FAIRCHILD SEMICONDUCTOR®

January 2008

Power-SPM™

FPP06R001

75V/60A Synchronous Rectifier Module

General Features

- Very High Rectification Efficiency at Output 12V
- Integrated Solution for Saving Board Space
- Improved Driving Capability with Prominent Internal Driver IC
- RoHS Compliant

Sync-Rectifier Switch Features

- $R_{DS(ON)}$ = 3.5mΩ(Typ.), V_{IN} = 10V, I_D = 40A
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)

Driver IC Features

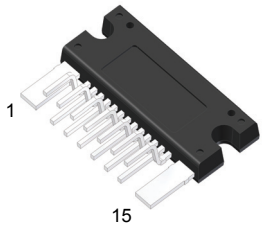
- 2.5A Max Current Driving Capability
- Low Propagation Delay Time
- Optimized for Increasing Driving Capability Using General Low-Current Gate Driver with a Minimum Delay Time

General Description

The FPP06R001 is one product in the Power-SPM™ family that Fairchild has newly developed and designed to be most suitable for more compact and more efficient synchronous rectification applications such as internet server power supplies and telecom system power supplies. For higher efficiency, it includes built-in very low $R_{DS(ON)}$ MOSFETs. In addition, it includes the superior gate driver that supports higher driving capability to be more suitable for these low $R_{DS(ON)}$ MOSFETs. This Power-SPM device can be used in the secondary side of the PWM transformer of forward/bridge converter to provide high current rectification at output voltages ranging from 12 Volts down to 5 Volts. With this product, it is possible to design the secondary side of power supply systems with reduced parasitic elements resulting in minimized voltage spike and EMI noise.

Applications

- High Current Isolated Converter
- Distributed Power Architectures



EPM15 Package

Block Diagram

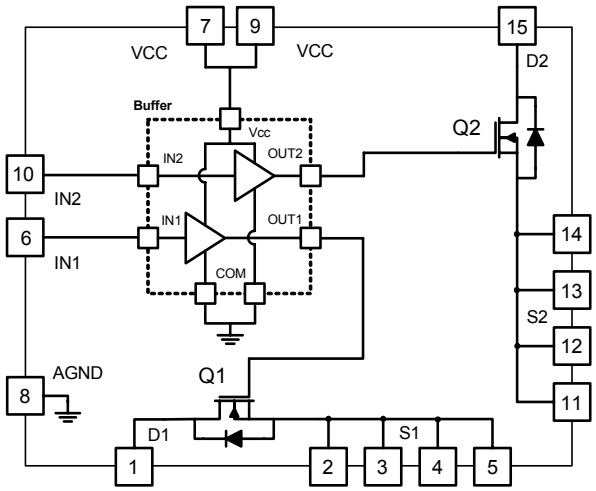


Figure 1. FPP06R001 Module Block Diagram

Pin Configuration and Pin Description

Top View

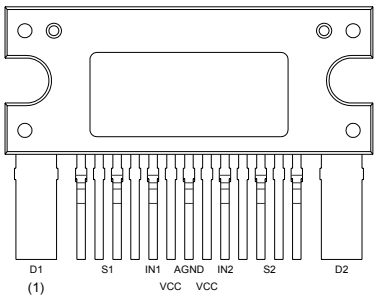


Figure 2. Pinmap of FPP06R001

Pin Number	Pin Name	Pin Description
1	D1	Drain of Q1, MOSFET
2 ~ 5	S1	Source of Q1, MOSFET
6	IN1	Input signal for Q1, MOSFET
7	VCC	Supply voltage for Driver IC
8	AGND	Analog ground
9	VCC	Supply voltage for Driver IC
10	IN2	Input signal for Q2, MOSFET
11 ~ 14	S2	Source of Q2, MOSFET
15	D2	Drain of Q2, MOSFET

Absolute Maximum Ratings T_C = 25°C, Unless Otherwise Specified

Symbol	Parameter		Rating	Unit
V_{DS}	Drain to Source Voltage	(Note1)	75	V
V_{IN}	Input Voltage		V_{CC} + 0.3	V
I_D	Drain Current, Continuous (V_{IN} = 10V)	(Note1)	60	A
E_{AS}	Single Pulse Avalanche Energy	(Note1,2)	681	mJ
V_{CC}	Driver IC Supply Voltage		20	V
T_J, T_{STG}	Operating and Storage Temperature Range		-40 ~ 125	°C

