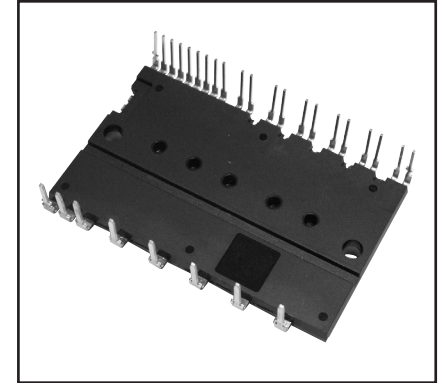
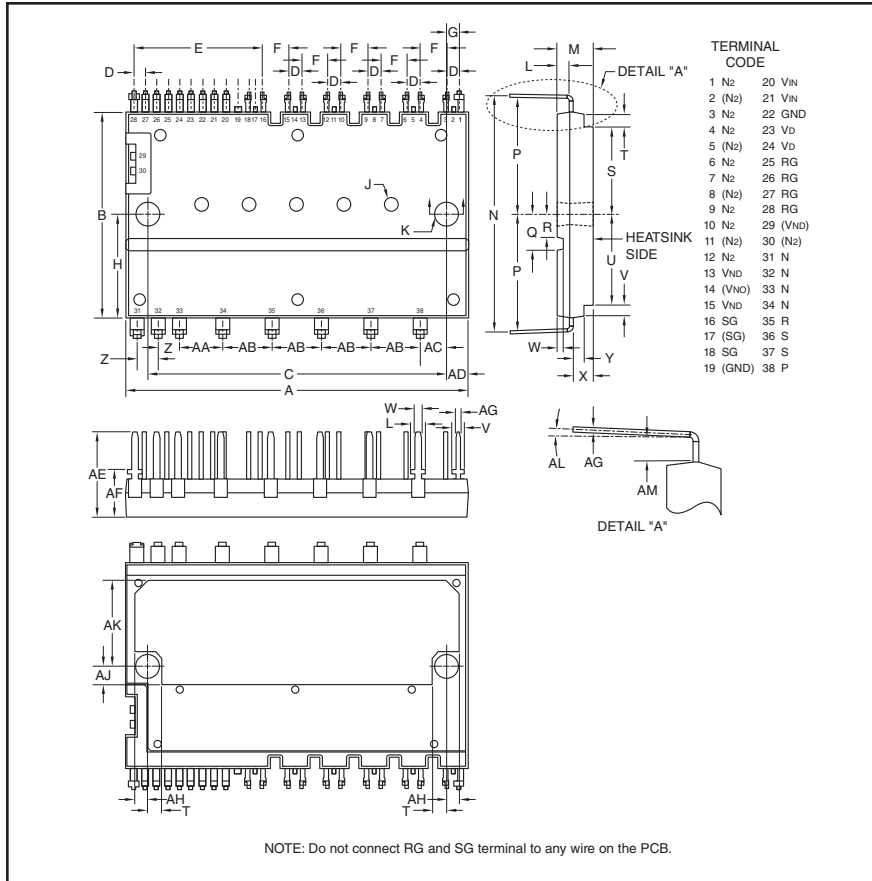


### Intellimod™ Module Dual-In-Line Intelligent Power Factor Correction Module 20 Amperes/600 Volts



#### Description:

DIPPFCT™ is an intelligent power factor correction module that integrates power devices, drivers and protection circuitry in an ultra-compact dual-in-line package. Design time is reduced by the use of application-specific HVIC and a bridge-less topology. Overall efficiency and reliability are increased by use of CSTBT technology and low thermal impedance.

#### Features:

- Low-loss CSTBT IGBTs
- Single Power Supply
- Efficient bridge-less Topology
- Integrated HVIC

#### Applications:

- HVAC
- Compressors
- Pumps

#### Ordering Information:

PS51787 is a 600V, 20 A<sub>RMS</sub> DIPPFCT™ Module.

#### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	2.07	52.5
B	1.22	31.0
C	1.81±0.008	46.0±0.2
D	0.07±0.008	1.78±0.2
E	0.77	19.58
F	0.17±0.008	4.32±0.2
G	0.08±0.019	2.04±0.3
H	0.61	15.5
J	0.09 Dia. x 0.1 Depth	2.2 Dia. x 2.6 Depth
K	0.13 Dia.	3.3 Dia.
L	0.08	2.0
M	0.22	5.6
N	1.41±0.02	35.9±0.5
P	0.69	17.7
Q	0.216	5.5
R	0.14	3.5
S	0.503	12.78
T	0.09	2.2

Dimensions	Inches	Millimeters
U	0.53	13.5
V	0.06	1.5
W	0.04	1.0
X	0.12	3.1±0.1
Y	0.06	1.55
Z	0.13±0.019	3.3±0.3
AA	0.26±0.019	6.6±0.3
AB	0.3±0.019	7.62±0.3
AC	0.15±0.019	3.95±0.3
AD	0.13	3.25
AE	0.5	12.7
AF	0.28	7.1
AG	0.02	0.5
AH	0.067	1.7
AJ	0.11	2.8
AK	0.51	13.0
AL	0° ~ 5°	
AM	0.078	1.96

**PS51787**  
**Intellimod™ Module**  
**Dual-In-Line Intelligent Power Factor Correction Module**  
 20 Amperes/600 Volts

### Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

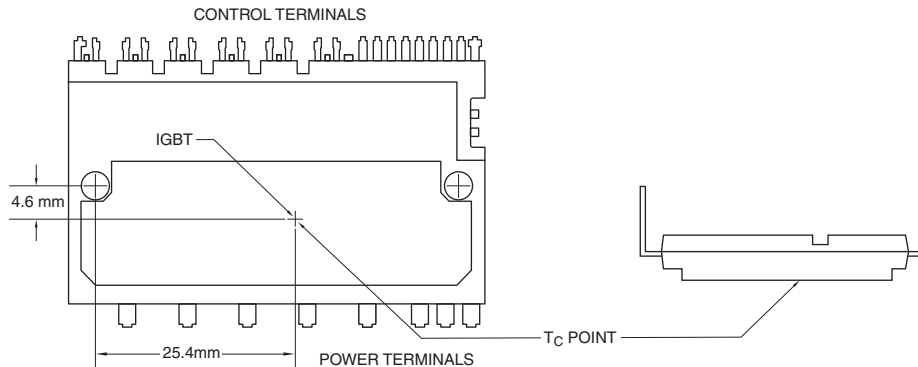
Characteristics	Symbol	PS51787	Units
Input Supply Voltage (Between S-R Terminals)	$V_i$	264	$V_{rms}$
Input Supply Voltage, Surge (Between S-R Terminals)	$V_{i(surge)}$	500	Volts
Output Voltage (Between P-N Terminals)	$V_O$	450	Volts
Output Voltage, Surge (Between P-N Terminals)	$V_{O(surge)}$	500	Volts
Collector-Emitter Voltage	$V_{CES}$	600	Volts
Repetative Peak Reverse Voltage	$V_{RRM}$	600	Volts
Input Current, 100% Load ( $T_C \leq 100^\circ\text{C}$ , $V_i = 220V_{rms}$ , $V_O = 390V$ , $f_{PWM} = 20\text{kHz}$ )	$I_i$	20	$A_{rms}$
Input Current, 125% Load ( $T_C \leq 100^\circ\text{C}$ , $V_i = 220V_{rms}$ , $V_O = 390V$ , $f_{PWM} = 20\text{kHz}$ , Non-repetative, within 1 Minute)	$I_{i(125\%)}$	25	$A_{rms}$
$I^2t$ for Fusing (Value for 1 Cycle of Surge Current, $t_w = 8.3\text{ms}$ , Non-repetitive)	$I^2t$	120	$A^2s$
Junction Temperature*	$T_j$	-20 to 150	$^\circ\text{C}$
Module Case Operation Temperature**	$T_C$	-20 to 100	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to 125	$^\circ\text{C}$
Mounting Torque, M3 Mounting Screws	—	8.7	in-lb
Module Weight (Typical)	—	21	Grams
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal, Connection Pins to Heatsink Plate	$V_{ISO}$	2500	$V_{rms}$

