FAIRCHILD SEMICONDUCTOR®

March 2008

Power-SPM™

FD6M043N08

75V/65A Synchronous Rectifier Module

General Features

- Very High Rectification Efficiency at Output 12V
- Integrated Solution for Saving Board Space
- RoHS Compliant

100% LEAD-FREE IMPLEMENTATION

General Description

The FD6M043N08 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. 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.

MOSFET Features

- V_{DSS} = 75V
- $Q_{G(TOTAL)}$ = 99nC(Typ.), V_{GS} = 10V
- $R_{DS(ON)}$ = 3.5mΩ(Typ.), V_{GS} = 10V, I_D = 40A
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Fully Isolated Package

Applications

- High Current Isolated Converter
- Distributed Power Architectures
- Synchronous Rectification
- DC/DC Converter
- Battery Supplied Application
- ORing MOSFET

EPM15 Package

Block Diagram

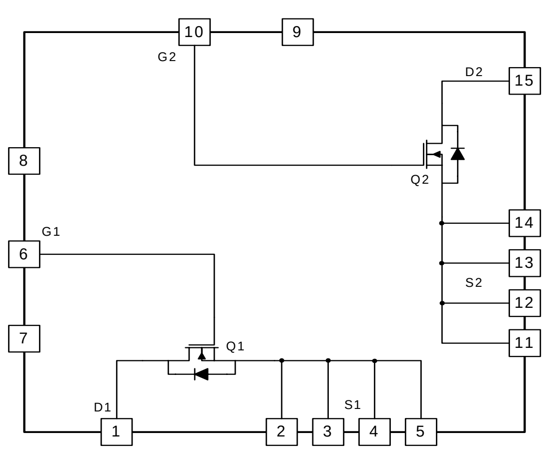


Figure 1. FD6M043N08 Module Block Diagram

Pin Configuration and Pin Description

Top View

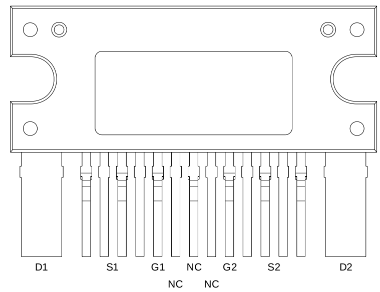


Figure 2. Pinmap of FD6M043N08

Pin Number	Pin Name	Pin Description
1	D1	Drain of Q1, MOSFET
2 ~ 5	S1	Source of Q1, MOSFET
6	G1	Gate of Q1, MOSFET
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	G2	Gate of 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_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current, Continuous (V_{GS} = 10V) (Note1)	65	A
E_{AS}	Single Pulse Avalanche Energy (Note1,2)	681	mJ
T_J, T_{STG}	Operating and Storage Temperature Range	-40 ~ 150	°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
Synchronous Rectifier Switch Part (Each Switch)						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D= 250μA, V_{GS} = 0V	75	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 60V	-	-	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	V_D = 20V, I_{DS} = 250μA	2.0	-	4.0	V
$R_{DS(ON)}$	Drain to Source On Resistance	I_D = 40A, V_{GS} = 10V	-	3.5	4.3	mΩ
		T_J = 150°C	-	6.44	-	mΩ
Dynamic Charateristics						
C_{ISS}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	6180	-	pF
C_{OSS}	Output Capacitance		-	990	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	310	-	pF
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V	-	99	148	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0V to 2V	-	12	18	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 40V	-	30	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau	I_D = 80A	-	18	-	nC
Q_{gd}	Gate to Drain “MIller” Charge	I_g = 1.0mA	-	25	-	nC
Switching Charateristics (V_{GS} = 10V)						
t_{ON}	Turn-On Time	I_D = 40A, V_{GS} = 10V, V_{DD} = 40V, R_G = 5Ω	-	-	90	ns
$t_{d(on)}$	Turn-On Delay Time		-	25	-	ns
t_r	Rise Time		-	25	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	50	-	ns
t_f	Fall Time		-	26	-	ns
t_{OFF}	Turn-Off Time		-	-	130	ns
Drain-Source Diode Charateristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 80A, V_{GS} = 0V	-	-	1.25	V
		I_{SD} = 40A, V_{GS} = 0V	-	-	1.0	V
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