Thermal Resistance

Symbol	Parameter		Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance	(Note1)	-	-	3.9	°C/W

Note:

1. Each MOSFET Switch
2. Starting T_J = 25°C, V_D = 40V, L = 0.2mH, I_{AS} = 56.4A

Electrical Characteristics T_C = 25°C, Unless Otherwise Specified

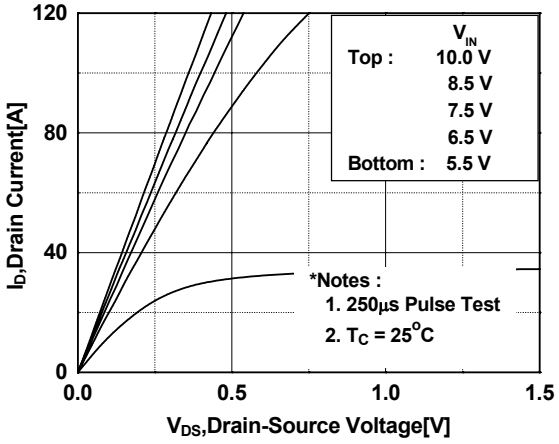
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Sync-Rectifier Switch Part (Each Switch)						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D= 250μA, V_{IN} = 0V Source is connected to AGND	75	-	-	V
I_{DSS}	Zero IN Voltage Drain Current	V_{IN} = 0V, V_{DS} = 60V Source is connected to AGND	-	-	1	μA
$V_{IN(TH)}$	IN Threshold Voltage	V_{CC} = 15V, V_D = 20V, I_{DS} = 250μA Source is connected to AGND	2.5	-	4.5	V
$R_{DS(ON)}$	Drain to Source On Resistance	V_{CC} = 15V, I_D = 40A, V_{IN} = 10V	-	3.5	4.3	mΩ
		Source is connected to AGND, T_J = 125°C	-	6.3	-	
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 80A	-	-	1.25	V
		I_{SD} = 40A	-	-	1.0	
t_{rr}	Reverse Recovery Time	I_{SD} = 40A, dI_{SD}/dt = 100A/μs	-	42	-	ns
Q_{rr}	Reverse Recovery Charge	I_{SD} = 40A, dI_{SD}/dt = 100A/μs	-	62	-	nC
Driver IC Part						
V_{CC}	Supply Voltage		5	-	20	V
I_{SOURCE}	Peak Output Source Current	V_{CC} = 15V	-	-	-2.5	A
I_{SINK}	Peak Output Sink Current	V_{OUT} = 15V	2.5	-	-	A
V_{OH}	Output Voltage High	V_{CC} = V_{IN} = 15V	14.0	-	-	V
V_{OL}	Output Voltage Low	V_{CC} = 15V, V_{IN} = 0V	-	-	1.0	V
R_{ON}	Turn-on Output Resistance		-	5	-	Ω
R_{OFF}	Turn-off Output Resistance		-	0	-	Ω
I_{QCC}	Quiescent Supply Current	V_{CC} = 20V, V_{IN} = 0V	-	-	2	μA
R_{LIN}	Input Pull-down Resistance		-	50	-	kΩ
R_{LOUT}	Output Pull-down Resistance		-	10	-	kΩ
td1	Output Turn-On Propagation Delay	f_{IN} = 20kHz	-	-	20	ns
td2	Output Turn-Off Propagation Delay	f_{IN} = 20kHz	-	-	20	ns
Switching Time						
t_{ON}	Turn-On Time	V_{CC} = 15V, I_D = 40A V_{IN} = 10V, V_{DD} = 40V, R_{IN} = 5Ω (Note3)	-	-	100	ns
$t_{d(on)}$	Turn-On Delay Time		-	25	-	ns
t_r	Rise Time		-	40	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	50	-	ns
t_f	Fall Time		-	22	-	ns
t_{OFF}	Turn-Off Time		-	-	115	ns

Note:

3. t_{ON} and t_{OFF} include the propagation delay time of the internal driver IC. For the detailed information, please see Figure 14.

