

## Description

The MCP8062136 is a three-phase gate driver IC designed for high-voltage, high-speed applications, driving N-channel MOSFETs and IGBTs in a half-bridge configuration. The device's high voltage process enables the MCP8062136 high sides to switch to 600V in a bootstrap operation.

The MCP8062136 logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) to interface easily with controlling devices and are enabled low to better function in high noise environments. The driver outputs feature high pulse current buffers designed for minimum driver cross conduction.

The MCP8062136 offers numerous protection functions. A shoot-through protection logic prevents both outputs being high with both inputs high (fault state), an undervoltage lockout for VCC shuts down all drivers through an internal fault control, and a UVLO for VBS shuts down the respective high side output. Also an overcurrent protection will terminate the six outputs. Both the VCC UVLO and the overcurrent protection trip an automatic fault clear with a timing that is adjustable with an external capacitor.

The MCP8062136 is offered in SOIC-28 package and operates over an extended  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range.

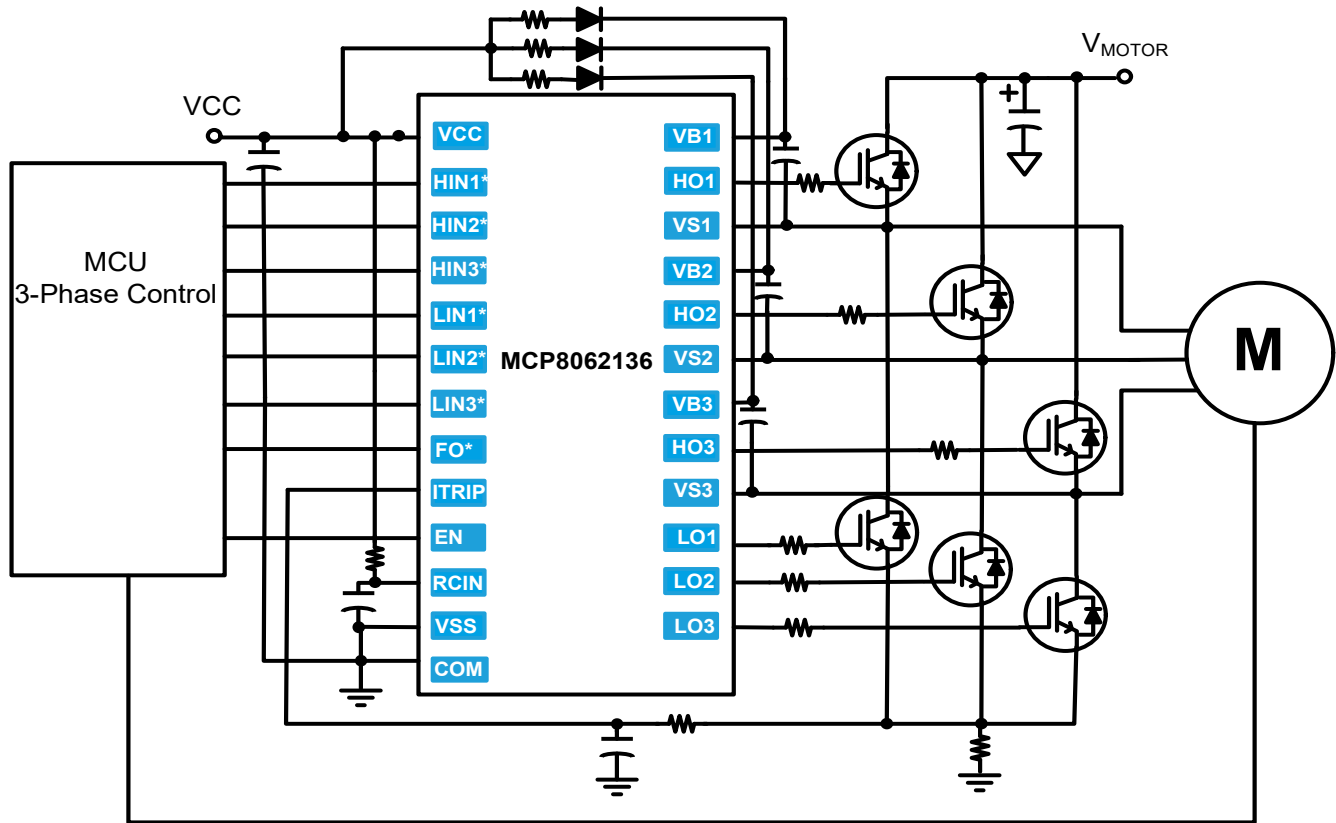
## Features

- Three High-Side Drivers in Bootstrap Operation up to 600V
- 200 mA Source/350 mA Sink Output Current Capability
- Outputs Tolerant to Negative Transients,  $dV/dt$  Immune
- Wide VCC Operating Range: 10V to 20V
- Logic Input 3.3V Capability
- Internal Deadtime of 290 ns to Protect MOSFETs
- Matched Prop Delay for All Channels
- Outputs Out of Phase With Inputs
- Schmitt Triggered Logic Inputs
- Cross Conduction Prevention Logic
- Undervoltage Lockout for All Channels
- Overcurrent Protection Shuts Down Drivers

