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FPF1007-FPF1009 IntelliMAX™ Advanced Load Products

Features

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

Applications

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



General Description

The FPF1007/8/9 are low R_{DS} P-Channel MOSFET load switches offered in a selection of $10\text{ }\mu\text{s}$, $80\text{ }\mu\text{s}$, and 1 ms 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 1.2 V , the input current leakage has been minimized to extend battery life, and the ESD-protection has been designed to withstand a minimum of 8 kV (HBM) and 2 kV (CDM).

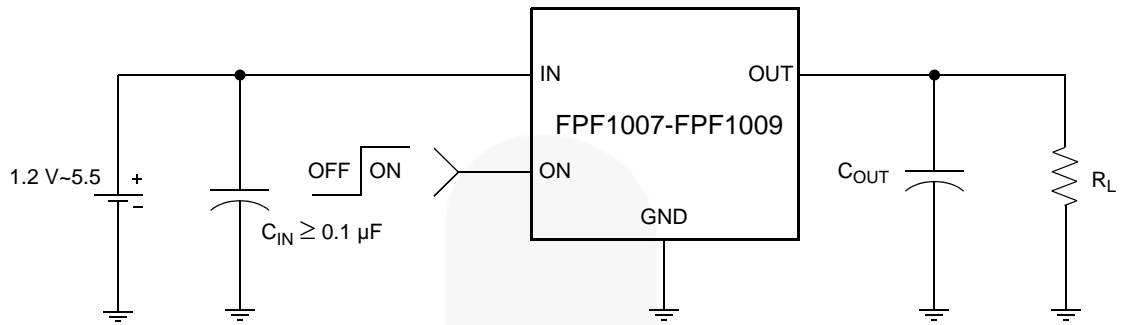
The switch is controlled by an active-high logic input (ON pin), allowing direct interface with a low-voltage control signal. An internal ON pin pull-down resistor protects against unintentional device turn-on in the initial state. An on-chip pull-down resistor on the output is enabled when the switch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



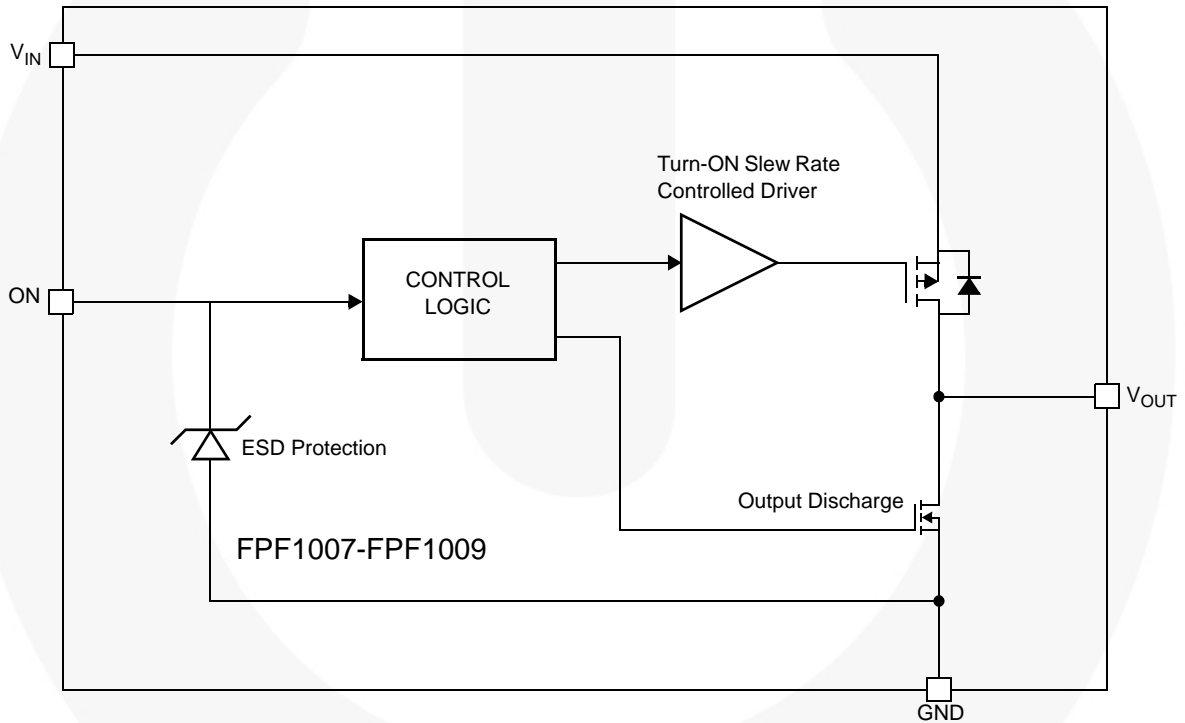
Ordering Information

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

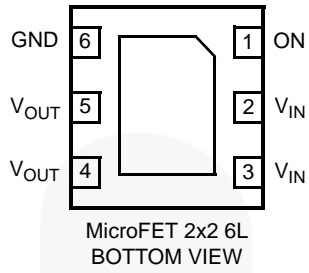
Typical Application Circuit



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	6.0	V
Maximum Continuous Switch Current		1.5	A
Power Dissipation at $T_A = 25^\circ\text{C}^{(1)}$		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	$^\circ\text{C/W}$
Electrostatic Discharge Protection	HBM	8000	V
	CDM	2000	V

Note:

Package power dissipation on 1-square inch pad, 2 oz. copper board.

