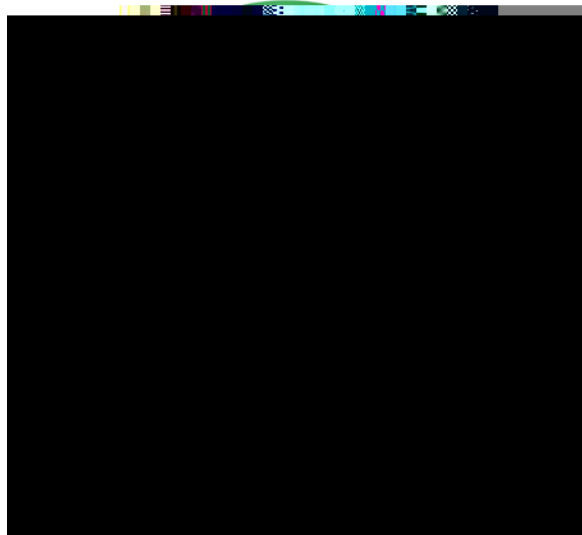




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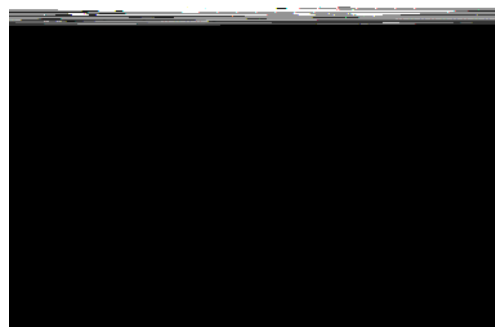
April 2017

# FNF51060TD1

## Motion SPM® 55 Series

### Features

- UL Certified No. E209204 (UL1557)
- 600 V - 10 A 3-Phase IGBT Inverter Including Control IC for Gate Drive and Protections
- Low-Loss, Short-Circuit Rated IGBTs
- Built-In Bootstrap Diodes in HVIC
- Separate Open-Emitter Pins from Low-Side IGBTs for Three-Phase Current Sensing
- Active-HIGH interface, works with 3.3 / 5 V Logic, Schmitt-trigger Input
- HVIC for Gate Driving, Under-Voltage and Short-Circuit Current Protection
- Fault Output for Under-Voltage and Short-Circuit Current Protection



## Integrated Power Functions

- 600 V - 10 A IGBT inverter for three phase DC / AC power conversion (Please refer to Figure 3)

## Integrated Drive, Protection and System Control Functions

- For inverter high-side IGBTs: gate drive circuit, high-voltage isolated high-speed level shifting control circuit Under-Voltage Lock-Out (UVLO) protection
- For inverter low-side IGBTs: gate drive circuit, Short-Circuit Protection (SCP) control supply circuit Under-Voltage Lock-Out (UVLO) protection
- Fault signaling: corresponding to UVLO (low-side supply) and SC faults
- Input interface: High-active interface, works with 3.3 / 5 V logic, Schmitt trigger input
- Built in Bootstrap circuitry in HVIC

