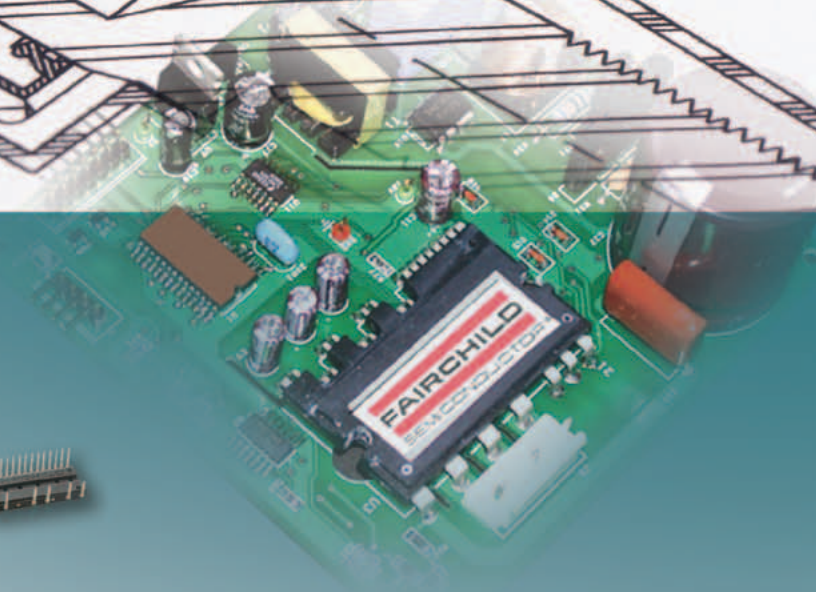
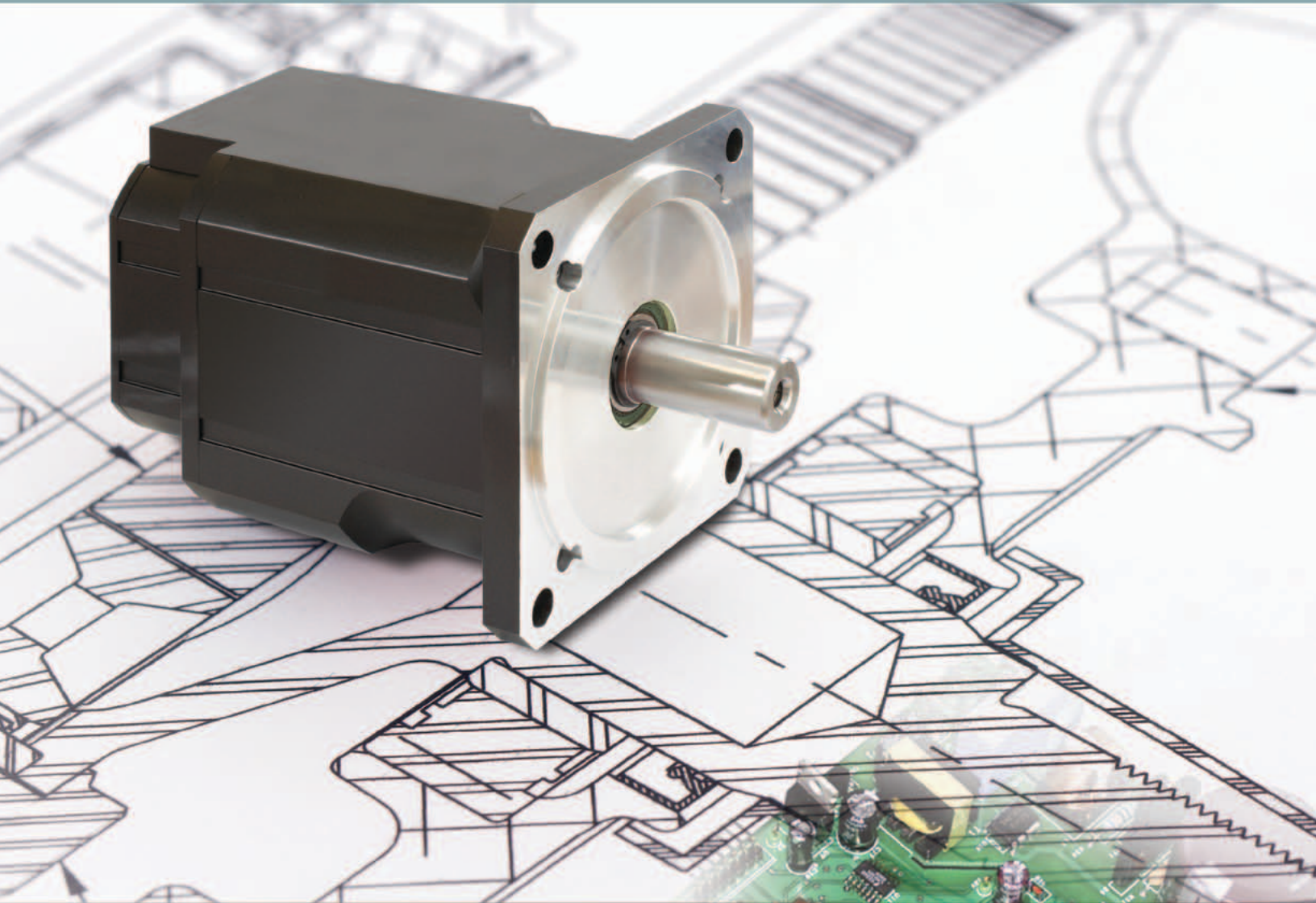


# MOTOR DRIVE SOLUTIONS



Saving our world, 1mW at a time™



# FAIRCHILD'S MOTOR DRIVE SOLUTIONS

## Optimize Your Motor Designs: Less Energy, Cost and Time

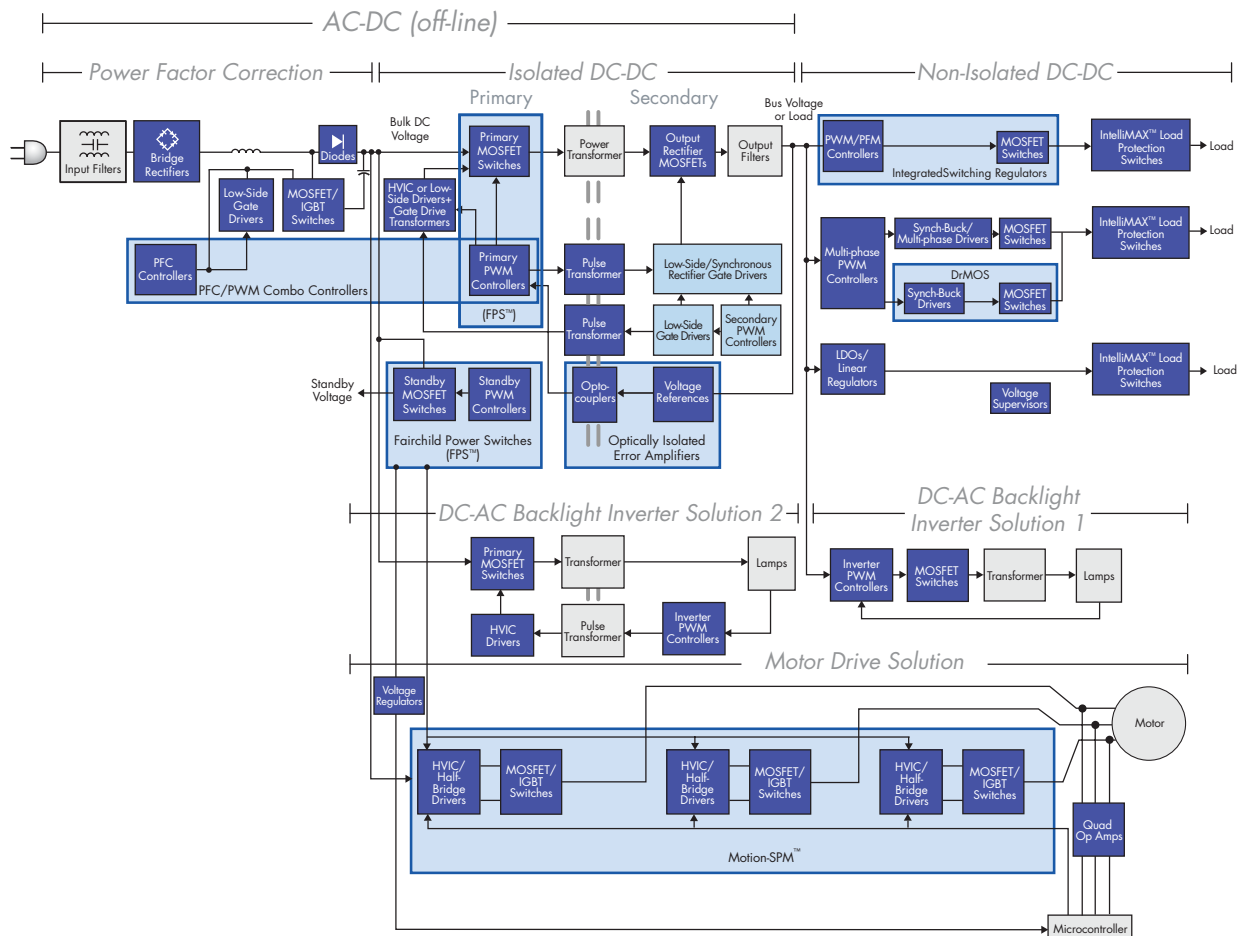
Fairchild has the motor drive solutions you need to significantly improve the performance/cost ratio of variable speed designs. You'll find a broad range of power components and support for motor control design in consumer and industrial applications.

Our portfolio includes:

- Smart Power Modules (SPM®)—integrated drive and protection in a single package, so you simplify and accelerate your design as you optimize efficiency
- Industry-leading discrete components—from Insulated Gate Bipolar Transistors (IGBTs), High Voltage Gate Drivers (HVICs) and MOSFETs, to rectifiers and optocouplers—to build your own drive
- Best-in-class packaging technology that reduces board space while providing excellent thermal performance
- Online motor design tools, application notes and technical information

In addition, Fairchild offers the industry's only complete selection of Switch Mode Power Supplies (SMPS) building blocks. If energy and cost savings are important for your motor control design, Fairchild has the solution for you.

## Complete Power Solutions



Note: Fairchild products are in blue.

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# 3 PHASE MOTOR SOLUTIONS FOR BLDC, PMSM/BLAC AND ACIM

## INTEGRATED MOTOR DRIVE SOLUTIONS

### Motion-SPM

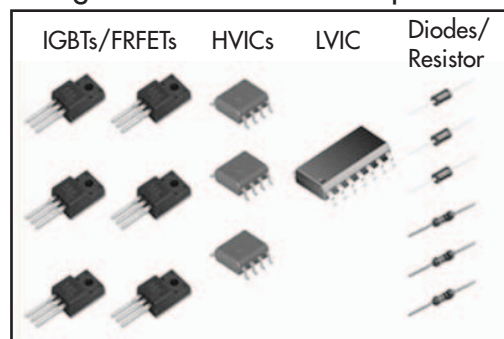
Energy efficiency continues to drive electrical standards and designs in inverter motor-based applications. As a result, companies are developing products that are smaller, more efficient and offer better performance. Traditional inverter designs are composed of discrete components that provide flexibility and lower cost. However, these designs sacrifice design time, reliability and manufacturing costs. Fairchild's Smart Power Modules (SPM®) integrate discrete technologies into highly efficient and reliable modules that are designed for 100V<sub>AC</sub> to 253V<sub>AC</sub>, 50W to 7.5kW, motor control applications.

To eliminate external components and increase system reliability, each Motion-SPM™ integrates six MOSFET IGBTs, six freewheeling diodes and drive ICs into one compact module. The built-in drive ICs work with a single power supply voltage referenced to the negative input for optocoupler-less control, which reduces component count and protection functions such as UVLO and SCP. Each module also offers all three negative terminals for low cost phase current sensing.

### Features & Benefits

- Design and development
  - Saves space
  - Meets key efficiency and EMI regulations
  - Saves development time
  - Reduces time-to-market
- Manufacturing: single component instead of several
  - Easier procurement
  - Lower assembly cost (single placement, no special steps)
  - Higher yield (pre-tested, fewer connections)
- The right technology for the future
  - Cutting edge technology
  - Higher efficiency
  - High quality and reliability

### Integration of Discrete Components



A protection circuit using analog components causes time delays and noise.

**SPM's built-in HVIC and LVIC with protection circuit.**

**Design Considerations**  
Design engineers need to optimize the circuit using discrete components.

**SPM optimizes driving characteristics for built-in power devices.**

**Manufacturing Impact**  
Assembling these components increases manufacturing time and causes low yields.

**SPM integrates diverse components, enhances productivity while simplifying manufacturing.**



- Reduced total system cost
- Reduced development time
- Easy management
- Optimized control flexibility
- Higher reliability

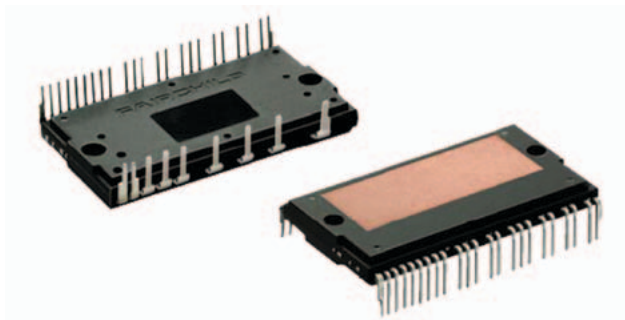


### Motion-SPM in DIP Package

The Motion-SPM in DIP packaging offers a high-performance, simplified solution for commercial and industrial inverter motor designs. Each SPM integrates six IGBTs, six diodes, three HVICs, one LVIC and a thermistor in a single compact module (60 mm × 31 mm). Compared to discrete IGBT solutions, the integrated SPM requires less than half the board space, while providing low-voltage control and high-voltage output stage rated at 10A~75A at 220V<sub>AC</sub>. This compact, ceramic and DBC-based transfer molded-type package optimizes heat transfer from the IGBTs.