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

$V_{IN} = 1.2\text{ V to } 5.5\text{ V}$, $T_A = -40\text{ to } +85^\circ\text{C}$ 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
Basic Operation						
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		μA
		$I_{OUT} = 0\text{ mA}$, $V_{IN} = 5.5\text{ V}$, $V_{ON} = \text{Enabled}$			15	
Off Supply Current	$I_{Q(\text{off})}$	$V_{ON} = \text{GND}$, $V_{OUT} = \text{OPEN}$			1	μA
Off Switch Current	$I_{SD(\text{off})}$	$V_{ON} = \text{GND}$, $V_{OUT} = \text{GND}$		0.1	1.0	μA
On-Resistance	R_{ON}	$V_{IN} = 5.5\text{ V}$, $I_{OUT} = 200\text{ mA}$, $T_A = 25^\circ\text{C}$		30	40	$\text{m}\Omega$
		$V_{IN} = 3.3\text{ V}$, $I_{OUT} = 200\text{ mA}$, $T_A = 25^\circ\text{C}$		40	55	
		$V_{IN} = 1.5\text{ V}$, $I_{OUT} = 200\text{ mA}$, $T_A = 25^\circ\text{C}$		100	130	
		$V_{IN} = 1.2\text{ V}$, $I_{OUT} = 200\text{ mA}$, $T_A = 25^\circ\text{C}$		175	250	
		$V_{IN} = 3.3\text{ V}$, $I_{OUT} = 200\text{ mA}$, $T_A = -40^\circ\text{C to } +85^\circ\text{C}$	20		65	
Output Pull Down Resistance	R_{PD}	$V_{IN} = 3.3\text{ V}$, $V_{ON} = 0\text{ V}$, $T_A = 25^\circ\text{C}$		60		Ω
ON Input Logic Low Voltage	V_{IL}	$V_{IN} = 1.2\text{ V to } 5.5\text{ V}$			0.4	V
ON Input Logic High Voltage	V_{IH}	$V_{IN} = 1.2\text{ V to } 5.5\text{ V}$	1			V
ON Input Leakage (On)		$V_{ON} = V_{IN} = 5.5\text{ V}$			10	μA
ON Input Leakage (Off)		$V_{ON} = \text{GND}$			1	μA
Dynamic						
FPF1007						
Turn On	t_{ON}	$V_{IN} = 3.3\text{ V}$, $R_L = 500\ \Omega$, $R_{L_CHIP} = 60\ \Omega$, $C_{OUT} = 0.1\ \mu\text{F}$, $T_A = 25^\circ\text{C}$		12		μs
Rise Time	t_R			10		μs
Turn Off	t_{OFF}			40		μs
Fall Time	t_F			15		μs
FPF1008						
Turn On	t_{ON}	$V_{IN} = 3.3\text{ V}$, $R_L = 500\ \Omega$, $R_{L_CHIP} = 60\ \Omega$, $C_{OUT} = 0.1\ \mu\text{F}$, $T_A = 25^\circ\text{C}$		125		μs
Rise Time	t_R			80		μs
Turn Off	t_{OFF}			40		μs
Fall Time	t_F			15		μs
FPF1009						
Turn On	t_{ON}	$V_{IN} = 3.3\text{ V}$, $R_L = 500\ \Omega$, $R_{L_CHIP} = 60\ \Omega$, $C_{OUT} = 0.1\ \mu\text{F}$, $T_A = 25^\circ\text{C}$		2		ms
Rise Time	t_R			1		ms
Turn Off	t_{OFF}			40		μs
Fall Time	t_F			15		μs