Typical Performance Characteristics Each Switch, Unless Otherwise Specified

Figure 3. On-Region Characteristics

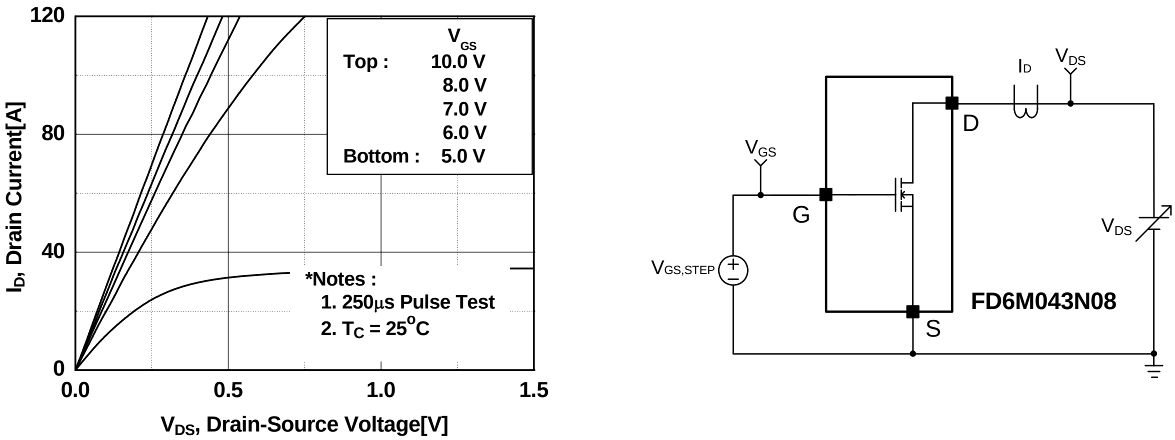


Figure 4. Transfer Characteristics

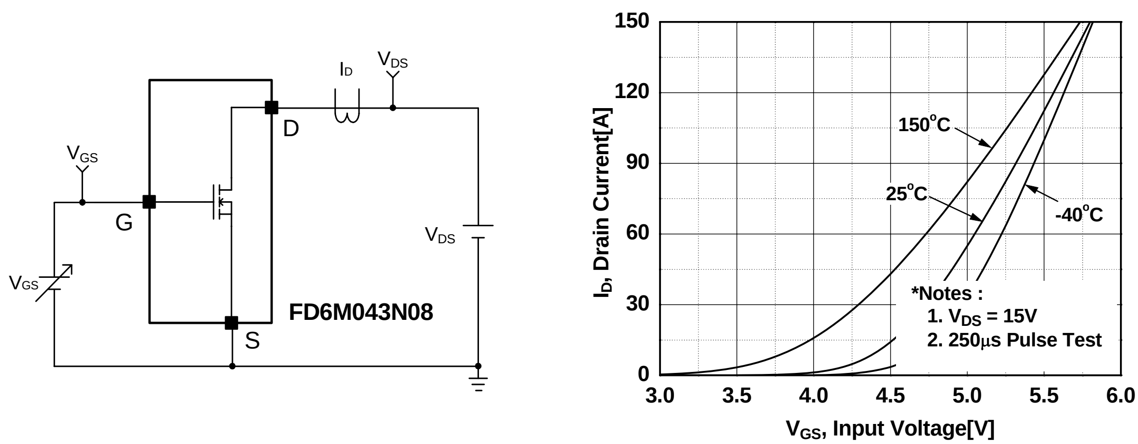


Figure 5. Body Diode Forward Voltage Variation vs. Source Current and Temperature

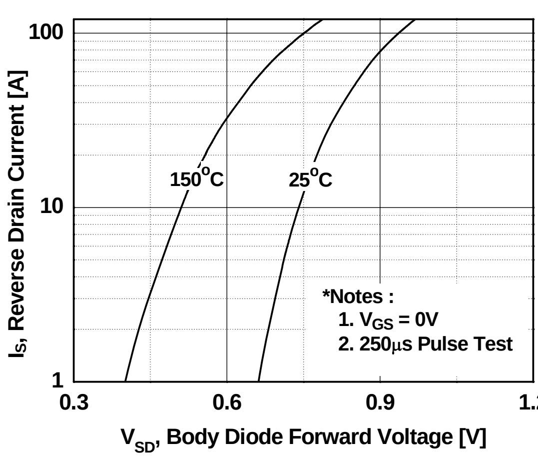
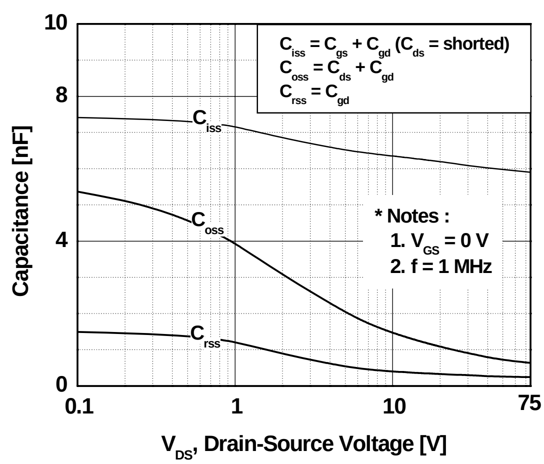