SPM® (Smart Power Module) for VSD Motor Control



Fairchild Offers SPM® Devices for Motor Drives up to 7.5kW

### Features & Benefits

- Built-in thermistor for temperature monitoring
- Adjustable short-circuit current protection using low-side Sense-IGBTs
- Divided negative DC-link terminals for inverter current sensing applications
- Switching frequency up to 20kHz
- Single-grounded power supply and optocoupler-less interface due to built-in HVIC
- Inverter power rating covering up to 7.5kW at 230V<sub>AC</sub> input with single package
- Optimized IGBTs for low and high switching applications respectively
- Isolation voltage rating of 2500Vrms/min
- Low thermal resistance due to ceramic and DBC substrate

### Motion-SPM in DIP Package

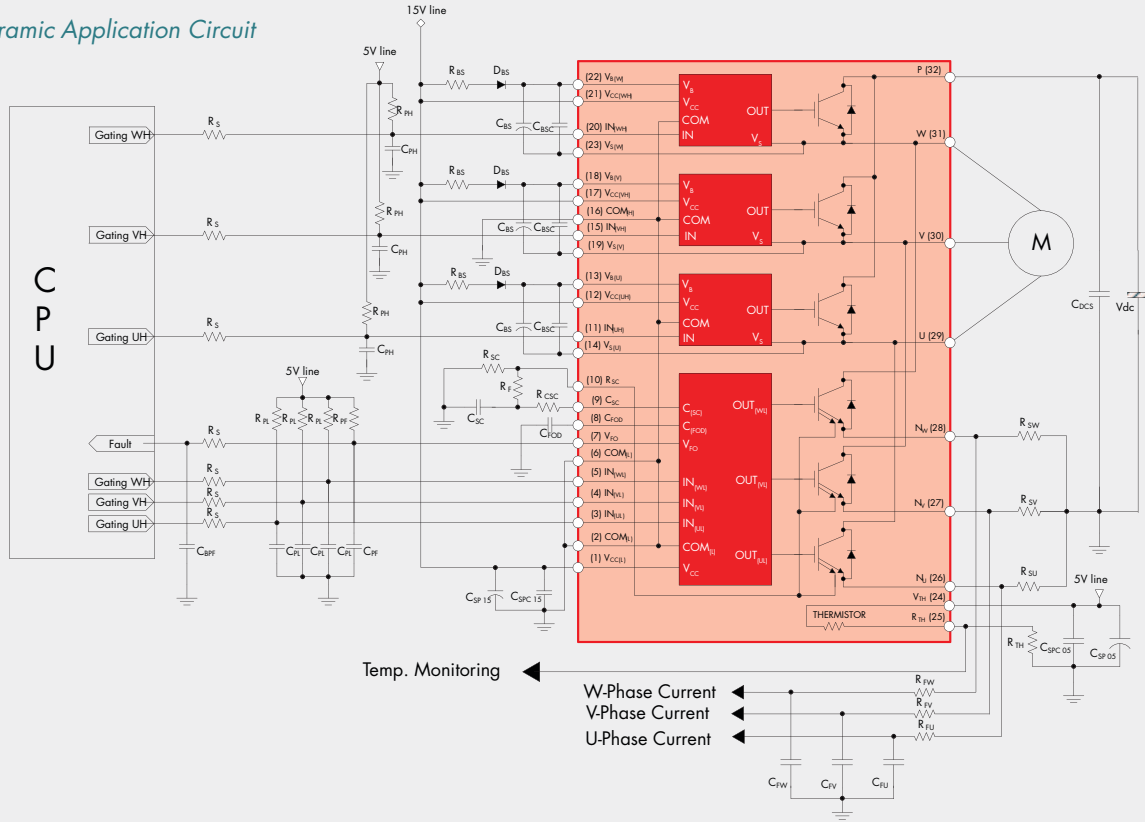
Product Number	BV <sub>CES</sub> (V)	I <sub>C</sub> (A) T <sub>c</sub> = 25°C	I <sub>CP</sub> (A <sub>pk</sub> ) T <sub>c</sub> = 25°C, Pulse Width	Typical Switching Frequency (kHz)	Power Rating (kW)	t <sub>dead</sub> (μs)	R <sub>th(j-c)</sub> (°C/W)	Isolation Voltage (V <sub>rms</sub> @ 1 Min.)	Input Interface	Substrate	Package
FSAM10SH60A	600	10	20, <1ms	15/20	1.0	3	2.90	2500	Active Low	Ceramic	DIP
FSAM15SM60A	600	15	30, <1ms	5	1.5	3	2.50				
FSAM15SH60A	600	15	30, <1ms	15/20	1.5	3	2.50				
FSAM20SM60A	600	20	40, <1ms	5	2.0	3	2.10				
FSAM20SH60A	600	20	40, <1ms	15/20	2.0	3	2.10				
FSAM30SM60A	600	30	60, <1ms	5	3.0	3	2.00				
FSAM30SH60A	600	30	60, <1ms	15/20	3.0	3	2.00	2500	Active Low	DBC	DIP
FSAM50SM60A	600	50	100, <1ms	5	5.0	3.5	1.00				
FSAM75SM60A	600	75	110, <1ms	5	7.5	3.5	0.56				

# 3 PHASE MOTOR SOLUTIONS FOR BLDC, PMSM/BLAC AND ACIM

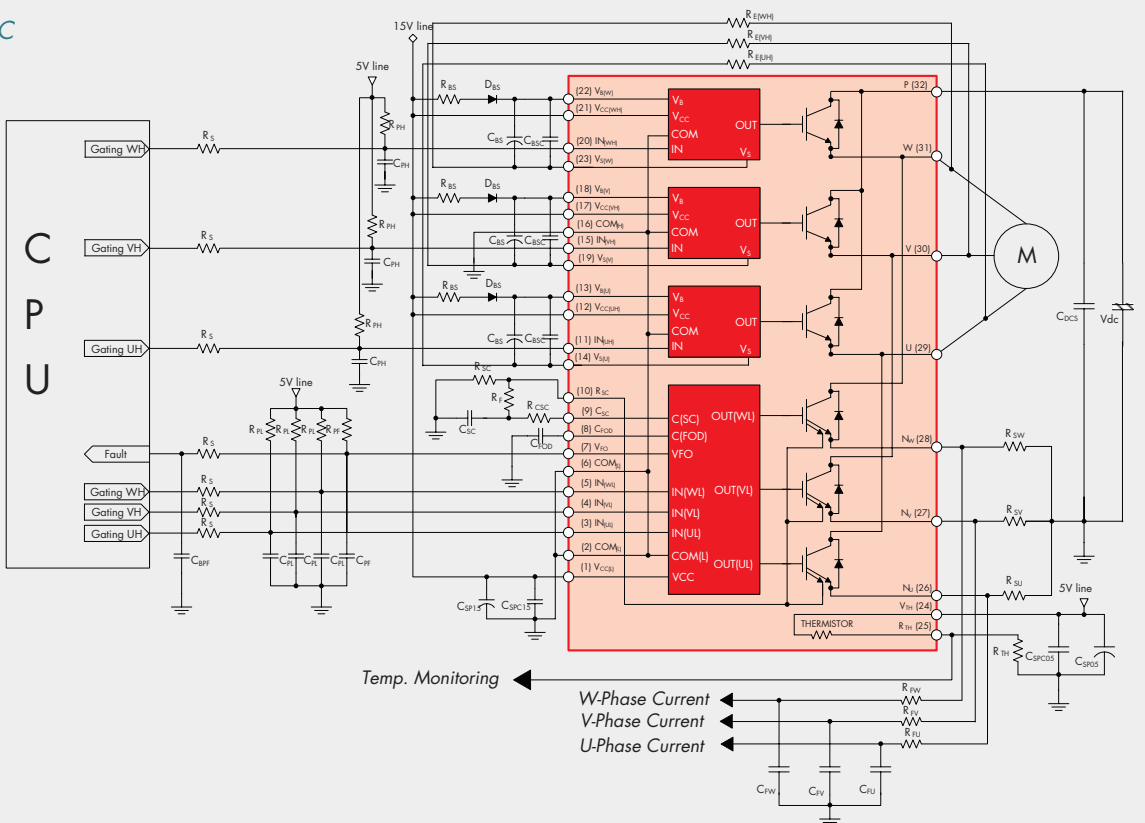
## INTEGRATED MOTOR DRIVE SOLUTIONS

### Motion-SPM in DIP Package Application Diagram

SPM2 Ceramic Application Circuit

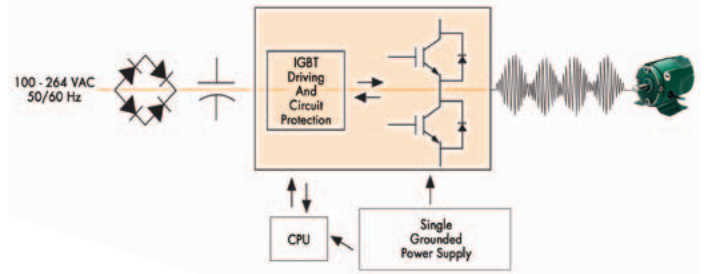


SPM2 DBC



### Motion-SPM™ in Mini-DIP Series Optimizes Wide Range of Inverter Driver Applications

Integrating three HVICs, one LVIC, six IGBTs, six FRDs and three bootstrap diodes that are fully tested into a compact 44mm x 26.8mm Mini-DIP package, Motion-SPM modules replace up to 22 discrete components. These products are instrumental in reducing board space, decreasing manufacturing costs and speeding time-to-market and increasing system reliability.



Mini-DIP packaged modules integrate three bootstrap diodes with bootstrap resistor characteristics to eliminate an additional six external components. Mini-DIP packaged modules also feature NPT IGBTs that provide optimal trade-offs between conduction and switching losses, short dead time and high guaranteed junction temperature, ( $T_j = 150^\circ\text{C}$ ) to improve system efficiency and reliability.

### Features & Benefits

- Built-in NPT IGBTs provide optimal tradeoffs between conduction losses and switching losses
- Short dead time
- The package optimized for thermal performance, high-power density and compactness for low-power inverter-driven applications
- Extended range of  $T_j$  from  $-40^\circ\text{C}$  to  $150^\circ\text{C}$
- Isolation voltage of  $2500V_{rms}$
- Better ruggedness due to NPT IGBT
- UVLO, TSD and SCP
- 3 divided negative DC-link terminals for inverter current sensing applications
- Easy PCB layout due to built-in bootstrap diode and gate resistances
- Single-grounded power supply due to built-in HVIC

### Motion-SPM in Mini-DIP Package

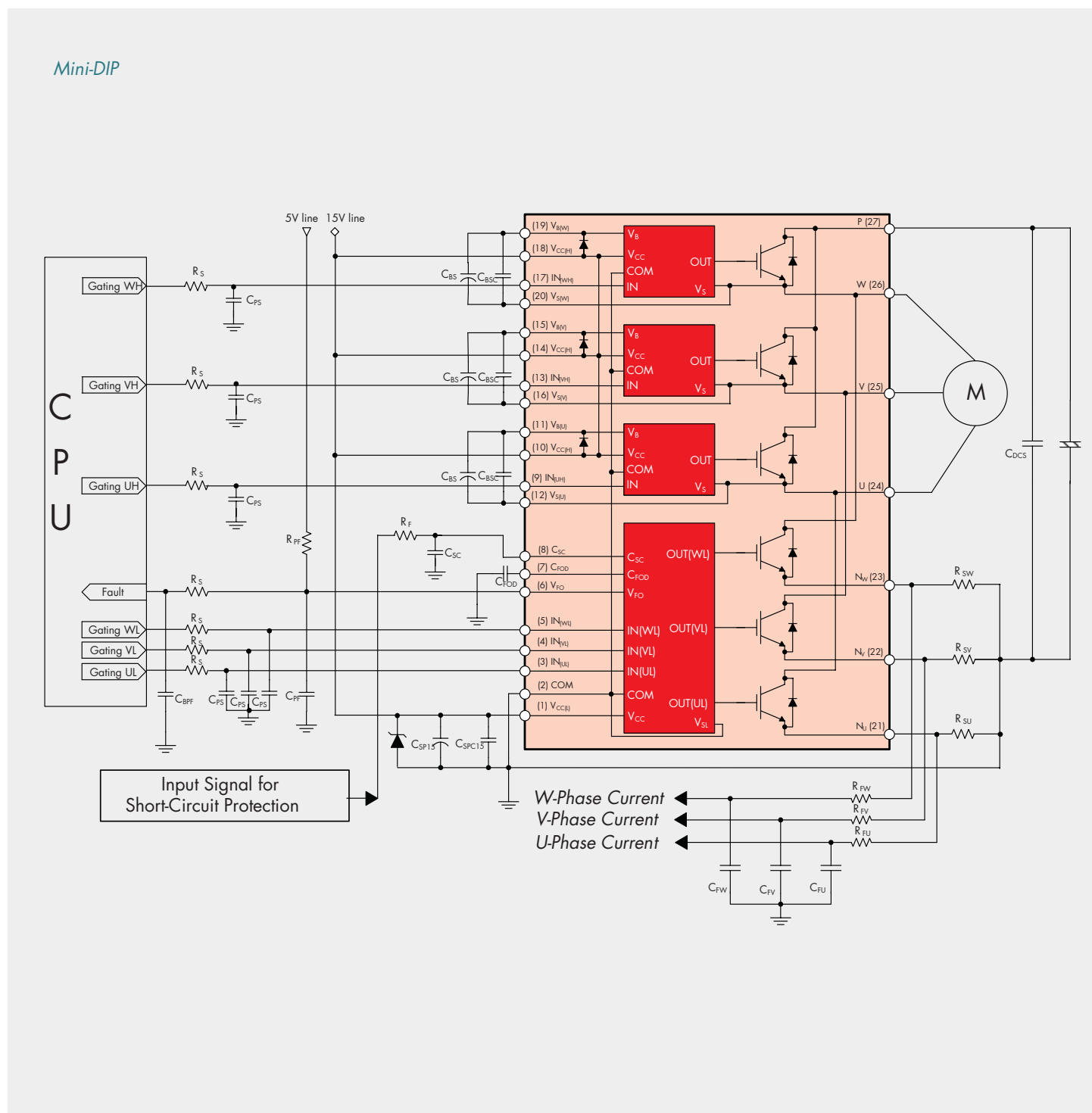
Product Number	$V_{CES}$ $V_{DSS}$ (V)	$I_{C, I_D}$ (A) @ $T_c = 25^\circ\text{C}$	$I_{CP, I_{DP}}$ ( $A_{PK}$ ) @ $T_c = 25^\circ\text{C}$ , $\leq 1\text{ms pulse}$	Switching Frequency (kHz)	Typical Power Rating (kW)	$V_{CE(sat)}$ @ 15V (V)	$T_{dead}$ ( $\mu\text{s}$ )	$R_{th(j-c)}$ ( $^\circ\text{C}/\text{W}$ )	Isolation Voltage ( $V_{rms}$ @ 1 Min.)	Input Interface	Substrate	Switching Device
FSBF3CH60B	600	3	6	$\leq 20\text{k}$	0.3k	2.0	$\geq 1.5$	$\leq 6.5$	2500	Active High	Fullpack	IGBT
FSBF5CH60B	600	5	10	$\leq 20\text{k}$	0.5k	2.0	$\geq 1.5$	$\leq 6.3$				
FSBF10CH60BT	600	10	20	$\leq 20\text{k}$	1.0k	2.2	$\geq 1.5$	$\leq 6.2$				
FSBF10CH60BTL	600	10	20	$\leq 20\text{k}$	-	2.2	$\geq 1.5$	$\leq 6.2$				
FSBF10CH60B	600	10	20	$\leq 20\text{k}$	1.0k	2.1	$\geq 1.5$	$\leq 5.5$				
FSBF15CH60BT	600	15	30	$\leq 20\text{k}$	1.5k	2.1	$\geq 1.5$	$\leq 4.9$				
FSBF15CH60BTL	600	15	30	$\leq 20\text{k}$	-	2.2	$\geq 1.5$	$\leq 4.9$				
FSBB15CH60BT	600	15	30	$\leq 20\text{k}$	1.7k	2.2	$\geq 1.5$	$\leq 2.68$	2500	Active High	DBC	
FSBB15CH60C	600	15	30	$\leq 20\text{k}$	1.7k	2.0	$\geq 2.0$	$\leq 2.27$				
FSBB20CH60C	600	20	40	$\leq 20\text{k}$	2.4k	2.0	$\geq 2.0$	$\leq 2.0$				
FSBB30CH60C	600	30	60	$\leq 20\text{k}$	3.0k	2.0	$\geq 2.0$	$\leq 1.17$				



# 3 PHASE MOTOR SOLUTIONS FOR BLDC, PMSM/BLAC AND ACIM

## INTEGRATED MOTOR DRIVE SOLUTIONS

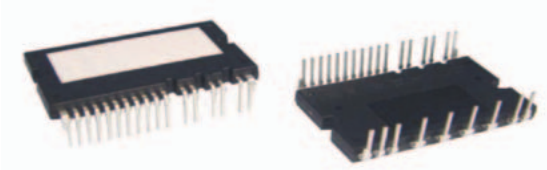
### Motion-SPM in Mini-DIP Package Application Diagram



### Motion-SPM™ in μMini-DIP Series Optimizes Wide Range of Inverter Driver Applications

Integrating one HVIC, one LVIC, six IGBTs, six FRDs, three bootstrap diodes and NTC thermistor that are fully tested into a compact 39mm x 23mm μMini-DIP package, Motion-SPM™ modules replace up to 23 discrete components. These products are instrumental in reducing board space, decreasing manufacturing costs and speeding time-to-market and increasing system reliability.

