

PRODUCT DESCRIPTION

The IMAT5011 is an isolated power MOSFET module with 2 switches connected in a half bridge configuration, with associated drivers, protections and isolation circuits.

Each switch is connected with series and antiparallel fast recovery "soft" FREDs in order to inhibit the MOSFETs body diodes and therefore allow high switching frequency operations up to 100KHz.

The reliability of these modules are further enhanced by integrating all of the above functions as close as possible to the power semiconductors thanks to the use of our standard LP8 package.

M5 screw on terminals and 0.6mm square pins on a 2.54mm raster allow direct mounting of the control board without the need for wire links.

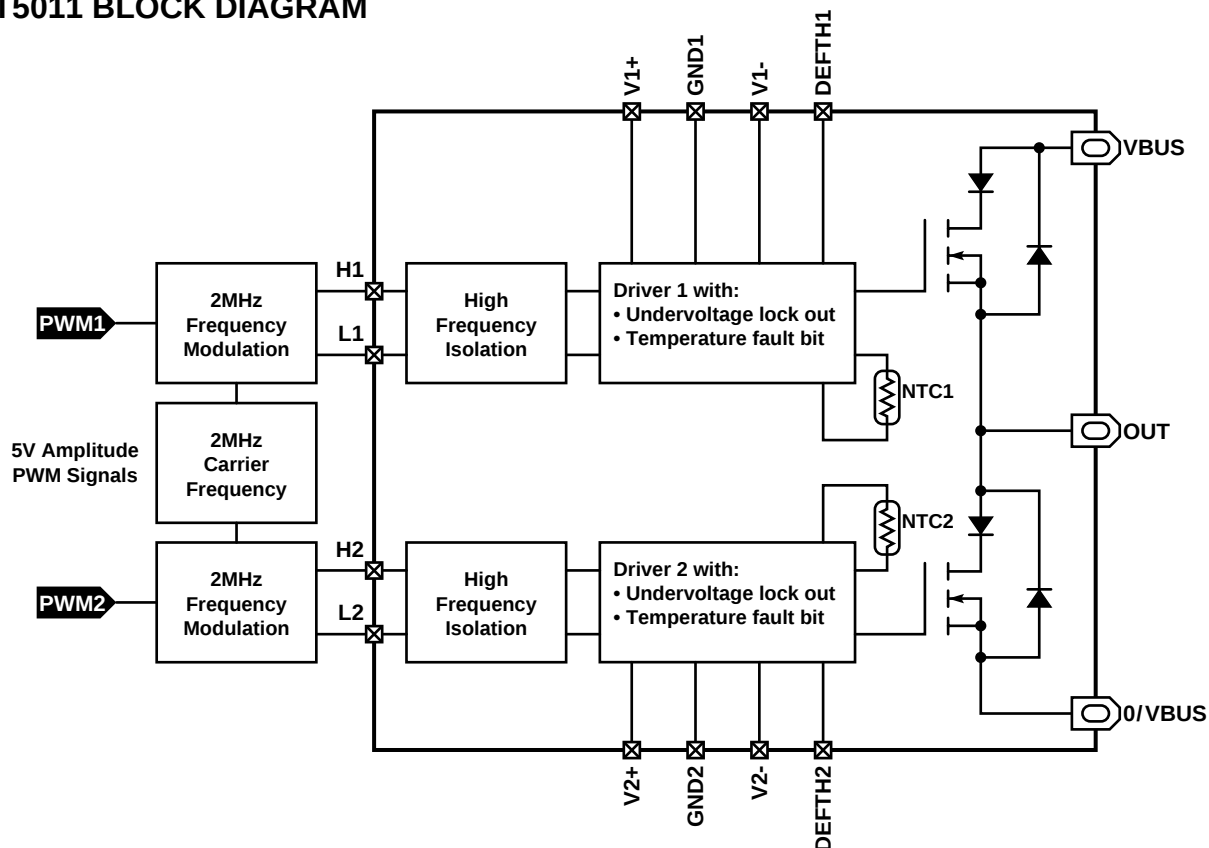
PRODUCT FEATURES

- High Switching Frequency (up to 100KHz)
- Low $R_{DS(ON)}$
- Series and Freewheeling FREDs
- Power Supply Under Voltage Lockout
- Temperature Monitoring
- Galvanic isolation by high frequency transformers

