

# Motion SPM<sup>®</sup> 45 Series

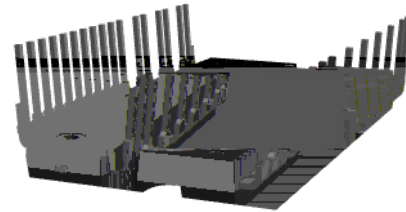
## FND43060T2

### General Description

FND43060T2 is an advanced Motion SPM 45 module providing a fully featured, high performance inverter output stage for AC Induction, BLDC, and PMSM motors. These modules integrate optimized gate drive of the built in IGBTs to minimize EMI and losses, while also providing multiple on module protection features including under voltage lockouts, over current shutdown, thermal monitoring, and fault reporting. The built in, high speed HVIC requires only a single supply voltage and translates the incoming logic level gate inputs to the high voltage, high current drive signals required to properly drive the module's robust short €



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Built In Bootstrap Diodes and Dedicated Vs Pins Simplify PCB Layout

- Built In NTC Thermistor for Temperature Monitoring
- Separate Open Emitter Pins from Low Side IGBTs for Three Phase Current Sensing
- Single Grounded Power Supply
- Isolation Rating: 4000 V<sub>rms</sub>/min
- Remove Dummy Pin

### Applications

- Motion Control Home Appliance/Industrial Motor

### Related Resources

- [AN 9084](#) Smart Power Module, Motion SPM<sup>®</sup> 45 H V3 Series User's Guide
- [AN 9072](#) Smart Power Module, Motion SPM<sup>®</sup> in SPM45H Thermal Performance Information
- [AN 9071](#) Smart Power Module Motion SPM<sup>®</sup> in SPM45H Mounting Guidance
- [AN 9760](#) PCB Design Guidance for SPM<sup>®</sup>

### Integrated Power Functions

- 600 V 30 A IGBT inverter for three phase DC/AC power conversion (Refer to Figure 3)

SPMAA-C26  
CASE MODFC

### MARKING DIAGRAM

XXXXXXXXXX  
ZZZ ATYWW  
NNNNNNN

XXXX = Specific Device Code  
ZZZ = Lot ID  
AT = Assembly and Test Location  
Y = Year  
WW = Work Week  
NNN = Serial Number



## FND43060T2

### PIN DESCRIPTIONS

Pin Number	Pin Name	Pin Description
1	$V_{TH}$	Thermistor Bias Voltage
2	$R_{TH}$	Series Resistor for the Use of Thermistor (Temperature Detection)
3	P	Positive DC-Link Input
4	U	Output for U-Phase
5	V	Output for V-Phase
6	W	Output for W-Phase
7	$N_U$	Negative DC-Link Input for U-Phase
8	$N_V$	Negative DC-Link Input for V-Phase
9	$N_W$	Negative DC-Link Input for W-Phase
10	$C_{SC}$	Capacitor (Low-Pass Filter) for Short-circuit Current Detection Input
11	$V_{FO}$	Fault Output
12	IN	