Typical Characteristics

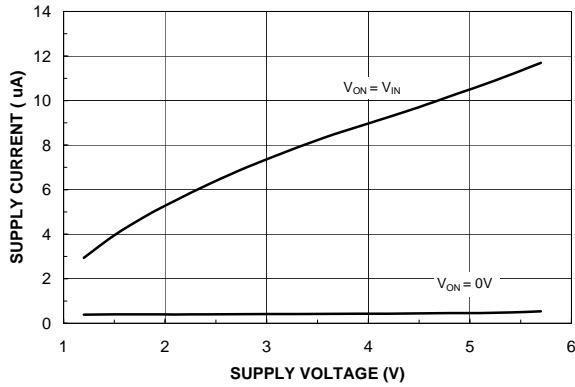


Figure 1. Quiescent Current vs. Input Voltage

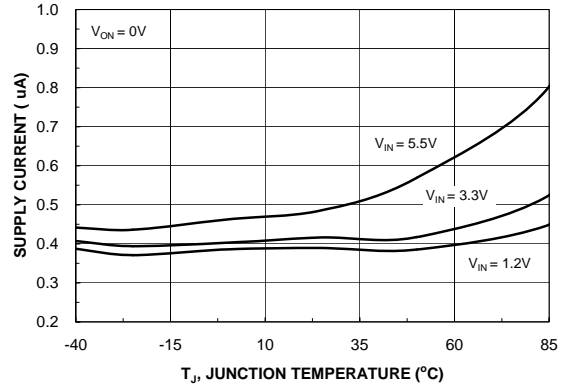


Figure 2. Quiescent Current vs. Temperature

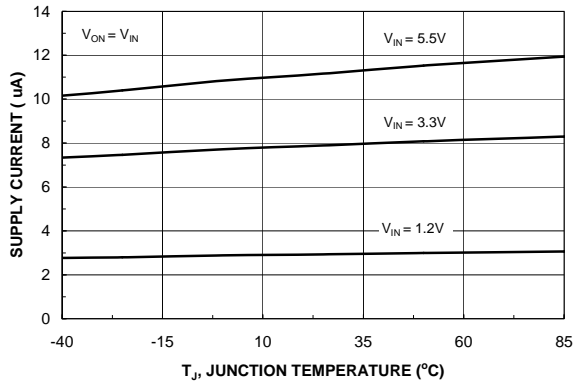


Figure 3. Quiescent Current vs. Temperature

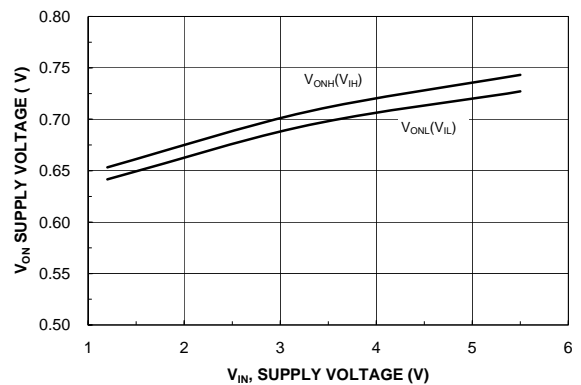


Figure 4. V_{ON} Voltage vs. Input Voltage

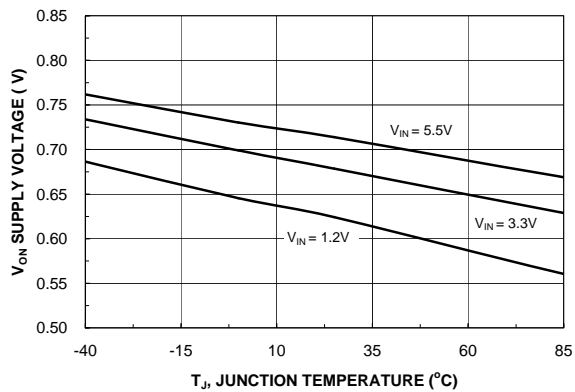


Figure 5. V_{ON} Low Voltage vs. Temperature

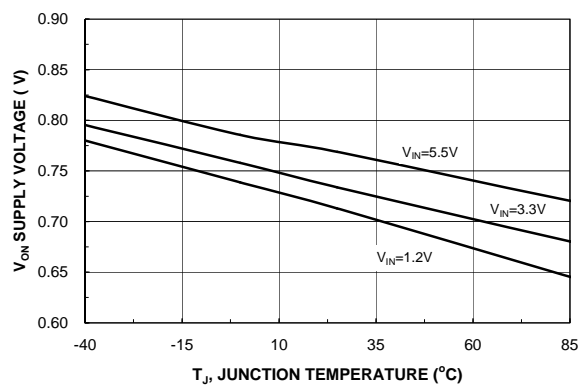


Figure 6. V_{ON} High Voltage vs. Temperature