Typical Performance Characteristics 1. Each Switch, 2. V_{CC} = 15V, Unless Otherwise Specified

Figure 3. On-Region Characteristics



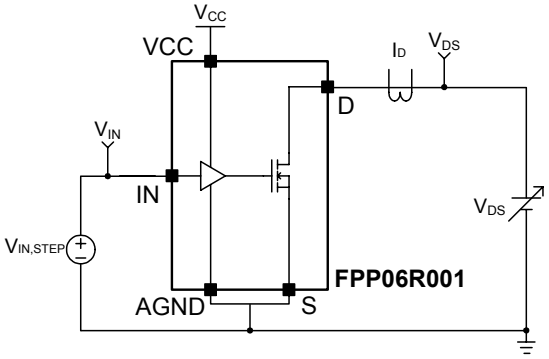
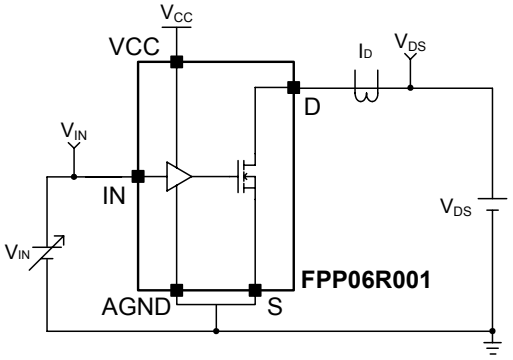


Figure 4. Transfer Characteristics



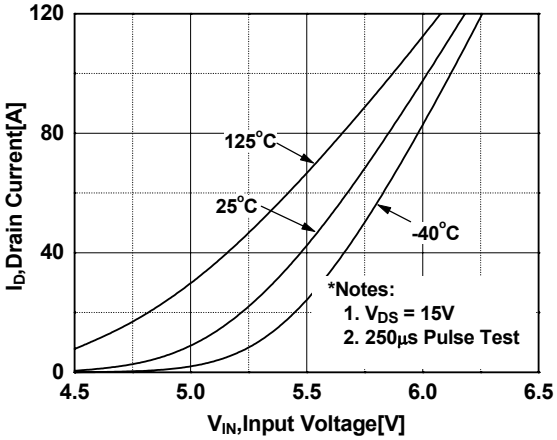


Figure 5. Body Diode Forward Voltage Variation vs. Source Current and Temperature

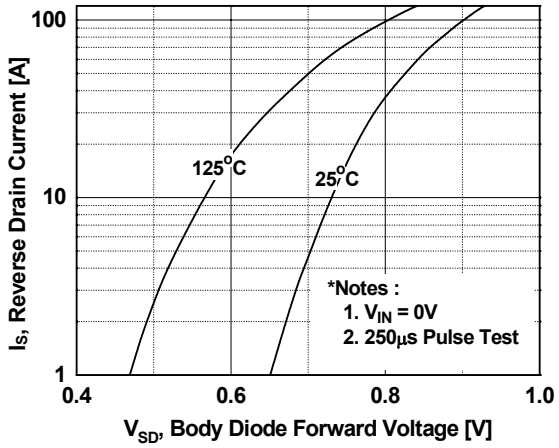
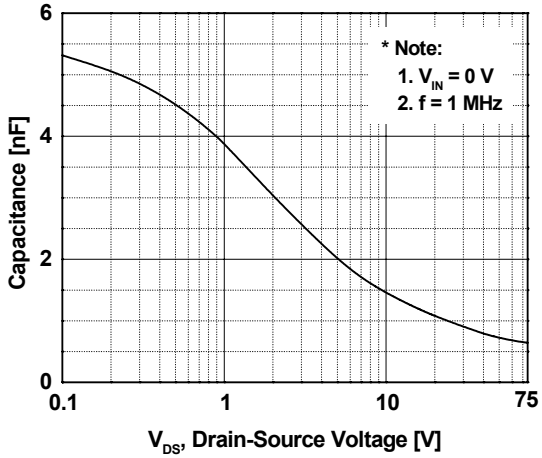


