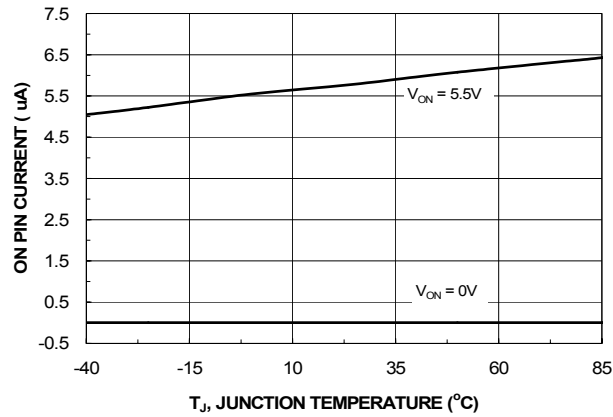


Figure 7. On Pin Current vs. Temperature

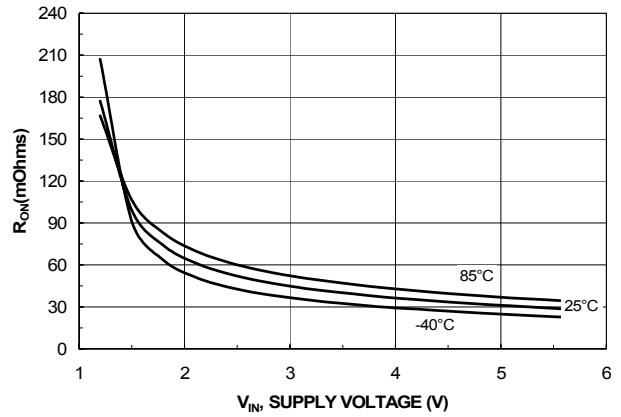


Figure 8.  $R_{ON}$  vs.  $V_{IN}$

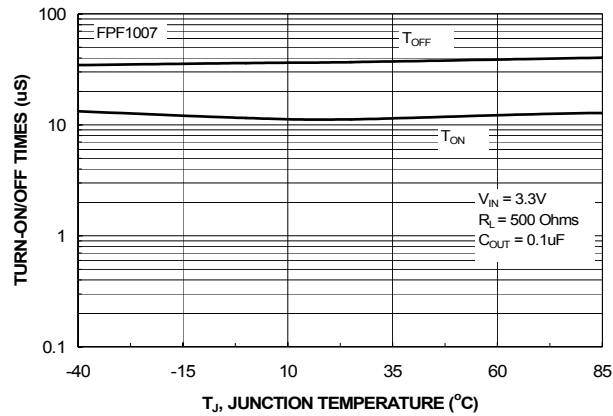


Figure 9. FPF1007  $T_{ON}$  /  $T_{OFF}$  vs. Temperature

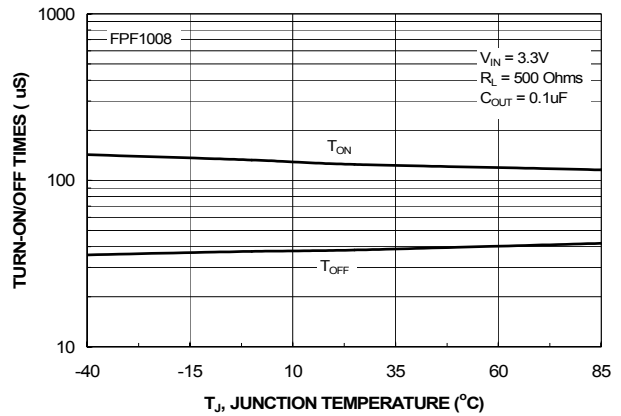


Figure 10. FPF1008  $T_{ON}$  /  $T_{OFF}$  vs. Temperature