### Control Sector

Control Supply Voltage (Applied between $V_D$ -GND)	$V_D$	20	Volts
Input Voltage (Applied between $V_{IN}$ -GND)	$V_{IN}$	$0 \sim V_D + 0.5$	Volts

\*The maximum junction temperature rating of the power chips integrated within the DIPFPC is  $150^\circ\text{C}$  ( $@T_C \leq 100^\circ\text{C}$ ). However, to ensure safe operation of the DIPFPC, the average junction temperature should be limited to  $T_{j(avg)} \leq 125^\circ\text{C}$  ( $@T_C \leq 100^\circ\text{C}$ ).

### \*\* $T_C$ Measurement Point



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**Electrical and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{IN} = 5\text{V}, I_C = 30\text{A}$	—	1.9	2.5	Volts
H-Diode Forward Voltage*	$V_{F(H)}$	$I_F = 30\text{A}$ , Applied Between R-P, S-P	—	1.9	2.5	Volts
L-Diode Forward Voltage*	$V_{F(L)}$	$I_F = 30\text{A}$ , Applied Between N2-R, N2-S	—	1.0	1.3	Volts
Switching Times	$t_{on}$		—	0.25	0.35	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 300\text{V}, V_D = 15\text{V}$ ,	—	0.14	0.23	$\mu\text{s}$
	$t_{off}$	$I_C = 30\text{A}, T_j = 125^\circ\text{C}$ ,	—	0.40	0.65	$\mu\text{s}$
	$t_{C(off)}$	Inductive Load, $V_{IN} = 0 \leftrightarrow 5\text{V}$	—	0.18	0.35	$\mu\text{s}$
	$t_{rr}$		—	0.11	—	$\mu\text{s}$
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = 600\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = 600\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Reverse Current	$I_R$	$V_R = 600\text{V}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_R = 600\text{V}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Recovery Current	$I_{rr}$	$V_{CC} = 300\text{V}, V_D = 15\text{V}, I_C = 30\text{A}$	—	11	—	Amperes

**Control Sector**

Circuit Current	$I_D$	Applied Between $V_D$ -GND, $V_D = 15\text{V}, V_{IN} = 5\text{V}$	—	0.8	3.0	mA
		Applied Between $V_D$ -GND, $V_D = 15\text{V}, V_{IN} = 0\text{V}$	—	0.7	3.0	mA
Input Current	$I_{IN}$	$V_D = 15\text{V}, V_{IN} = 5\text{V}$	—	0.3	0.45	mA
ON Threshold Voltage	$V_{th(on)}$	Applied Between $V_{IN}$ -GND	—	2.1	2.6	Volts
OFF Threshold Voltage	$V_{th(off)}$	Applied Between $V_{IN}$ -GND	0.8	1.3	—	Volts
Supply Circuit Undervoltage	$UV_{Dt}$	Trip Level, $T_j \leq 125^\circ\text{C}$	10.3	—	12.5	Volts
Protection	$UV_{Dr}$	Reset Level, $T_j \leq 125^\circ\text{C}$	10.8	—	13.0	Volts

**Thermal Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Thermal Resistance Junction to Case	$R_{th(j-c)Q}$	IGBT Part (Per 1 Chip)	—	—	0.96	$^\circ\text{C}/\text{Watt}$
Thermal Resistance Junction to Case	$R_{th(j-c)D}$	FWDi Part (Per 1 Chip)	—	—	1.35	$^\circ\text{C}/\text{Watt}$