Figure 6. Output Capacitance Characteristic



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

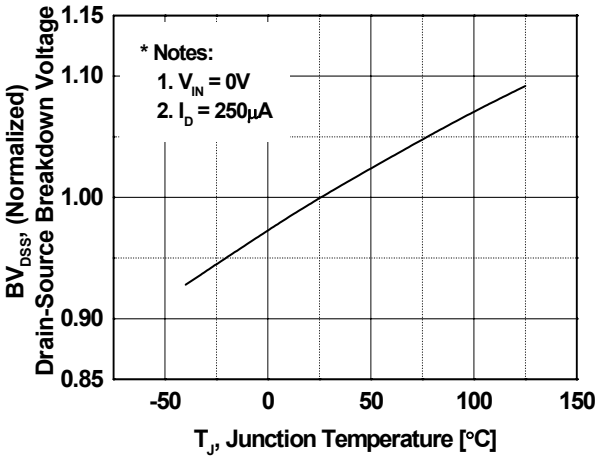


Figure 8. On-Resistance Variation vs. Temperature

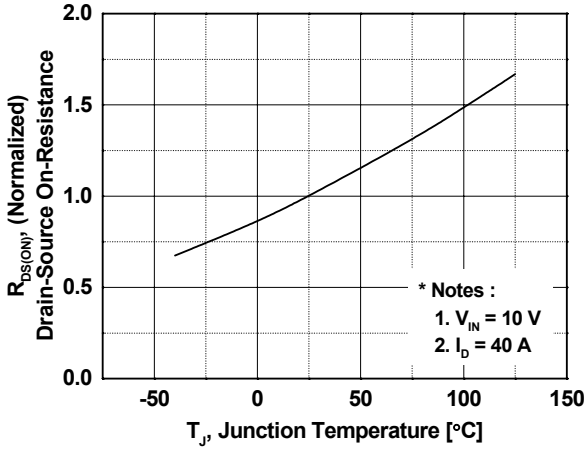


Figure 9. Transient Thermal Response Curve

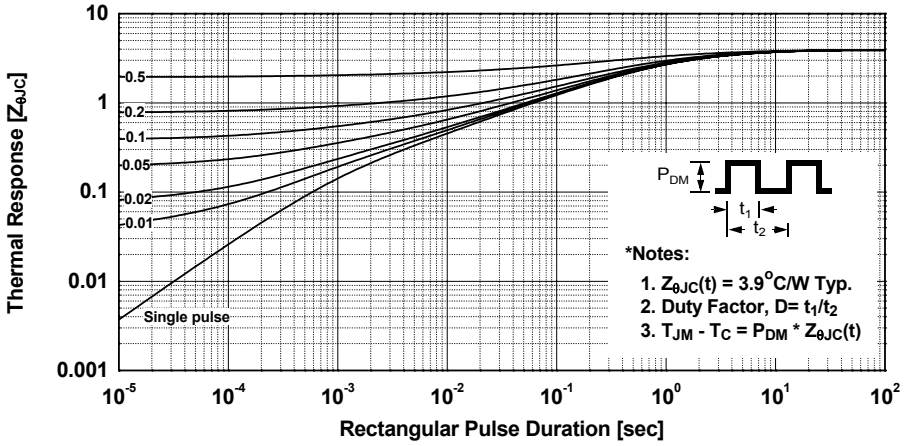


Figure 10. Maximum Safe Operating Area

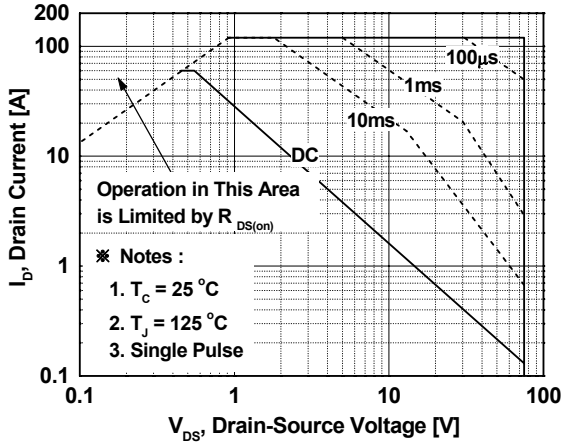
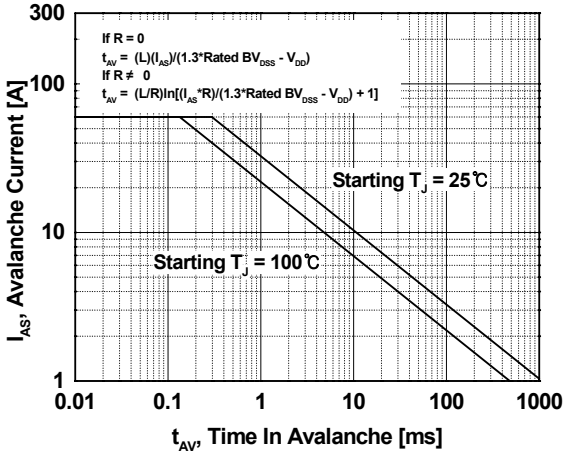