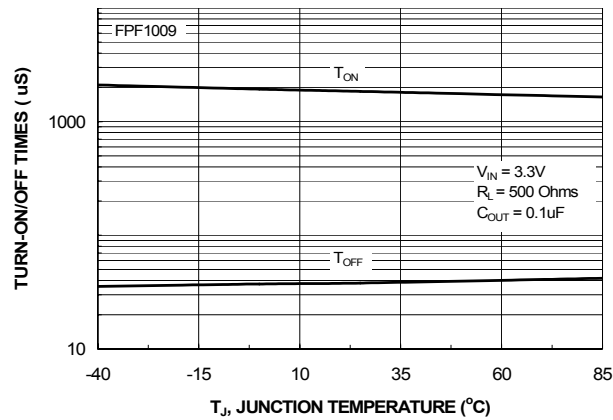


Figure 11. FPF1009  $T_{ON}$  /  $T_{OFF}$  vs. Temperature

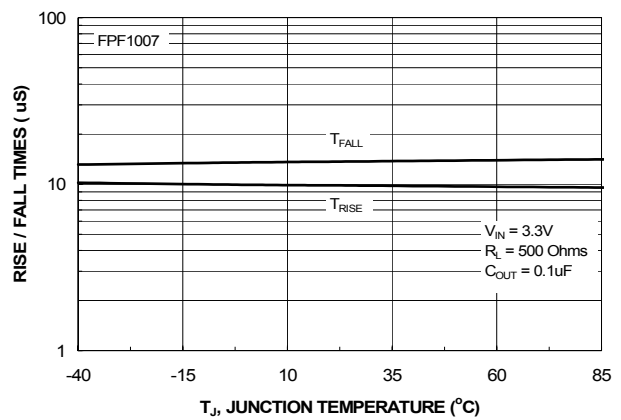


Figure 12. FPF1007  $T_{RISE}$  /  $T_{FALL}$  vs. Temperature

## Typical Characteristics

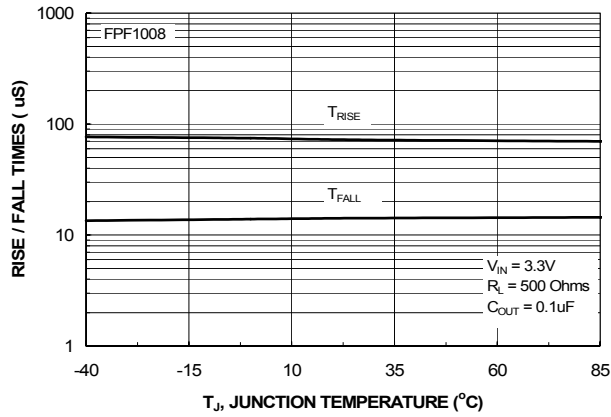


Figure 13. FPF1008 T<sub>RISE</sub> / T<sub>FALL</sub> vs. Temperature

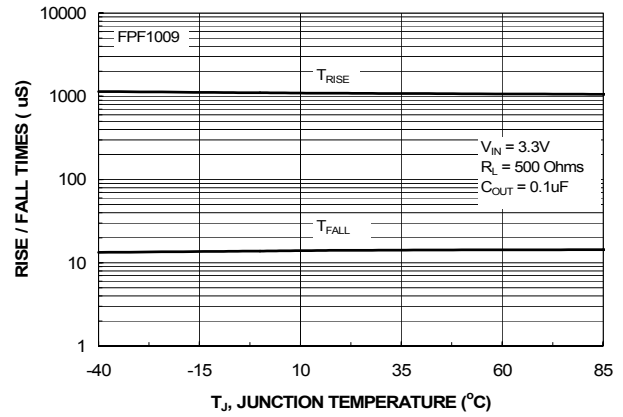