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## INTERNAL EQUIVALENT CIRCUIT AND INPUT/OUTPUT PINS

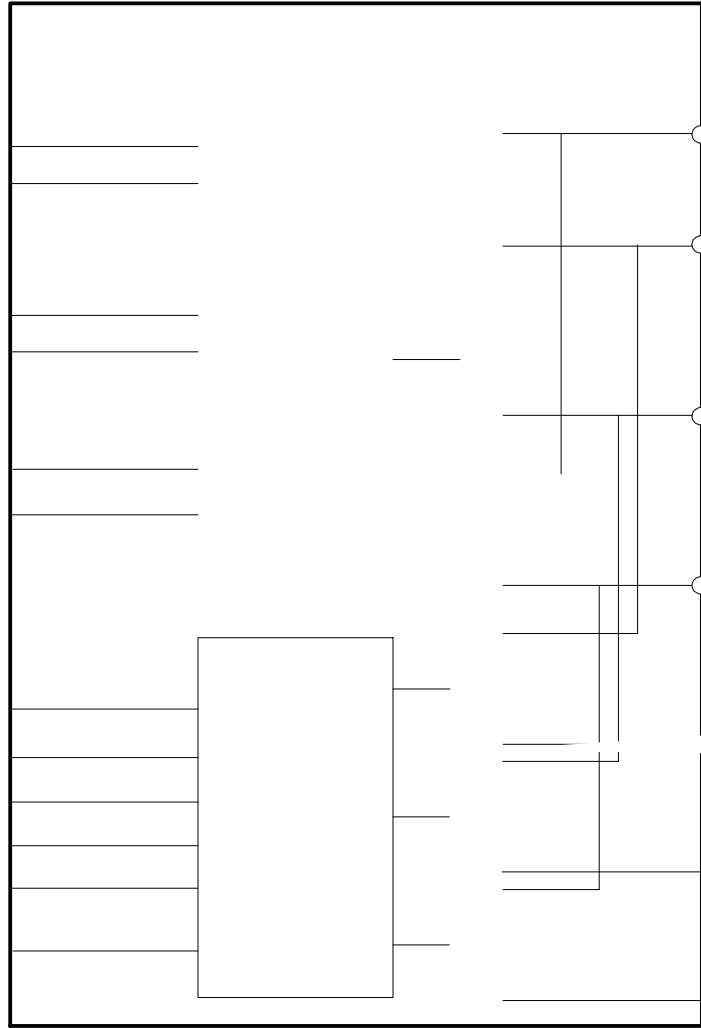


Figure 3. Internal Block Diagram

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## ABSOLUTE MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Rating	Unit
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### INVERTER PART

V <sub>PN</sub>	Supply Voltage			
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## ELECTRICAL CHARACTERISTICS – INVERTER PART ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
$V_{CE(SAT)}$	Collector – Emitter Saturation Voltage	$V_{DD} = V_{BS} = 15\text{ V}$ , $V_{IN} = 5\text{ V}$	-	1.65	2.25	V	
$V_F$	FWDi Forward Voltage	$V_{IN} = 0\text{ V}$	-	2.00	2.60	V	
HS	$t_{ON}$	Switching Times $V_{PN} = 300\text{ V}$ , $V_{DD} = V_{BS} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_J = 25^\circ\text{C}$ $V_{IN} = 0\text{ V} \leftrightarrow 5\text{ V}$ , Inductive Load (Note 4)	0.45	0.85	1.35	$\mu\text{s}$	
			$t_{C(ON)}$	-	0.20	0.50	$\mu\text{s}$
			$t_{OFF}$	-	0.70	1.20	$\mu\text{s}$
			$t_{C(OFF)}$	-	0.15	0.45	$\mu\text{s}$
			$t_{rr}$	-	0.10	-	$\mu\text{s}$
LS	$t_{ON}$	$V_{PN} = 300\text{ V}$ , $V_{DD} = V_{BS} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_J = 25^\circ\text{C}$ $V_{IN} = 0\text{ V} \leftrightarrow 5\text{ V}$ , Inductive Load (Note 4)	0.5	0.90	1.40	$\mu\text{s}$	
			$t_{C(ON)}$	-	0.30	0.60	$\mu\text{s}$
			$t_{OFF}$	-	0.80	1.30	$\mu\text{s}$
			$t_{C(OFF)}$	-	0.15	0.45	$\mu\text{s}$
			$t_{rr}$	-	0.15	-	$\mu\text{s}$
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE} = V_{CES}$	-	-	1	mA	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4.  $t_{ON}$  and  $t_{OFF}$  include the propagation delay of the internal drive IC.  $t_{C(ON)}$  and  $t_{C(OFF)}$  are the switching time of IGBT itself under the given gate driving condition internally. For the detailed information, please see Figure 4.