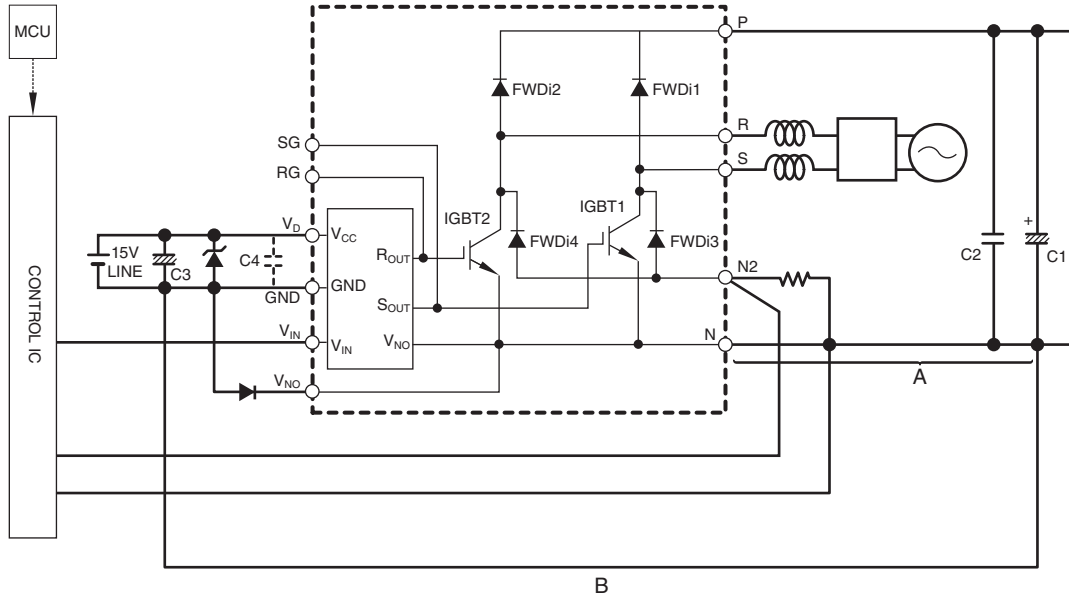
**Recommended Conditions for Use**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Input Supply Voltage	$V_i$	Applied between S-R	90	—	264	$V_{rms}$
Control Supply Voltage	$V_D$	Applied between $V_D$ -GND	13.5	15.0	16.5	Volts
Control Supply Variation	$\Delta V_D$		-1	—	1	$V/\mu\text{s}$
PWM Input Frequency	$f_{PWM}$	$T_C \leq 100^\circ\text{C}, T_j \leq 125^\circ\text{C}$	—	20	—	kHz

\*H-Diode and L-Diode corresponds to Diode1, Diode 2 and Diode 3, Diode 4 in the Application circuit.

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## Application Circuit



**NOTE:**

1. Due to high speed and large surge voltage switching, the area P-C1-N should be as small as possible. (C1: good temperature, frequency characteristic electrolytic type). Also add a bypass condenser (C2) with good frequency response such as polypropylene as close as possible to the P and N terminals.
2. To prevent erroneous protection, the wiring of A, B should be as short as possible.
3. It is recommended to insert a high-speed clamp diode between V<sub>NO</sub>-GND terminals to prevent surge destruction.
4. C3 and C4 capacitors should be mounted as close to the terminals of the DIPFPC as possible. C3, good temperature, frequency characteristic electrolytic type and C4, good temperature, frequency and DC bias characteristic ceramic type are recommended.
5. It is recommended to insert a Zener diode (24V/1W) between each pair of control supply terminals to prevent surge destruction.
6. Please connect adjacent terminals with the same name together on the PCB. (N, N2, V<sub>NO</sub>, V<sub>IN</sub>, V<sub>D</sub>, S)
7. Do not connect RG and SG terminals to any wire on the PCB.