Figure 14. FPF1009 T<sub>RISE</sub> / T<sub>FALL</sub> vs. Temperature

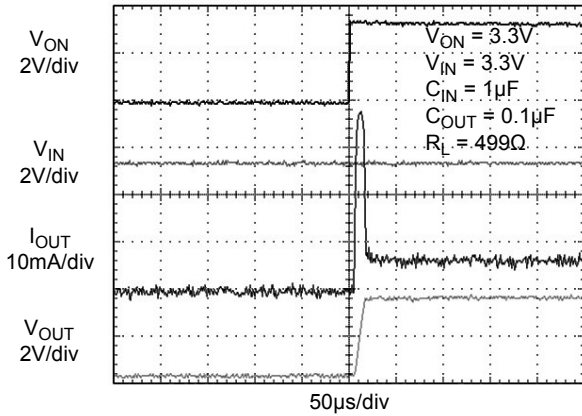


Figure 15. FPF1007 Turn ON Response

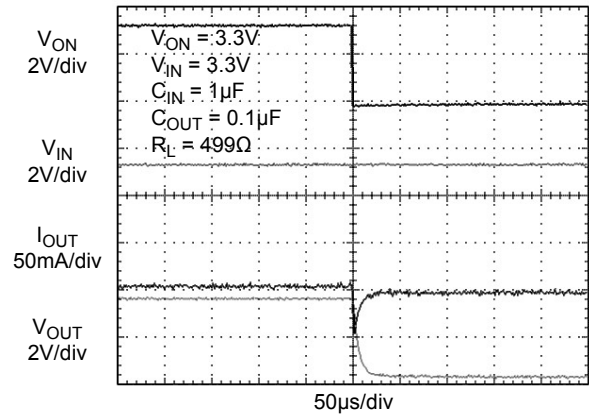


Figure 16. FPF1007 Turn OFF Response  
Load current is discharged through On-chip output discharge resistor.

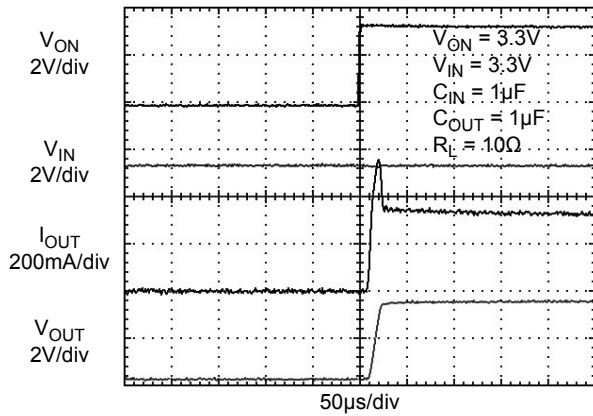


Figure 17. FPF1007 Turn ON Response (C<sub>OUT</sub> = 1μF)