μMini-DIP packaged modules integrate three bootstrap diodes with bootstrap resistor characteristics to eliminate an additional six external components and NTC thermistor (1% tolerance) to case temperature monitoring. μMini-DIP packaged modules also feature advanced NPT IGBTs that provide optimal trade-offs between conduction and switching losses, short dead time and high guaranteed junction temperature, ( $T_J=150^{\circ}\text{C}$ ) to improve system efficiency and reliability.



### Features & Benefits

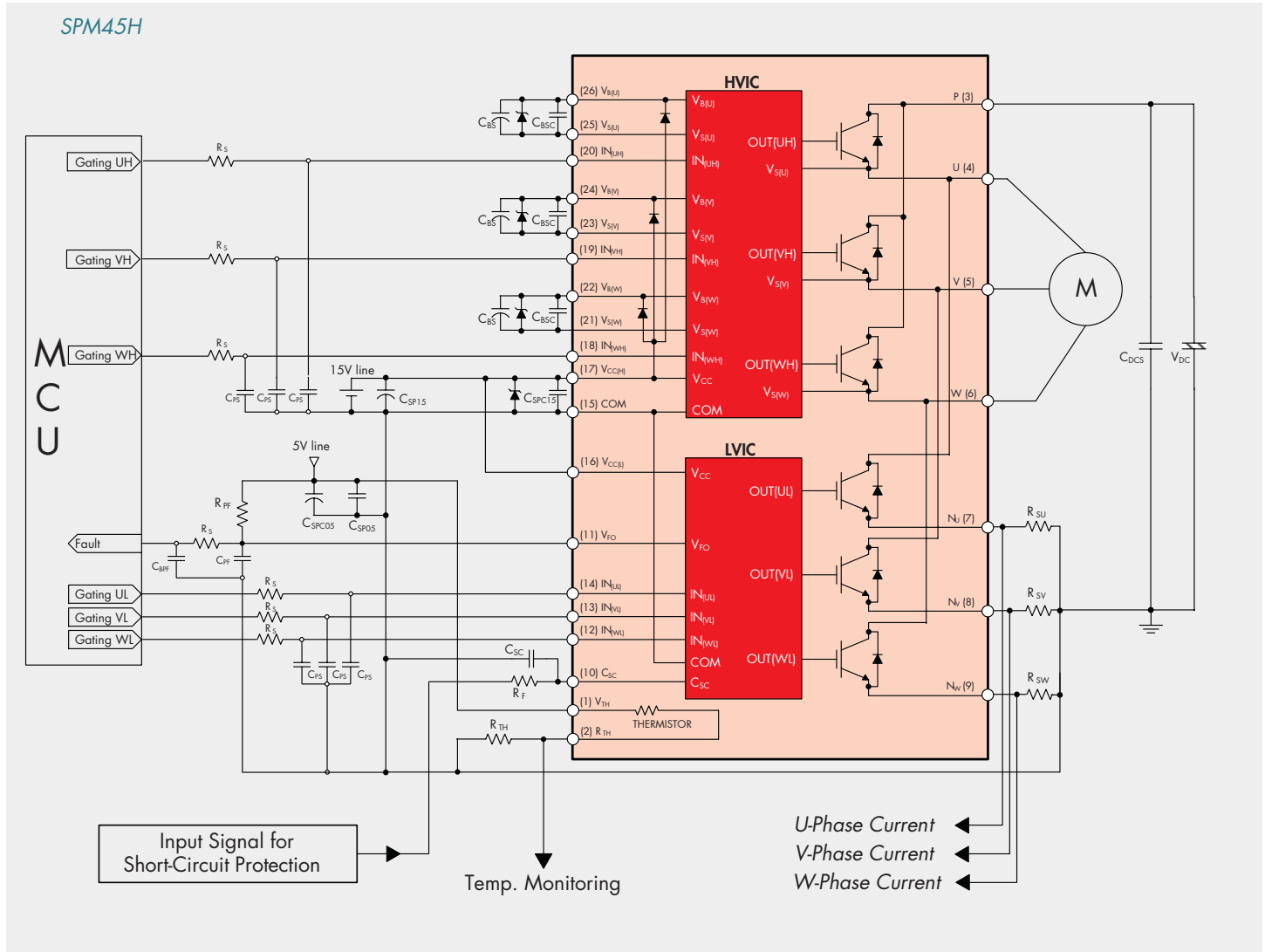
- Built-in advanced NPT IGBTs provide optimal conduction loss and switching loss.
- Short dead time
- The package optimized for thermal performance, high-power density and compactness for low-power inverter-driven applications
- High guaranteed junction temperature range ( $T_J = -40^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ )
- Improved ruggedness due to adopted advanced NPT IGBT
- Isolation voltage of  $2000V_{rms}$
- UVLO and SC protection function
- OT protection function using built-in NTC thermistor
- 3 divided negative DC-link terminals for inverter current sensing applications
- Easy PCB layout due to built-in bootstrap diode & independent  $V_S$  pin
- Single-grounded power supply due to built-in HVIC

Product Number	$BV_{CES}$ (V)	$I_c, I_o$ (A) @ $T_c=25^{\circ}\text{C}, T_J<150^{\circ}\text{C}$	$I_{cp}, I_{pk}$ (A) @ $T_c=25^{\circ}\text{C}, T_J<150^{\circ}\text{C}$	Typical Switching Frequency (Hz)	Typical Power Rating (W)	$V_{CE(SAT)}$ @ $V_{GE}=15V, T_J=25^{\circ}\text{C}$ (V)	$V_F$ @ $T_J=25^{\circ}\text{C}$ (V)	$T_{dead}$ ( $\mu\text{s}$ )	$R_{th(j-cj)}$ ( $^{\circ}\text{C}/\text{W}$ )	$R_{th(j-cf)}$ ( $^{\circ}\text{C}/\text{W}$ )	Isolation-Voltage ( $V_{rms}$ @ 1min)	Input Interface	Substrate	Package
FNA40560	600	5	10	3k	0.5k	$\leq 2.2$	$\leq 2.3$	1.5	$\leq 4.2$	$\leq 5.9$	2000	Active High	Ceramic	$\mu\text{Mini-DIP}$
FNA40860		8	16		0.8k	$\leq 2.2$	$\leq 2.2$	1.5	$\leq 3.8$	$\leq 4.8$				
FNA41060		10	20		1.0k	$\leq 2.2$	$\leq 2.3$	1.5	$\leq 3.6$	$\leq 4.8$				
FNA41560		15	30		1.5k	$\leq 2.3$	$\leq 2.3$	1.5	$\leq 3.0$	$\leq 4.3$				
FNB40560	600	5	7.5	15k	0.5k	$\leq 2.0$	$\leq 2.0$	1.5	$\leq 4.2$	$\leq 5.9$	2000	Active High	Ceramic	
FNB41060		10	15		1.0k	$\leq 2.1$	$\leq 2.1$	1.5	$\leq 3.8$	$\leq 4.8$				
FNB41560		15	22		1.5k	$\leq 2.1$	$\leq 2.2$	1.5	$\leq 3.6$	$\leq 4.8$				

# 3 PHASE MOTOR SOLUTIONS FOR BLDC, PMSM/BLAC AND ACIM

## INTEGRATED MOTOR DRIVE SOLUTIONS

### Motion-SPM™ in $\mu$ Mini-DIP Application Diagram

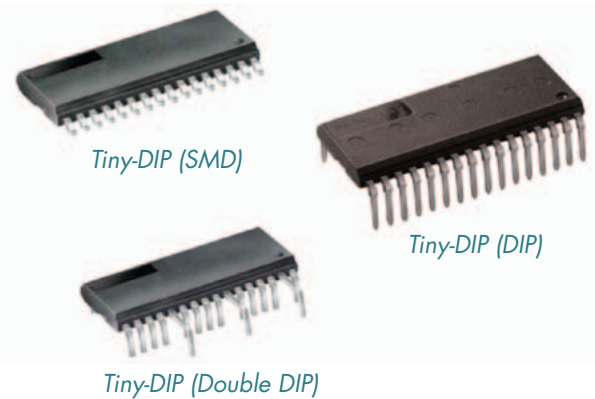


### Motion-SPM in Tiny-DIP (DIP), Tiny-DIP (SMD), and Tiny-DIP (Double-DIP) Packages

The Motion-SPM in Tiny-DIP combines six MOSFETs (FRFET™, UniFET) and three half-bridge HVICs in a compact, thermally efficient, 29mm x 12mm dual DIP and SMD package. The FRFETs, featuring fast and soft recovery body diodes, offer a combination of lower switching losses, lower conduction losses at low current and a wider reverse bias safe operating area (RBSOA) when compared to IGBTs. The body diodes are used as freewheeling diodes, eliminating the need for additional components. This Motion-SPM series is designed to enhance energy efficiency, lower electromagnetic interference, increase reliability and save PCB board space in low power brushless direct current (BLDC) motor applications.

### Features & Benefits

- Tiny-DIP smart power module (SPM) based on FRFET technology
- Package's optimization for thermal performance, high-power density, and compactness is ideal for both integral motor and stand-alone controls
- The best solution for the compact inverter providing energy efficiency
- Ruggedness at switching and short-circuit
- FRFET has much better ruggedness and larger safe operation area (SOA) than that of an IGBT-based power module or one-chip solution
- Low conducted and radiated EMI due to low dv/dt and di/dt
- 3 divided negative DC-link terminals for inverter current sensing applications
- Built-in HVIC and LVIC with 3.3/5V CMOS/TTL compatible, active-high interface
- $T_j$ , max is 150°C
- Isolation voltage rating for 1 min is 1500V<sub>rms</sub>
- Tiny-DIP smart power module (SPM) based on FRFET, UniFET technology



### Motion-SPM in Tiny-DIP Package

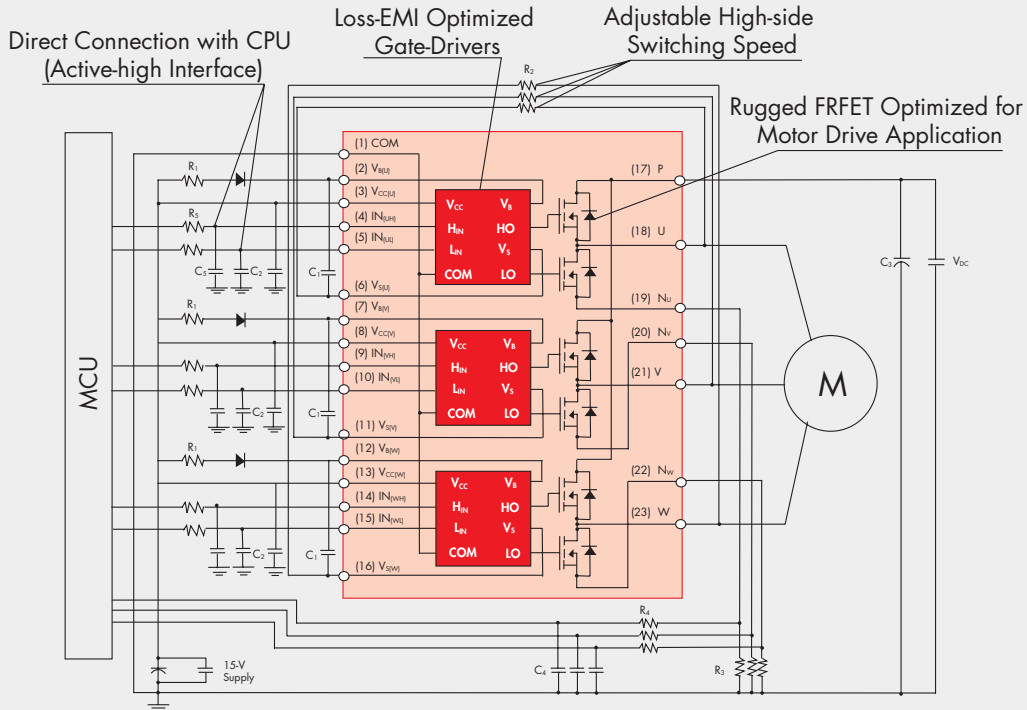
Product Number	BV <sub>DSS</sub> (V)	I <sub>D</sub> @ T <sub>C</sub> = 25°C (A)	I <sub>DP</sub> (Apk) @ T <sub>C</sub> = 25°C, ≤ 100µs pulse	Typical Switching Frequency (Hz)	Typical Power Rating for B <sub>LDC</sub> (W)	R <sub>DS(ON)</sub> (Ω)	T <sub>dead</sub> (µs)	R <sub>th(j-c)</sub> (°C/W)	Isolation Voltage (V <sub>rms</sub> @ 1 Min.)	Input Interface	Fullpack Package
FSB50325	250	1.5	3	15k	100	≤ 1.8 @15V	≥ 1.0	≤ 10.2	1500	Active High	Tiny-DIP (DIP)
FSB50250	500	1	2		100	≤ 4.0 @15V	≥ 1.0	≤ 9.3			
FSB50450	500	1.5	3		150	≤ 2.4 @15V	≥ 1.0	≤ 8.9			
FSB50325S	250	1.5	3		100	≤ 1.8 @15V	≥ 1.0	≤ 10.2			Tiny-DIP (SMD)
FSB50250S	500	1	2		100	≤ 4.0 @15V	≥ 1.0	≤ 9.3			
FSB50450S	500	1.5	3		150	≤ 2.4 @15V	≥ 1.0	≤ 8.9			
FSB50325T	250	1.5	3		100	≤ 1.8 @15V	≥ 1.0	≤ 10.20			Tiny-DIP (Double-DIP)
FSB50450T	500	1.5	3		150	≤ 2.4 @15V	≥ 1.0	≤ 8.9			
FSB50550T	500	1.8	3.5		200	≤ 1.7 @15V	≥ 1.0	≤ 8.9			
FSB52006S	60	2.6	5		100	≤ 0.08 @15V	≥ 1.0	≤ 9.2			Tiny-DIP (SMD)
FSB50825US	250	4	8		200	≤ 0.45 @12V	≥ 1.0	≤ 8.8			
FSB50550US	500	2.0	5.0		200	≤ 1.4 @15V	≥ 1.0	≤ 8.6			
FSB50450US	500	1.5	3.8		150	≤ 2.4 @15V	≥ 1.0	≤ 8.9			
FSB50250US	500	1.1	2.8		100	≤ 4.2 @15V	≥ 1.0	≤ 9.3			
FSB50550U	500	2.0	5.0		200	≤ 1.4 @15V	≥ 1.0	≤ 8.6			

# 3 PHASE MOTOR SOLUTIONS FOR BLDC, PMSM/BLAC AND ACIM

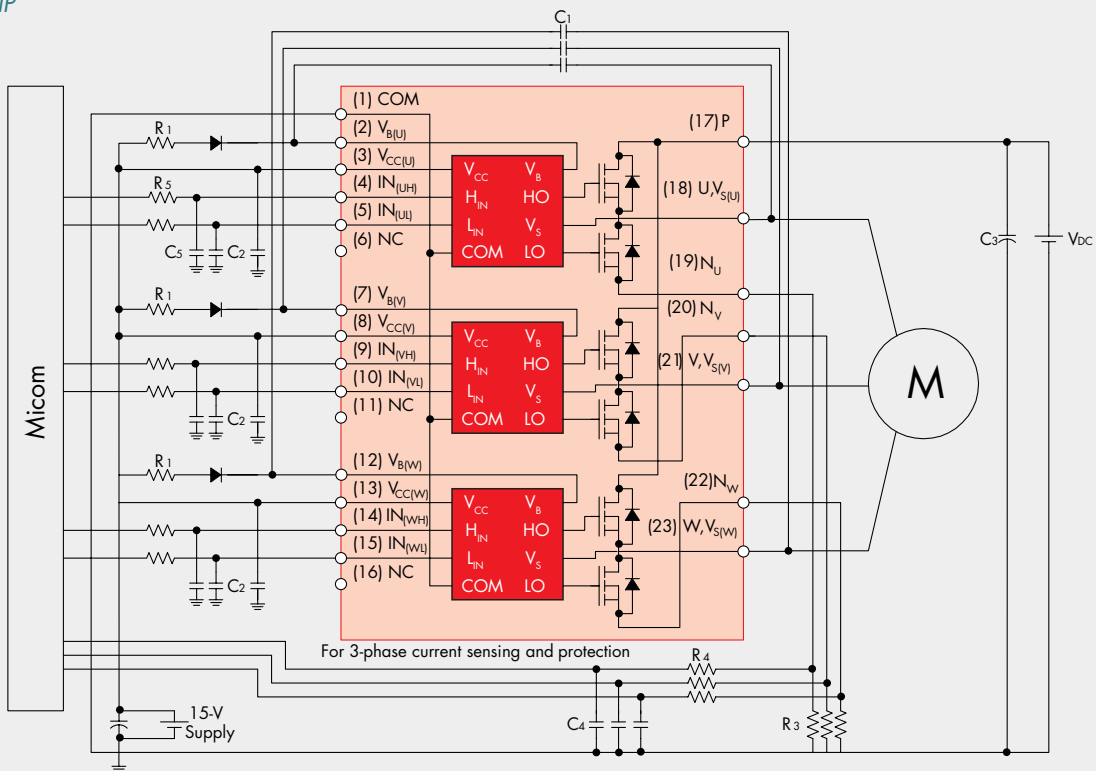
## INTEGRATED MOTOR DRIVE SOLUTIONS

### Motion-SPM in Tiny DIP Package Application Diagram

DIP & SMD



Double DIP



### Fairchild Power Switches (FPS)

Fairchild Power Switches are highly integrated off-line power switches with a fully avalanche-rated SenseFET™ and current mode PWM IC. Offering Advanced Burst Mode operation to meet low standby power regulations as well as reduce EMI emissions through intelligent frequency modulation, these switches simplify designs and lower costs in target applications.