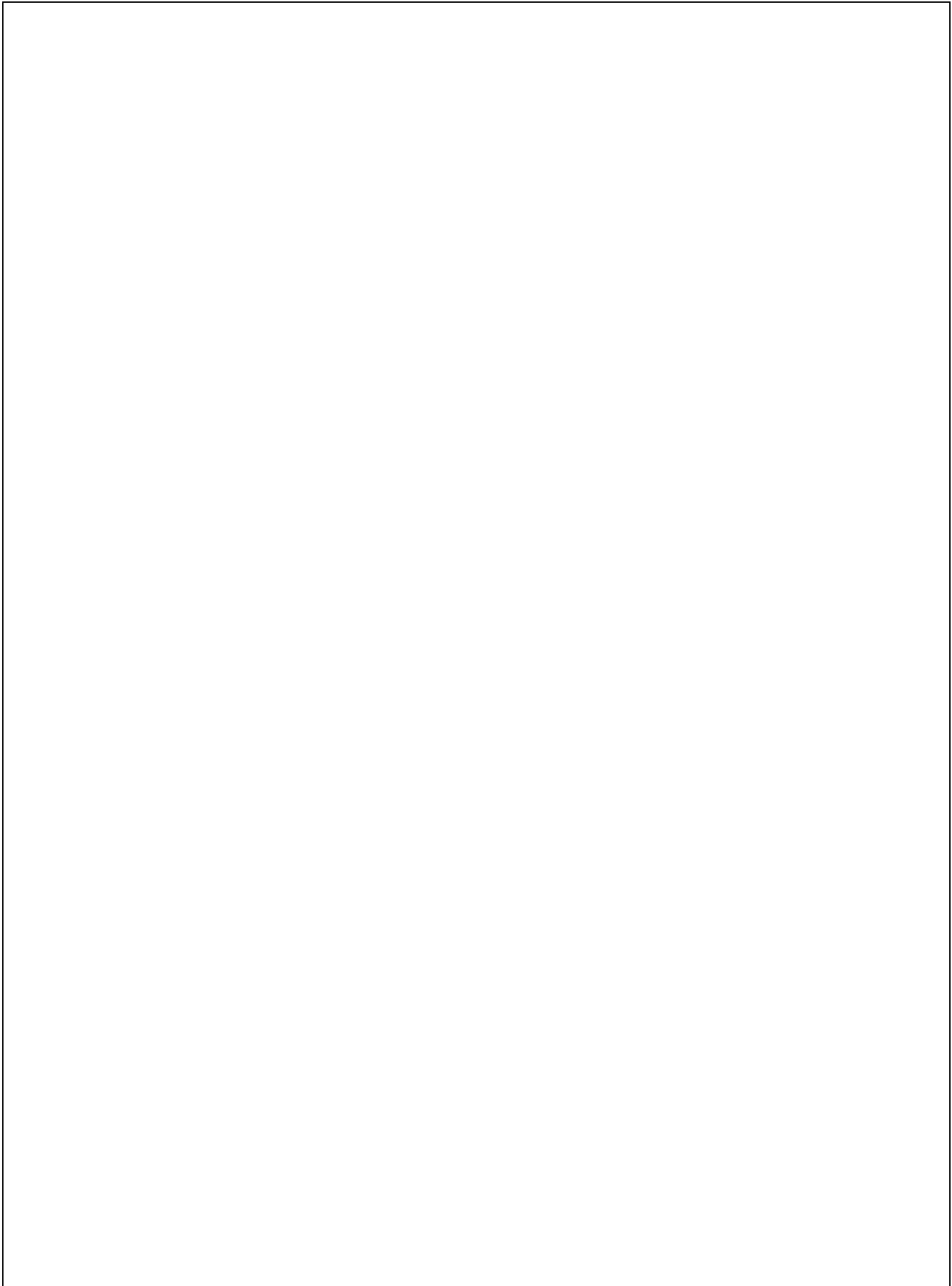
## Pin Configuration

**Figure 2. Top View**

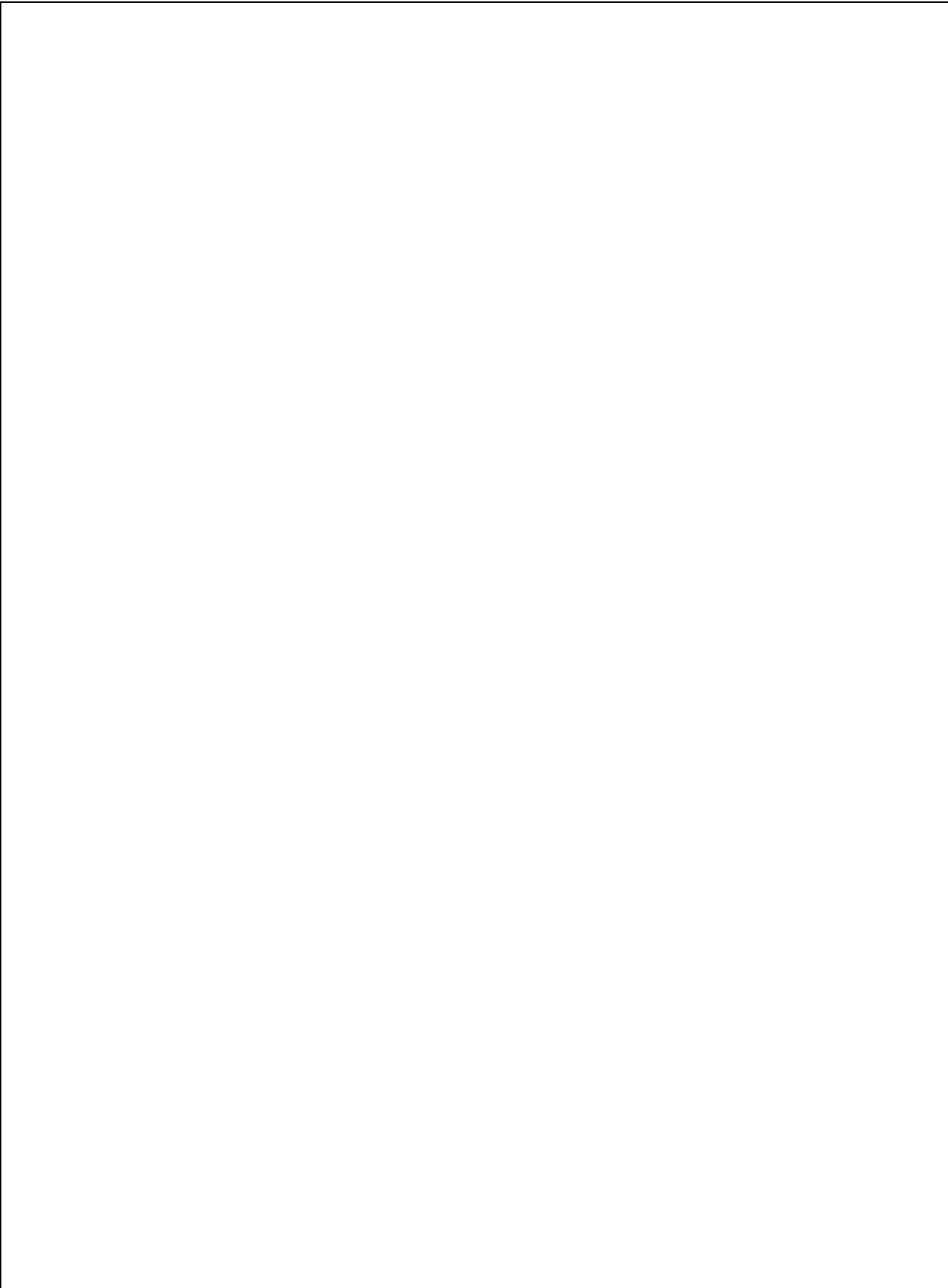
## Pin Descriptions

Pin Number	Pin Name	Pin Description
1	P	Positive DC-Link Input
2	U, V <sub>S</sub> (U)	Output for U Phase
3	V, V <sub>S</sub> (V)	Output for V Phase
4	W, V <sub>S</sub> (W)	Output for W Phase
5	N <sub>U</sub>	Negative DC-Link Input for U Phase
6	N <sub>V</sub>	Negative DC-Link Input for V Phase
7	N <sub>W</sub>	