Typical Characteristics

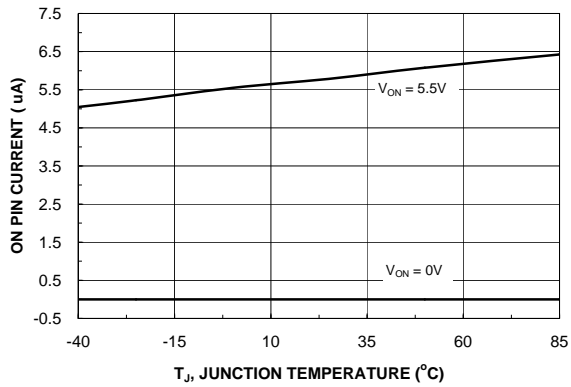


Figure 7. On Pin Current vs. Temperature

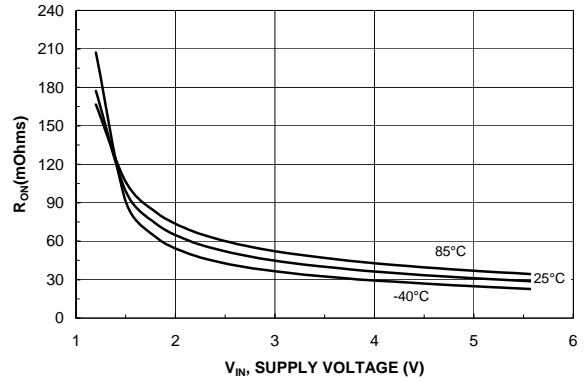


Figure 8. R_{ON} vs. V_{IN}

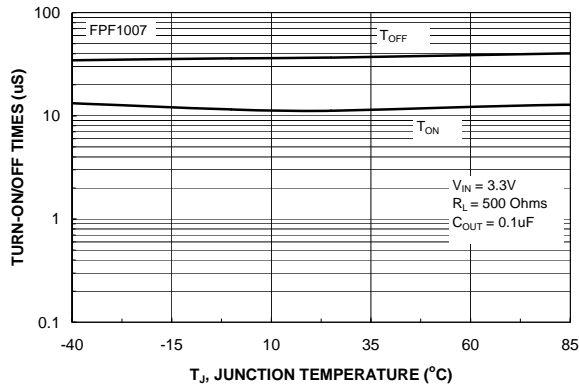


Figure 9. FPF1007 t_{ON} / t_{OFF} vs. Temperature

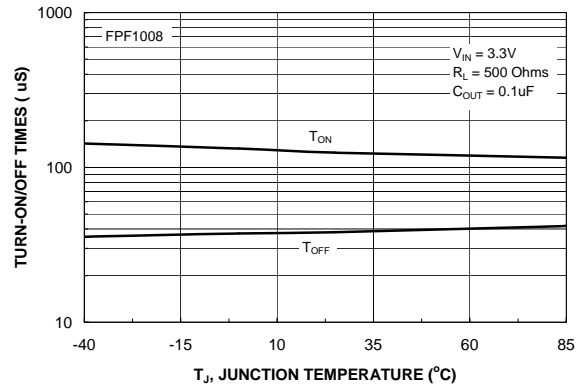


Figure 10. FPF1008 t_{ON} / t_{OFF} vs. Temperature

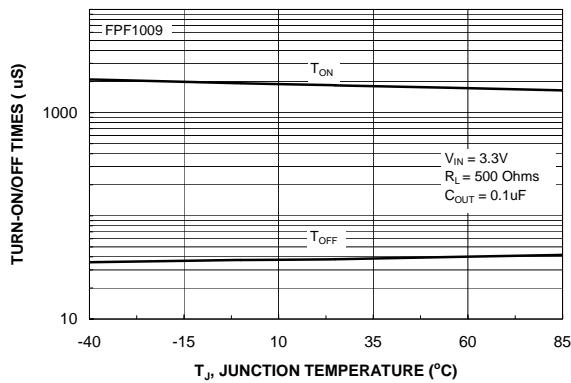


Figure 11. FPF1009 t_{ON} / t_{OFF} vs. Temperature

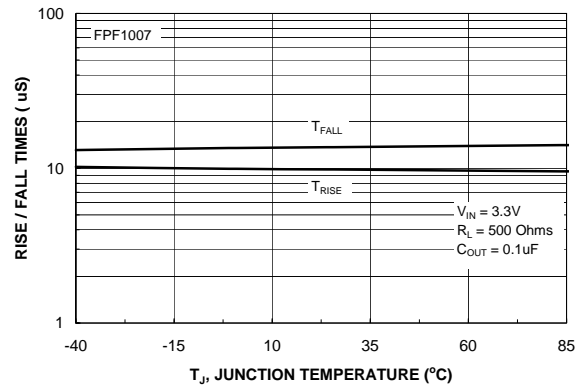


Figure 12. FPF1007 t_{RISE} / t_{FALL} vs. Temperature

