Power Products Division

Advance Information

SELF-OSCILLATING HALF-BRIDGE DRIVER

The MPIC2151 is a high voltage, high speed, self–oscillating power MOSFET and IGBT driver with both high side and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The front–end features a programmable oscillator which is similar to the 555 timer. The output drivers feature a high pulse current buffer stage and an internal deadtime designed for minimum driver cross–conduction. Propagation delays for the two channels are matched to simplify use in 50% duty cycle applications. The floating channel can be used to drive an N–channel power MOSFET or IGBT in the high side configuration that operates off a high voltage rail from 10 to 600 volts.

- Floating Channel Designed for Bootstrap Operation
- Fully Operational to +600 V
- Tolerant to Negative Transient Voltage
- dV/dt Immune

Deadtime (typical)

- Undervoltage Lockout
- Programmable Oscillator Frequency:

$$f = \frac{1}{1.4 \text{ (RT + 75\Omega) CT}}$$

- Matched Propagation Delay for Both Channels
- Low Side Output In Phase with RT

PRODUCT SUMMARY

1.2 μs

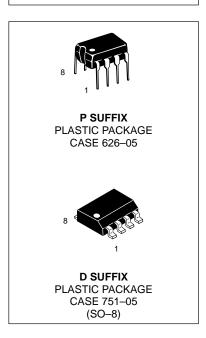
VOFFSET 600 V MAX

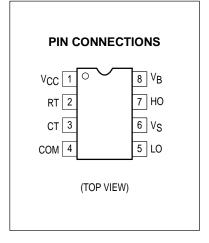
 $\begin{array}{lll} \mbox{Duty Cycle} & & 50\% \\ \mbox{VOUT} & & 10-20 \ \mbox{V} \\ \mbox{t}_{\mbox{r/f}} \ \mbox{(typical)} & & 120 \ \& \ 60 \ \mbox{ns} \end{array}$

This document contains information on a new product. Specifications and information herein are subject to change without notice.

MPIC2151

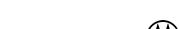
SELF-OSCILLATING HALF-BRIDGE DRIVER



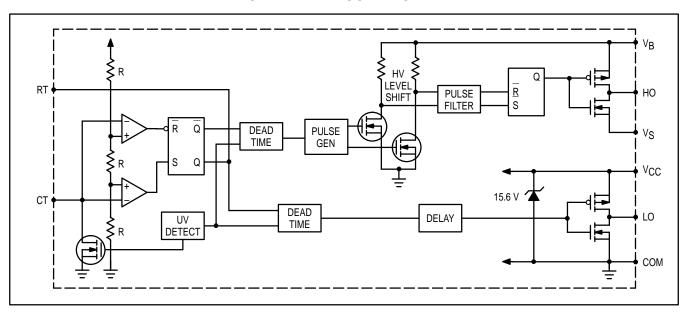


ORDERING INFORMATION

Device	Package
MPIC2151D	SOIC
MPIC2151P	PDIP



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, all currents are defined positive into any lead. The Thermal Resistance and Power Dissipation ratings are measured under board mounted and still air conditions.

Rating	Symbol	Min	Max	Unit	
High Side Floating Supply Absolute Voltage High Side Floating Supply Offset Voltage High Side Floating Output Voltage Low Side Output Voltage RT Voltage CT Voltage		VB VS VHO VLO VRT VCT	-0.3 V _B -25 V _S -0.3 -0.3 -0.3	625 VB+0.3 VB+0.3 VCC+0.3 VCC+0.3 VCC+0.3	VDC
Supply Current (Note 1) High Side Output Current Low Side Output Current RT Output Current		ICC IHO ILO IRT	- -500 -500 -5.0	25 500 500 5.0	mA _{DC}
Allowable Offset Supply Voltage Transient		dV _S /dt	-	50	V/ns
*Package Power Dissipation @ $T_C \le +25^{\circ}C$ (8 Lead DIP) (8 Lead SOIC)		P _D -	- -	1.0 0.625	Watt
Operating and Storage Temperature	T _j , T _{stg}	-55	150	°C	
Thermal Resistance, Junction to Ambient (8 Lead DIP) (8 Lead SOIC)		$R_{ heta JA}$	_ _	125 200	°C/W
Lead Temperature for Soldering Purposes, 10 seconds		TL	_	260	°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.

