

Power Products Division
HIGH AND LOW SIDE DRIVER

The MPIC2112 is a high voltage, high speed, power MOSFET and IGBT driver with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. Logic inputs are compatible with standard CMOS or LSTTL outputs. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates from 10 to 600 volts.

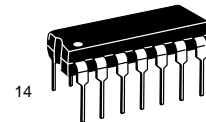
- Floating Channel Designed for Bootstrap Operation
- Fully Operational to +600 V
- Tolerant to Negative Transient Voltage
- dV/dt Immune
- Gate Drive Supply Range from 10 to 20 V
- Undervoltage Lockout for Both Channels
- Separate Logic Supply
- Operating Supply Range from 5 to 20 V
- Logic and Power Ground Operating Offset Range from -5 to +5 V
- CMOS Schmitt-triggered Inputs with Pull-down
- Cycle by Cycle Edge-triggered Shutdown Logic
- Matched Propagation Delay for Both Channels
- Outputs in Phase with Inputs

PRODUCT SUMMARY

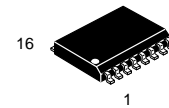
V_{OFFSET}	600 V MAX
I_{O+/-}	200 mA/400 mA
V_{OUT}	10 – 20 V
t_{on/off} (typical)	125 & 105 ns
Delay Matching	30 ns

MPIC2112

**HIGH AND LOW
SIDE DRIVER**



P SUFFIX
PLASTIC PACKAGE
CASE 646-06



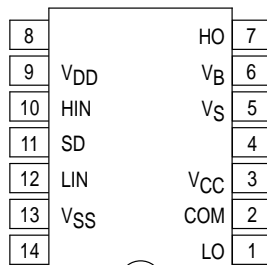
DW SUFFIX
PLASTIC PACKAGE
CASE 751G-02
SOIC – WIDE

ORDERING INFORMATION

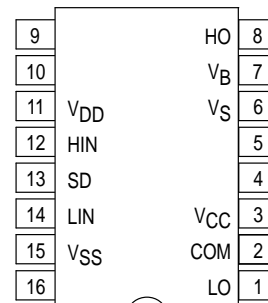
Device	Package
MPIC2112DW	SOIC WIDE
MPIC2112P	PDIP

PIN CONNECTIONS

(TOP VIEW)