Figure 6. Output Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

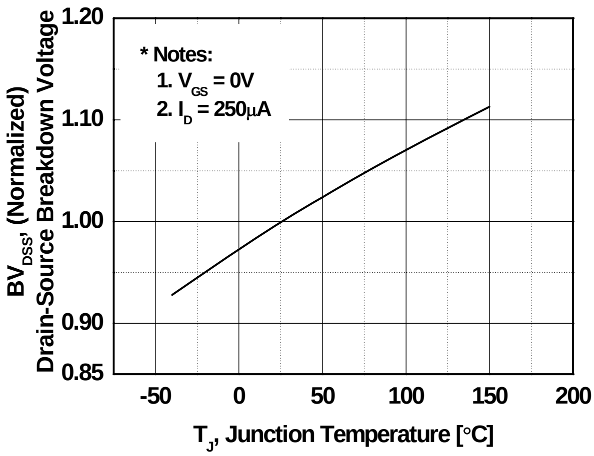


Figure 8. On-Resistance Variation vs. Temperature

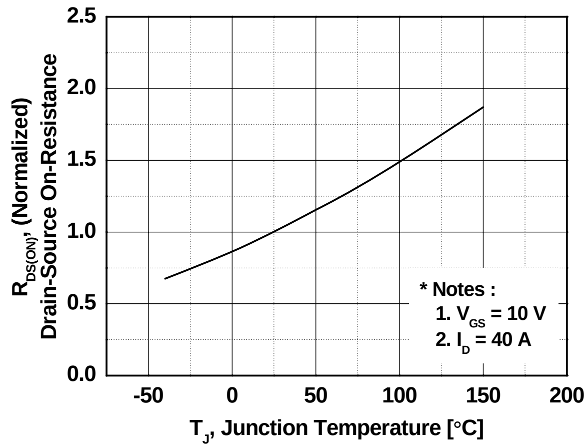


Figure 9. Transient Thermal Response Curve

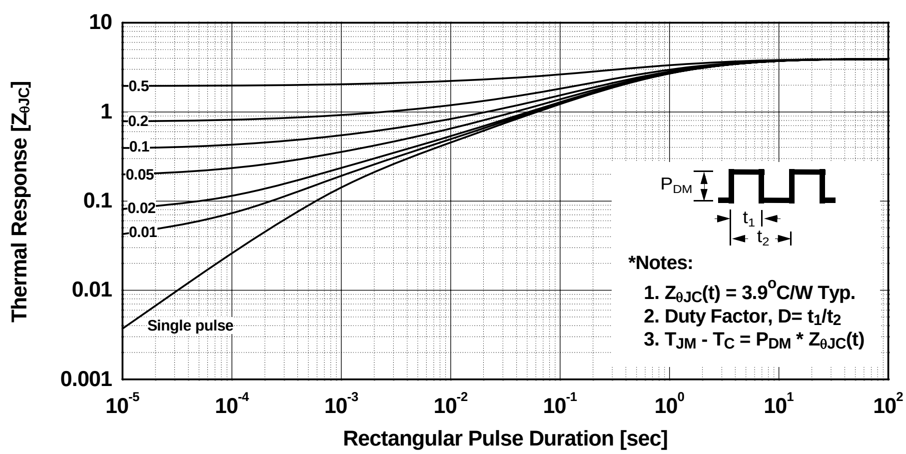


Figure 10. Maximum Safe Operating Area

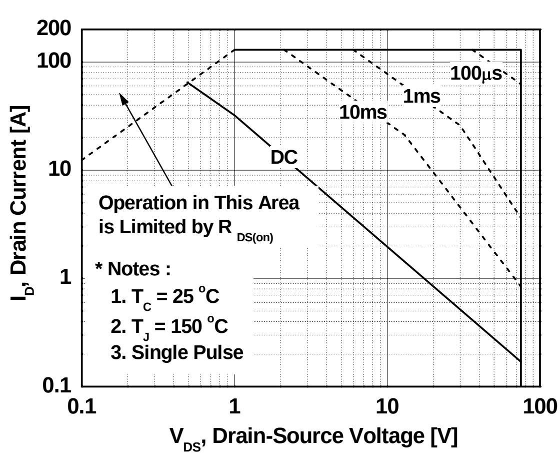
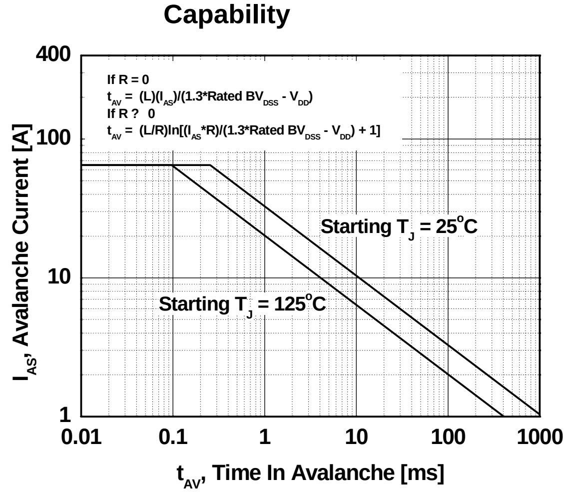