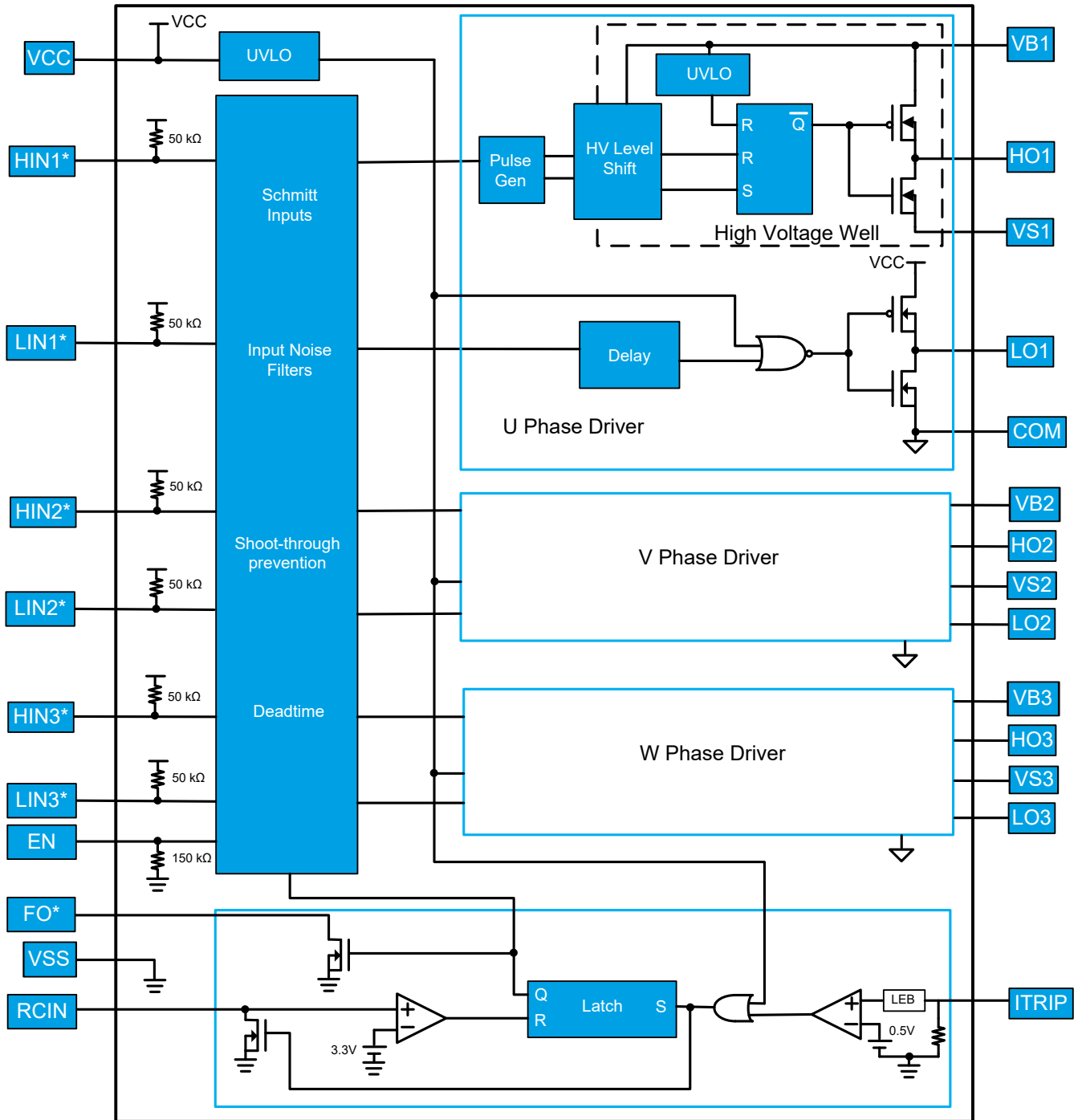
## Applications

- 3-Phase Motor Inverter Driver
- White Goods – Air Conditioners, Washing Machines, Refrigerators
- Industrial Motor Inverter – Power Tools, Robotics
- General Purpose 3-Phase Inverter

## Typical Application



## Block Diagram

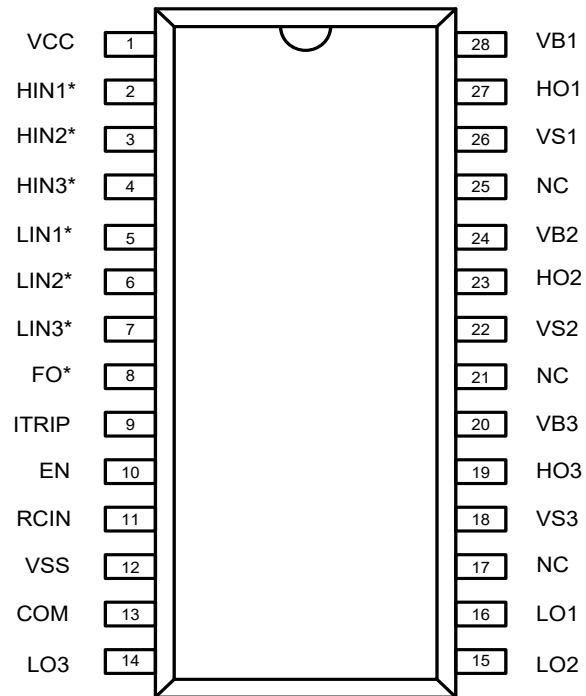


## 1. Pin Configuration

Pin No.	Pin Name	Pin Description
1	VCC	Low-side and logic fixed supply
2	HIN1*	Logic input for high-side gate driver output 1, out of phase with HO.
3	HIN2*	Logic input for high-side gate driver output 2, out of phase with HO.
4	HIN3*	Logic input for high-side gate driver output 3, out of phase with HO.
5	LIN1*	Logic input for low-side gate driver output 1, out of phase with LO.
6	LIN2*	Logic input for low-side gate driver output 2, out of phase with LO.
7	LIN3*	Logic input for low-side gate driver output 3, out of phase with LO.
8	FO*	Fault output with open drain (fault with overcurrent and VCC UVLO)
9	ITRIP	Analog input for overcurrent shutdown
10	EN	Logic input for functionality, I/O logic functions when EN is high.
11	RCIN	An external RC network input used to define FAULT CLEAR delay.
12	VSS	Logic ground
13	COM	Low-side driver return
14	LO3	Low-side gate driver output 3
15	LO2	Low-side gate driver output 2
16	LO1	Low-side gate driver output 1
17	NC	Not connected
18	VS3	High-side floating supply return 3
19	HO3	High-side gate driver output 3
20	VB3	High-side floating supply 3
21	NC	Not connected
22	VS2	High-side floating supply return 2
23	HO2	High-side gate driver output 2
24	VB2	High-side floating supply 2
25	NC	Not connected
26	VS1	High-side floating supply return 1
27	HO1	High-side gate driver output 1
28	VB1	High-side floating supply 1

## 1.1. Package Type

Figure 1-1. SOIC-28 Package (Top View)



## 2. Electrical Characteristics

### 2.1. Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
High-Side Floating Supply Voltage	$V_B$	-0.3	624	V
High-Side Floating Supply Offset Voltage	$V_S$	$V_B - 24$	$V_B + 0.3$	V
High-Side Floating Output Voltage	$V_{HO}$	$V_S - 0.3$	$V_B + 0.3$	V
Offset Supply Voltage Transient	$dV_S/dt$	—	50	V/ns
Low-Side Fixed Supply Voltage	$V_{CC}$	-0.3	24.0	V
Low-Side Output Voltage	$V_{LO}$	-0.3	$V_{CC} + 0.3$	V
Logic Input Voltage (HIN*, LIN*, ITRIP, EN and FO*)	$V_{IN}$	-0.3	5.5	V
SOIC-28 Package Power Dissipation @ $T_A \leq 25^\circ\text{C}$	$P_D$	—	2.3	W
SOIC-28 Thermal Resistance (See <a href="#">Note</a> )	$\theta_{JC}$	—	45	$^\circ\text{C}/\text{W}$
	$\theta_{JA}$	—	60	$^\circ\text{C}/\text{W}$
Junction Operating Temperature	$T_J$	—	150	$^\circ\text{C}$
Lead Temperature (Soldering 10s)	$T_L$	—	300	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55	150	$^\circ\text{C}$



Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Note:** Thermal resistance and power dissipation ratings are measured while board-mounted and under still air conditions.