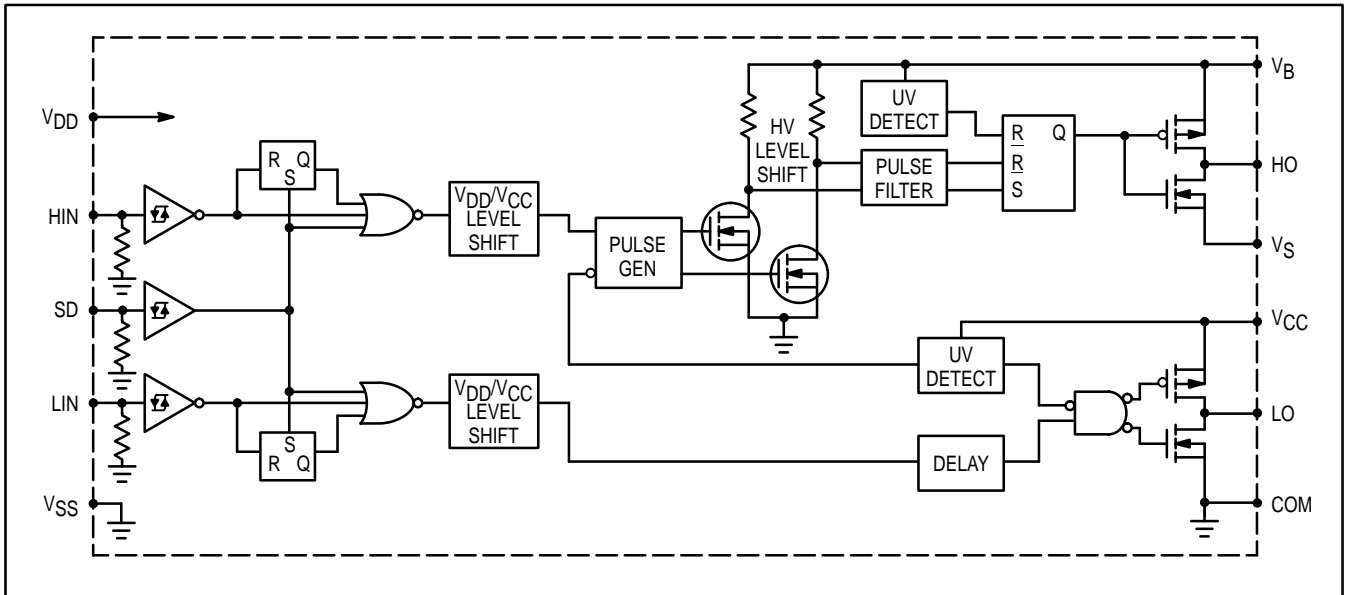


14 LEADS PDIP MPIC2112P



16 LEADS SOIC (WIDE BODY)
MPIC2112DW

SIMPLIFIED BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The Thermal Resistance and Power Dissipation ratings are measured under board mounted and still air conditions.

Rating	Symbol	Min	Max	Unit
High Side Floating Absolute Voltage	V_B	-0.3	625	V _{DC}
High Side Floating Supply Offset Voltage	V_S	V_B-25	$V_B+0.3$	
High Side Floating Output Voltage	V_{HO}	$V_S-0.3$	$V_B+0.3$	
Low Side Fixed Supply Voltage	V_{CC}	-0.3	25	
Low Side Output Voltage	V_{LO}	-0.3	$V_{CC}+0.3$	
Logic Supply Voltage	V_{DD}	-0.3	$V_{SS}+25$	
Logic Supply Offset Voltage	V_{SS}	$V_{CC}-25$	$V_{CC}+0.3$	
Logic Input Voltage (HIN, LIN & SD)	V_{IN}	$V_{SS}-0.3$	$V_{DD}+0.3$	
Allowable Offset Supply Voltage Transient	dV _S /dt	-	50	V/ns
*Package Power Dissipation @ $T_A \leq +25^\circ\text{C}$	P_D	-	1.6	Watt
	-	-	1.25	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	-	75	$^\circ\text{C/W}$
		-	100	
Operating and Storage Temperature	T_j, T_{stg}	-55	150	$^\circ\text{C}$
Lead Temperature for Soldering Purposes, 10 seconds	T_L	-	260	$^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS

The Input/Output logic timing Diagram is shown in Figure 1. For proper operation the device should be used within the recommended conditions. The V_S and V_{SS} offset ratings are tested with all supplies biased at 15 V differential.

High Side Floating Supply Absolute Voltage	V_B	V_S+10	V_S+20	V
High Side Floating Supply Offset Voltage	V_S	Note 1	600	
High Side Floating Output Voltage	V_{HO}	V_S	V_B	
Low Side Fixed Supply Voltage	V_{CC}	10	20	
Low Side Output Voltage	V_{LO}	0	V_{CC}	
Logic Supply Voltage	V_{DD}	$V_{SS}+5$	$V_{SS}+20$	
Logic Supply Offset Voltage	V_{SS}	-5	5	
Logic Input Voltage (HIN, LIN & SD)	V_{IN}	V_{SS}	V_{DD}	
Ambient Temperature	T_A	-40	125	$^\circ\text{C}$

Note 1: Logic operational for V_S of -5 to +600 V. Logic state held for V_S of -5 V to $-V_{BS}$.

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)