Typical Characteristics

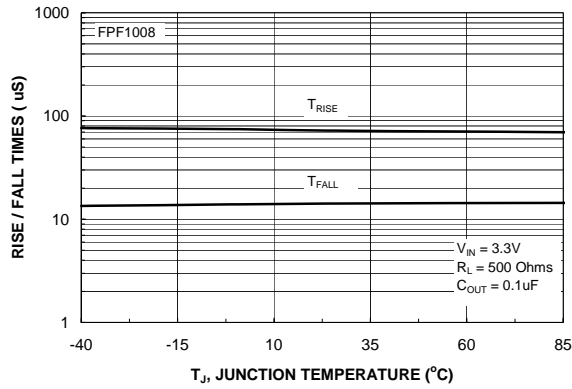


Figure 13. FPF1008 t_{RISE} / t_{FALL} vs. Temperature

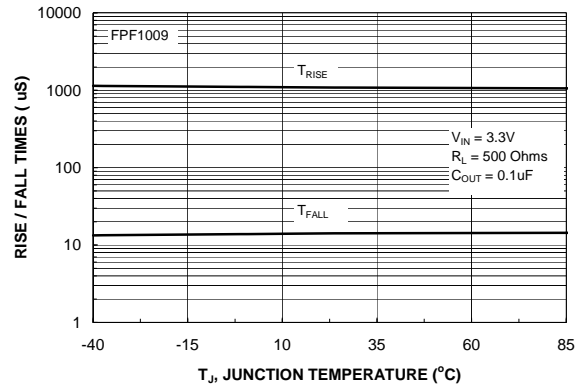


Figure 14. FPF1009 t_{RISE} / t_{FALL} vs. Temperature

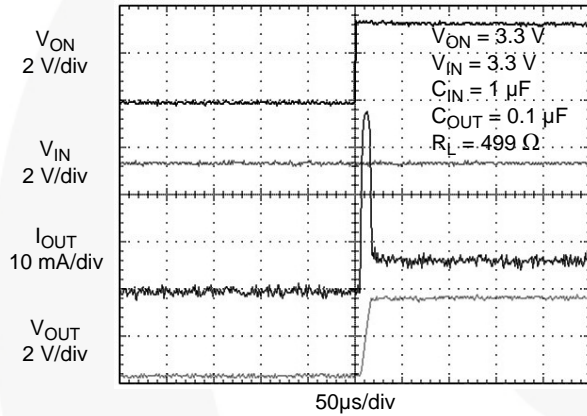


Figure 15. FPF1007 Turn-On Response

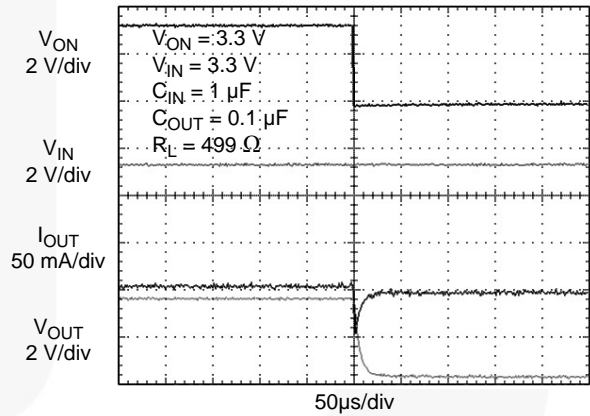


Figure 16. FPF1007 Turn-Off Response
Load current discharged through on-chip output discharge resistor

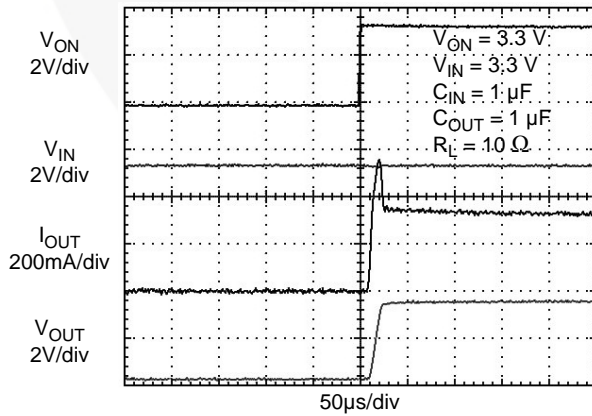


Figure 17. FPF1007 Turn-On Response ($C_{OUT} = 1 \mu F$)