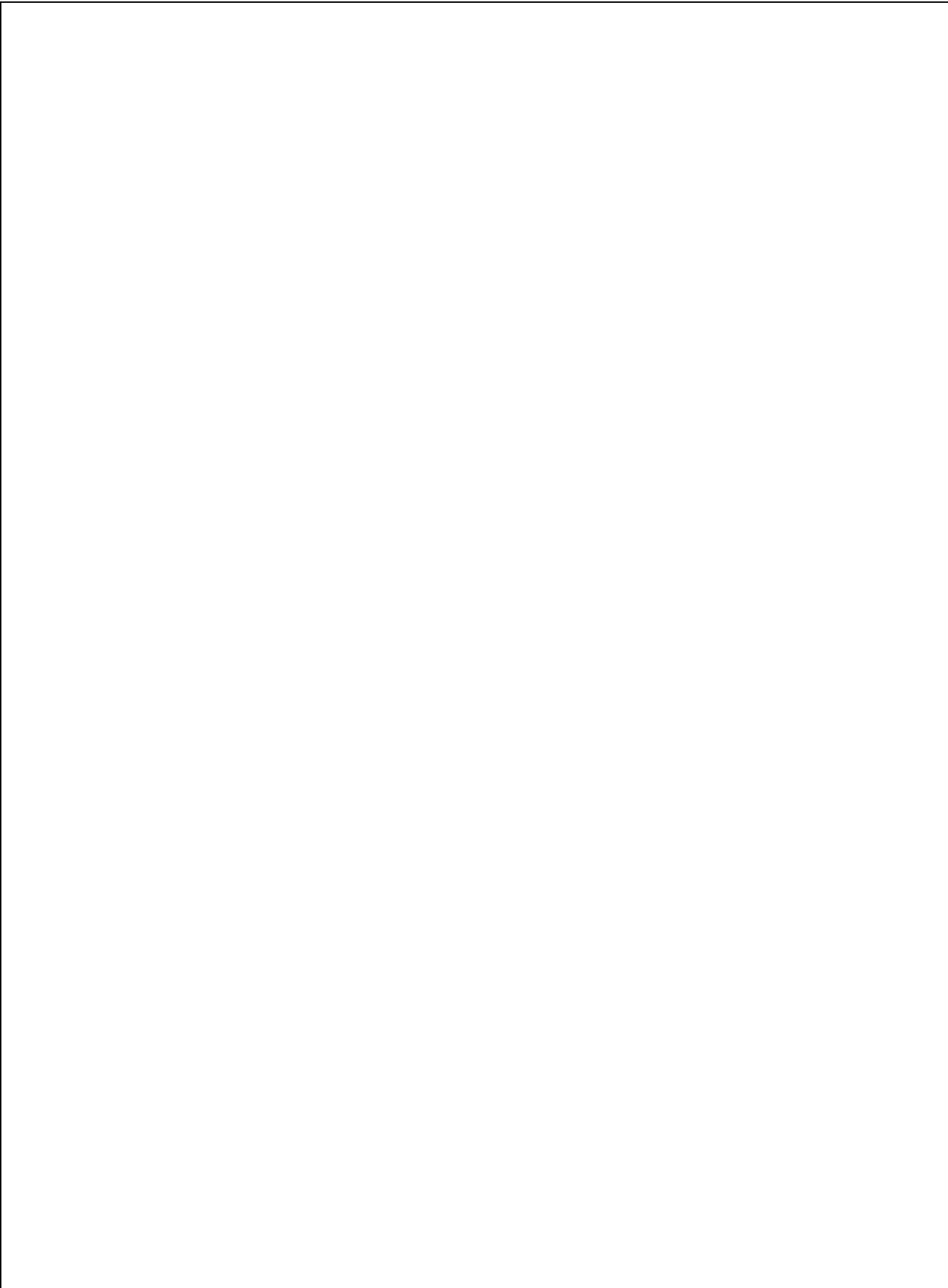






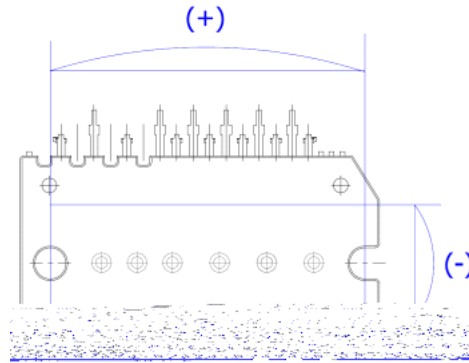




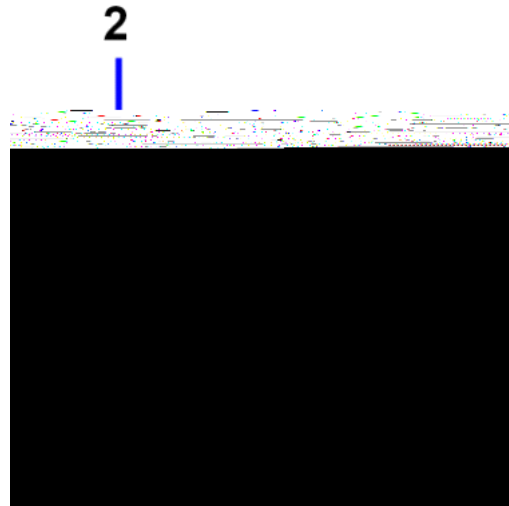


## Mechanical Characteristics and Ratings

Parameter	Conditions	Min.	Typ.	Max.	Unit	
Device Flatness	See Figure 8	-50	-	100	μm	
Mounting Torque	Mounting Screw: - M3	Recommended 0.7 N • m	0.6	0.7	0.8	N • m
	Note Figure 9	Recommended 7.1 kg • cm	5.9	6.9	7.9	kg • cm
Weight		-	6.0	-	g	