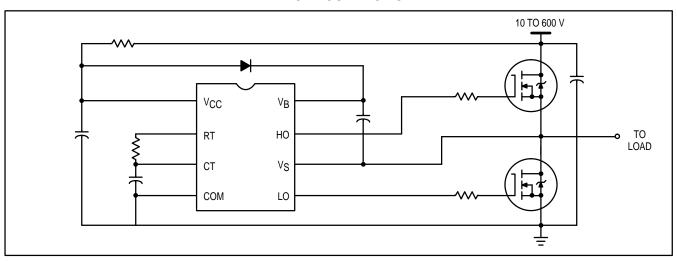
High Side Floating Supply Absolute Voltage	VB	V _S +10	V _S +V _{clamp}	V
High Side Floating Supply Offset Voltage	VS	-	600	
High Side Floating Output Voltage	VHO	٧s	VB	
Low Side Output Voltage	VLO	0	Vcc	
Supply Current (Note 1)	ICC	-	5.0	mA
Ambient Temperature	TA	-40	125	°C

Note 1: Because the MPIC2151 is designed specifically for off–line supply systems, this IC contains a zener clamp structure between the chip V_{CC} and COM which has a nominal breakdown voltage of 15.6 V. Therefore, the IC supply voltage is normally derived by forcing current into the supply lead (typically by means of a high value resistor connected between the chip V_{CC} and the rectified line voltage and a local decoupling capacitor from V_{CC} to COM) and allowing the internal zener clamp circuit to determine the nominal supply voltage. Therefore, this circuit should not be driven by a DC, low impedance power source of greater than V_{CLAMP} .

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

Characteristic	Symbol	Min	Тур	Max	Unit
STATIC ELECTRICAL CHARACTERISTICS					
Supply Characteristics $V_{BIAS} \ (V_{CC}, \ V_{BS}) = 12 \ V, \ V_{SS} = COM \ and \ C_L = 1000 \ pF \ unless \ otherwise \ space{-0.05cm}$	specified.				
V _{CC} Supply Undervoltage Positive Going Threshold	VCCUV+	_	8.4	_	VDC
V _{CC} Supply Undervoltage Negative Going Threshold	VCCUV-	-	8.0	-	
Quiescent V _{CC} Supply Current	IQCC	-	400	-	μΑ
V _{CC} Zener Shunt Clamp Voltage @ I _{OC} = 5 mA	VCLAMP	-	15.6	_	VDC
Floating Supply Characteristics			•	•	
Offset Supply Leakage Current @ V _B = V _S = 600 V	ILK	-	_	50	μA _{DC}
Quiescent V _{BS} Supply Current	IQBS	-	10	-	
Oscillator I/O Characteristics			•	•	
Oscillator Frequency @ RT = 35.7 KΩ, CT = 1 nF	fosc	_	20	_	kHz
Oscillator Frequency @ RT = 7.04 KΩ, CT = 1 nF	fosc	-	100	_	
CT Input Current	^I CT	-	0.001	1.0	μΑ
CT Undervoltage Lockout @ 2.5 V < V _{CC} < V _{CCUV+}	VCTUV	-	0	-	mV
RT High Level Output Voltage, $V_{CC}-RT$ @ IRT = $-100 \mu\text{A}$ @ IRT = -1mA	V _{RT+} V _{RT+}	- -	20 200	_ _	
RT Low Level Output Voltage, V _{CC} + RT @ IRT = 100 μA @ IRT = 1 mA	V _{RT} – V _{RT} –	_ _	20 200	_ _	
RT Undervoltage Lockout, V _{CC} – RT @ 2.5 V < V _{CC} < V _{CCUV+}	VRTUV	_	0	_	1
2/3 V _{CC} Threshold	V _{CT+}	_	8.0	_	V _{DC}
1/3 V _{CC} Threshold	V _{CT} -	_	4.0	_	
Output Characteristics	•		•	•	
High Level Output Voltage, V _{BIAS} -V _O @ I _O = 0 A	Voн	-	_	100	mV
Low Level Output Voltage, V _O @ I _O = 0 A	VOL	-	-	100	1
Dynamic Electrical Characteristics V_{BIAS} (V_{CC} , V_{BS}) = 12 V and C_L = 1000 pF unless otherwise specified. T_A :	= 25°C.		-		•
Turn-On Rise Time	t _r	-	120	_	ns
Turn–Off Fall Time	tf	-	60	-	
Deadtime, LS Turn-Off to HS Turn-On & HS Turn-Off to LS Turn-On	DT	-	1.2	-	μА
RT Duty Cycle, f _{OSC} = 20 kHz	DC	_	50	_	%