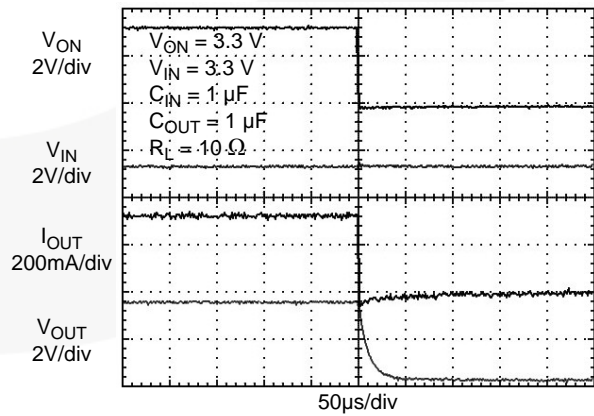


Figure 18. FPF1007 Turn-Off Response

Typical Characteristics

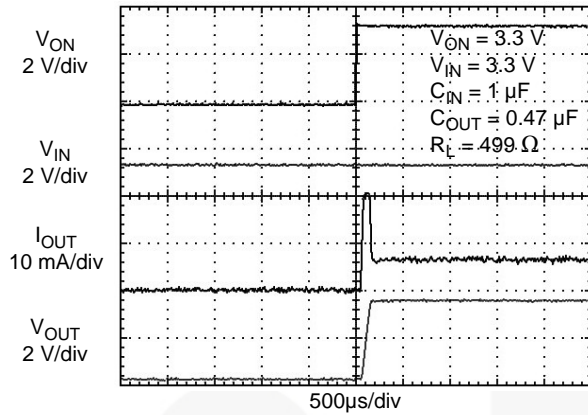


Figure 19. FPF1008 Turn-On Response

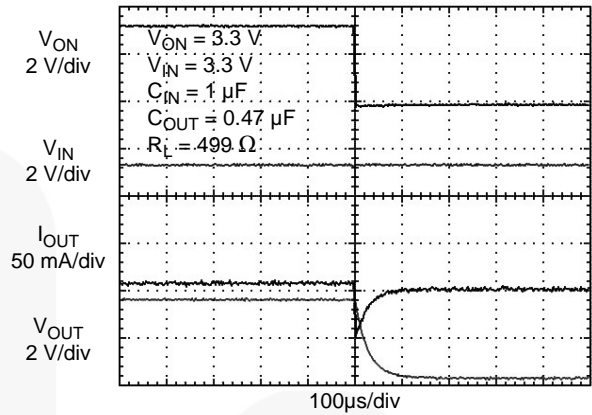


Figure 20. FPF1008 Turn-Off Response
Load current discharged through on-chip output discharge resistor

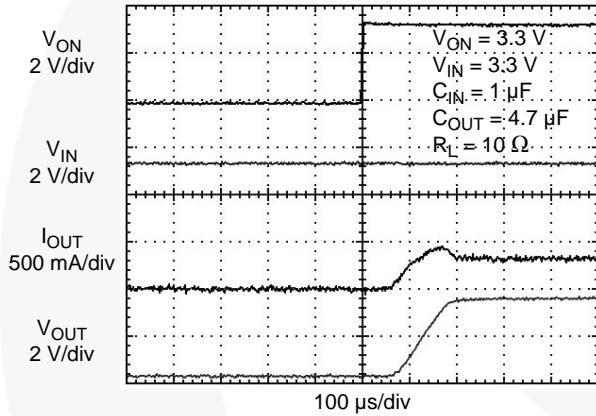


Figure 21. FPF1008 Turn-On Response ($C_{OUT} = 4.7\text{ }\mu\text{F}$)

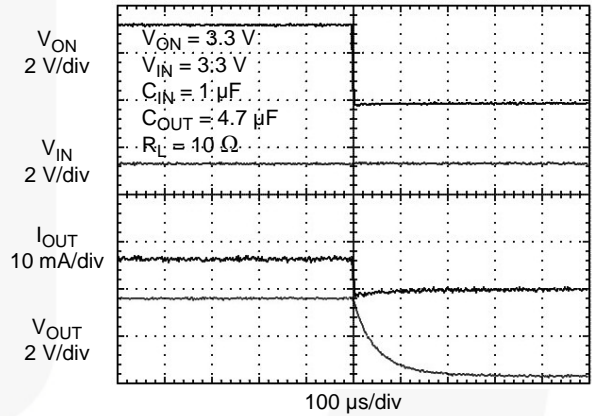


Figure 22. FPF1008 Turn-Off Response

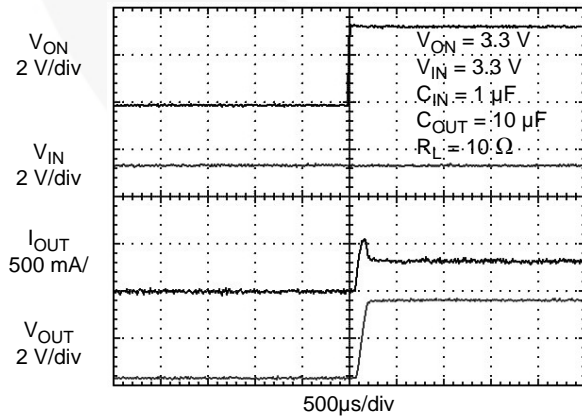


Figure 23. FPF1008 Turn-On Response ($C_{OUT} = 10\text{ }\mu\text{F}$)