### 2.2. Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
High-Side Floating Supply Absolute Voltage	$V_B$	$V_S + 10$	$V_S + 20$	V
High-Side Floating Supply Offset Voltage	$V_S$	See <a href="#">note</a>	600	V
High-Side Floating Output Voltage	$V_{HO}$	$V_S$	$V_B$	V
Low-Side Fixed Supply Voltage	$V_{CC}$	10	20	V
Low-Side Output Voltage	$V_{LO}$	COM	$V_{CC}$	V
Logic Ground	$V_{SS}$	-5	5	V
Logic Input Voltage (HIN*, LIN*, ITRIP and EN)	$V_{IN}$	$V_{SS}$	5	V
Fault Output Voltage	$V_{FO}$	$V_{SS}$	$V_{CC}$	
Ambient Temperature	$T_A$	-40	125	$^\circ\text{C}$

**Note:** Logic operational for  $V_S$  of -5V to +600V.

## 2.3. DC Electrical Characteristics

$V_{BIAS} (V_{CC}, V_{BS}) = 15V, T_A = 25^\circ C$ , unless otherwise specified.						
Parameter (Note 1)	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic "1" Input Voltage	$V_{IH}$	2.4	—	—	V	Note 2
Logic "0" Input Voltage	$V_{IL}$	—	—	0.8	V	Note 2
High-Level Output Voltage, $V_{BIAS} - V_O$	$V_{OH}$	—	—	0.1	V	$I_O = 0A$
Low-Level Output Voltage, $V_O$	$V_{OL}$	—	—	0.1	V	$I_O = 0A$
Offset Supply Leakage Current	$I_{LK}$	—	—	10	$\mu A$	$V_B = V_S = 600V$
Quiescent $V_{BS}$ Supply Current	$I_{BSQ}$	10	85	130	$\mu A$	$V_{IN} = 0V$ or $5V$ , $EN = 0V$
Quiescent $V_{CC}$ Supply Current	$I_{CCQ}$	—	1.1	1.6	mA	$V_{IN} = 0V$ or $5V$ , $EN = 0V$
Logic "1" Input Bias Current (HO = LO = HIGH)	$I_{IN+}$	—	130	200	$\mu A$	$V_{IN} = 0V$
Logic "0" Input Bias Current (HO = LO = LOW)	$I_{IN-}$	—	3.0	20	$\mu A$	$V_{IN} = 5V$
Logic Enable "1" Input Bias Current	$I_{EN+}$	—	33	80	$\mu A$	$V_{IN} = 5V$
Logic Enable "0" Input Bias Current	$I_{EN-}$	—	—	2	$\mu A$	$V_{IN} = 0V$
$V_{BS}$ Supply Undervoltage Positive Going Threshold	$V_{BSUV+}$	7.6	8.9	9.9	V	
$V_{BS}$ Supply Undervoltage Negative Going Threshold	$V_{BSUV-}$	7.1	8.3	9.4	V	
$V_{CC}$ Supply Undervoltage Positive Going Threshold	$V_{CCUV+}$	7.6	8.9	9.9	V	
$V_{CC}$ Supply Undervoltage Negative Going Threshold	$V_{CCUV-}$	7.1	8.3	9.4	V	
Output High Short Circuit Pulsed Current	$I_{O+}$	120	200	—	mA	$V_O = 0V$ , $PW \leq 10 \mu s$
Output Low Short Circuit Pulsed Current	$I_{O-}$	250	350	—	mA	$V_O = 15V$ , $PW \leq 10 \mu s$
Overcurrent Detection Positive Threshold	$V_{ITH+}$	400	500	600	mV	
Overcurrent Detection Negative Threshold	$V_{ITH-}$	340	420	500	mV	
Short-circuit Input Current	$I_{CSIN}$	—	11	16	$\mu A$	$V_{CSIN} = 1V$
RCIN Positive Going Threshold Voltage	$V_{RCINTH+}$	7.0	8.4	9.8	V	
RCIN Negative Going Threshold Voltage	$V_{RCINTH-}$	—	5	—	V	
Fault Output Low Level Voltage	$V_{FOL}$	—	0.2	0.5	V	$V_{CS} = 1V$ , $I_{FO} = 1.5 mA$
RCIN ON Resistance	$R_{DSRCIN}$	40	75	110	$\Omega$	$I_{RCIN} = 1.5 mA$
Fault Output ON Resistance	$R_{DSFO}$	80	130	180	$\Omega$	$I_{FO} = 1.5 mA$

### Notes:

1. The  $V_{IN}$ ,  $V_{TH}$ , and  $I_{IN}$  parameters are referenced to  $V_{SS}$  and are applicable to all six logic input pins (HIN1\*, HIN2\*, HIN3\* and LIN1\*, LIN2\*, LIN3\*). The  $V_O$  and  $I_O$  parameters are applicable to the outputs (HO1, HO2, HO3 and LO1, LO2, LO3) and are referenced to COM.
2. For optimal operation, it is recommended that the input pulse (to HIN1\*, HIN2\*, HIN3\* and LIN1\*, LIN2\*, LIN3\*) should have an amplitude of 2.4V minimum, with a Pulse Width (PW) of at least 600 ns.

## 2.4. AC Electrical Characteristics

$V_{BIAS} (V_{CC}, V_{BS}) = 15V, C_L = 1000 \text{ pF}, \text{ and } T_A = 25^\circ\text{C}, \text{ unless otherwise specified.}$						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Turn-on Propagation Delay	$t_{ON}$	200	330	460	ns	$V_S = 0V$ , see <a href="#">Figure 3-2</a>
Turn-off Propagation Delay	$t_{OFF}$	200	330	460	ns	$V_S = 0V$ or $600V$ , see <a href="#">Figure 3-2</a>
Turn-on Rise Time	$t_r$	—	90	150	ns	$V_S = 0V$ , see <a href="#">Figure 3-2</a>
Turn-off Fall Time	$t_f$	—	35	60	ns	$V_S = 0V$ , see <a href="#">Figure 3-2</a>
Delay Matching	$t_{DM}$	—	—	50	ns	
Enable Low to Output Shutdown Delay	$t_{EN}$	225	330	425	ns	
ITRIP Pin Leading-edge Blanking Time	$t_{BLT}$	200	300	400	ns	
Time From ITRIP Triggering to FO*	$t_{FLT}$	320	550	760	ns	From $V_{ITRIP} = 1V$ to FO* turn OFF, see <a href="#">Figure 3-4</a>
Time From ITRIP Triggering to All Gate Outputs Turn OFF	$t_{ITRIP}$	380	615	820	ns	From $V_{ITRIP} = 1V$ to starting gate turn OFF, see <a href="#">Figure 3-4</a>
Input Filtering Time (HIN*, LIN*, EN)	$t_{FLTIN}$	—	250	—	ns	
Fault Clear Time	$t_{FLTCLR}$	—	1.6	—	ms	$C_{RCIN} = 1 \text{ nF}, R_{RCIN} = 2 \text{ M}\Omega$ , see <a href="#">Figure 3-4</a>
Deadtime	$t_{DT}$	200	290	420	ns	See <a href="#">Figure 3-3</a>
Deadtime Matching	$t_{DTM}$	—	—	50	ns	See <a href="#">Figure 3-3</a>
Output Pulse Width Matching ( <a href="#">Note</a> )	$t_{PM}$	—	50	75	ns	$PW_{IN} > 1 \mu\text{s}$