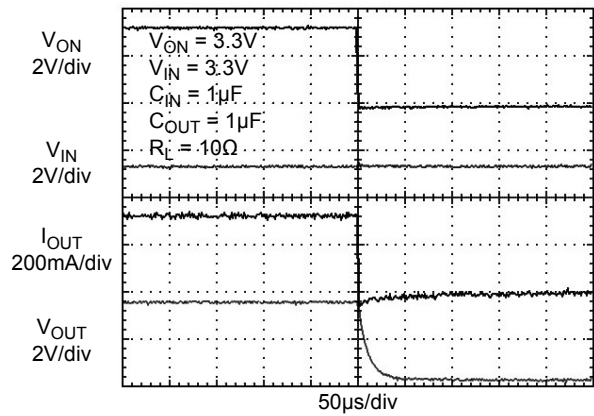


Figure 18. FPF1007 Turn OFF Response

## Typical Characteristics

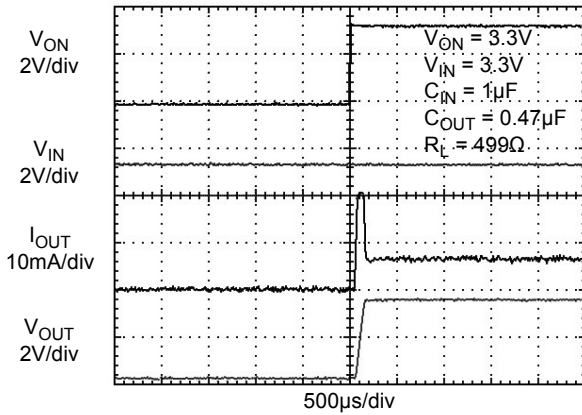


Figure 19. FPF1008 Turn ON Response

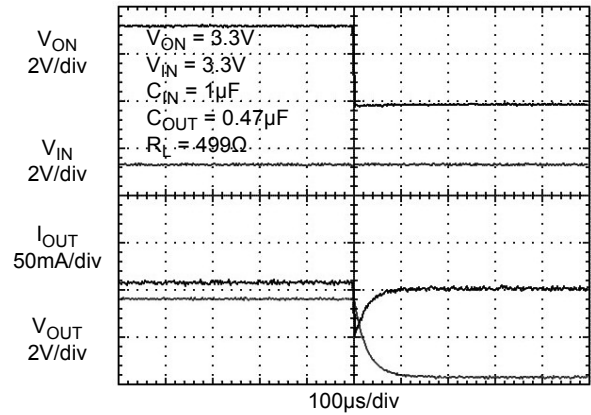


Figure 20. FPF1008 Turn OFF Response  
Load current is discharged through On-chip output discharge resistor.

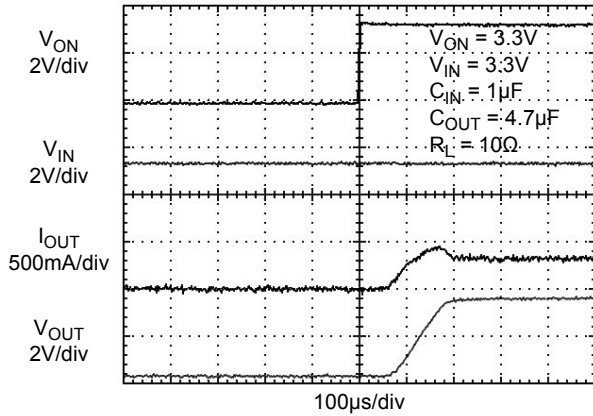


Figure 21. FPF1008 Turn ON Response ( $C_{OUT} = 4.7\mu\text{F}$ )

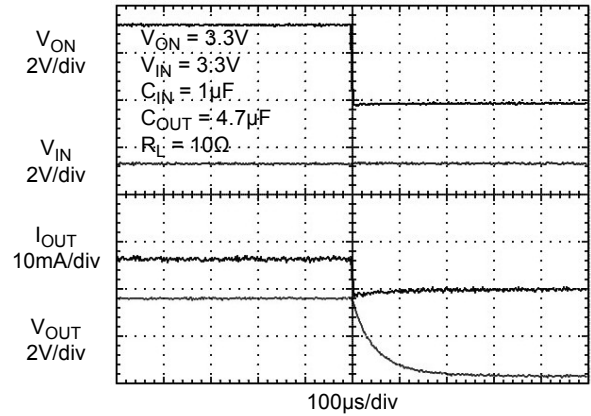


Figure 22. FPF1008 Turn OFF Response

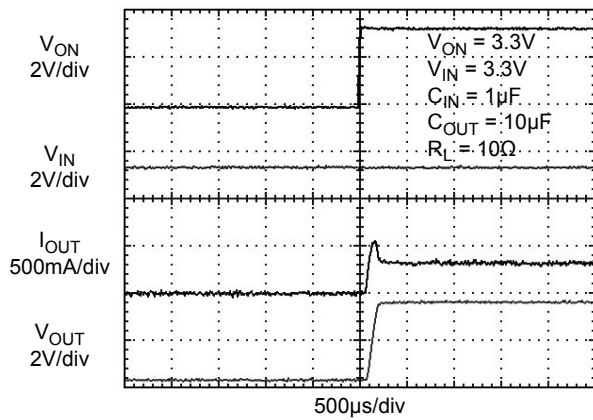


Figure 23. FPF1008 Turn ON Response ( $C_{OUT} = 10\mu\text{F}$ )