Fairchild Power Switches												
Product Number	Drain Voltage Max. (V)	Static Drain-Source On-Resistance Max. ( $\Omega$ )	Peak Current Limit (A)	Output Power Max. (W)		Switching Frequency (kHz)	Protections					Package
				@ 85-265V <sub>AC</sub>	@ 230V <sub>AC</sub>		Over Current	Over Load	Over Voltage	Output Short	Thermal Shutdown	
FSQ500L	700	25	0.28	2.5	3	130	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	SOT 223-4L
FSQ500N	700	25	0.32	6.5	5.5	130	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL106HR	650	11.5	0.7	13	10	100	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL106MR	650	11.5	0.55	10	8	67	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL116LR	650	7.3	1.2	16	14	50	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL126MR	650	4.9	1.5	21	17	67	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL136MR	650	3.5	2.15	26	20	67	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP
FSL206MR	650	14	0.6	12	7	67	Auto Restart	Auto Restart	Auto Restart	Auto Restart	Auto Restart	8DIP/8SLOP
FSEZ1307	700	17	Control by SENSE pin	5	7	50	Constant Current	Constant Current	Auto Restart	Constant Current	Auto Restart	7SOP
FSEZ1317A	700	13	Control by SENSE pin	6/7	8/9	50	Constant Current	Constant Current	Auto Restart	Constant Current	Auto Restart	7SOP/7DIP

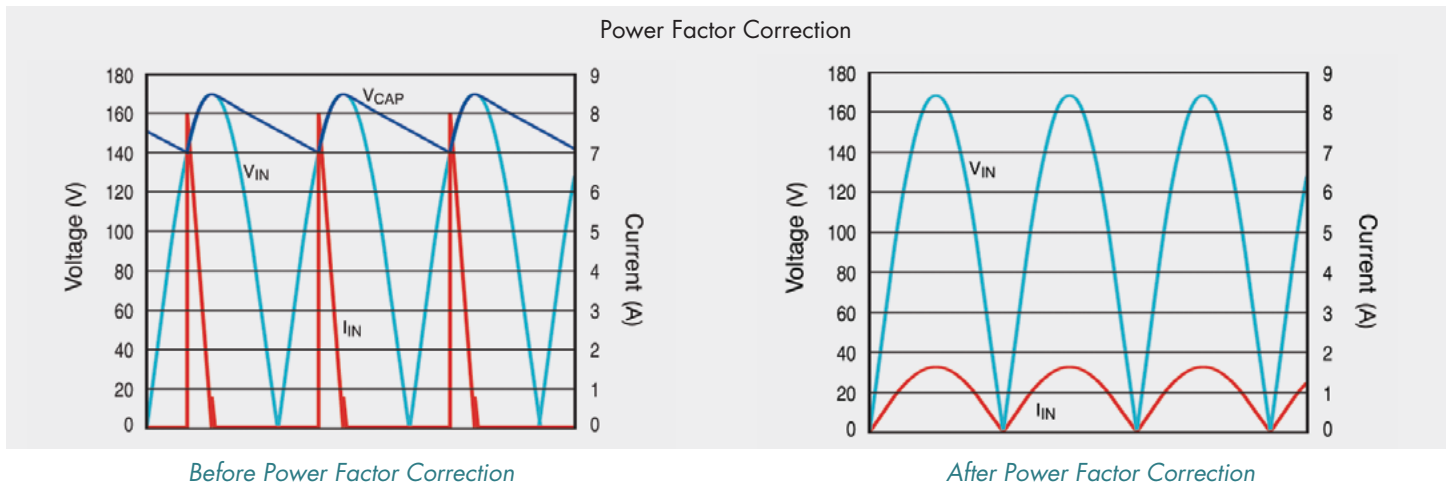
(1) Green FPS eSeries with Fairchild's proprietary valley switching technique



## POWER FACTOR CORRECTION

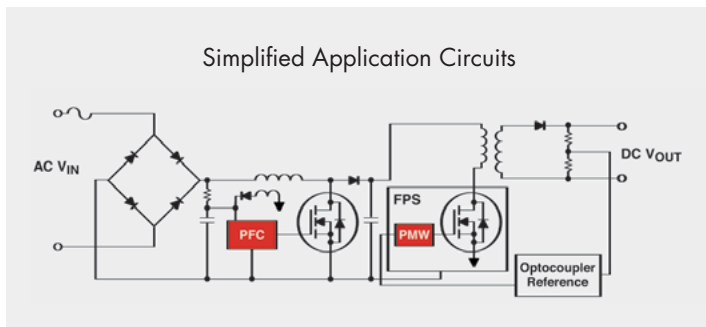
### Power Factor Correction (PFC) Controllers

Power Factor Correction (PFC) allows the use of smaller, lower cost bulk capacitors, reduces power line loading and stress on the switching MOSFETs. Fairchild's PFC solutions lower system costs, reduce power loss and meet the stringent requirements of IEC 6000.3.2. The benefits of these PFC controllers are increased efficiency, simplified compensation, reduced ripple voltage and capacitor size, as well as reduced EMI and system noise.



Power Factor Correction Stand-Alone Controllers				
Product Number	Type	Operating Current (mA)	Startup Current ( $\mu$ A)	Package
FAN7528	BCM PFC	2.5	40	DIP-8, SOP-8
FAN7930	BCM PFC	1.5	40	DIP-8, SOP-8
FAN7530	BCM PFC	1.5	40	DIP-8, SOP-8
FAN6961	BCM PFC	4.5	10	DIP-8, SOP-8
FAN6982	CCM PFC with Protection Features	4	10	DIP-16, SOIC-16

Note: BCM = Boundary Conduction Mode; CCM = Continuous Conduction Mode



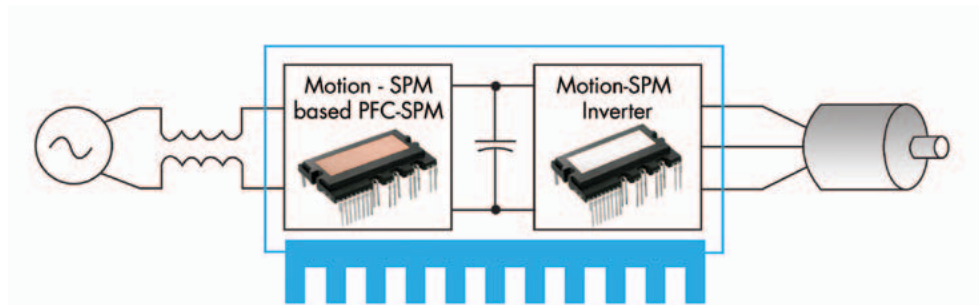
Stand-alone PFC Controllers

### PFC-SPM

PFC-SPM is a front-end rectifier circuit specially designed to meet the harmonic current regulations, such as IEC61000-3-2. Fairchild's PFC-SPM series integrates rectifier diodes, fast and soft recovery diodes, two IGBTs, one gate driving IC and a thermistor. The series consists of a PSCM (Partial Switching Converter Module) for low-power applications (1kW ~ 3kW) and PFCM (Power Factor Correction Module) for high-power systems (3kW ~ 6kW). By using the new DBC-plated package with the same mechanical dimension as Motion-SPM in Mini-DIP, the PFC-SPM can be installed on the same heat sink with Motion-SPM, enabling easy assembly and increased productivity.

### Features & Benefits

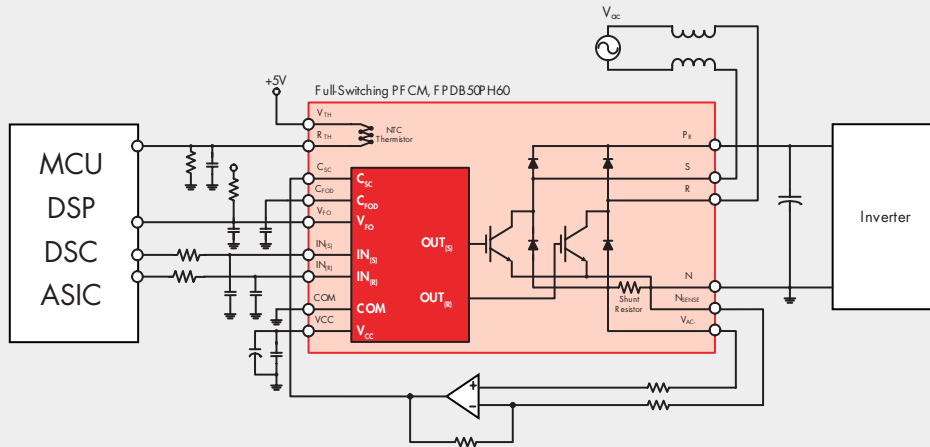
- Optimized IGBTs, diodes and driving IC for PFC applications
- Eliminate one diode drop using bridgeless PFC topology
- Good thermal resistance due to DBC substrate
- Isolation voltage rating of 2500V<sub>rms</sub> (@ 1 min)
- Gate driving IC under voltage (UV) and overcurrent (OC) protection
- Package designed to satisfy the basic creepage and clearance spacing
- UL certified No. E209204



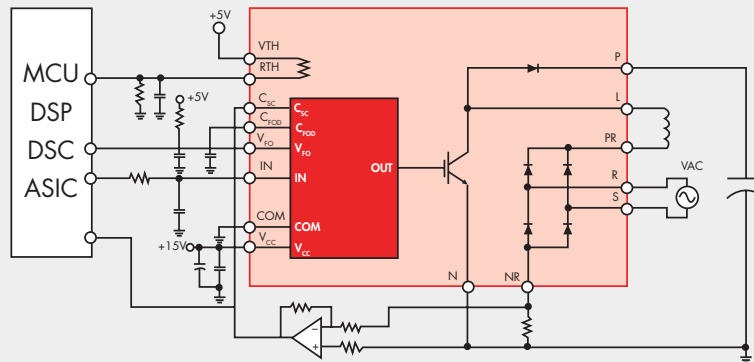
PFC-SPM														
Product Number	Type	$V_{CES}$ (V)	$I_C$ (A)	$I_{CP}$ (A)	Typical Switching Frequency (Hz)	Typical Power Rating (W)	$V_{CE(SAT)}$ @ 15V (V)	$R_{th(j-cj)}$ ( $^{\circ}C/W$ )	$R_{th(j-chd)}$ ( $^{\circ}C/W$ )	$R_{th(j-cld)}$ ( $^{\circ}C/W$ )	Isolation-Voltage (V <sub>rms</sub> @ 1min)	Input Interface	Substrate	Package
FPDB40PH60B	Bridgeless PFC	600	40 @ $T_C=25^{\circ}C$	70 @ $T_C=25^{\circ}C, \leq 1ms$	20k	3k	$\leq 2.3$	$\leq 1.1$	$\leq 1.9$	$\leq 1.4$	2500	Active High	DBC	Mini-DIP
FPDB60PH60B			60 @ $T_C=25^{\circ}C$	90 @ $T_C=25^{\circ}C, \leq 1ms$		5k	$\leq 2.5$	$\leq 0.7$	$\leq 1.5$	$\leq 0.85$				
FPAB20BH60B	Boost-PFC		20 @ $T_C=25^{\circ}C$	40 @ $T_C=25^{\circ}C, \leq 1ms$	20k	2k	$\leq 2.5$	$\leq 1.63$	$\leq 1.44$	$\leq 2.07$				
FPAB30BH60B			30 @ $T_C=25^{\circ}C$	60 @ $T_C=25^{\circ}C, \leq 1ms$		3k	$\leq 2.3$	$\leq 1.17$	$\leq 1.44$	$\leq 1.4$				

### PFC-SPM Application Diagrams

*Bridgeless PFCM (Power Factor Correction Module)*



*Boost PFCM (Power Factor Correction Module)*



Fairchild Semiconductor also offers a number of discrete solutions for low-power motor applications. These solutions include high voltage gate drivers (HVIC), IGBTs, MOSFETs, diodes, rectifiers and optocouplers. The benefits of a discrete solution include increased flexibility and greater design control.

### High Voltage Gate Drivers

Fairchild's HVICs improve system reliability with an innovative noise canceling circuit that provides excellent noise immunity. HVIC solutions save at least 50% PCB area compared to commonly used optocoupler-based or pulse transformer-based solutions. The industry-leading, high-side driver operation with negative  $V_s$  swings of up to -9.8V (at  $V_{BS} = 1.5V$ ) protects the HVIC against negative noise. Competitive products must use an additional diode to provide this protection. These HVIC products feature the industry's lowest quiescent currents for extremely low-power consumption as well as the market's lowest temperature dependency of electrical characteristics, guaranteeing stable operation in a wide range of applications.