Figure 11. Unclamped Inductive Switching Capability



AC Test Circuits and Waveforms

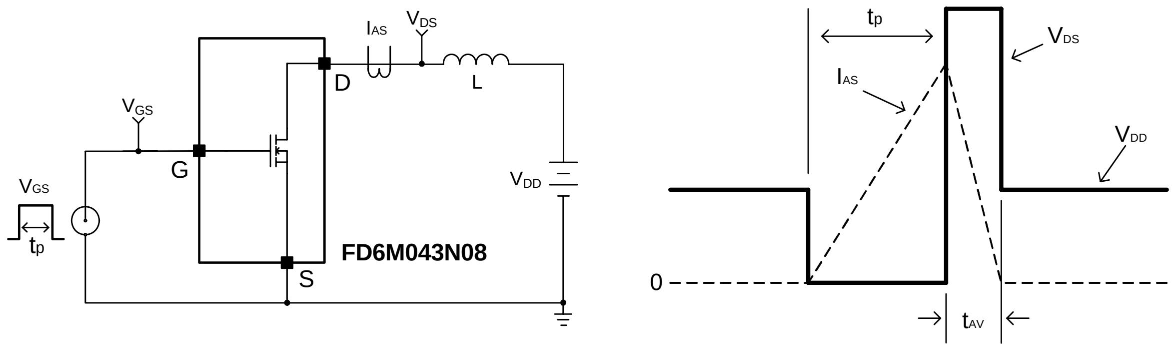


Figure 12. Unclamped Inductive Switching Test Circuit and Waveforms

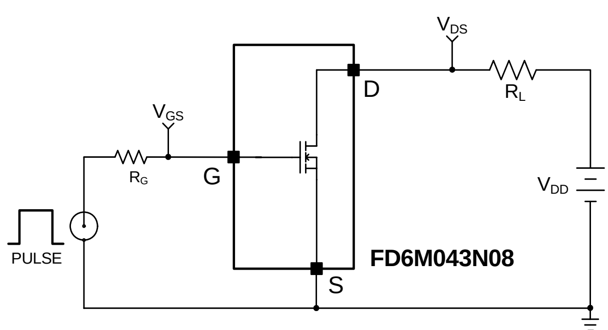


Figure 13. Switching Test Circuit

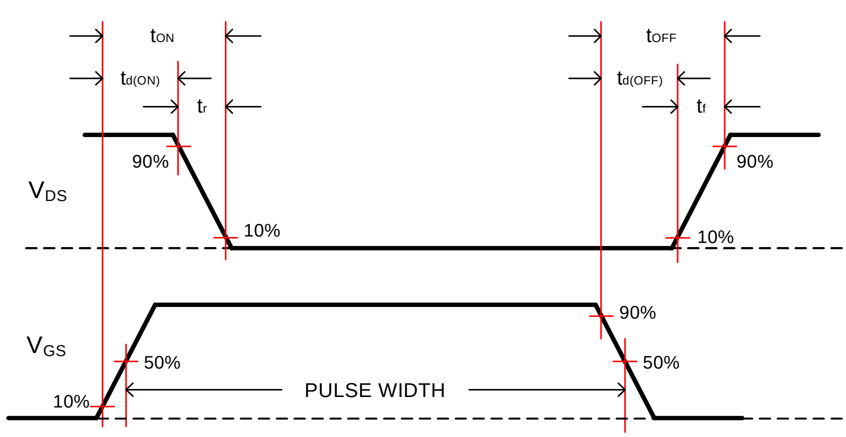