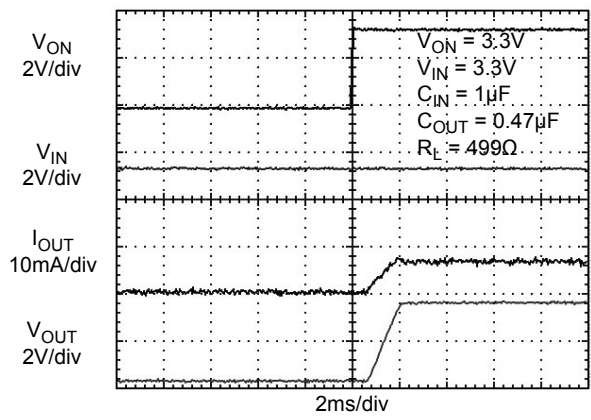


Figure 24. FPF1009 Turn ON Response



### Typical Characteristics

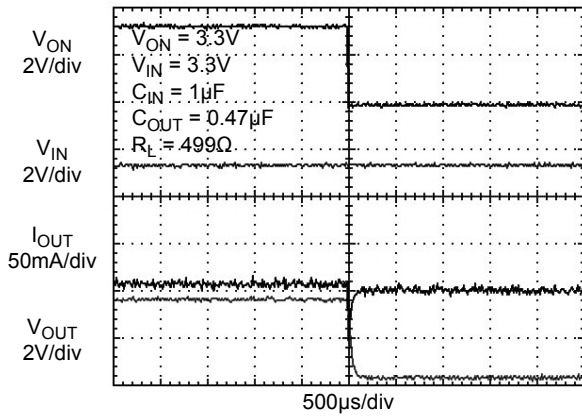


Figure 25. FPF1009 Turn OFF Response  
Load current is discharged through On-chip output discharge resistor.

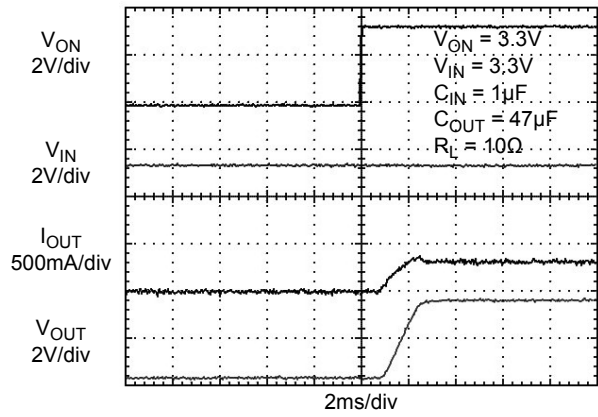


Figure 26. FPF1009 Turn ON Response ( $C_{OUT} = 47\mu F$ )

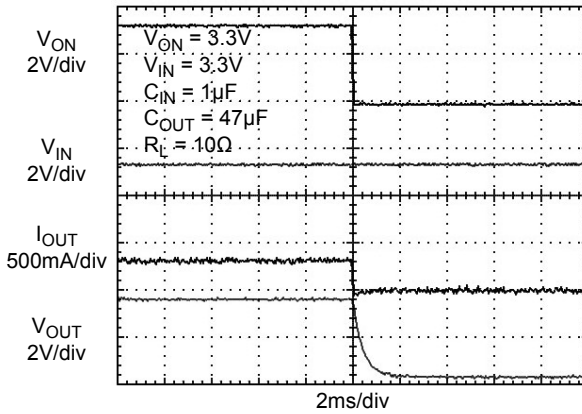


Figure 27. FPF1009 Turn OFF Response

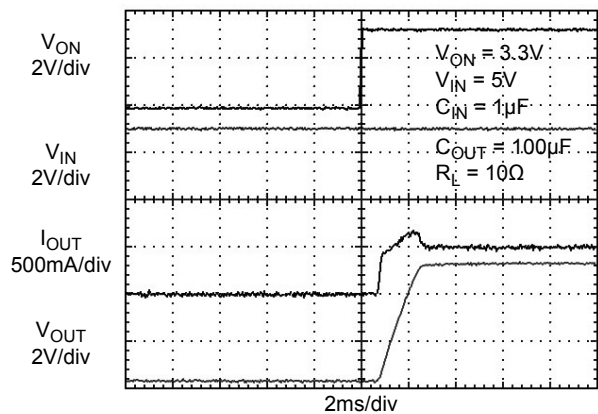
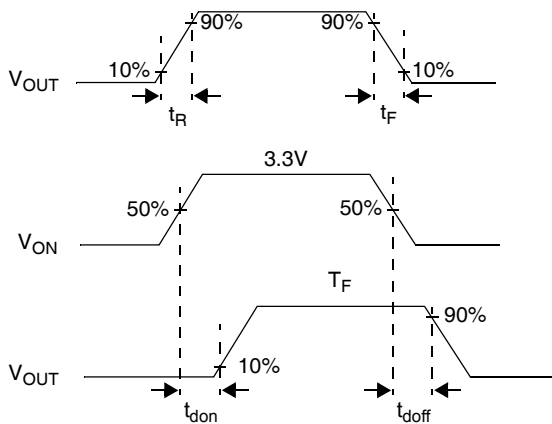