High Voltage Gate Drivers (HVICs)														
Product Number	Circuit		Offset Voltage (V)	Output Current (mA)		Delay Time (nS)		Shut-down	Dead Time Control	Quiescent Current ( $\mu A$ )		dv/dt (V/ns)	$V_s$ (V)	Package
	Type	Input to Output		Source	Sink	$t_{ON}$	$t_{OFF}$			$I_{OBS}$	$I_{OCC}$			
FAN7888	3 Phase	6 to 6	200	350	650	130	150	No	Fixed	50	160	50	-9.8	20-SOP
FAN7842	High & Low Side	2 to 2	200	350	650	170	200	No	No	45	70	50	-9.8	8-SOP
FAN7380	Half-Bridge	2 to 2	600	90	180	135	130	No	Fixed	45	70	50	-9.8	8-SOP
FAN7384	Half-Bridge	2 to 2	600	250	500	180	170	Yes	Fixed	50	600	50	-9.8	14-SOP
FAN7382	High & Low Side	2 to 2	600	350	650	170	200	No	No	45	70	50	-9.8	8-SOP/DIP
FAN7383	Half-Bridge	1 to 2	600	350	650	500	170	Yes	Variable	35	650	50	-9.8	14-SOP
FAN73832	Half-Bridge	1 to 2	600	350	650	580	180	Yes	Variable	35	300	50	-9.8	8-SOP/DIP
FAN7385	2 Ch. High Side	2 to 2	600	350	650	110	110	No	No	50	28	50	-9.8	14-SOP
FAN7388	3 Phase	6 to 6	600	350	650	130	150	No	Fixed	50	160	50	-9.8	20-SOP
FAN7387	Self Oscillatory	1 to 2	600	350	650	170	200	Yes	Variable	50	220	50	-9.8	8-SOP/DIP
FAN73833	Half-Bridge	2 to 2	600	350	650	150	140	No	Fixed	35	80	50	-9.8	8-SOP
FAN7371	High Side	1 to 1	600	4000	4000	150	150	No	No	60	25	50	-9.8	8-SOP
FAN7390	High & Low Side	2 to 2	600	4500	4500	140	140	No	No	45	75	50	-9.8	8-SOP/DIP 14-SOP
FAN7392	High & Low Side	2 to 2	600	3000	3000	130	150	Yes	No	60	40	50	-9.8	14DIP/ 16wSOP
FAN7393	Half Bridge	1 to 2	600	2500	2500	550	200	Yes	Yes	50	900	50	-9.8	14-SOP
FAN73932	Half Bridge	1 to 2	600	2500	2500	600	200	Yes	Yes	50	320	50	-9.8	8-SOP
FAN7389*	3 phase	6 to 6	600	350	350	500	-	Yes	Yes	60	450	50	-9.8	24-SOP

\* In development

## INSULATED GATE BIPOLAR TRANSISTORS (IGBTs)

### Insulated Gate Bipolar Transistors (IGBTs)

Fairchild's IGBTs provide low conduction and switching losses as well as short circuit ruggedness. They are designed for applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness is a required feature. Some of the features include: short circuit rated and high-speed switching, low-saturation voltage, high-input impedance, fast and soft anti-parallel freewheeling diode (FWD).

Insulated Gate Bipolar Transistors (IGBTs)							
Product Number	$V_{CE(sat)}$ Min. (V)	$I_C$ (A)	$V_{CE(sat)}$ Typical (V)	$t_f$ Typical (ns)	Built In Diode	SCWT Rated <sup>2</sup>	Package
FGH50N3	300	75	1.3	12	No	Typical Data <sup>3</sup>	TO-247
HGT1S7N60C3DS	600	7	1.6	140	Yes	Yes	TO-263(D <sup>2</sup> PAK)
HGTP7N60C3D	600	7	1.6	140	Yes	Yes	TO-220
HGTP3N60A4	600	8	2	47	No	Typical Data <sup>3</sup>	TO-220
HGTP3N60A4D	600	8	2	47	Yes	Typical Data <sup>3</sup>	TO-220
HGTP12N60C3D	600	12	1.65	210	Yes	Yes	TO-220
HGT1S7N60C3D	600	14	1.6	140	Yes	Yes	TO-220
HGTD7N60C3S	600	14	1.6	140	No	Yes	TO-252(DPAK)
HGTG7N60A4	600	14	1.9	140	No	Typical Data <sup>3</sup>	TO-3P
HGTG7N60A4D	600	14	1.9	45	Yes	Typical Data <sup>3</sup>	TO-247
HGTP7N60A4	600	14	1.9	45	No	Typical Data <sup>3</sup>	TO-220
HGTP7N60A4D	600	14	1.9	45	Yes	Typical Data <sup>3</sup>	TO-220
HGTG20N60B3D	600	20	1.8	210	Yes	Yes	TO-247
HGTG12N60A4	600	23	2	18	No	Typical Data <sup>3</sup>	TO-247
HGTG12N60A4D	600	23	2	18	Yes	Typical Data <sup>3</sup>	TO-247
HGTP12N60A4	600	23	2	18	No	Typical Data <sup>3</sup>	TO-220
HGTP12N60A4D	600	23	2	18	Yes	Typical Data <sup>3</sup>	TO-220
FGAF40N60UF	600	40	2.3	35	No	Typical Data <sup>3</sup>	TO-3PF
FGAF40N60UFD	600	40	2.3	35	No	Typical Data <sup>3</sup>	TO-3PF
FGH80N60FD <sup>1</sup>	600	40	1.8	50	No	Typical Data <sup>3</sup>	TO-247
HGT1S20N60A4S9A	600	40	1.8	32	No	Typical Data <sup>3</sup>	TO-263(D <sup>2</sup> PAK)
HGTG20N60A4	600	40	2	32	No	Typical Data <sup>3</sup>	TO-247
HGTG20N60A4D	600	40	2	73	Yes	Typical Data <sup>3</sup>	TO-247
HGTP20N60A4	600	40	1.8	32	No	Typical Data <sup>3</sup>	TO-220
HGTG30N60A4	600	60	1.8	38	No	Typical Data <sup>3</sup>	TO-247
HGTG30N60A4D	600	60	1.8	38	Yes	Typical Data <sup>3</sup>	TO-247
HGTD1N120BNS	1200	5.3	2.5	226	No	Yes	TO-252(DPAK)
FGA15N120AND	1200	15	2.4	60	Yes	Typical Data <sup>3</sup>	TO-3P
FGA25N120ANTD	1200	25	2	100	Yes	Typical Data <sup>3</sup>	TO-3P
FGL40N120AND	1200	40	2.6	40	Yes	Yes	TO-264
FGH40N120AN	1200	40	2.6	40	No	Yes	TO-247
FGH40N60UFD <sup>1</sup>	600	40	1.8	50	Yes	Typical Data <sup>3</sup>	TO-247
FGH40N60SFD <sup>1</sup>	600	40	1.8	50	Yes	Typical Data <sup>3</sup>	TO-247

<sup>1</sup> New field stop IGBTs

<sup>2</sup> Short circuit withstand time

<sup>3</sup> Typical SCWT vs.  $V_{gate}$  curve

## High Voltage MOSFETs

Fairchild's MOSFET portfolio is one of the industry's broadest with outstanding low on-resistance and low gate charge performance. This is the result of proprietary technologies such as the SuperFET™, QFET™, UniFET™ and FRFET® MOSFETs. Fairchild's extensive packaging solutions have advantages such as superior size, low package height and excellent thermal and electrical performance.

Power MOSFETs						
Product Number	$BV_{DSS}$ Min. (V)	$R_{DS(ON)}$ Max. ( $\Omega$ ) @ $V_{GS}=10V$	$Q_g$ Typ (nC) @ $V_{GS}=10V$	$I_D$ (A)	$P_D$ (W)	Package
FCP20N60	600	0.19	75	20	208	TO-220
FCP11N60	600	0.38	40	11	125	TO-220
FCP7N60	600	0.6	25	7	83	TO-220
FQP12N60C	600	0.65	48	12	225	TO-220
FQP10N60C	600	0.73	44	9.5	156	TO-220
FQP8N60C	600	1.2	28	7.5	147	TO-220
FCPF20N60	600	0.19	75	20	39	TO-220F
FCPF11N60F	600	0.38	40	11	36	TO-220F
FQPF12N60C	600	0.65	48	12	51	TO-220F
FQPF10N60C	600	0.73	44	9.5	50	TO-220F
FQPF8N60CF	600	1.5	28	6.26	48	TO-220F
FCH47N60	600	0.07	210	47	417	TO-247
FCH47N60F	600	0.073	210	47	417	TO-247
FCH20N60	600	0.19	75	20	208	TO-247
FQA10N60C	600	0.73	44	10	192	TO-3P
FQP8N80C	800	1.55	35	8	178	TO-220
FQP7N80C	800	1.9	27	6.6	167	TO-220
FQP6N80C	800	2.5	21	5.5	158	TO-220
FQP5N80	800	2.6	25	4.8	140	TO-220
FQPF8N80C	800	1.55	35	8	59	TO-220F
FQPF7N80C	800	1.9	27	6.6	56	TO-220F
FQPF6N80C	800	2.5	21	5.5	51	TO-220F
FQPF3N80C	800	4.8	13	3	39	TO-220F
FQA13N80	800	0.75	68	12.6	300	TO-3P
FQA10N80C	800	1.1	44	10	240	TO-3P
FQA8N80C	800	1.55	35	8.4	220	TO-3P
FQA7N80C	800	1.9	27	7	198	TO-3P
FQP8N90C	900	1.9	35	6	170	TO-220
FQP6N90C	900	2.3	30	6	167	TO-220
FQP4N90C	900	4.2	17	4	140	TO-220
FQPF8N90C	900	1.9	35	6	60	TO-220F
FQPF6N90C	900	2.3	30	6	56	TO-220F
FQPF4N90C	900	4.2	17	4	47	TO-220F
FQA11N90C	900	1.1	60	11	300	TO-3P
FQA8N90C	900	1.1	35	8	240	TO-3P
FQA9N90C	900	1.4	45	9	280	TO-3P
FQA7N90M	900	1.8	40	7	210	TO-3P
FQA6N90C	900	2.3	30	6	198	TO-3P
FQA8N100C	1000	1.45	53	8	225	TO-3P
FQD2N100	1000	0.009	12	1.7	2.5	TO-252(DPAK)



## DIODES AND RECTIFIERS

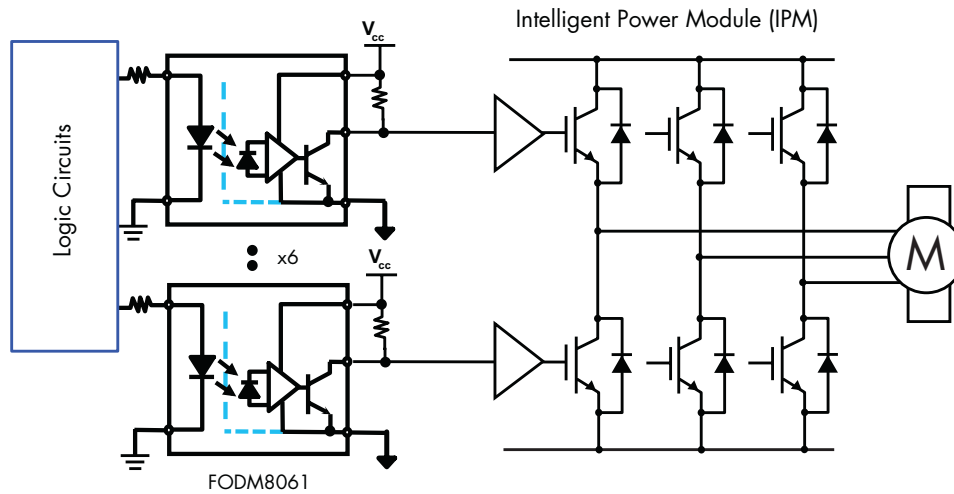
### Rectifiers

Fairchild's diode technologies are optimized for low-loss performance in high-frequency, hard-switched applications. The family exhibits low reverse recovery current (IRRM) and exceptionally soft recovery under typical operating conditions. These devices are intended for use as a free wheeling or boost diode in power supplies and other power switching applications. The soft recovery minimizes ringing, expanding the range of conditions under which the diode can operate without the use of additional snubber circuitry.

Rectifiers						
Product Number	Configuration	V <sub>RRM</sub> (V)	I <sub>F(AV)</sub> (A)	V <sub>f</sub> Max. (V)	t <sub>rr</sub> (ns)	Package
1N4005	Single	600	1	1.1	-	DO-41
1N4937	Single	600	1	1.2	150	DO-41
1N4937GP	Single	600	1	1.2	150	DO-41
RGF1J	Single	600	1	1.3	250	DO-214AC (SMA)
RS1J	Single	600	1	1.3	250	DO-214AC (SMA)
S1J	Single	600	1	1.1	1800	DO-214AC (SMA)
UF4005	Single	600	1	1.7	75	DO-41
EGP30J	Single	600	3	1.7	75	DO-201AD
ES3J	Single	600	3	1.7	20	DO-214AB (SMC)
S3J	Single	600	3	1.2	2500	DO-214AB (SMC)
ISL9R460PF2	Single	600	4	2.4	22	TO-220F
RURD460S	Single	600	4	1.5	60	TO-252 (DPAK)
FFPF05U60S	Single	600	5	2.3	80	TO-220F
RHRD660S	Single	600	6	2.1	35	TO-252 (DPAK)
RURD660	Single	600	6	1.5	60	TO-251 (IPAK)
RURD660S	Single	600	6	1.5	60	TO-252 (DPAK)
RURD660S9A	Single	600	6	1.5	60	TO-252 (DPAK)
FFP08H60S	-	600	8	2.1	35	TO-220
FFPF60SA60DS	Series	600	8	2.4	25	TO-220F
ISL9R860P2	Single	600	8	2.4	30	TO-220
ISL9R860PF2	Single	600	8	2.4	25	TO-220F
RHRP860	Single	600	8	2.1	35	TO-220
RURP860	Single	600	8	1.5	70	TO-220
FFP10U60DN	Common Cathode	600	10	2.2	90	TO-220
FFPF10U60DN	Common Cathode	600	10	2.2	90	TO-220F
FFPF10UP60S	Single	600	10	2.2	40	TO-220F
1N5397	Single	600	1.5	1.4	-	DO-15
FFA120UP60DN	Common Cathode	600	120	2.2	90	TO-3P
ISL9R1560P2	Single	600	15	2.2	40	TO-220
ISL9R1560PF2	Single	600	15	2.2	40	TO-220F
ISL9R1560S3S	Single	600	15	2.2	40	TO-263 (D <sup>2</sup> PAK)
RHRG1560CC	Common Cathode	600	15	1.5	60	TO-247
RHRP1560	Single	600	15	2.1	40	TO-220
FFPF20U60S	Single	600	20	2.2	90	TO-220F
FFPF60B150DS	Series	600	20	1.6	170	TO-220F
FF1N30HS60DD	Single	600	30	2.4	35	SOT-227B (ISOTOP)
FFA30U60DN	Common Cathode	600	30	2.3	90	TO-3P
FFA60UP60DN	Single	600	30	2.3	70	3P
FFPF30U60S	Single	600	30	2.3	90	TO-220F
ISL9R3060G2	Single	600	30	2.4	45	TO-247
ISL9R3060P2	Single	600	30	2.4	45	TO-220
RHRG3060	Single	600	30	2.1	45	TO-247
RHRP3060	Single	600	30	2.1	45	TO-220
RURG3060	Single	600	30	1.5	60	TO-247
RURG3060CC	Common Cathode	600	30	1.5	60	TO-247
RURP3060	Single	600	30	1.5	60	TO-220
FFH50US60S	Single	600	50	1.54	80	TO-247
RHRG5060	Single	600	50	2.1	50	TO-247
RURG5060	Single	600	75	1.6	75	TO-247
RURG8060	Single	600	80	1.6	85	TO-247

### High Performance Optocoupler

3.3V/5V high-speed logic gate optocouplers provide isolation to Intelligent Power Modules to prevent catastrophic failure of the motor drive, and meet safety regulatory standards. It utilizes Fairchild's patented coplanar packaging technology, Optoplanar®, and optimized design to achieve excellent noise immunity, characterized by high common mode transient immunity and power supply rejection specifications