Figure 14. Switching Test Waveforms

Application circuits

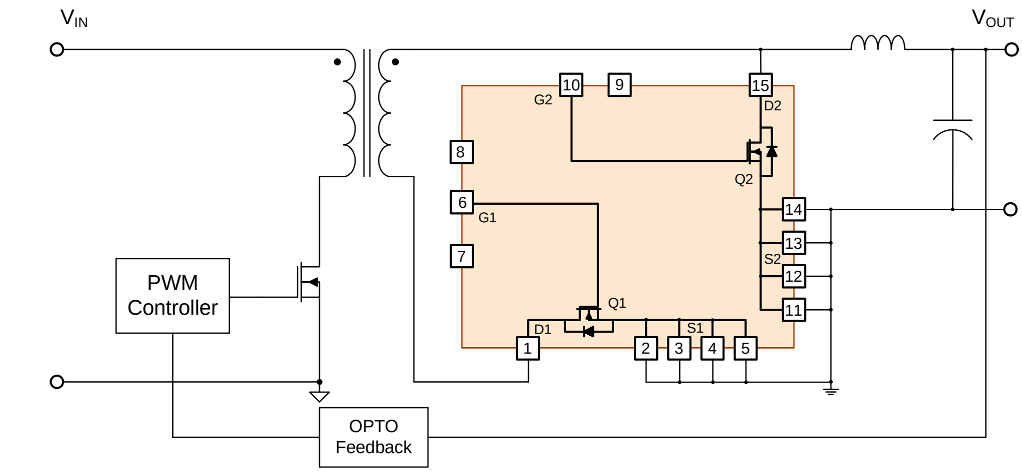


Figure 15. Application Circuit of Forward Converter with FD6M043N08

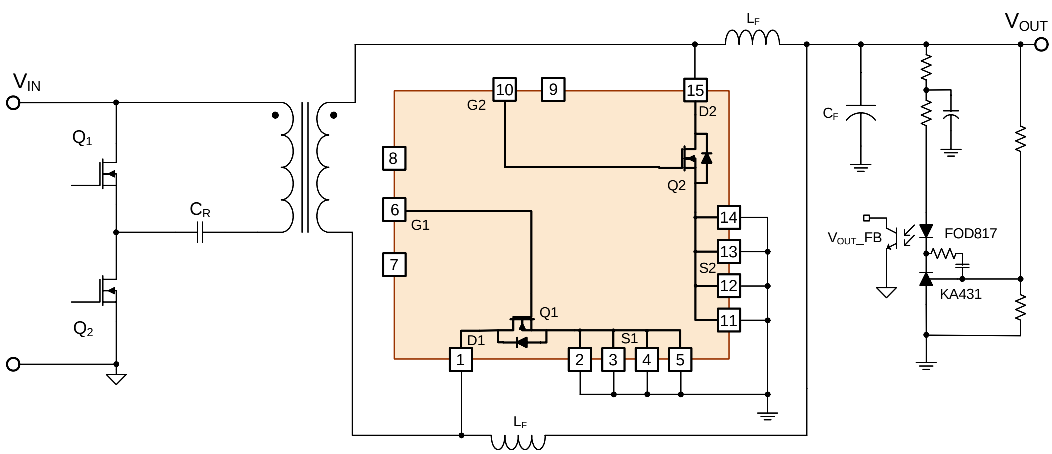


Figure 16. Application Circuit of Asymmetrical HB Converter with FD6M043N08