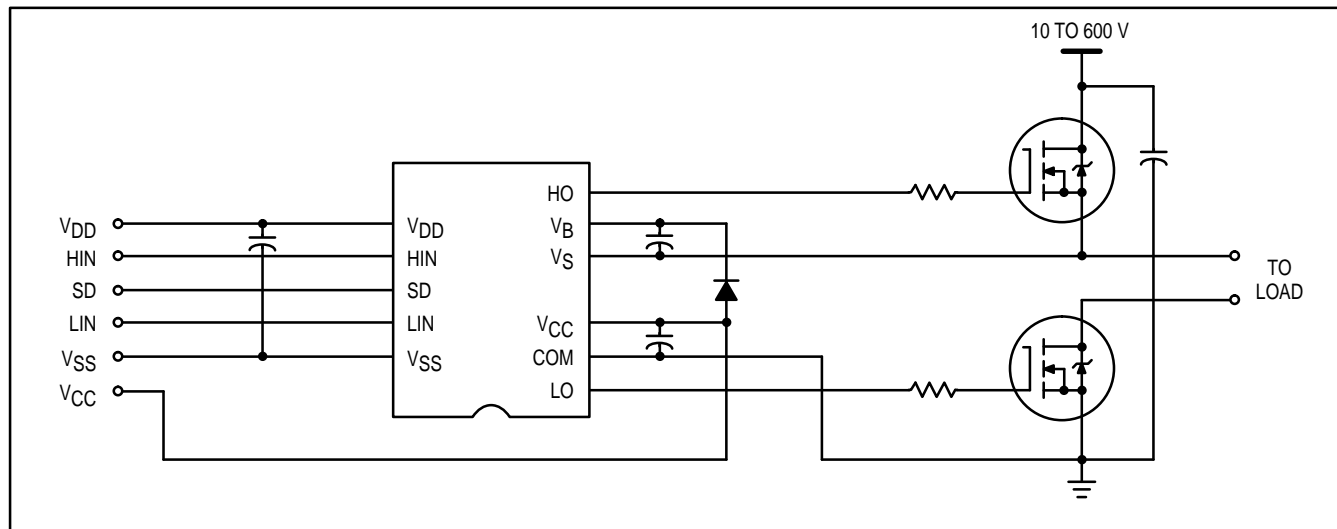
Characteristic	Symbol	Min	Typ	Max	Unit
STATIC ELECTRICAL CHARACTERISTICS – SUPPLY CHARACTERISTICS					
V _{BIAS} (V _{CC} , V _{BS} , V _{DD}) = 15 V and V _{SS} = COM unless otherwise specified. The V _{IN} , V _{TH} and I _{IN} parameters are referenced to V _{SS} and are applicable to all three logic input leads: HIN, LIN and SD. The V _O and I _O parameters are referenced to COM or V _{SS} and are applicable to the respective output leads: HO or LO.					
Logic "1" Input Voltage	V _{IH}	9.5	–	–	V
Logic "0" Input Voltage	V _{IL}	–	–	6.0	
High Level Output Voltage, V _{BIAS} -V _O @ V _{IN} = V _{IH} , I _O = 0 A	V _{OH}	–	–	100	mV
Low Level Output Voltage, V _O @ V _{IN} = V _{IL} , I _O = 0 A	V _{OL}	–	–	100	
Offset Supply Leakage Current @ V _B = V _S = 600 V	I _{LK}	–	–	50	μA
Quiescent V _{BS} Supply Current @ V _{IN} = 0 V or V _{DD}	I _{QBS}	–	25	60	
Quiescent V _{CC} Supply Current @ V _{IN} = 0 V or V _{DD}	I _{QCC}	–	80	180	
Quiescent V _{DD} Supply Current @ V _{IN} = 0 V or V _{DD}	I _{QDD}	–	2.0	5.0	
Logic "1" Input Bias Current @ V _{IN} = 15 V	I _{IN+}	–	20	40	
Logic "0" Input Bias Current @ V _{IN} = 0 V	I _{IN-}	–	–	1.0	
V _{BS} Supply Undervoltage Positive Going Threshold	V _{BSUV+}	7.4	–	9.6	V
V _{BS} Supply Undervoltage Negative Going Threshold	V _{BSUV-}	7.0	–	9.2	
V _{CC} Supply Undervoltage Positive Going Threshold	V _{CCUV+}	7.6	–	9.6	
V _{CC} Supply Undervoltage Negative Going Threshold	V _{CCUV-}	7.2	–	9.2	
Output High Short Circuit Pulsed Current @ V _{OUT} = 0 V, V _{IN} = 15 V, PW ≤ 10 μs	I _{O+}	200	250	–	mA
Output Low Short Circuit Pulsed Current @ V _{OUT} = 15 V, V _{IN} = 0 V, PW ≤ 10 μs	I _{O-}	420	500	–	

DYNAMIC ELECTRICAL CHARACTERISTICS

V_{BIAS} (V_{CC}, V_{BS}, V_{DD}) = 15 V and V_{SS} = COM unless otherwise specified. T_A = 25°C.