**Figure 8. Flatness Measurement Position**



**Figure 9. Mounting Screws Torque Order**

**Note:**

12. Do not make over torque when mounting screws. Much mounting torque may cause package cracks, as well as bolts and Al heat-sink destruction.
13. Avoid one side tightening stress. Figure 10 shows the recommended torque order for mounting screws. Uneven mounting can cause the ceramic substrate of the Motion SPM 55 product to be damaged. The Pre-screwing torque is set to 20 ~ 30 % of maximum torque rating.

## Time Charts of Protective Function

Input Signal

Control  
Supply Voltage

Output Current

Fault Output Signal

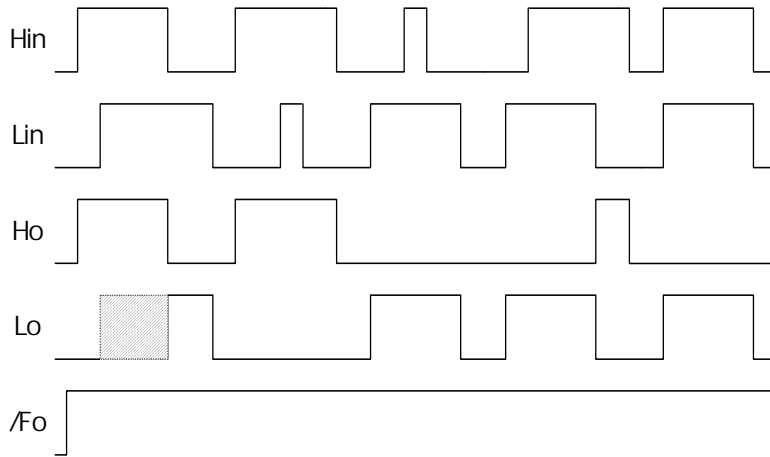
- a1 : Control supply voltage rises: After the voltage rises  $UV_{DDR}$ , the circuits start to operate when next input is applied.  
 a2 : Normal operation: IGBT ON and carrying current.  
 a3 : Under voltage detection ( $UV_{DD}$ ).  
 a4 : IGBT OFF in spite of control input condition.  
 a5 : Fault output operation starts.  
 a6 : Under voltage reset ( $UV_{DDR}$ ).  
 a7 : Normal operation: IGBT ON and carrying current.

### Figure 10. Under-Voltage Protection (Low-Side)

- b1 : Control supply voltage rises: After the voltage reaches  $UV_{BSR}$ , the circuits start to operate when next input is applied.  
 b2 : Normal operation: IGBT ON and carrying current.  
 b3 : Under voltage detection ( $UV_{BSD}$ ).  
 b4 : IGBT OFF in spite of control input condition, but there is no fault output signal.  
 b5 : Under voltage reset ( $UV_{BSR}$ )  
 b6 : Normal operation: IGBT ON and carrying current

### Figure 11. Under-Voltage Protection (High-Side)

(with the external shunt resistance and CR connection)