PRODUCT APPLICATIONS

- Class D Power Amplifiers
- Motor Control
- High Frequency Power Supplies
- Welding
- UPS

IMAT5011 BLOCK DIAGRAM



EUROPE

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ABSOLUTE MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Characteristic/ Test Conditions	IMAT5011	UNIT
V_{BUS}	Bus Voltage (applied between V_{BUS} and $0/V_{BUS}$)	500	Volts
I_{OUT}	Continuous Output Current	± 30	Amps
I_{OUTM}	Pulsed Output Current ^①	± 120	
P_D	MOSFET Total Power Dissipation	310	Watts
	Diode Total Power Dissipation	70	
$V1+, V2+$	Positive Auxillary Power Supply Voltage	16	Volts
$V1-, V2-$	Negative Auxillary Power Supply Voltage	-11	
V_{HL}	PWM Signal Amplitude ($f_{sc} = 2\text{MHz}$)	6	
$V_{Isolation}$	RMS Voltage (50-60 Hz Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.)	2500	Volts
T_J	Power Devices Operating Junction Temperature	-40 to 150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-40 to 150	

ELECTRICAL CHARACTERISTICS

Symbol	Characteristic/Test Conditions	MIN	TYP	MAX	UNIT
BV_{BUS}	Output Breakdown Voltage ($V_{HL} = 0V, I_D = 3mA$)	500			Volts
$V_{BUS(OP)}$	Recommended Operating Voltage			400	
I_{DSS}	Output Leakage Current ($V_{BUS} = 500V, V_{HL} = 0V, T_J = +125^\circ\text{C}$)			1	mA
$V_{OUT(ON)}$	On Voltage ($V_{HL} = 6V/2\text{MHz}, I_{OUT} = 30A, T_J = +25^\circ\text{C}$)			5.1	Volts
	On Voltage ($V_{HL} = 6V/2\text{MHz}, I_{OUT} = 30A, T_J = +80^\circ\text{C}$)			6.7	
V_F	Antiparallel Diode Forward Voltage ($I_{OUT} = 30A$)			1.8	
$V1+, V2+$	Positive Auxillary Power Supply Voltage	13	15	16	
$V1-, V2-$	Negative Auxillary Power Supply Voltage	-8	-10	-11	mA
$I1+, I2+$	Positive Auxillary Power Supply Current			500	
$I1-, I2-$	Negative Auxillary Power Supply Current			-300	Volts
V^+_{LOCK}	Positive Undervoltage Lockout	10			
V^+_{HYS}	Positive Undervoltage Hysteresis			2	
V^-_{LOCK}	Negative Undervoltage Lockout	-5			
V^-_{HYS}	Negative Undervoltage Hysteresis			2	$^\circ\text{C}$
$T_C \text{ Max}$	Case Overtemperature Trigger Level	67.5		82.5	
DEFTH	Case Overtemperature Fault Output	$T_C = \geq 67.5^\circ\text{C}$		0.5	Volts
		$T_C = \leq 67.5^\circ\text{C}$	12	16	
PWM	PWM Signal Amplitude ($f_{sc} = 2\text{MHz}, \vartheta = 50\%$)	4.5	5.0	6.0	ns
D_t	Minimum Required PWM Signal Dead Time ($f_{sc} = 2\text{MHz}$)	600			