Figure 28. FPF1009 Turn ON Response  
( $C_{OUT} = 100\mu F$ ,  $V_{IN} = 5V$ )

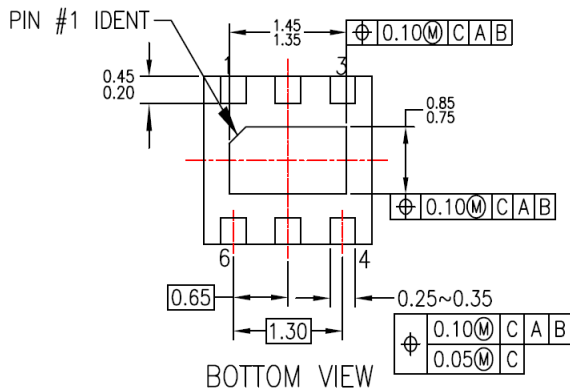
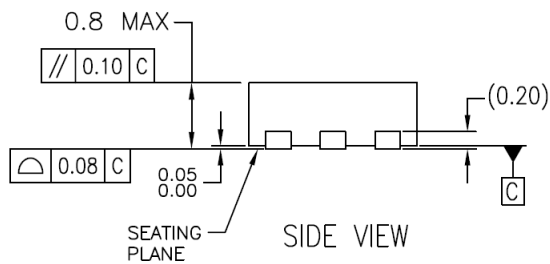
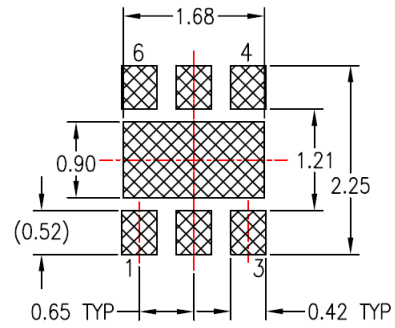
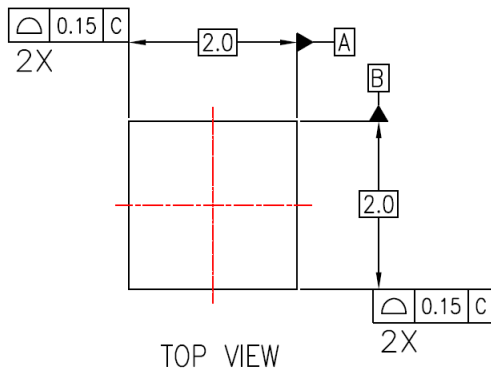
### Timing Diagram



where:

- $t_{ON}$  = Turn ON Time
- $t_{OFF}$  = Turn OFF Time
- $t_{don}$  = Turn ON Delay Time
- $t_{doff}$  = Turn OFF Delay Time
- $t_R$  = Rise Time
- $t_F$  =  $V_{OUT}$  Fall Time
- $t_{ON} = t_R + t_{don}$
- $t_{OFF} = t_F + t_{doff}$

### Dimensional Outline and Pad Layout



NOTES:


- A. NON-CONFORMS TO JEDEC REGISTRATION,
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

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| FlashWriter® *  | OPTOPLANAR®                         | SuperSOT™-6                | Ultra FRFET™         |
|   |                                     | SuperSOT™-8                | UniFET™              |
|   |                                     |                            | VCX™                 |

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- A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.