Figure 11. Unclamped Inductive Switching Capability



AC Test Circuits and Waveforms

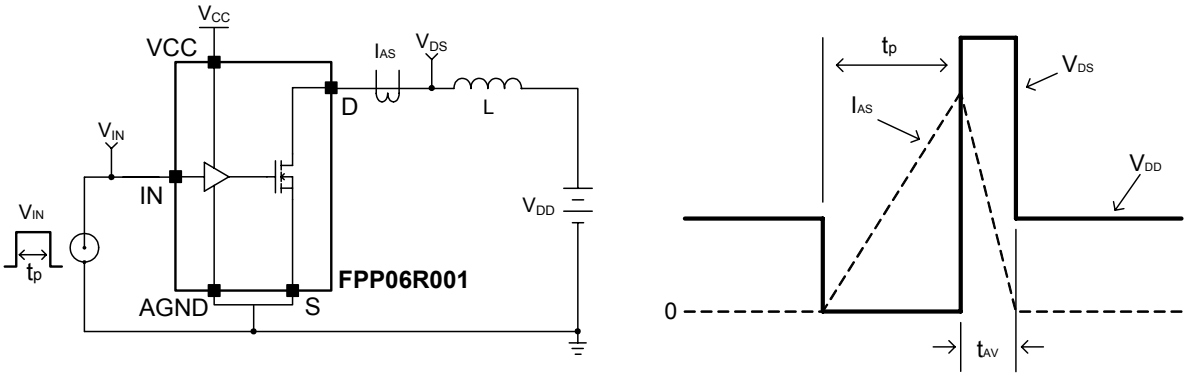


Figure 12. Unclamped Inductive Switching Test Circuit and Waveforms

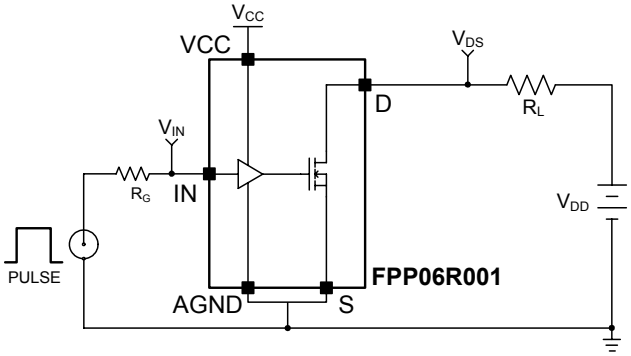


Figure 13. Switching Test Circuit

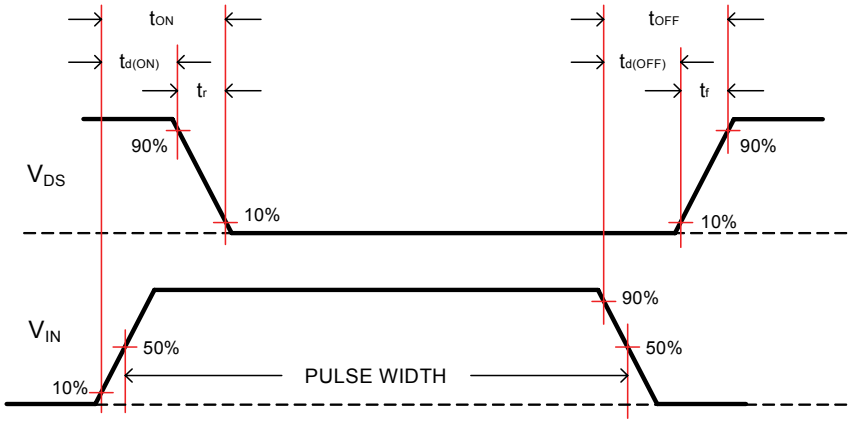