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DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$t_{D(ON)}$	Turn-on Delay Time	$V_{HL} = 6V/2MHz,$ $V_{1+} = V_{2+} = 15V,$ $V_{1-} = V_{2-} = -10V,$ $V_{BUS} = 250V, I_D = 30A$		1.0	1.1	μs
$t_{D(OFF)}$	Turn-off Delay Time			1.1	1.2	
t_r	Rise Time			70		ns
t_f	Fall Time			60		
t_{rr}	Reverse Recovery Time ($T_J = +25^\circ C$)	$I_F = 30A$ $di_F/dt = -240A/\mu s$ $V_R = 350V$		50		ns
	Reverse Recovery Time ($T_J = +100^\circ C$)			80		
Q_{rr}	Reverse Recovery Charge ($T_J = +25^\circ C$)			100		nC
	Reverse Recovery Charge ($T_J = +100^\circ C$)			300		

THERMAL AND PACKAGE CHARACTERISTICS

Symbol	Characteristic		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case Thermal Resistance	MOSFET			0.4	$^\circ C/W$
		Diode			1.8	
L_S	Internal Lead Inductance			30	40	nH
Wt	Package Weight				500	gm
					17.64	oz
Torque	Maximum Torque for Mounting Screws and Screw-on Terminals	Mounting			3	N•m
		Screw-on			2	
		Mounting			27.2	lb•in
		Screw-on			18.1	

① Repetitive Rating: Pulse width limited by maximum junction temperature.

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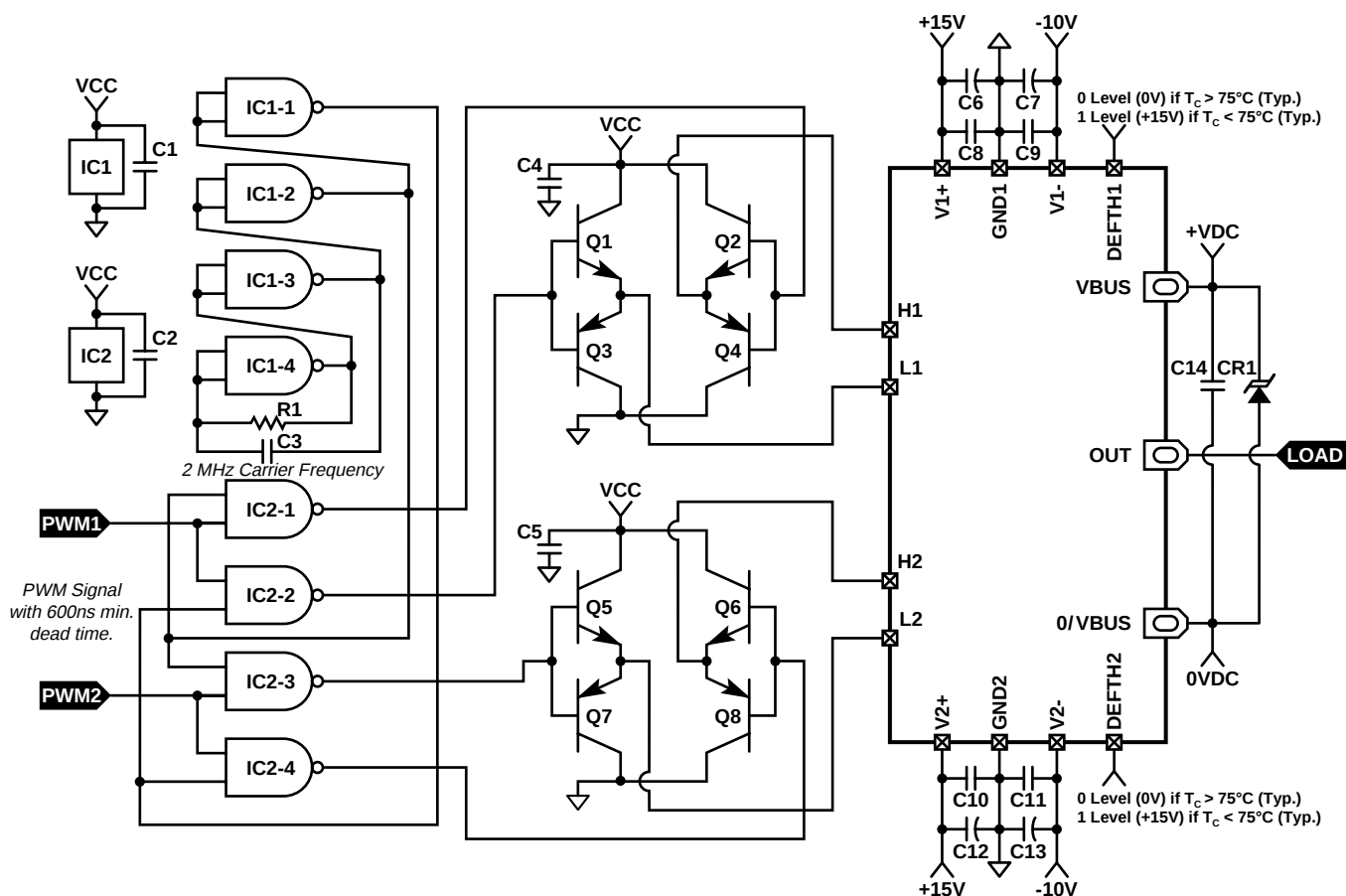
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APPLICATION CIRCUIT EXAMPLE