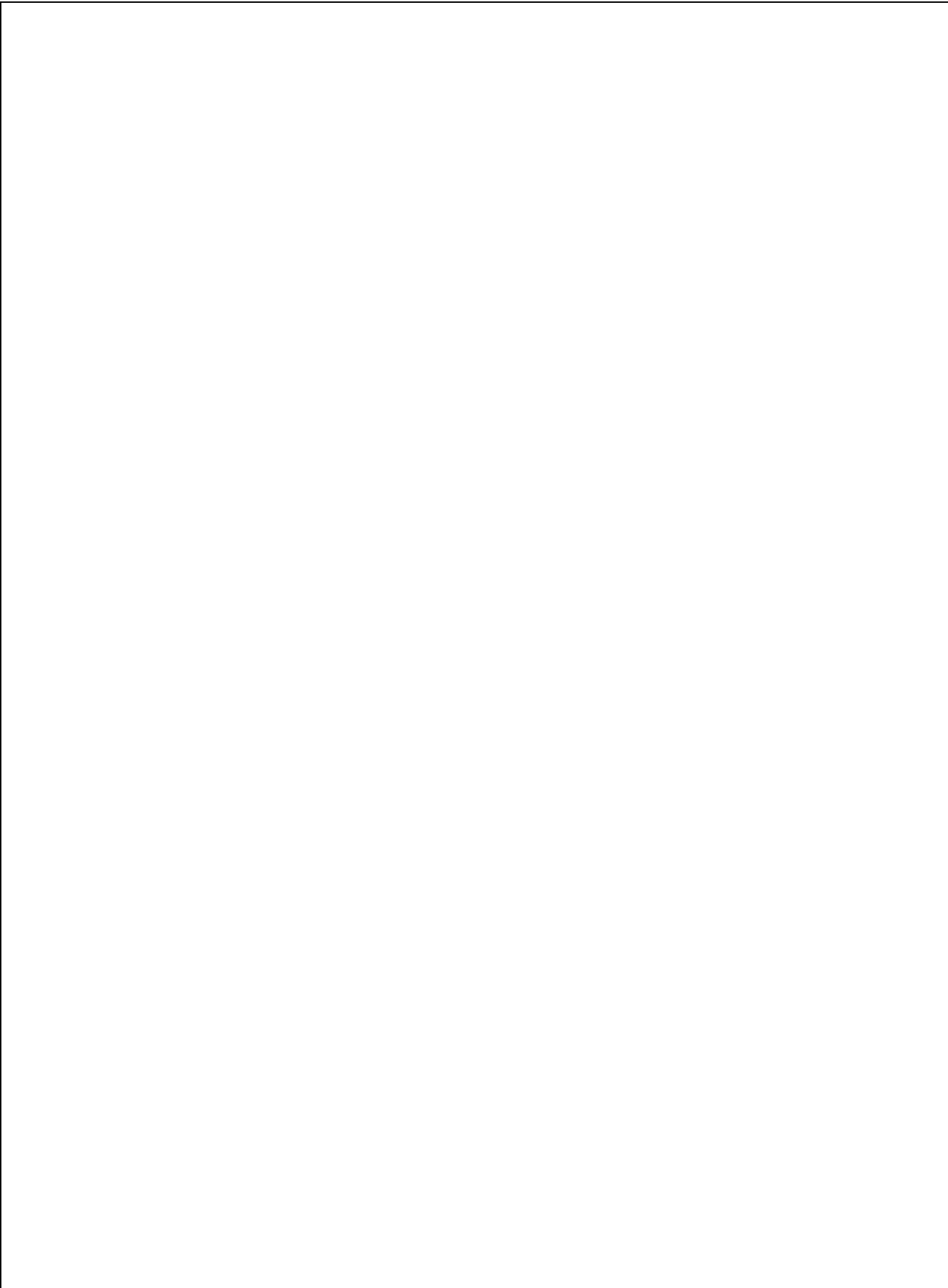


- d1 : High Side First - Input - First - Output Mode
- d2 : Low Side Noise Mode : No Lo
- d3 : High Side Noise Mode : No Ho
- d4 : Low Side First - Input - First - Output Mode
- d5 : In - Phase Mode : No Ho

**Figure 12. Inter-Lock Function**

- HIN : High-side Input Signal
- LIN : Low-side Input Signal
- HO : High-Side Output Signal
- LO : Low-Side Output Signal
- CSC : Short-circuit Current Detection Input
- VF : Fault Out Function

**Figure 13. Fault-Out Function By Over Current Protection**



**Note:**

- 1) To avoid malfunction, the wiring of each input should be as short as possible. (less than 2 ~ 3 cm)
- 2) By virtue of integrating an application specific type of HVIC inside the SPM® 55 product, direct coupling to MCU terminals without any opto-coupler or transformer isolation is possible.
- 3)  $V_F$  is open-drain type. This signal line should be pulled up to the positive side of the MCU or control power supply with a resistor that makes I

### Detailed Package Outline Drawings (FNF51060TD1, Short Lead)



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