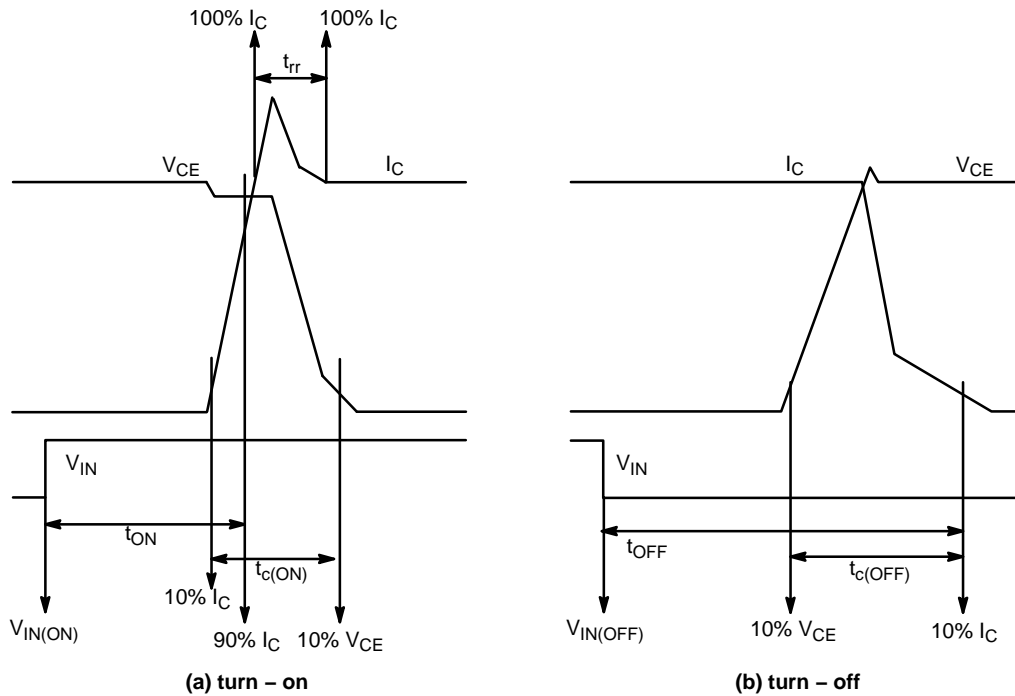
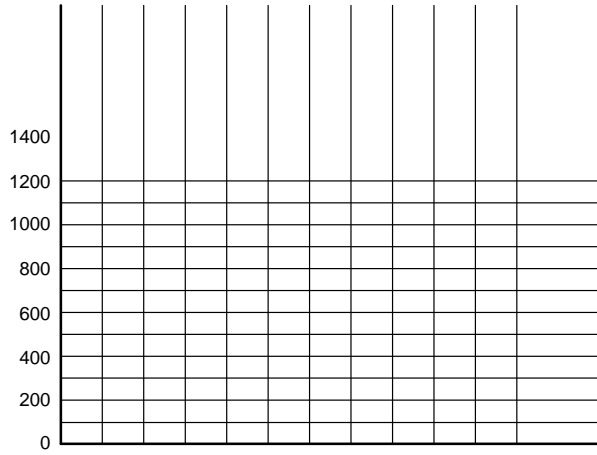


Figure 4. Switching Time Definition

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COLLECTOR CURRENT, I<sub>C</sub> [AMPERES]

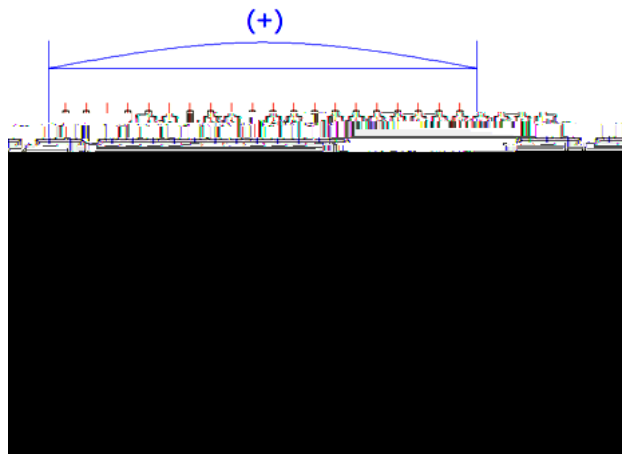
Figure 5. Switching Loss Characteristics (Typical)







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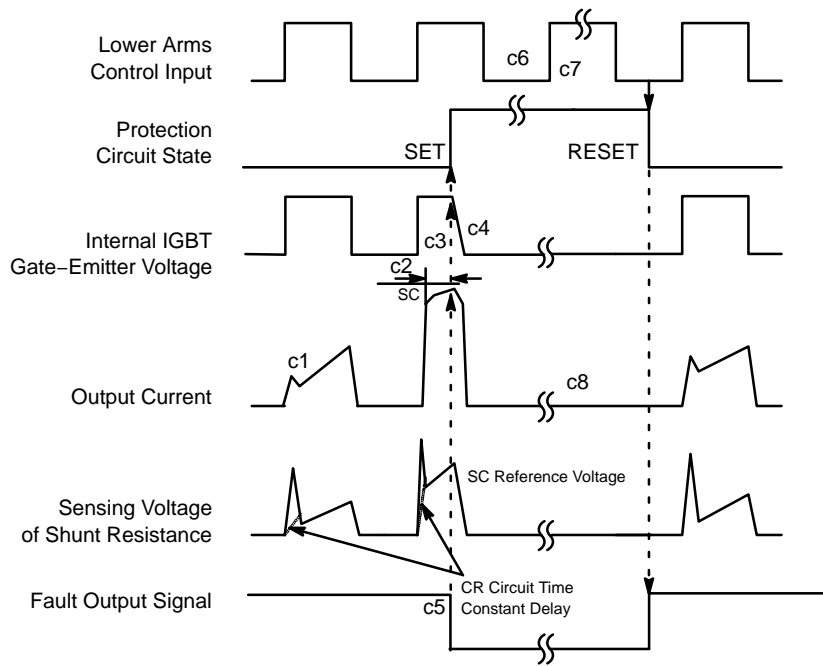
**Figure 9. Flatness Measurement Position**