Turn-On Propagation Delay @ V _S = 0 V	t _{on}	–	125	180	ns
Turn-Off Propagation Delay @ V _S = 600 V	t _{off}	–	105	160	
Shutdown Propagation Delay @ V _S = 600 V	t _{sd}	–	105	160	
Turn-On Rise Time @ C _L = 1000 pF	t _r	–	80	130	
Turn-Off Fall Time @ C _L = 1000 pF	t _f	–	40	65	
Delay Matching, HS & LS Turn-On/Off	MT	–	–	30	

TYPICAL CONNECTION



MPIC2112

LEAD DEFINITIONS

Symbol	Lead Description
V _{DD}	Logic Supply
HIN	Logic Input for High Side Gate Driver Output (HO), In Phase
SD	Logic Input for Shutdown
LIN	Logic Input for Low Side Gate Driver Output (LO), In Phase
V _{SS}	Logic Ground
V _B	High Side Floating Supply
HO	High Side Gate Drive Output
V _S	High Side Floating Supply Return
V _{CC}	Low Side Supply
LO	Low Side Gate Drive Output
COM	Low Side Return

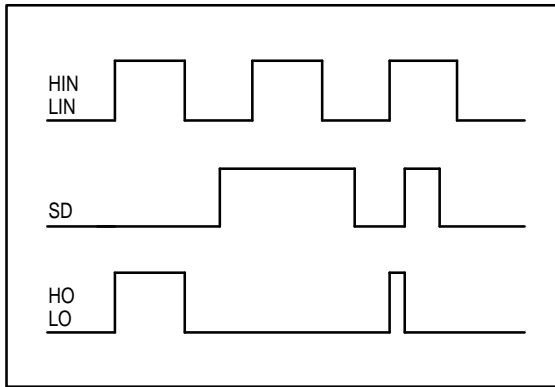


Figure 1. Input / Output Timing Diagram

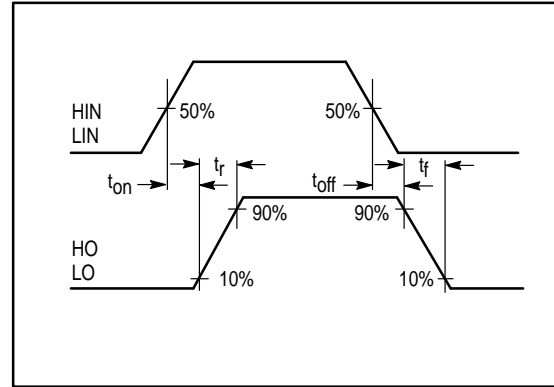


Figure 2. Switching Time Waveform Definitions

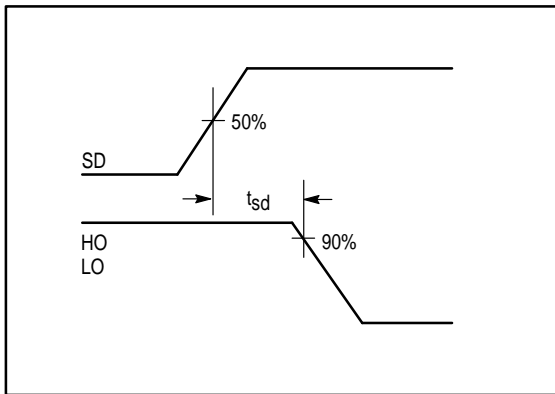


Figure 3. Deadtime Waveform Definitions

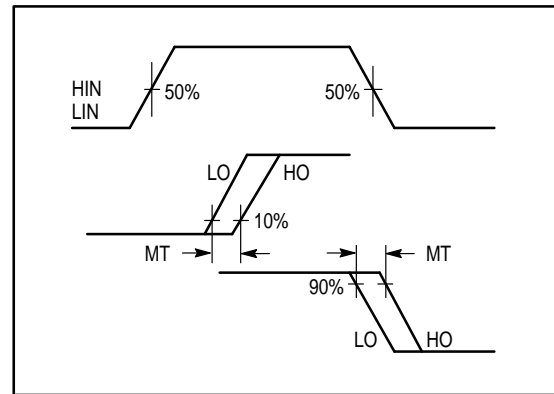


Figure 4. Delay Matching Waveform Definitions

PACKAGE DIMENSIONS

NOTES:

- LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION B DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0°	10°	0°	10°
N	0.015	0.039	0.39	1.01


**CASE 646-06
ISSUE L**

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.15	10.45	0.400	0.411
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

**CASE 751G-02
ISSUE A**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447 or 602-303-5454

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609
INTERNET: <http://Design-NET.com>

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-81-3521-8315

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