### Low Voltage (3.3V/5V), High Performance

Product Number	Pin Connections	Package	Data Rate (Mbps)	I <sub>FT</sub> Max. (mA)	V <sub>OL</sub> Max. (V)	I <sub>CCL</sub> Max. (mA)	t <sub>PHL</sub> Max. (ns)	t <sub>PLH</sub> Max. (ns)	PWD Max. (ns)	CMR Typ. (kV/μs)	V <sub>ISO</sub> AC <sub>RMS</sub> (V)	T <sub>OPR</sub> (°C)
FOD8001		SOIC-8	25	-	1.0	9	40	40	6	40	3750	-40 to +105
FODM8071		5-Pin MFP (SO5)	20	5	0.6	4.8	55	55	20	40	3750	-40 to +110
FODM8061		5-Pin MFP (SO5)	10	5	0.6	8.5	80	80	25	40	3750	-40 to +110
FOD060L		SOIC-8	10	5	0.6	10	75	90	25	50	3750	-40 to +85
FOD260L		DIP-8	10	5	0.6	10	75	90	25	50	5000	-40 to +85

## OPTOCOUPLERS

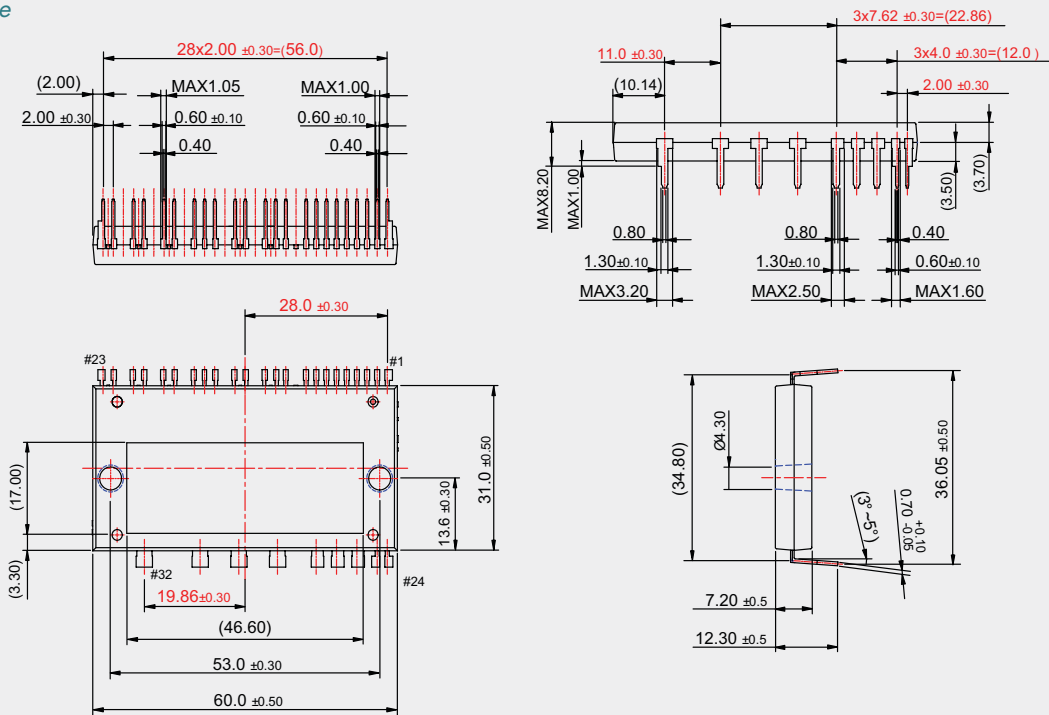
### Gate Drive Optocoupler

These IGBT/MOSFET gate drive optocouplers complement Fairchild's well-established offering in the discrete power IGBT/MOSFET line of products. Fairchild now offers customers one-stop shopping from the logic control portion of the circuit to the isolated gate driver to the power IGBT/MOSFET. This combined solution converts the mW to kW providing electrical isolation between the primary and secondary circuits.

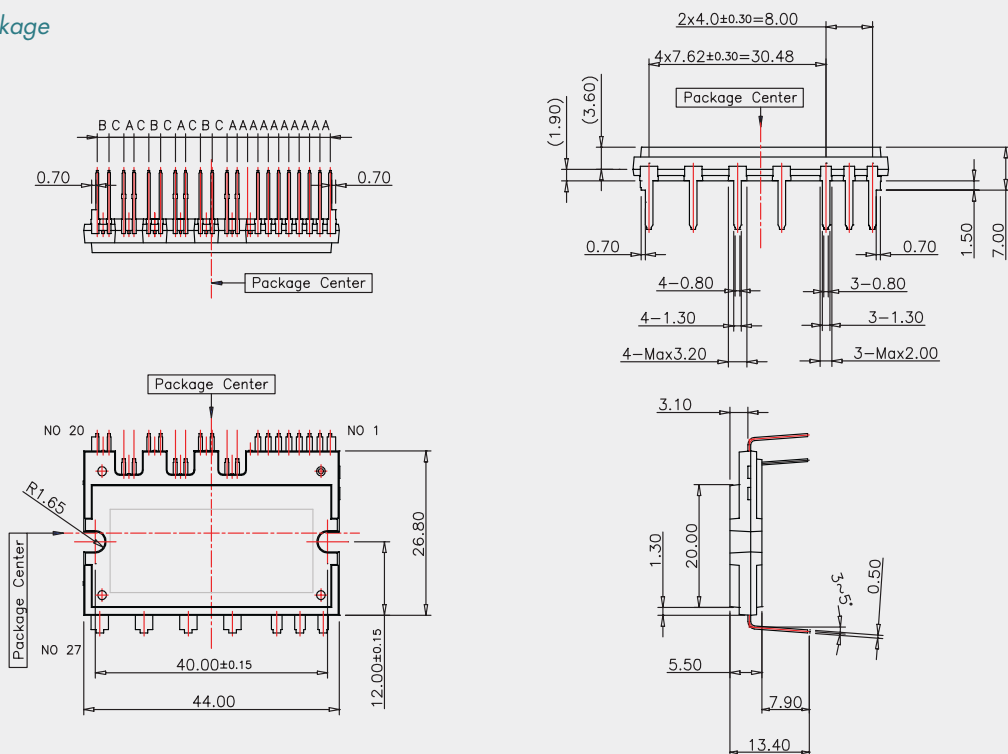
Gate Drivers														
Product Number	Pin Connections	$I_{OH}$ Min. (A)	$I_{OL}$ Min. (A)	$V_{OH}$ Min. (V)	$V_{OL}$ Max. (V)	$V_{CC}$ Max. (V)	$I_{CC}$ Max. (mA)	$t_{PLH} / t_{PHL}$ Max. (ns)	PWD Max. (ns)	$V_{UVLO+}$ Max. (V)	$V_{UVLO-}$ Max. (V)	CMR (kV/ $\mu$ s) @ $V_{cm}$ Min. (V)	$V_{ISO}$ $AC_{RMS}$ (V)	$T_{OPR}$ ( $^{\circ}$ C)
FOD3120	<p>DIP-8</p>	1.0 @ $V_O=V_{CC}$ -3.0V, 2.0 @ $V_O=V_{CC}-6V$	1.0 @ $V_O=V_{EE}$ +3V, 2.0 @ $V_O=V_{EE}+6V$	$V_{CC}$ -0.3	$V_{EE}$ +0.3	30	3.8	400	100	11.5 ~13.5	10.0 ~12.0	35 @ 2000	5000	-40 to 100
FOD3150		0.2 @ $V_O=V_{CC}$ -0.75V, 1.0 @ $V_O=V_{CC}-4V$	0.2 @ $V_O=V_{EE}$ +0.75V, 1.0 @ $V_O=V_{EE}+4V$	$V_{CC}$ -0.5	$V_{EE}$ +0.5	30	5	500	300	11.0 ~13.5	9.5 ~12.0	20 @ 2000	5000	-40 to 100
FOD3180		0.5 @ $V_O=V_{CC}$ -1V, 2.0 @ $V_O=V_{CC}-3V$	0.5 @ $V_O=V_{EE}$ +1V, 2.0 @ $V_O=V_{EE}+3V$	$V_{CC}$ -0.5	$V_{EE}$ +0.5	20	6	200	65	8.3	7.7	15 @ 1500	5000	-40 to 100
FOD3181		0.5 @ $V_O=V_{CC}$ -1V	0.5 @ $V_O=V_{EE}$ +1V	$V_{CC}$ -0.5	$V_{EE}$ +0.5	20	6	500	-	-	-	10 @ 1500	5000	-40 to 100