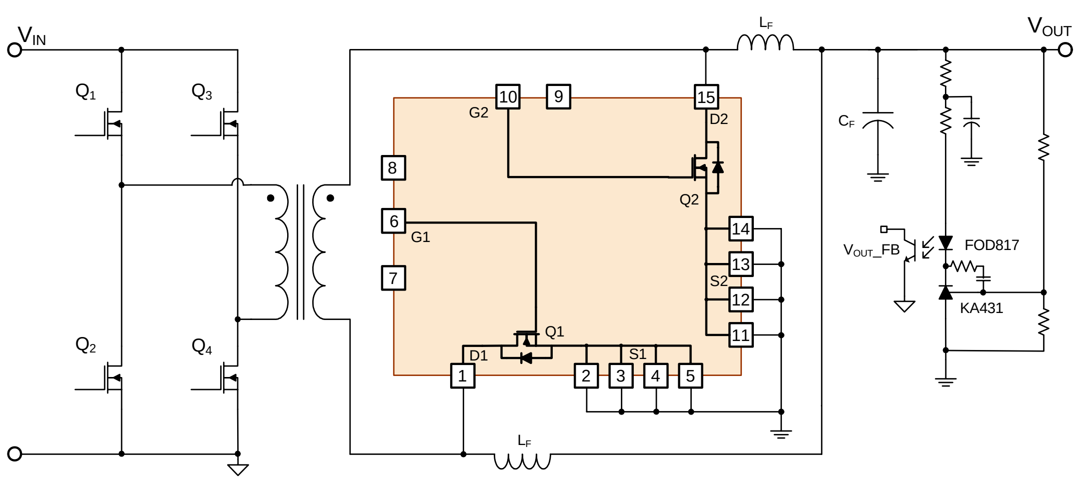


Figure 17. Application Circuit of Full Bridge Converter with FD6M043N08

Detailed Package Outline Drawings

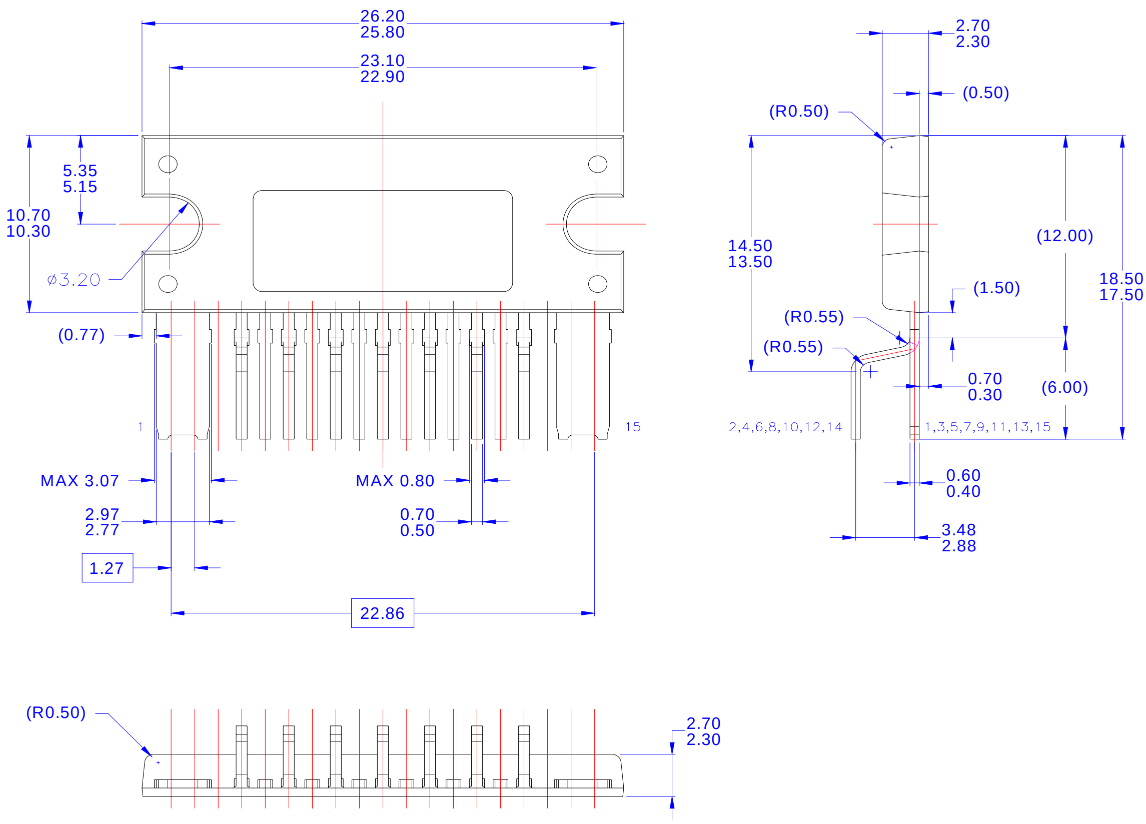


Figure 18. EPM15 Package

Dimensions in Millimeters

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