Figure 14. Switching Test Waveforms

Application circuits

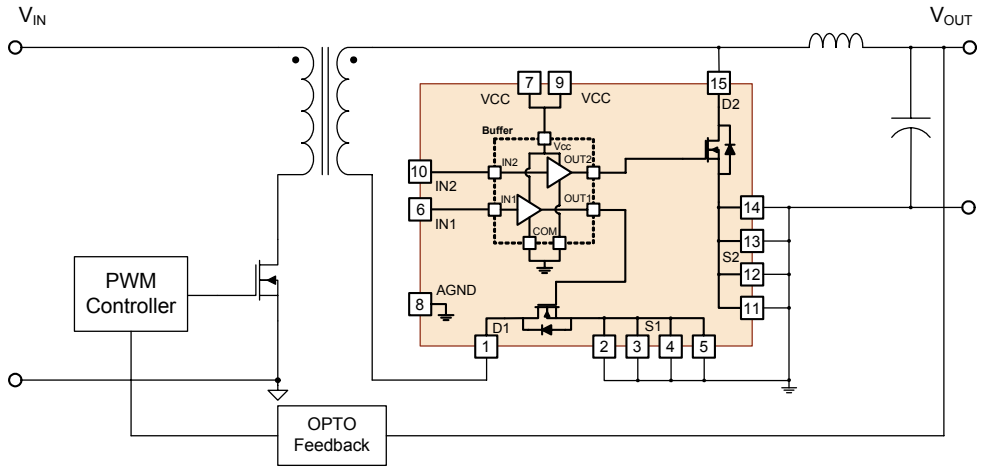


Figure 15. Application Circuit of Forward Converter with FPP06R001

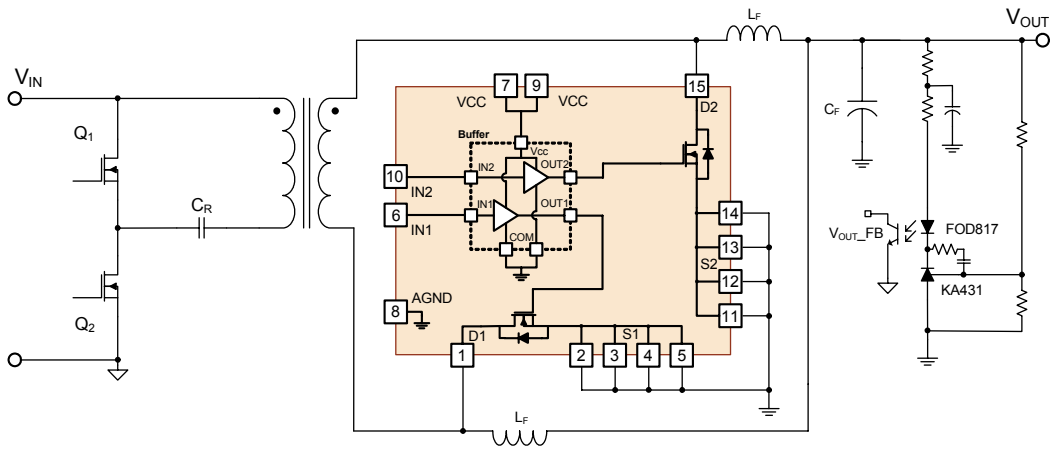


Figure 16. Application Circuit of Asymmetrical HB Converter with FPP06R001