**Note:**  $t_{PM}$  is defined as  $PW_{IN} - PW_{OUT}$ .

### 3. Timing Waveforms

Figure 3-1. Input/Output Timing Diagram

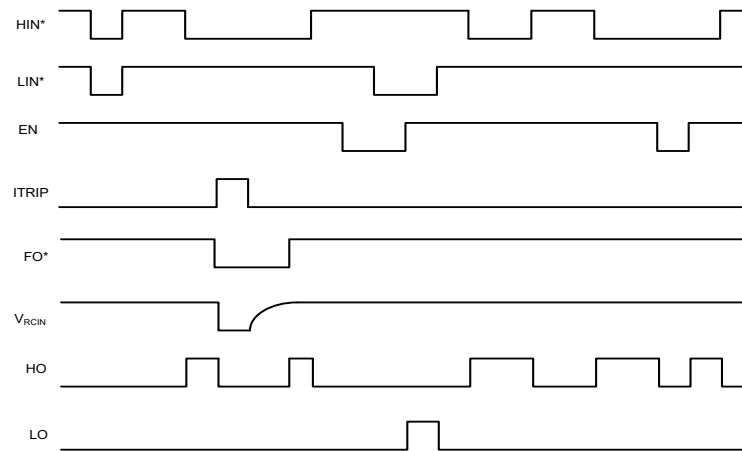


Figure 3-2. Switching Time Waveform Definitions

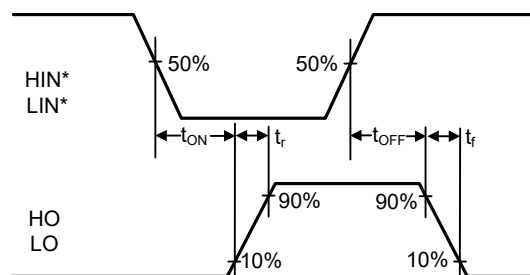


Figure 3-3. Deadtime Waveform Definitions

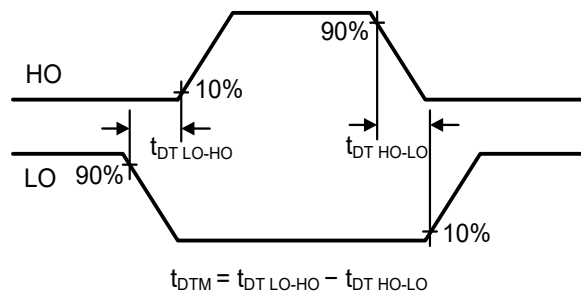
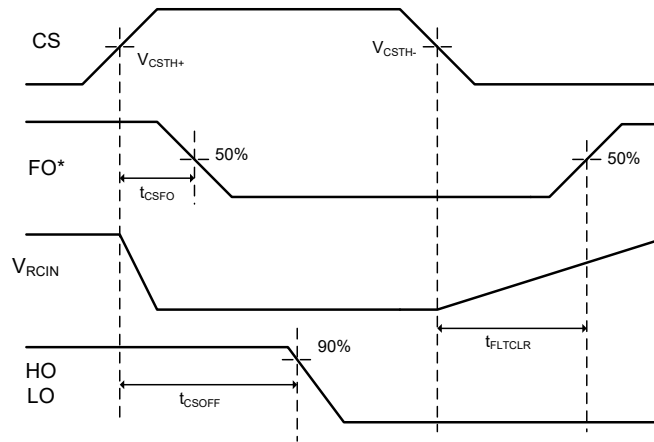


