

## Table of Contents

CHAPTER 1	DIIPM PRODUCT OUTLINES	3
1.1	Product Line-up	3
1.2	Functions and Features	3
1.2.1	Function outlines	3
1.2.2	Product Features	4
CHAPTER 2	ELECTRICAL CHARACTERISTICS	5
2.1	Maximum Ratings	5
2.2	Electric Characteristics	6
2.2.1	Thermal Resistance	6
2.2.2	Static Characteristics and Switching Characteristics	6
2.2.3	Control (Protection) Characteristics	8
2.3	Recommended Operation Conditions	9
CHAPTER 3	PACKAGE OUTLINE	11
3.1	Package Outline	11
3.2	Outline differential between Pb-free solder plating type(-P/-AP) and Pb solder plating type	12
3.2.1	Large DIIPM (PS2186X)	12
3.2.2	Mini DIIPM (PS2156X)	13
3.3	Isolation	14
3.4	Laser Marking	15
3.5	Input / Output Terminals Description	16
3.5.1	Terminal Arrangement	16
3.5.2	Detailed Description of Input / Output Terminals	18
3.5.3	Description of Protective Functions	19
3.5.4	Operation Sequence	19
3.5.5	Installation Guidelines (Flatness / Mounting Strength / Screw Type / Grease)	20
CHAPTER 4	APPLICATION SYSTEM	21
4.1	System Connection Diagram	21
4.2	Input circuit	22
4.2.1	Structure of Control Input Terminals and Application Examples	22
4.2.2	Input Signal Voltage Rating	22
4.2.3	Minimum Rating of Control Input Pulse Width	22
4.3	Single Supply Drive Scheme	23
4.3.1	Initial Charging	23
4.3.2	Charging and Discharging of the Bootstrap Capacitor During Inverter Operation	24
4.3.3	Current Characteristics	27
4.4	Interface Circuit Examples and Guidelines	29
4.4.1	Example of Direct Input Interface	29
4.4.2	Example of Interface with Fast Opto-Coupler	32
4.4.3	Snubber Circuit	33
4.4.4	Parallel Connection	33
4.4.5	Input Signal Connection	34
4.4.6	Recommended Wiring of Shunt Resistor	34
4.4.7	Precaution for wiring on PCB	35
4.5	Short Circuit Protective Function	36
4.5.1	Timing Chart of Short Circuit (SC) Protection (Figure 4-20)	36
4.5.2	Selecting Current Sensing Shunt Resistor	37
4.5.3	Filter Circuit Setting (RC Time Constant) for Short-circuit Protection Operation	38
4.5.4	SOA of DIIPM	40
4.5.5	Power Life Cycles	41
4.6	Fault Output Circuit	42
4.7	Guidelines for Control Supply	43
4.7.1	Timing Charts of Under-Voltage Protection (Figure 4-29,30,31)	43
4.7.2	Other Guidelines	44
4.8	Power Loss and Thermal Dissipation Design	45
4.8.1	Power Loss Calculation	45
4.8.2	Temperature Rise Considerations and Calculation Example	47
4.9	Noise Withstand Capability	48
4.9.1	Evaluation Circuit	48
4.9.2	Countermeasures and Precautions	48
4.9.3	Surge Withstand Capability	49
CHAPTER 5	ADDITIONAL GUIDELINES	50
5.1	Packaging Specification	50
5.2	Attention for Handling	52