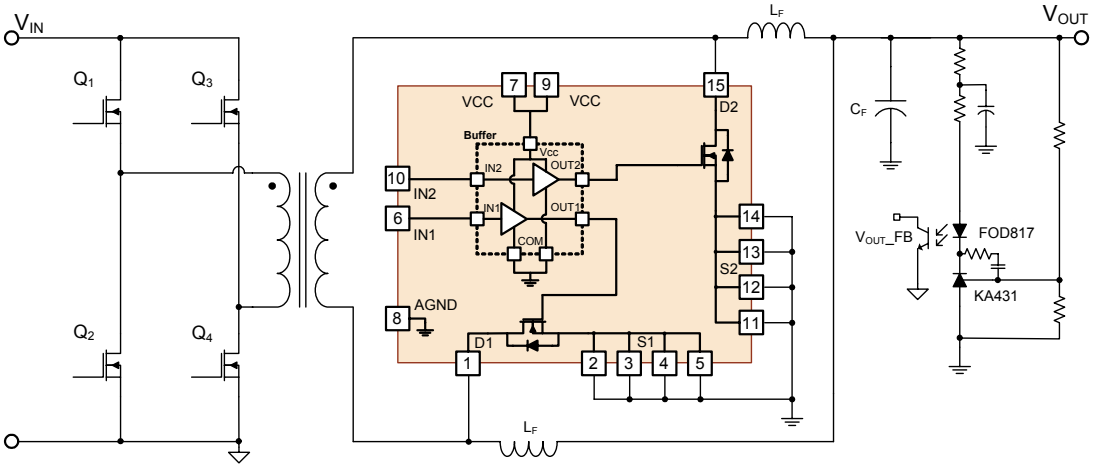


Figure 17. Application Circuit of Full Bridge Converter with FPP06R001

Detailed Package Outline Drawings

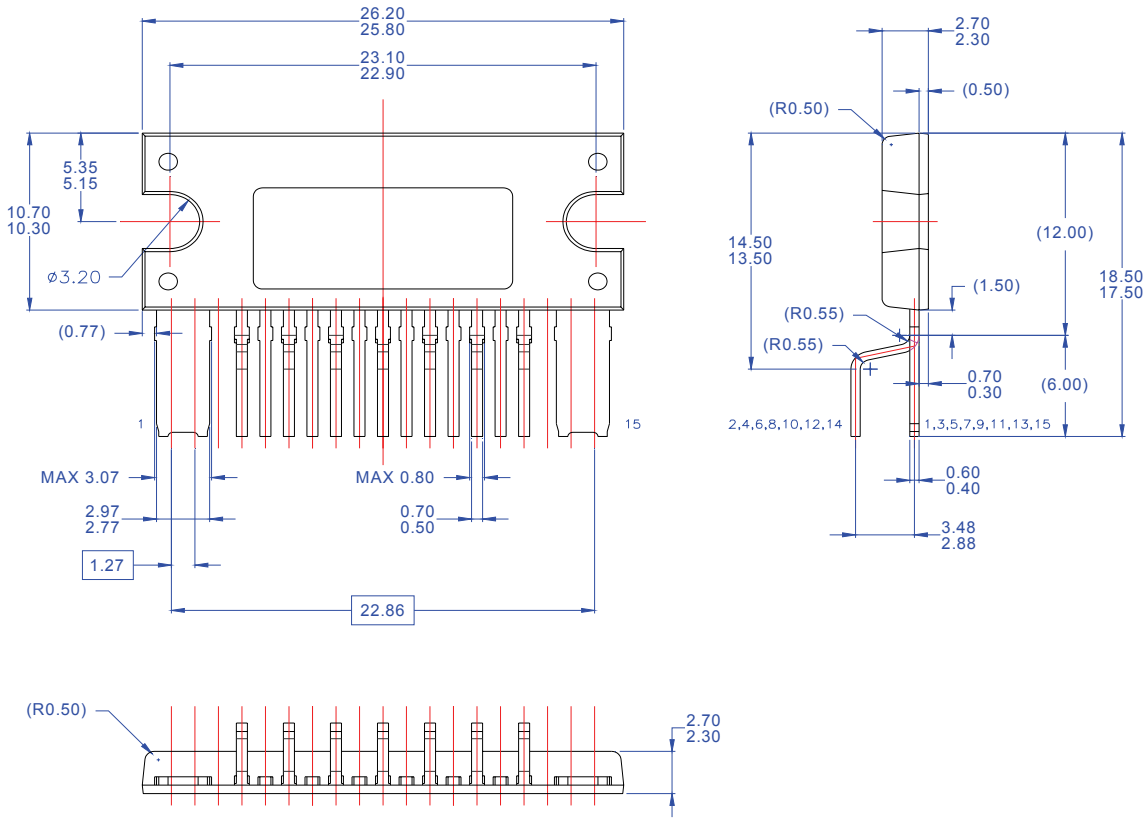


Figure 18. EPM15 Package

Dimensions in Millimeters

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