Figure 3-4. Overcurrent Timing Definitions



## 4. Typical Performance Curves

Figure 4-1. Output Source Current vs. Supply Voltage

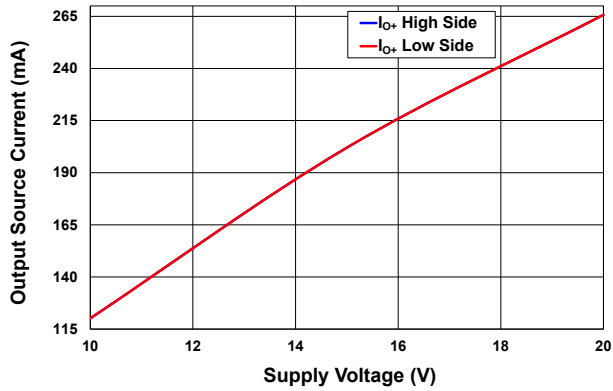


Figure 4-2. Output Source Current vs. Temperature

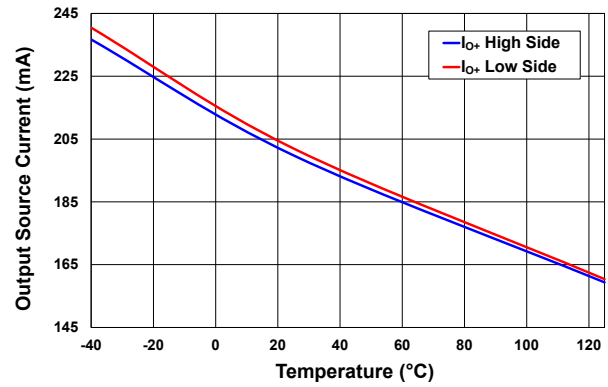


Figure 4-3. Output Sink Current vs. Supply Voltage

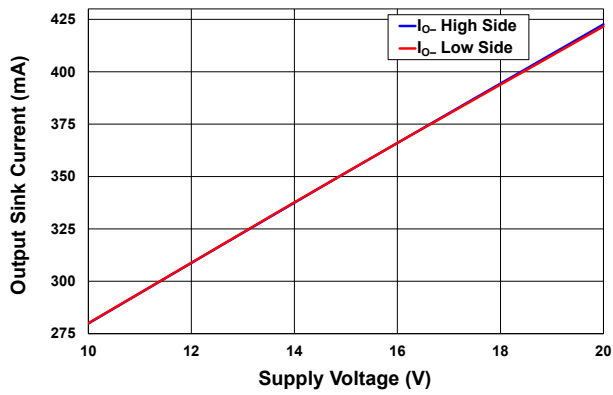


Figure 4-4. Output Sink Current vs. Temperature

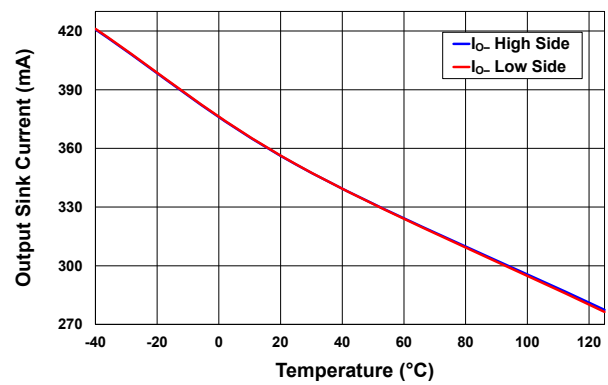


Figure 4-5. Logic 1 Input Voltage vs. Supply Voltage

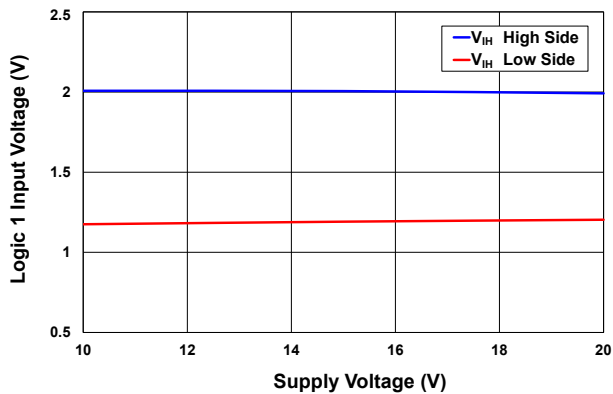


Figure 4-6. Logic 1 Input Voltage vs. Temperature

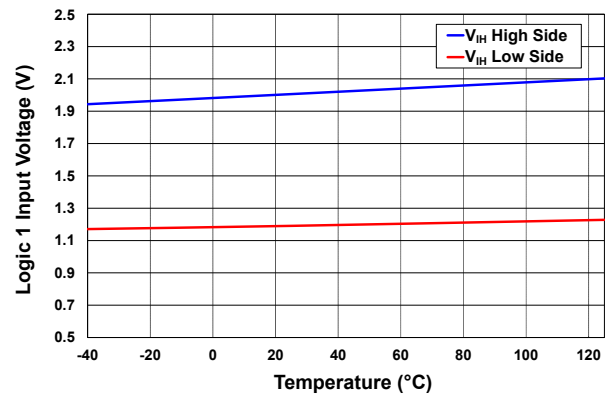


Figure 4-7. Logic 0 Input Voltage vs. Supply Voltage

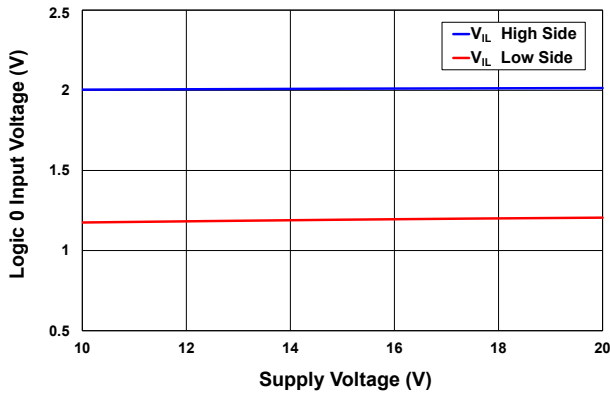


Figure 4-8. Logic 0 Input Voltage vs. Temperature

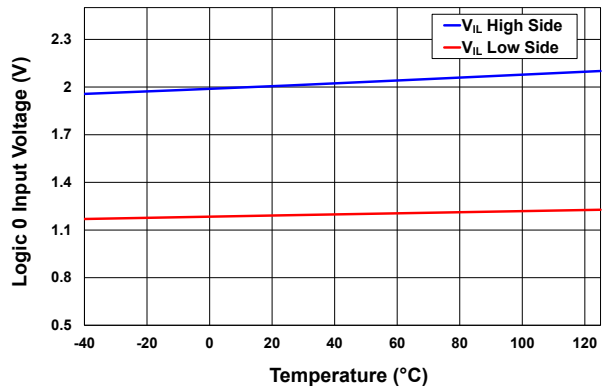


Figure 4-9. Quiescent Current vs. Supply Voltage

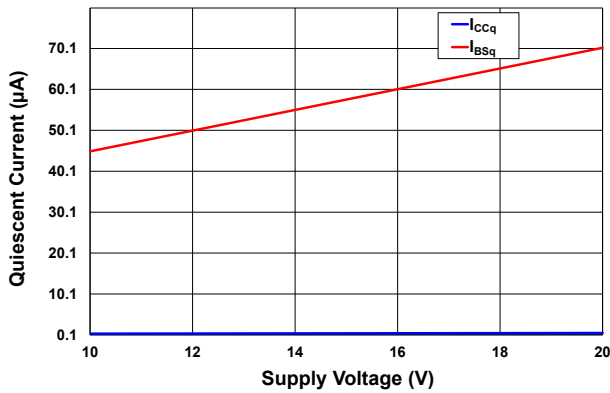


Figure 4-10. Quiescent Current vs. Temperature

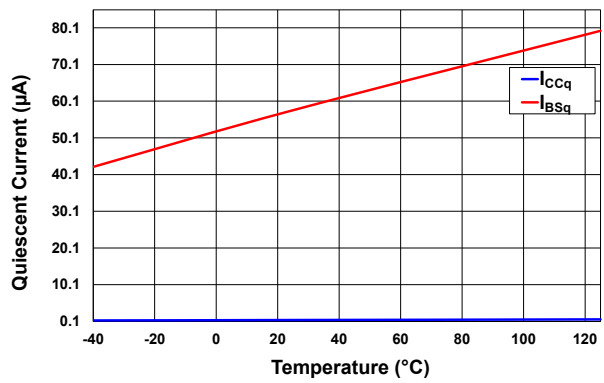


Figure 4-11. Turn-on Propagation Delay vs. Supply Voltage

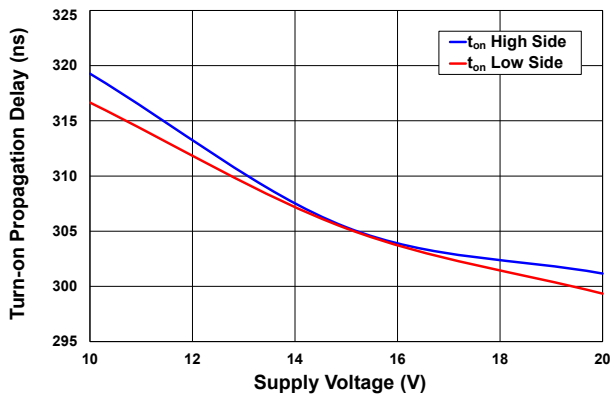
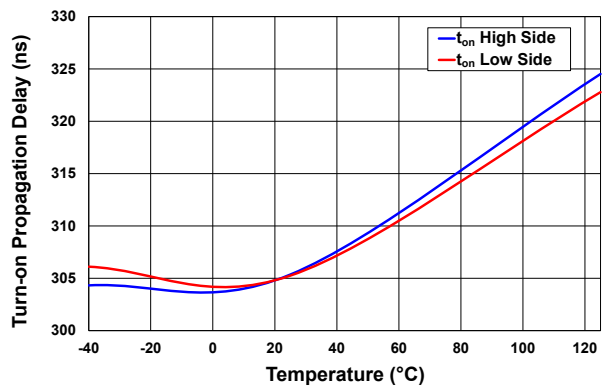
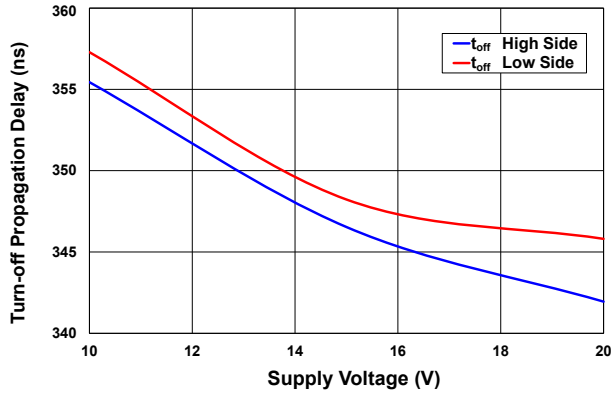