Parts List:

IC1, IC2 = 4011	C1, C2, C4, C5, C8 to C11 = 0.1μF / 63V	C14 = 0.047μF / 500V XR7
Q1, Q2, Q5, Q6 = BCX19	C3 = 100pF / 63V	CR1 = 450V / 1.5KW Transzorb
Q3, Q4, Q7, Q8 = BCX17	C6, C7, C12, C13 = 100μF / 25V Low ESR Electrolytic	R1 = 3.9K / 0.25W

- The 5V amplitude PWM signals, PWM1 and PWM2, are modulated by a 2MHz carrier frequency with 50% duty cycle.
- The resulting signals are applied to a full bridge configuration which drives the isolation transformers.
- Prior to this modulation the PWM signals have to include a minimum dead time in order to avoid cross conduction (600ns for a 2MHz carrier frequency).
- Both a very low series resistance 100μF/25V electrolytic and a .001μF ceramic capacitor have to be placed in parallel with the auxillary power supplies V1+, V1-, V2+ and V2- as close as possible to the power terminals.
- In order to cancel the effect of the parasitic wiring inductance, a .001μF/500V ceramic or a 1.0μF/500V polypropylene capacitor (C14) must be connected across the VBUS and 0/VBUS terminals as close as possible to the terminals.
- An additional 500V overvoltage suppressor (CR1) may be implemented in order to eliminate transient overvoltages under abnormal operating conditions.