## SPM Package Dimensions

### DIP Package



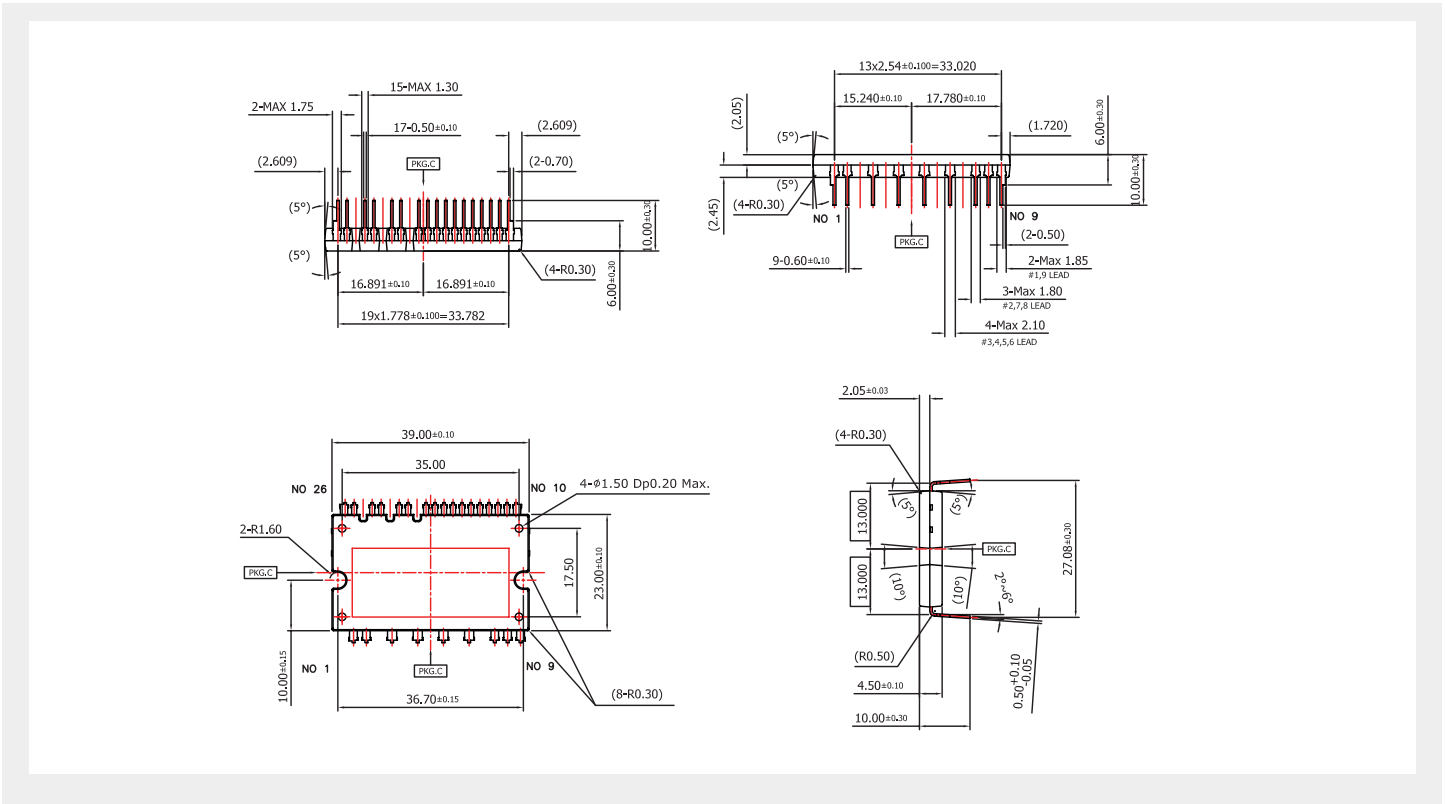
### Mini-Dip Package



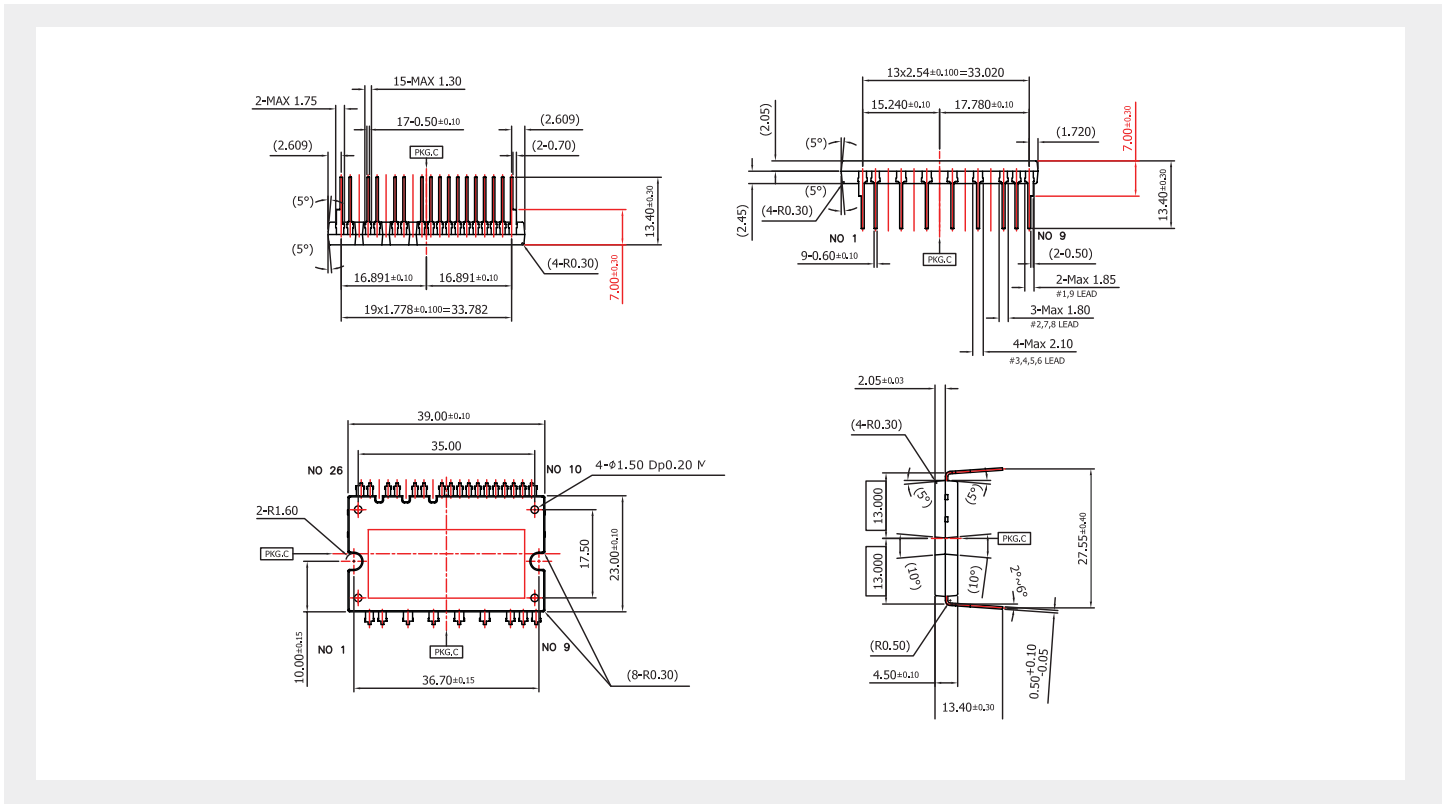
SPM PACKAGE DIMENSIONS

SPM Package Dimensions

*μMini DIP SPM Normal Forming (Short Lead)*

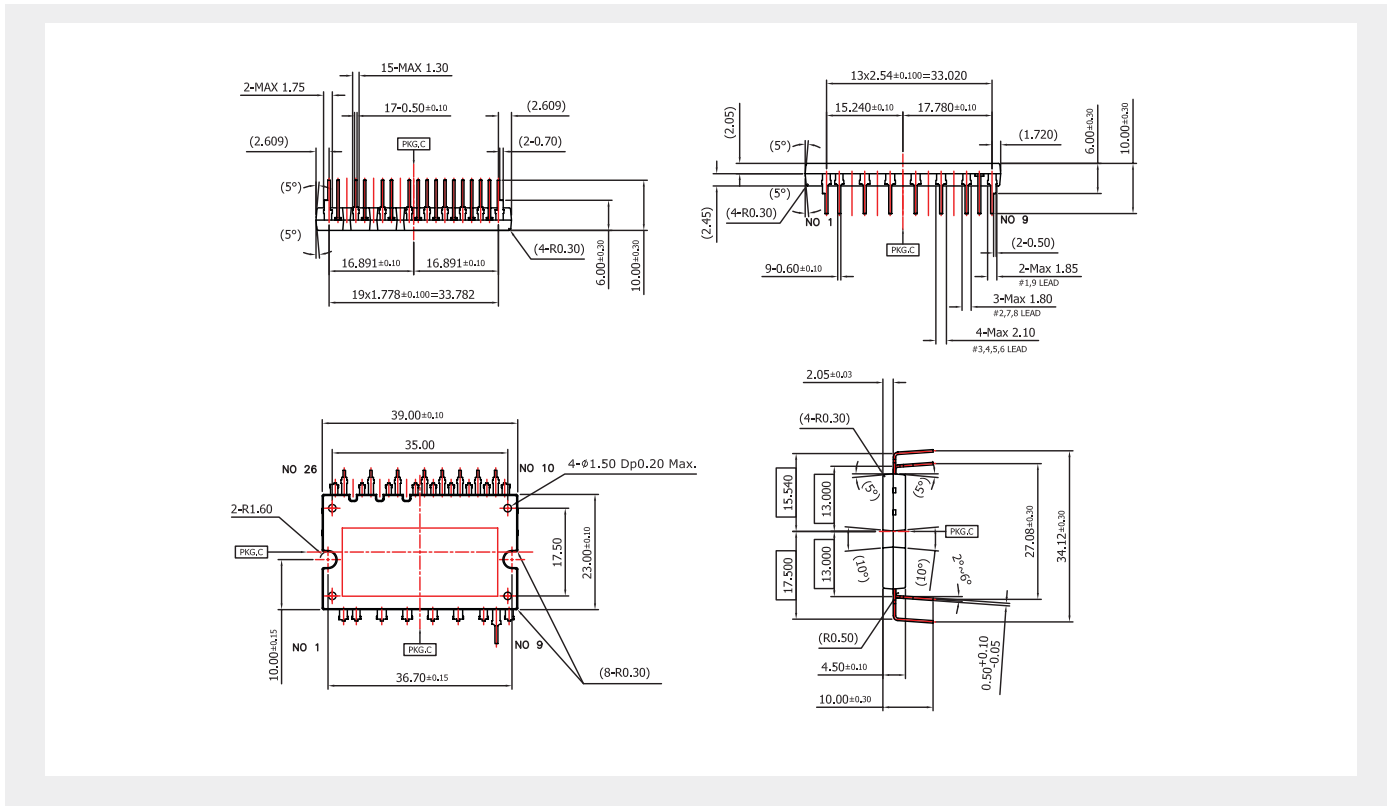


*μMini DIP SPM Normal Forming (Long Lead)*

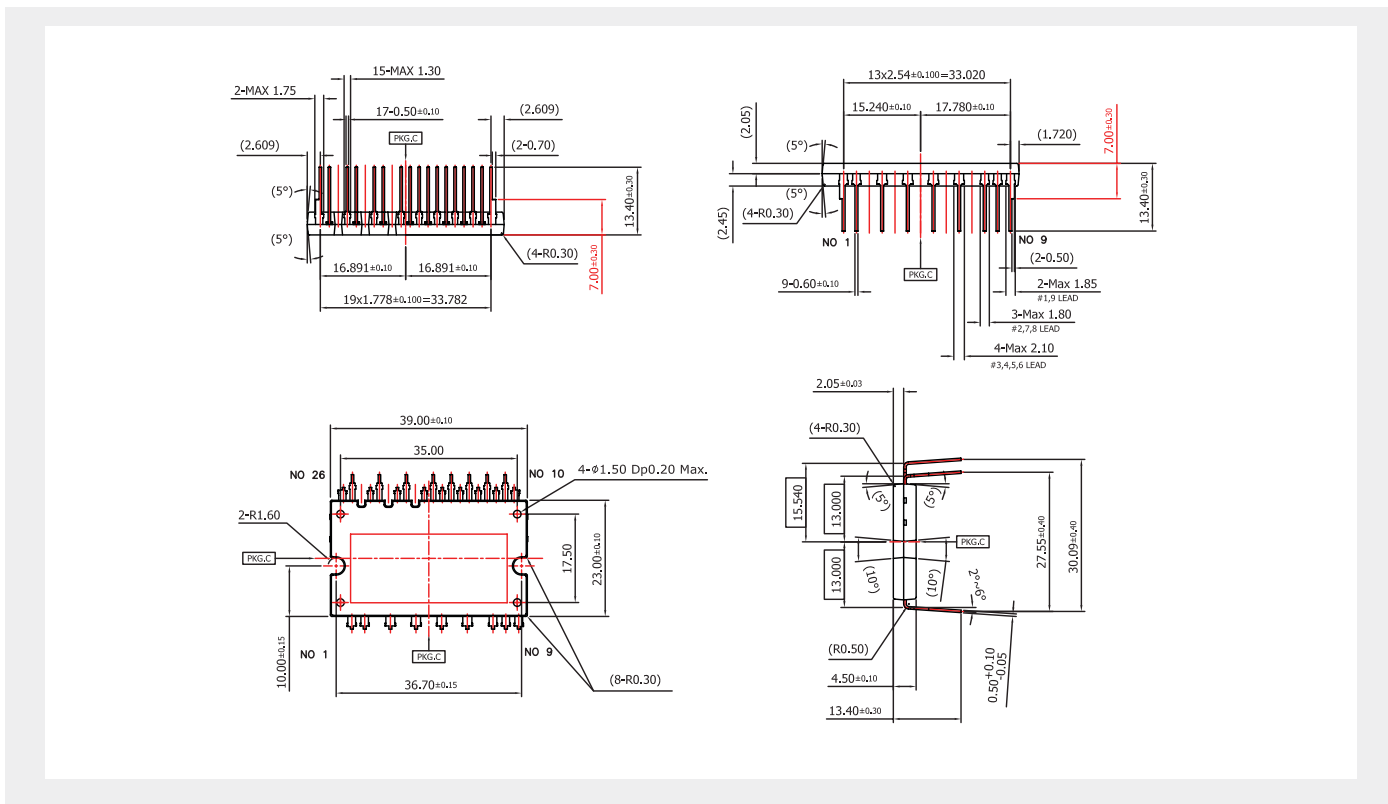


## SPM Package Dimensions

### *μMini DIP SPM Double Forming (Short Lead)*



### *μMini DIP SPM Double Forming (Long Lead)*

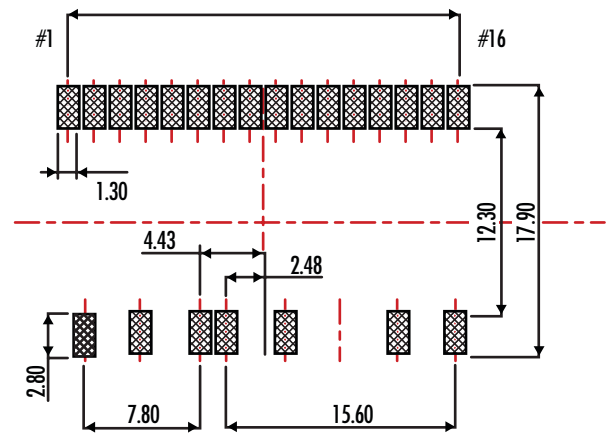
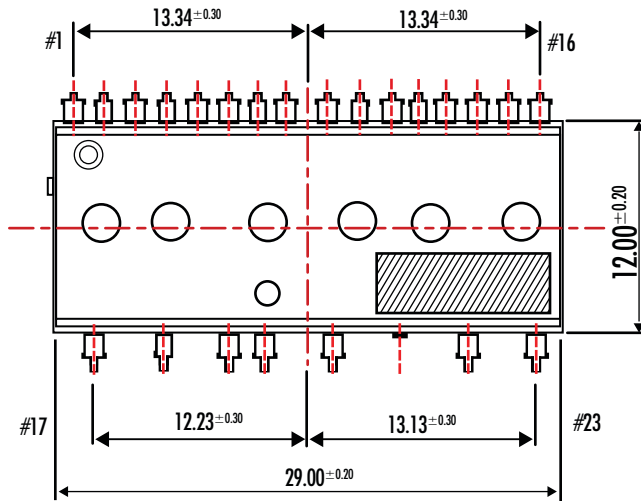
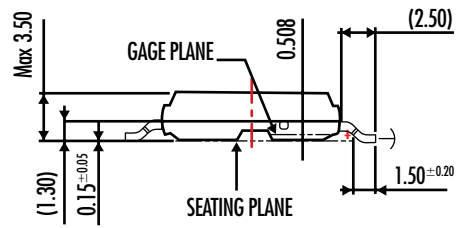
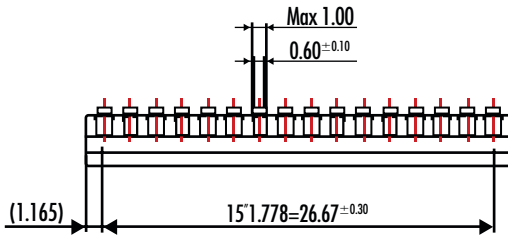




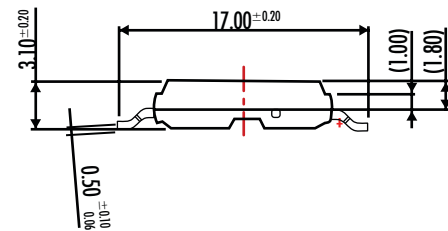
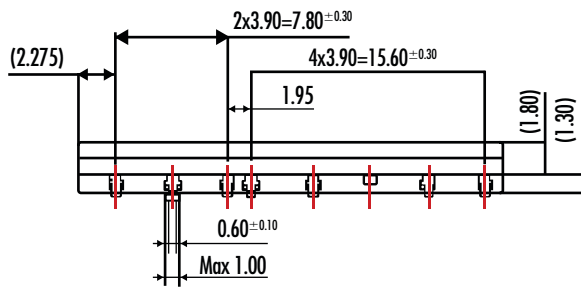
SPM PACKAGE DIMENSIONS

SPM Package Dimensions

Tiny-DIP (SMD) Package

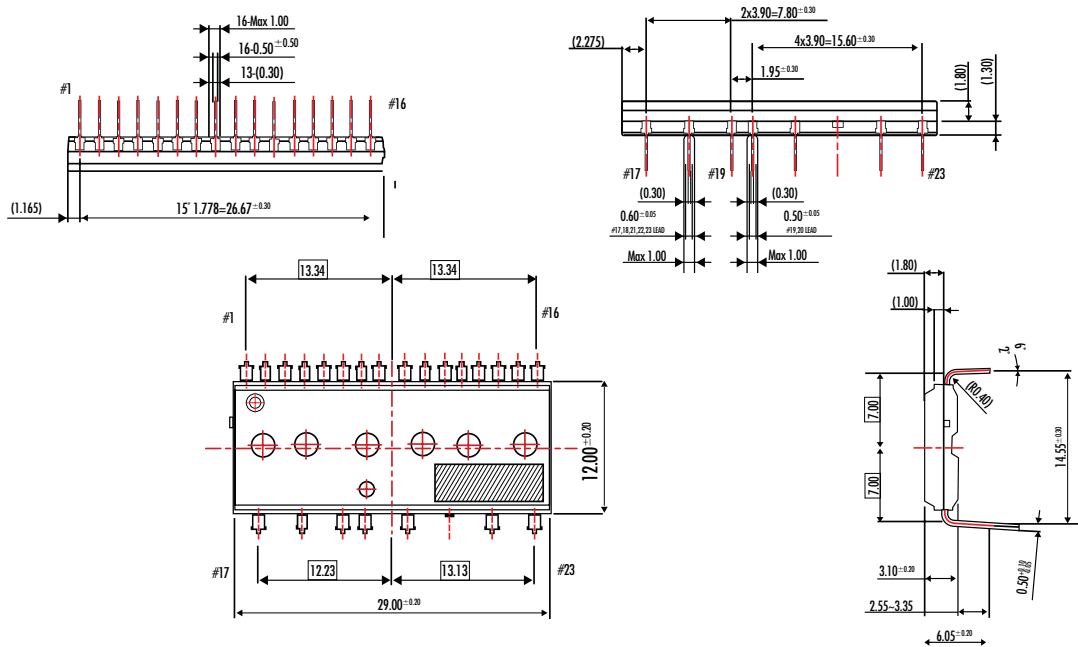


LAND PATTERN RECOMMENDATIONS

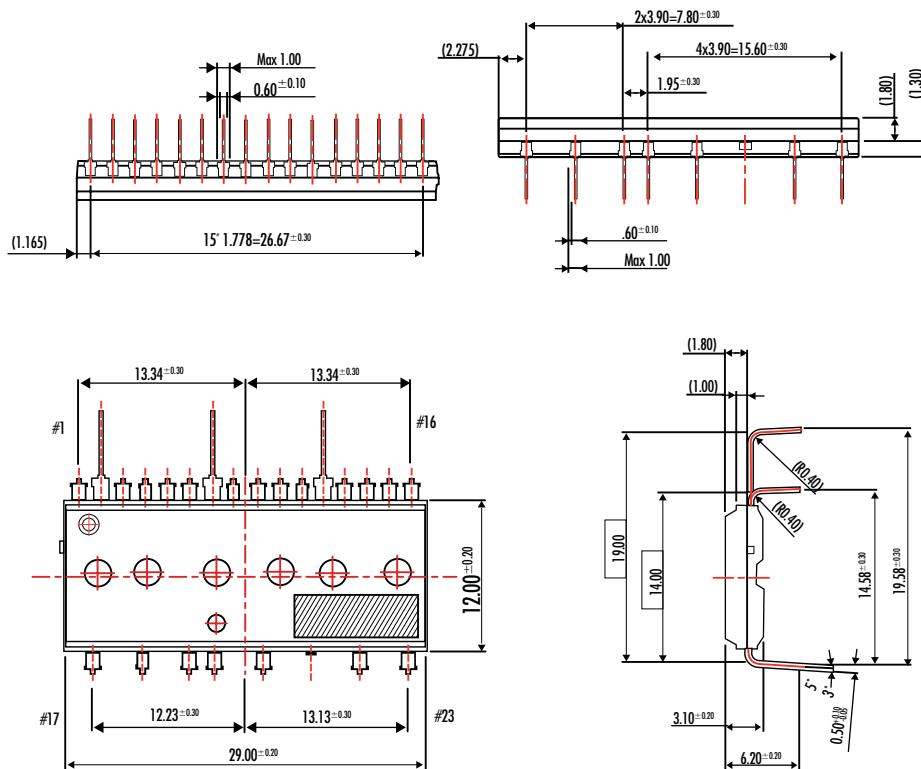


## SPM Package Dimensions

### Tiny-DIP (Normal DIP) Package

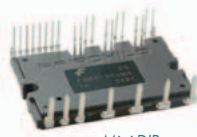


### Tiny-DIP (Double Dip) Package

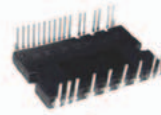




DIP  
(60mm x 31mm)