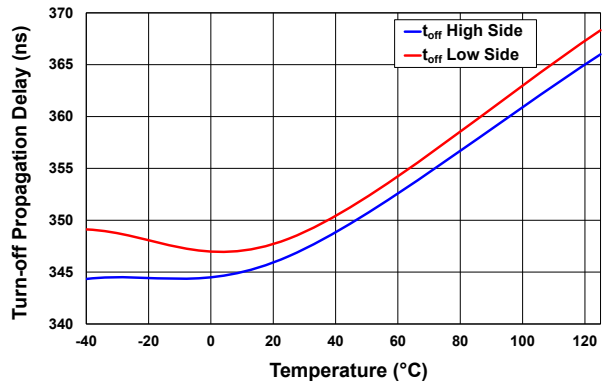
Figure 4-12. Turn-on Propagation Delay vs. Temperature



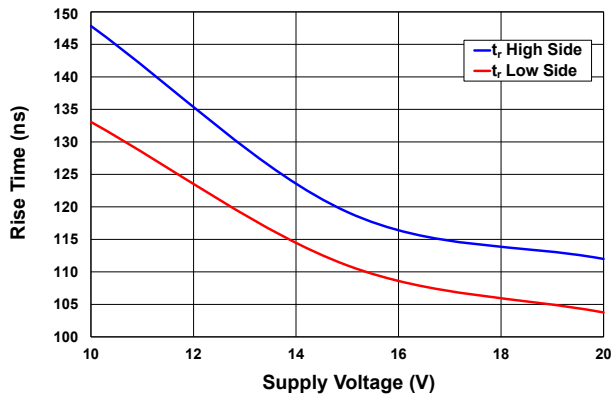
**Figure 4-13.** Turn-off Propagation Delay vs. Supply Voltage



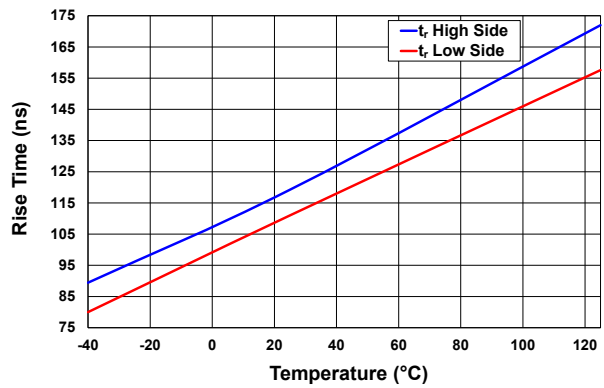
**Figure 4-14.** Turn-off Propagation Delay vs. Temperature



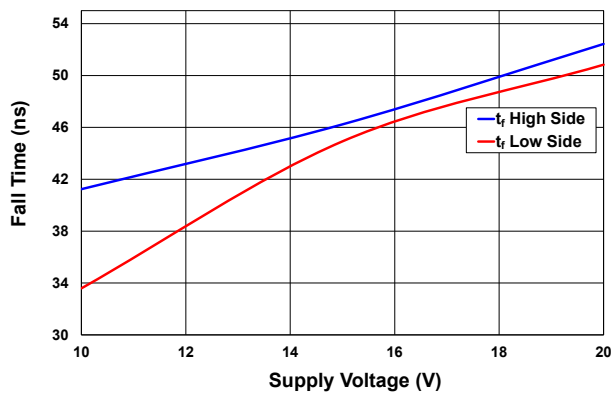
**Figure 4-15.** Rise Time vs. Supply Voltage