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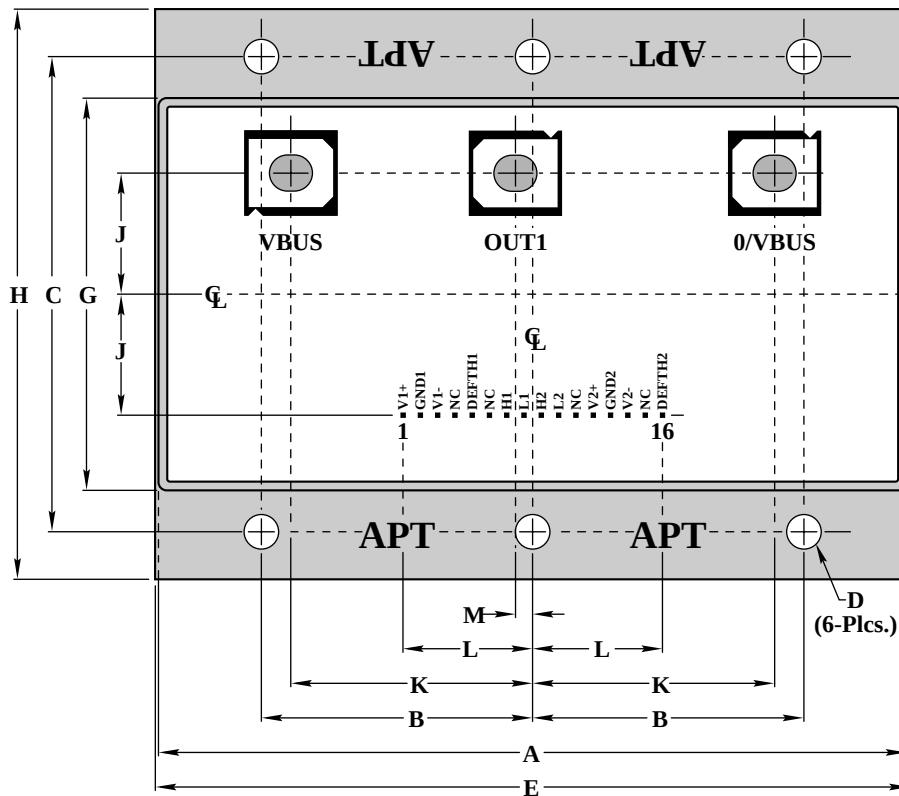
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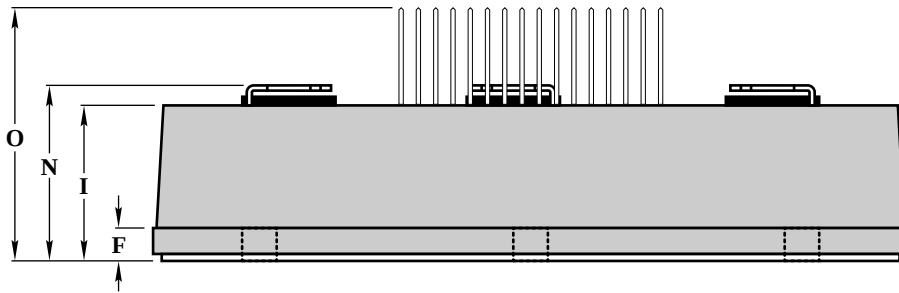
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MECHANICAL DIMENSIONS AND PINOUT LOCATION



Dimension	Inches	Millimeters
A	4.33	110.00
B	1.57 ±0.010	40.00 ±0.25
C	2.75 ±0.010	70.00 ±0.25
D	0.20 Dia.	5.20 Dia.
E	4.37	111.00
F	0.19 ±0.020	5.00 ±0.50
G	2.27	57.70
H	3.33	84.80
I	0.90 ±0.020	23.00 ±0.50
J	0.70	17.78
K	1.40	35.56
L	0.75	19.05
M	0.10	2.54
N	1.024 ±0.020	26.00 ±0.50
O	1.464 ±0.020	37.20 ±0.50
P	0.394	10.00
Q	0.488	12.40
R	0.039	1.00
S	0.104 Rad.	2.65 Rad.
T	0.260	6.60

Mounting Torque	27.2 lb•in	3 N•m
Flatness	12 mils max.	200 µm max.



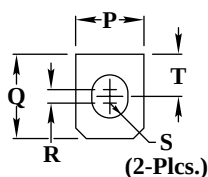
MECHANICAL MOUNTING

6 ea. - M5 Screw & Washer
Maximum Torque: 27.2 lb•in (3 N•m)

Base plate flatness: 200µm max.

ELECTRICAL MOUNTING

POWER TERMINALS:



M5 Screw & Washer
Maximum Torque: 18.1 lb•in (2 N•m)
All terminals are on the same plane ±0.008" (±0.2mm)

SIGNAL TERMINALS:

0.025" (0.6mm) square pin on 0.100" (2.54mm) centers
compatible with PC Board inserted feed through connectors.
Suggested female connector type:
6160xx1T2300 Series from Alcatel (xx = number of pins)

TOLERANCE BETWEEN AXIS OF ELECTRICAL TERMINALS ±0.008" (0.2mm)

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