TYPICAL CONNECTION



LEAD DEFINITIONS

Symbol	Lead Description
RT	Oscillator timing resistor input; a resistor is connected from RT to CT. RT is in phase with LO for normal IC operation.
СТ	Oscillator timing capacitor input; a capacitor is connected from CT to COM in order to program the oscillator frequency according to the following equation: $f = \frac{1}{1.4 \; (\text{RT} + 75\Omega) \; \text{CT}}$ where 75 Ω is the effective impedance of the RT output stage.
V _B	High Side Floating Supply
НО	High Side Gate Drive Output
٧s	High Side Floating Supply Return
Vcc	Logic and Low Side Fixed Supply
LO	Low Side Gate Drive Output
СОМ	Logic and Low Side Return

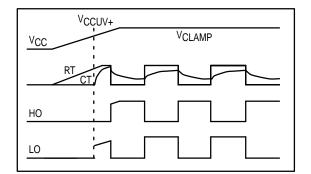


Figure 1. Input / Output Timing Diagram

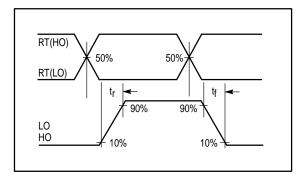


Figure 2. Switching Time Waveform Definitions

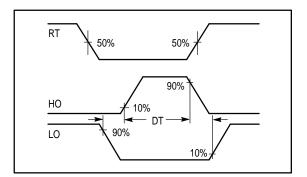
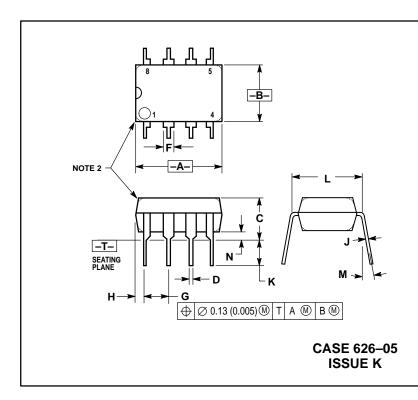


Figure 3. Deadtime Waveform Definitions

PACKAGE DIMENSIONS

ISSUE P



NOTES:

- OTIES:

 1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

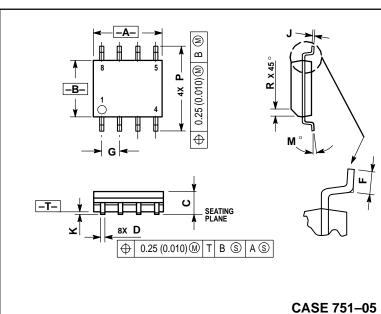
 2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).

- 3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	9.40	10.16	0.370	0.400
В	6.10	6.60	0.240	0.260
С	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
Н	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
М		10°		10°
N	0.76	1.01	0.030	0.040

- STYLE 1:
 PIN 1. AC IN
 2. DC + IN
 3. DC IN
 4. AC IN
 5. GROUND
 6. OUTPUT
 7. AUXILIARY

 - 8. V_{CC}



NOTES

- DIMENSIONS A AND B ARE DATUMS AND T IS A DATUM SURFACE.
- 2. DIMENSIONING AND TOLERANCING PER ANSI

- Y14.5M, 1982.
 3. DIMENSIONS ARE IN MILLIMETER.
 4. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
- PROTRUSION.

 MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 DIMENSION D DOES NOT INCLUDE MOLD
 PROTRUSION. ALLOWABLE DAMBAR
 PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS
 OF THE D DIMENSION AT MAXIMUM MATERIAL
 CONDITION.

	MILLIMETERS			
DIM	MIN	MAX		
Α	4.80	5.00		
В	3.80	4.00		
С	1.35	1.75		
D	0.35	0.49		
F	0.40	1.25		
G	1.27 BSC			
J	0.18	0.25		
K	0.10	0.25		
M	0 °	7 °		
Р	5.80	6.20		
R	0.25	0.50		

MPIC2151

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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



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