**Figure 4-16.** Rise Time vs. Temperature



**Figure 4-17.** Fall Time vs. Supply Voltage



**Figure 4-18.** Fall Time vs. Temperature

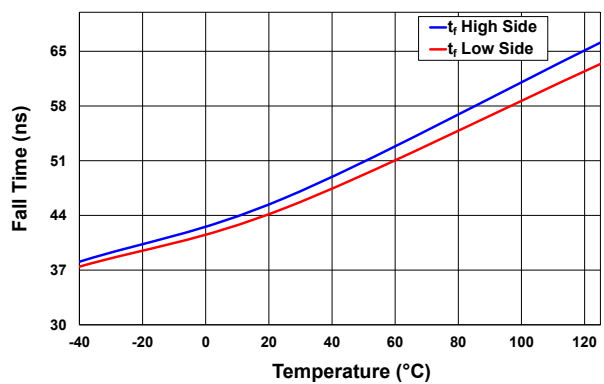


Figure 4-19. Delay Matching vs. Supply Voltage

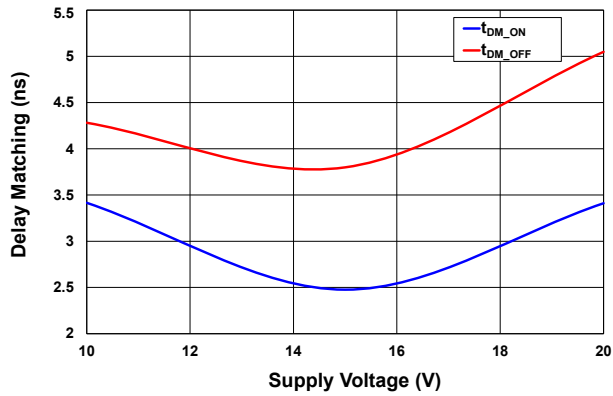


Figure 4-20. Delay Matching vs. Temperature

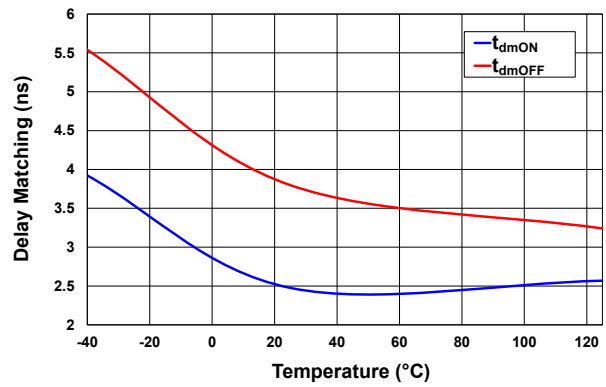


Figure 4-21. VCC UVLO vs. Temperature

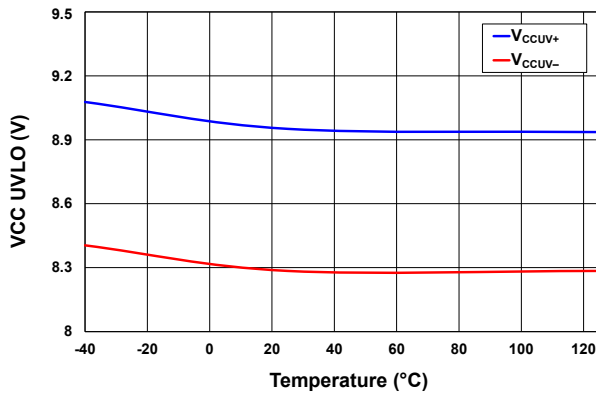
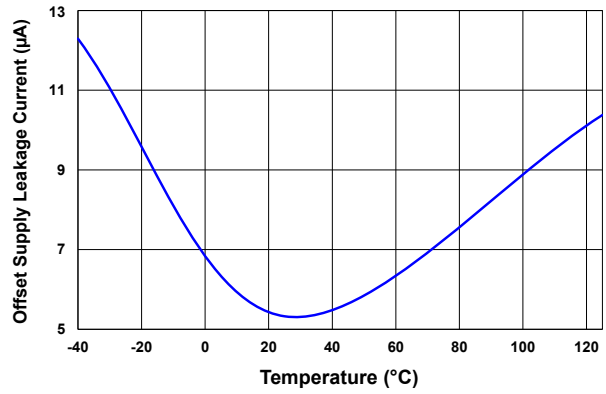
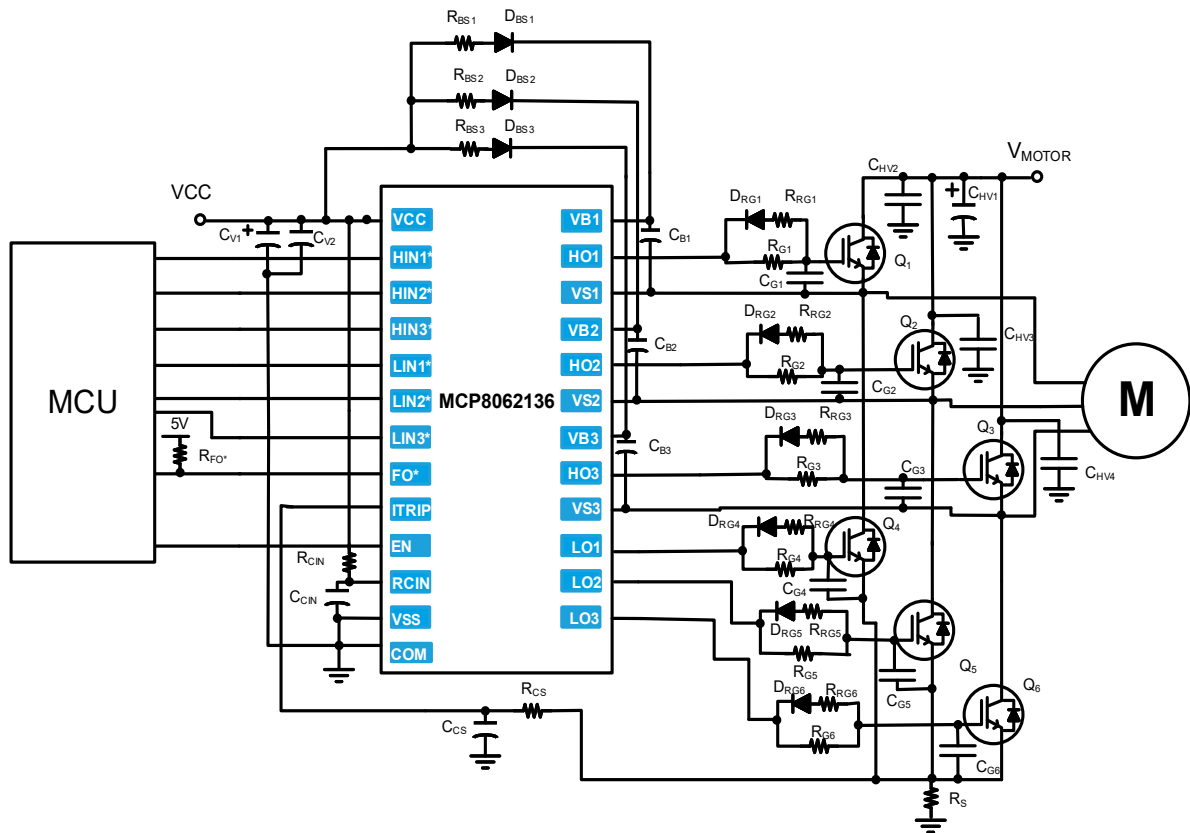


Figure 4-22. Offset Supply Leakage Current vs. Temperature



## 5. Application Information

Figure 5-1. MCP8062136 in a 3 Phase Motor Drive Application

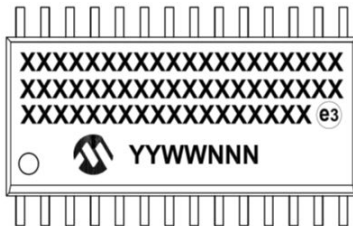


- $R_{RG1}$ ,  $R_{RG2}$ ,  $R_{RG3}$ ,  $R_{RG4}$ ,  $R_{RG5}$  and  $R_{RG6}$  values are typically between  $0\Omega$  and  $10\Omega$ . The exact value is decided based on the MOSFET junction capacitance and the drive current of gate driver. A value of  $10\Omega$  is used in this example.
- $R_{G1}$ ,  $R_{G2}$ ,  $R_{G3}$ ,  $R_{G4}$ ,  $R_{G5}$  and  $R_{G6}$  values are typically between  $20\Omega$  and  $100\Omega$ . The exact value is decided based on the MOSFET junction capacitance and drive current of the gate driver. A value of  $50\Omega$  is used in this example.
- $R_{BS1}$ ,  $R_{BS2}$  and  $R_{BS3}$  values are typically between  $3\Omega$  and  $20\Omega$ . The exact value is calculated based on the bootstrap capacitor value and the amount of current limiting required for bootstrap capacitor charging. A value of  $10\Omega$  is used in this example. Also,  $D_{BS1}$ ,  $D_{BS2}$  and  $D_{BS3}$  should be ultra fast diodes with a minimum rating of 1A, and a voltage rating greater than the system operating voltage.
- It is recommended that the input pulse (to  $HINx^*$  and  $LINx^*$ ) should have an amplitude of 2.4V minimum, with a minimum pulse width of 600 ns.