Mini-DIP  
(44mm x 26.8mm)



Micro Mini-DIP  
(37.7mm x 23mm)



Tiny-DIP (DIP)  
(29mm x 12mm)



Tiny-DIP (SMD)  
(29mm x 12mm)



Tiny-DIP (Double-DIP)  
(29mm x 12mm)

SPM Series		Rating (Motor Rating)	Features	Main Applications
Motion-SPM	DIP	600V 10~75A (0.8~7.5 kW)	3-phase IGBT inverter with: <ul style="list-style-type: none"> <li>• 3 divided N-terminal for current sensing</li> <li>• Built-in HVIC with UVP</li> <li>• Built-in LVIC with UVP, SCP</li> <li>• Sense IGBT for low-side</li> <li>• Built-in thermistor for temperature sensing</li> </ul>	<ul style="list-style-type: none"> <li>• Air conditioners (Compressor)</li> <li>• Washing machines (Drum)</li> <li>• Treadmills</li> <li>• Industrial inverters</li> <li>• Sewing machines</li> <li>• Pumps</li> </ul>
	Mini-DIP	600V 3~30A (0.3~3.0 kW)	3-phase IGBT inverter with: <ul style="list-style-type: none"> <li>• 3 divided N-terminal for current sensing</li> <li>• Independently V<sub>s</sub> pin for bootstrap circuits</li> <li>• Built-in HVIC with UVP</li> <li>• Built-in LVIC with UVP, SCP</li> <li>• Built-in TSD</li> <li>• Built-in bootstrap diode</li> <li>• Extended T<sub>j</sub> (-40°C - +150°C)</li> </ul>	<ul style="list-style-type: none"> <li>• Air conditioners (Compressor)</li> <li>• Washing machines (Drum)</li> <li>• Refrigerator (Compressor)</li> <li>• Dish washer</li> <li>• Treadmills</li> <li>• Industrial inverters</li> <li>• Sewing machines</li> <li>• Pumps</li> </ul>
	Micro Mini-DIP	600V 5 ~ 15A (0.5~1.5kW)	3-phase IGBT inverter with: <ul style="list-style-type: none"> <li>• 3 divided N-terminal for current sensing</li> <li>• Independently V<sub>s</sub> pin for bootstrap circuits</li> <li>• Built-in HVIC with UVP</li> <li>• Built-in LVIC with UVP, SCP</li> <li>• Built-in Bootstrap Diode</li> <li>• Built-in thermistor for temperature sensing</li> <li>• Extended T<sub>j</sub> (-40°C - +150°C)</li> </ul>	<ul style="list-style-type: none"> <li>• Air conditioners (Compressor, Fan)</li> <li>• Washing machines (Drum)</li> <li>• Refrigerator (Compressor)</li> <li>• Dish washer</li> <li>• Treadmills</li> <li>• Industrial inverters</li> <li>• Sewing machines</li> <li>• Pumps</li> </ul>
	Tiny-DIP (DIP)	250V 3A 500V 2~3A (50~125W)	3-phase IGBT inverter with: <ul style="list-style-type: none"> <li>• 3 divided N-terminal for current sensing</li> <li>• Built-in HVIC with UVP</li> <li>• Low EMI &amp; ruggedness</li> <li>• Small footprint</li> </ul>	<ul style="list-style-type: none"> <li>• Washing machines (Dry fans)</li> <li>• Air conditioners (Fans of indoor/outdoor)</li> <li>• Refrigerator (Fans of evaporator)</li> <li>• Dish washer</li> <li>• Pumps</li> <li>• Fans</li> </ul>
	Tiny-DIP (SMD)	60~500V, 2~8A (100~200W)		
	Tiny-DIP (Double-DIP)	250~500V, 3~3.5A (100~200W)		
PFC-SPM	Mini-DIP	600V 40, 60A (2~5kW)	Active Power Factor Correction Module with: <ul style="list-style-type: none"> <li>• Bridgeless circuit topology</li> <li>• Built-in LVIC with UVP, SCP</li> <li>• Built-in thermistor for temperature sensing</li> <li>• Built-in shunt resistor</li> </ul>	• PFC block of Air conditioners
		600V 20, 30A (2~3kW)	Active Power Factor Correction Module with: <ul style="list-style-type: none"> <li>• Boost Converter circuit topology</li> <li>• Built-in LVIC with UVP, SCP</li> <li>• Built-in thermistor for temperature sensing</li> <li>• Built-in bridge rectifier</li> </ul>	• PFC block of Air conditioners

\* In development

# Smart Power Module (SPM®) Selection Guide

SPM Series	Product Number	Switching Device	BV <sup>CEVF</sup> BV <sub>DSS</sub> (V)	I <sub>C</sub> I <sub>B</sub> (A) T <sub>C</sub> =25°C	I <sub>CP</sub> I <sub>BP</sub> (A <sub>pk</sub> ) T <sub>C</sub> =25°C, Pulse Width	Typical Switching Frequency (Hz)	Power Rating (W)	t <sub>dead</sub> (µs)	R <sub>th(j-c)</sub> (°C/W)	Built-In Thermistor	Built-In Shunt Resistor	Isolation Voltage (V <sub>rms</sub> @ 1 Min.)	Active	Boot Strap Diode	Substrate	
Large DIP (SPIM) (9.5x5.5mm)	FSSN50CH601		600	50	100	10k	5k	≥2.5	≤0.74	Yes	No	2500	High	No	DBC	
	FSAM10SH60A		600	10	20, <1ms	15k	1k	≥3.0	≤2.90							
	FSAM15SM60A		600	15	30, <1ms	5k	1.5k	≥3.0	≤2.50							
	FSAM15SH60A		600	15	30, <1ms	15k	1.5k	≥3.0	≤2.50							
	FSAM20SM60A	IGBT	600	20	40, <1ms	5k	2k	≥3.0	≤2.10	Yes	No	2500	Low	No	Ceramic	
	FSAM20SH60A		600	20	40, <1ms	15k	2k	≥3.0	≤2.10							
	FSAM30SM60A		600	30	60, <1ms	5k	3k	≥3.0	≤2.00							
	FSAM30SH60A		600	30	60, <1ms	15k	3k	≥3.0	≤2.00							
	FSAM50SM60A		600	50	100, <1ms	5k	5k	≥3.5	≤1.00		Yes	No	2500	Low	No	DBC
	FSAM75SM60A		600	75	110, <1ms	5k	7.5k	≥3.5	0.56							
	Motion-SPM	FSBF3CH60B			3, ≤1ms	6		0.3k	1.5	≤6.5						
		FSBF5CH60B			5, ≤1ms	10		0.5k	1.5	≤6.3						
		FSBF10CH60BT			10, ≤1ms	20		1.0k	1.5	≤6.2						
		FSBF10CH60BTL			10, ≤1ms	20		1.0k	1.5	≤6.2						
FSBF10CH60B				10, ≤1ms	20		1.0k	1.5	≤5.5							
FSBF15CH60BT			600	15, ≤1ms	30		1.5k	1.5	≤4.9					Yes		
FSBF15CH60BTL			600	15, ≤1ms	30	≤20k	1.5k	1.5	≤4.9	No	No	2500	High	Yes		
FSBB15CH60BT				15, ≤1ms	30		1.7k	1.5	≤2.68							
FSBB15CH60C				15, ≤1ms	30		1.7k	2.0	≤2.27							
FSBB20CH60CT				20, ≤1ms	40		2.4k	2.0	≤2.16							
FSBB20CH60C				20, ≤1ms	40		2.4k	2.0	≤2.0							
FSBB30CH60C				30, ≤1ms	60		3.0k	2.0	≤1.17							
µ Mini-DIP		FNA40560			5, T <sub>J</sub> =150°C	10, T <sub>J</sub> =150°C, ≤1ms		0.5k	1.5	≤4.2						
		FNA40860		600	8, T <sub>J</sub> =150°C	16, T <sub>J</sub> =150°C, ≤1ms	3k	0.8k	1.5	≤3.8			2000			Ceramic
	FNA41060		600	10, T <sub>J</sub> =150°C	20, T <sub>J</sub> =150°C, ≤1ms		1.0k	1.5	≤3.6							
	FNA41560	IGBT	600	15, T <sub>J</sub> =150°C	30, T <sub>J</sub> =150°C, ≤1ms		1.5k	1.5	≤3.0	Yes	No		High	Yes		
	FNB40560		600	5, T <sub>J</sub> =150°C	7.5, T <sub>J</sub> =150°C, ≤1ms		0.5k	1.5	≤4.2							
	FNB41060		600	10, T <sub>J</sub> =150°C	15, T <sub>J</sub> =150°C, ≤1ms	15k	1.0k	1.5	≤3.8			2000			Ceramic	
FNB41560		600	15, T <sub>J</sub> =150°C	22, T <sub>J</sub> =150°C, ≤1ms		1.5k	1.5	≤3.6								

# Smart Power Module (SPM®) Selection Guide

SPM Series	Product Number	Switching Device	$V_{CES}$ $V_{GSS}$ (V)	$I_{C,H}(A)$ $T_C=25^\circ C$	$I_{CP}, I_{DP}(A_{pk})$ $T_C=25^\circ C$ , Pulse Width	Typical Switching Frequency (Hz)	Power Rating (W)	$t_{resd}$ ( $\mu s$ )	$R_{th(j-c)}$ ( $^\circ C/W$ )	Built-In Thermistor	Built-In Shunt Resistor	Isolation Voltage ( $V_{rms}$ @ 1 Min.)	Active	Boot Strap Diode	Substrate		
Motion-SPM	DIP		250	1.5	3, $\leq$ 100 $\mu s$			100	1.0	-							
			500	1.0	2, $\leq$ 100 $\mu s$			100	1.0	-							
			500	1.5	3, $\leq$ 100 $\mu s$			150	1.0	-							
	SMD			250	1.5	3, $\leq$ 100 $\mu s$	$\leq$ 15k		100	1.0	-		1500				
				250	1.0	2, $\leq$ 100 $\mu s$			100	1.0	-						
				500	1.5	3, $\leq$ 100 $\mu s$			150	1.0	-						
	Double DIP		MOSFET	250	1.5	3, $\leq$ 100 $\mu s$			100	1.0	-				High	No	Fullpack
				500	1.5	3, $\leq$ 100 $\mu s$			150	1.0	-						
				500	1.8	3.5, $\leq$ 100 $\mu s$			200	1.0	-						
	SMD			60	2.6	5, $\leq$ 100 $\mu s$			100	1.0	-						
				500	2.0	5, $\leq$ 100 $\mu s$			200	1.0	-						
				500	1.5	3.8, $\leq$ 100 $\mu s$			150	1.0	-						
	SMD			500	1.1	2.8, $\leq$ 100 $\mu s$	$\leq$ 15k		100	1.0	-			1500			
				500	2.0	5, $\leq$ 100 $\mu s$			200	1.0	-						
				250	4.0	8, $\leq$ 100 $\mu s$			200	1.0	-						
PFC SPM	Mini-DIP (44x26.8mm)	IGBT	600	20	70, $\leq$ 1 min	20k		3k	-	$\leq$ 1.1	Yes	Yes	2500	High	No	DBC	
					90, $\leq$ 1 min			5k	-	$\leq$ 0.7							
					40, $\leq$ 1 min			2k	-	$\leq$ 1.63							
					60, $\leq$ 1 min			3k	-	$\leq$ 1.10							

For data sheets, application notes, samples and more, please visit: [www.fairchildsemi.com](http://www.fairchildsemi.com)

**PRODUCTS & SAMPLES**

APPLICATIONS

DESIGN SUPPORT

COMPANY

**POWER MANAGEMENT ICs**

**AC-DC: Power Factor Correction**

- Continuous Conduction Mode (CCM) PFC Controllers
- Critical (CrCM) / Boundary Conduction Mode (BCM) PFC Controllers
- PFC + PWM Combination (Combo) Controllers
- Interleaved PFC Controllers

**Isolated DC-DC**

- Green-mode PWM Controllers
- Integrated Green-mode PWM Regulators (Green FPS™)
- Integrated PWM Regulators (FPS™)
- Primary-side only CV/CC Controllers
- Standard SMPS PWM Controllers
- Synchronous Rectifier Controllers

**Non-Isolated DC-DC**

- Charge-pump Converters
- Multi-phase Controllers
- Step-down Controllers (External Switch)
- Step-down Regulators (Integrated Switch)
- Step-up Regulators (Integrated Switch)

**Power Drivers**

- High Voltage Gate Drivers (HVIC)
- Low-side Gate Drivers
- Synchronous Rectifier Controllers/Drivers
- Synchronous-Buck/Multi-phase Drivers

**Supervisory/Monitor ICs**

- Ground Fault Interrupt (GFI) Controllers
- Supervisors + PWM
- Temperature Sensors
- Voltage Supervisors/Detectors/Stabilizers

**Voltage Regulators**

- LDOs
- Positive Voltage Linear Regulators
- Negative Voltage Linear Regulators
- Shunt Regulators

**POWER SEMICONDUCTORS**

**Diodes & Rectifiers**

- Bridge Rectifiers
- Rectifiers
- Schottky Diodes and Rectifiers
- Small Signal Diodes
- Transient Voltage Suppressors
- Zener Diodes

**IGBTs**

- Discrete IGBTs
- Ignition IGBTs

**Integrated Power Solutions**

- DrMOS FET Plus Driver Multi-chip Modules
- Full Function Load Switches (IntelliMAX™)
- MOSFET/Schottky Combos
- Motion-(SPM®) Smart Power Modules
- PDP-(SPM®) Smart Power Modules
- PFC-(SPM®) Smart Power Modules
- Power-(SPM®) Smart Power Modules
- Smart Switches

**MOSFETs**

- Discrete MOSFETs
- Full Function Load Switches (IntelliMAX™)
- MOSFET/Schottky Combos

**Transistors**

- BJTs
- Discrete IGBTs
- JFETs
- Load Switches
- Discrete MOSFETs
- MOSFET/Schottky Combos
- Small Signal Transistors

**LIGHTING AND DISPLAY**

- CCFL Ballast ICs
- CFL/Lighting Ballast Control ICs
- Critical (CrCM)/Boundary Conduction Mode (BCM) PFC Controllers for Lighting
- High Voltage Gate Drivers (HVICs)
- LED Drivers
- PDP Smart Power Modules (PDP-SPM™)

**SIGNAL PATH ICs**

**Amplifiers & Comparators**

- Comparators
- Current Sense Amplifiers
- High Performance Amplifiers (>15MHz)
- Operational Amplifiers

**Battery Protection ICs**

- Battery Protection ICs

**Interface**

- LVDS
- Serializers/Deserializers (µSerDes™)
- USB Transceivers

**Signal Conditioning**

- Triple Video DACs
- Video Filter Drivers
- Video Switch Matrix/Multiplexers

**Switches**

- Analog/Audio Switches
- Bus Switches
- Camera Switches
- Multimedia Switches
- USB Switches
- Video Switches

**AUTOMOTIVE PRODUCTS**

- Automotive Power Modules
- Discrete Power
- Intelligent Power

**LOGIC | TINYLOGIC®**

- Buffers, Drivers, Transceivers
- Flip Flops, Latches, Registers
- Gates
- MSI Functions
- Multiplexer/Demultiplexer Encoders/Decoders
- Specialty Logic
- TinyLogic
- Voltage Level Translators

**OPTOELECTRONICS**

- Infrared
- High Performance Optocouplers
- TRIAC Driver Optocouplers
- Phototransistor Optocouplers
- Solid State Relay Optocouplers