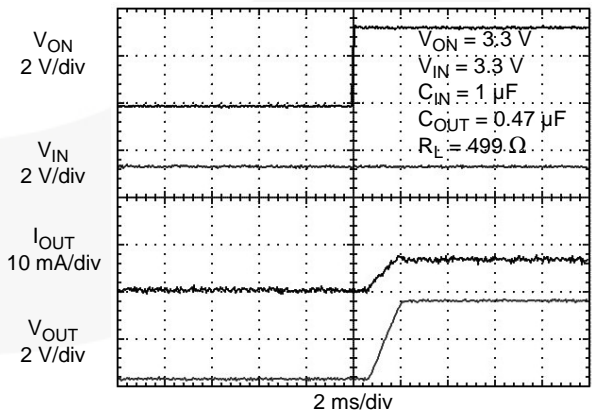


Figure 24. FPF1009 Turn-On Response

Typical Characteristics

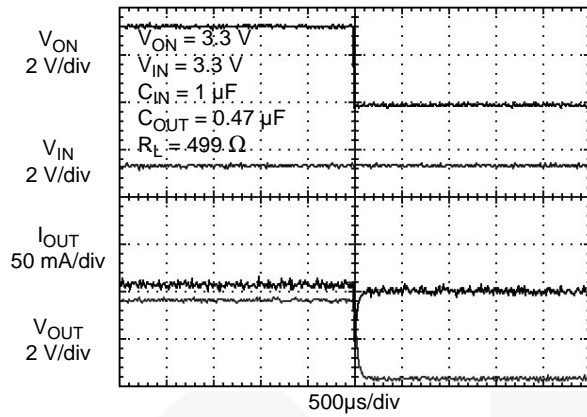


Figure 25. FPF1009 Turn-Off Response
Load current discharged through on-chip output discharge resistor

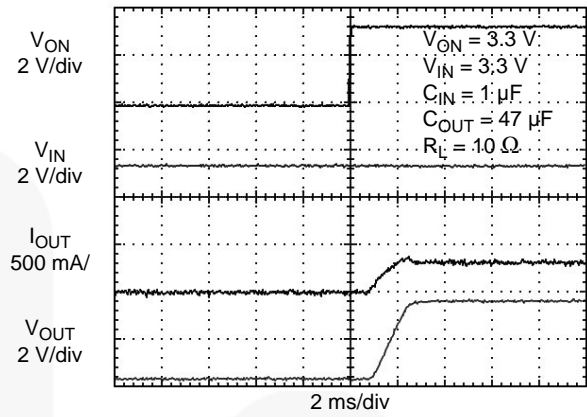


Figure 26. FPF1009 Turn-On Response ($C_{OUT} = 47 \mu\text{F}$)

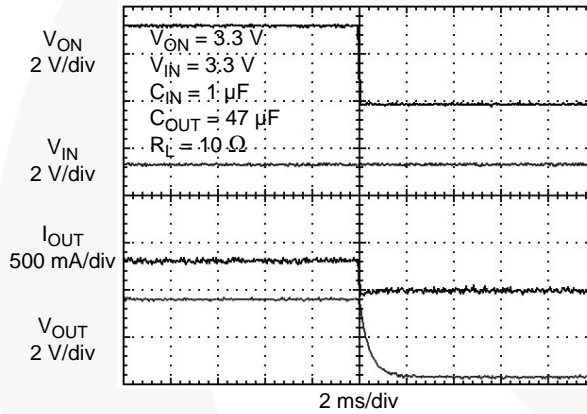


Figure 27. FPF1009 Turn-Off Response

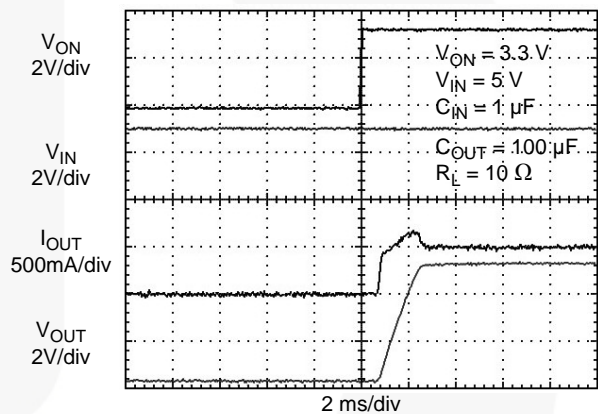
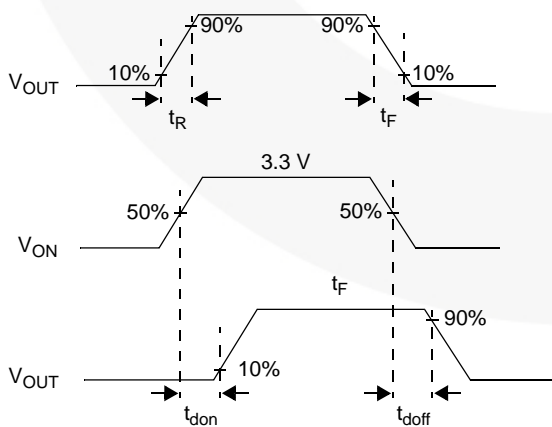