## 6. Packaging Information

### Package Marking Information

28-Pin SOIC (7.5 mm):



Example:

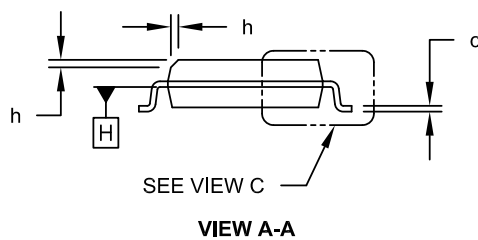
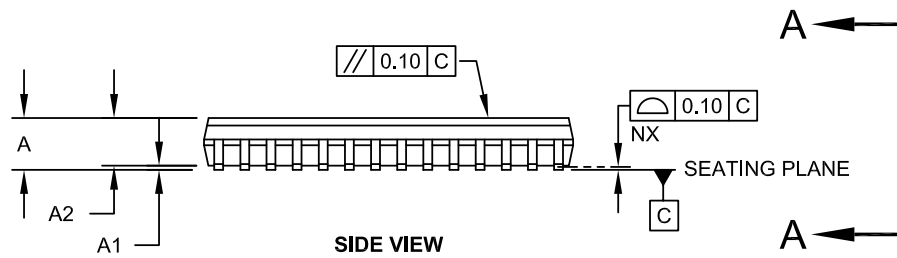
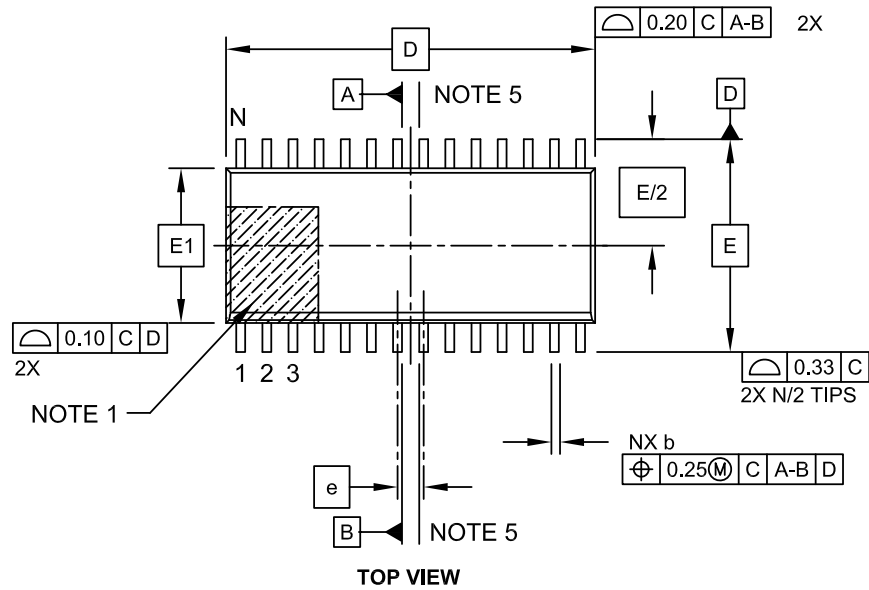


<b>Legend:</b>	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.
<b>Note:</b>	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or not include the corporate logo.	

Package Outline Drawings

28-Lead Plastic Small Outline (SO) - Wide, 7.50 mm Body [SOIC]

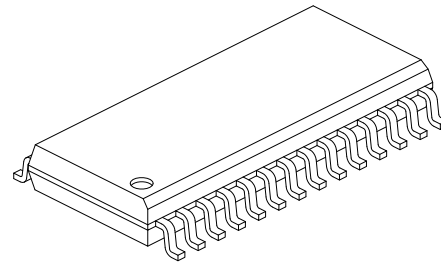
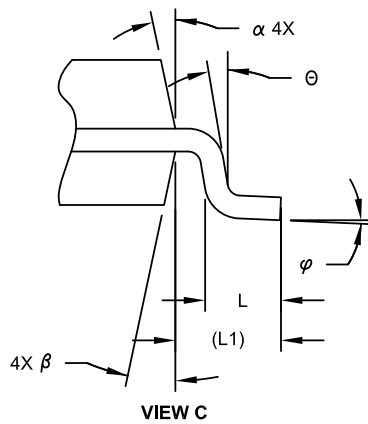
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-052C Sheet 1 of 2

## 28-Lead Plastic Small Outline (SO) - Wide, 7.50 mm Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	28		
Pitch	e	1.27 BSC		
Overall Height	A	-	-	2.65
Molded Package Thickness	A2	2.05	-	-
Standoff §	A1	0.10	-	0.30
Overall Width	E	10.30 BSC		
Molded Package Width	E1	7.50 BSC		
Overall Length	D	17.90 BSC		
Chamfer (Optional)	h	0.25	-	0.75
Foot Length	L	0.40	-	1.27
Footprint	L1	1.40 REF		
Lead Angle	θ	0°	-	-
Foot Angle	φ	0°	-	8°
Lead Thickness	c	0.18	-	0.33
Lead Width	b	0.31	-	0.51
Mold Draft Angle Top	α	5°	-	15°
Mold Draft Angle Bottom	β	5°	-	15°

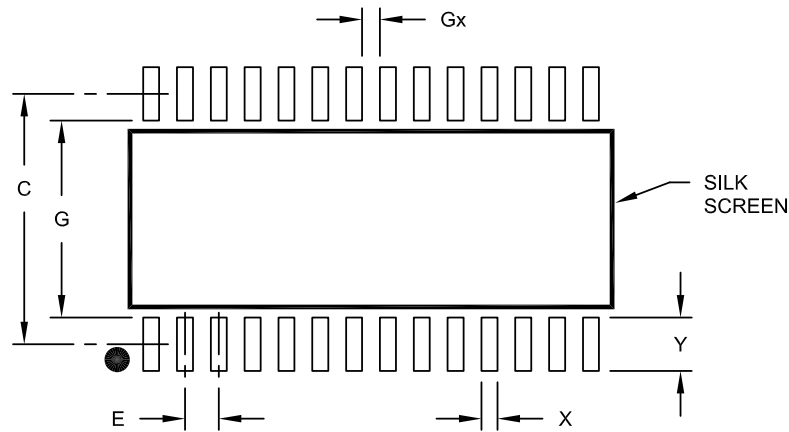
**Notes:**

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- § Significant Characteristic
- Dimension D does not include mold flash, protrusions or gate burrs, which shall not exceed 0.15 mm per end. Dimension E1 does not include interlead flash or protrusion, which shall not exceed 0.25 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M  
 BSC: Basic Dimension. Theoretically exact value shown without tolerances.  
 REF: Reference Dimension, usually without tolerance, for information purposes only.
- Datums A & B to be determined at Datum H.

Microchip Technology Drawing C04-052C Sheet 2 of 2

28-Lead Plastic Small Outline (SO) - Wide, 7.50 mm Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	1.27 BSC		
Contact Pad Spacing	C		9.40	
Contact Pad Width (X28)	X			0.60
Contact Pad Length (X28)	Y			2.00
Distance Between Pads	Gx	0.67		
Distance Between Pads	G	7.40		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2052A

## 7. Revision History

Doc. Rev.	Date	Section	Comments
A	November 2025		Initial release of this document.

## Product Identification System

To order or obtain information, for example, on pricing or delivery, contact Microchip: <https://www.microchip.com/en-us/about/contact-us>.



<b>Device:</b>	MCP8062136: Half-Bridge Gate Driver	
<b>Tape and Reel Option<sup>(1)</sup>:</b>	Blank	= Tube (25/Tube)
	T	= Tape and Reel (1500/Reel)
<b>Temperature Range:</b>	E	= -40°C to +125°C (Extended)
<b>Package:</b>	SO	= Plastic Small Outline IC, 7.50 mm, SOIC, 28-Pin

Examples:

- MCP8062136T-E/SO: Half-Bridge Gate Driver, Tape and Reel, Extended temperature range, SOIC-28 package

### Note:

1. Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package.

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