Pre

**Figure 10. Mounting Screws Torque Order**



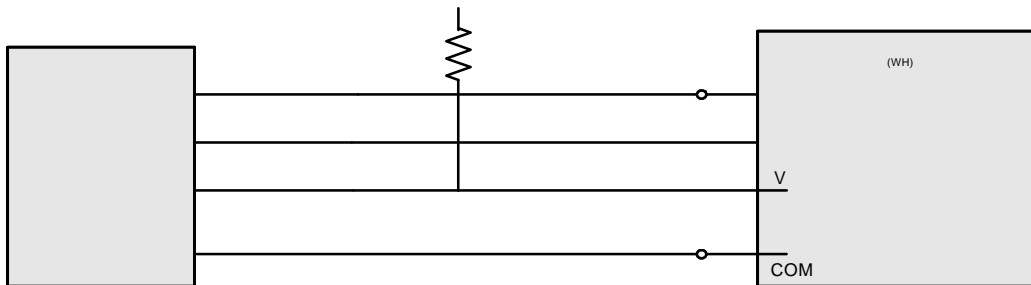
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(with the external sense resistance and CR connection)

- c1: Normal operation: IGBT ON and carrying current.
- c2: Short-circuit current detection (SC trigger).
- c3: Hard IGBT gate interrupt.
- c4: IGBT turns OFF.
- c5: Input "LOW": IGBT OFF state.
- c6: Input "HIGH": IGBT ON state, but during the active period of fault output the IGBT doesn't turn ON.
- c7: IGBT OFF state.
- c8: Normal operation: IGBT ON and carrying current.

**Figure 14. Short-Circuit Protection (Low-Side Operation Only)**



**Figure 15. Recommended MCU I/O Interface Circuit**

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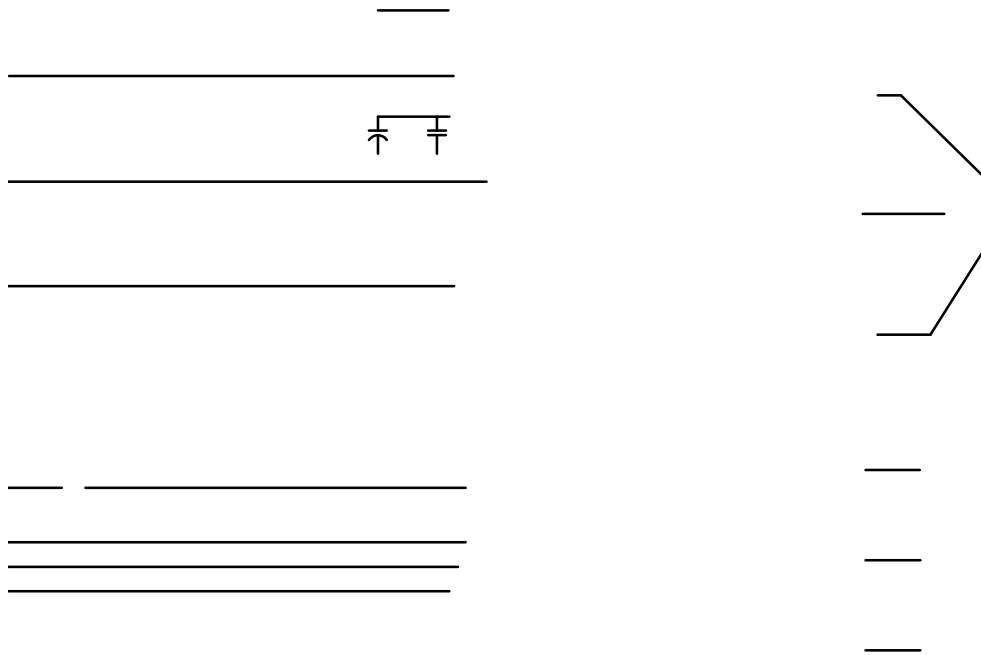


Figure 16. Typical Application Circuit



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