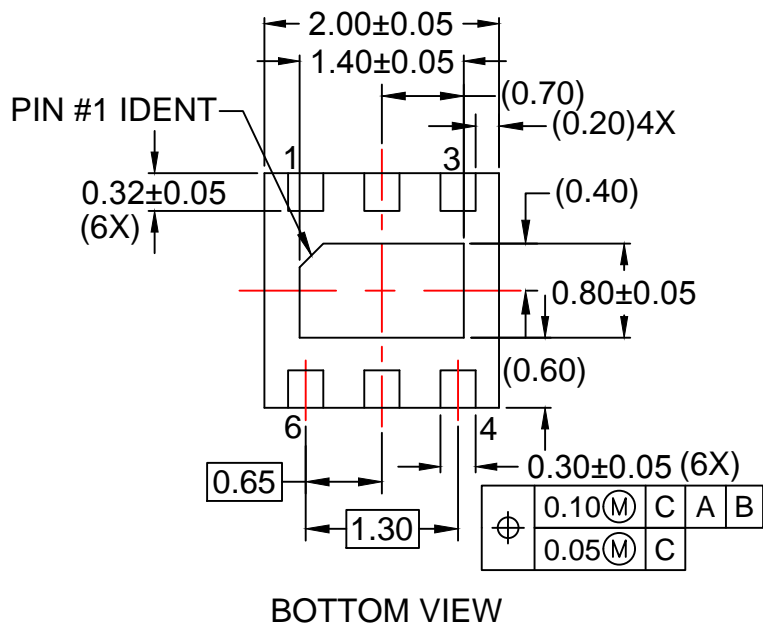
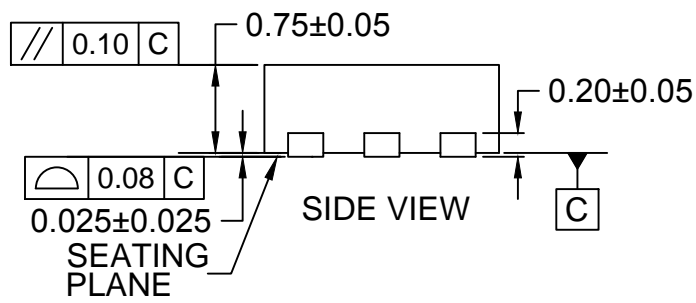
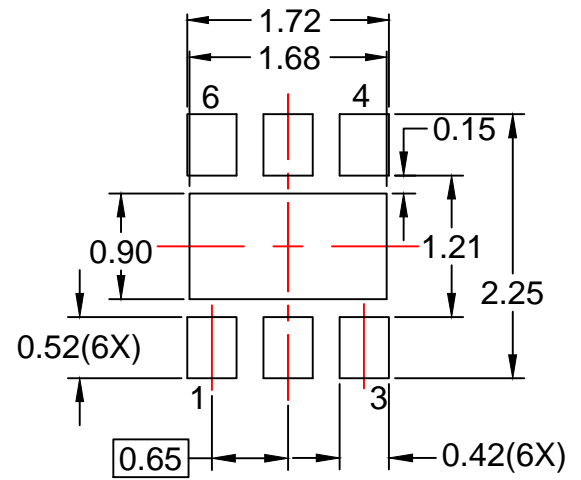
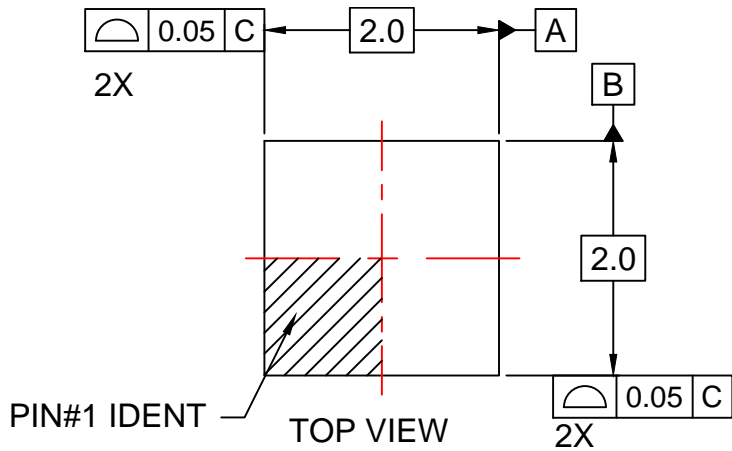
Figure 28. FPF1009 Turn-On Response
($C_{OUT} = 100 \mu\text{F}$, $V_{IN} = 5 \text{ V}$)

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
- $t_{ON} = t_R + t_{don}$
- $t_{OFF} = t_F + t_{doff}$



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