

Transformer Driver for Isolated Power Supplies

Features

- Integrated Power Switches for Push-Pull Topology
- Operational Input Supply Voltage Range: 3.0V - 5.5V
- Drive Current Capability: 1.7A Peak
- Switching Frequency Options: 150 kHz or 450 kHz
- Overcurrent and Overtemperature Protections
- External Clock Input for Multiple Devices Synchronization
- Undervoltage Lockout (UVLO) Protection
- Enable Function
- Internal Soft-Start Function
- Low Shutdown Current: < 1 μ A (typical)
- Junction Operating Temperature Range: -40°C to 125°C
- AEC-Q100 Automotive Qualified
- RoHS Compliant
- SOT23-6 Package

Applications

- Isolated Power Supplies for SiC/Si MOSFETs and IGBTs
- Bias Generators for Isolated Communication Interfaces: CAN, LIN, USB, etc.
- Bias Generators for Isolated Sensing Circuitry

General Description

The MCP14T0517 is a push-pull transformer driver specifically designed for small form factor, isolated power supplies with a typical input voltage range from 3V to 5.5V DC.

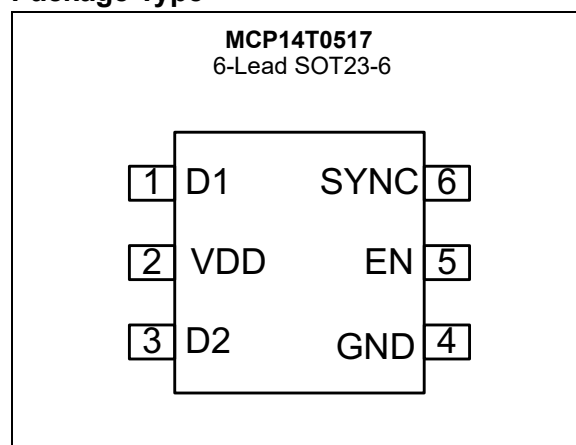
The device includes two power MOSFETs and drives push-pull center-tapped transformers from a 3V to 5.5V DC power supply.

The MCP14T0517 consists of an oscillator followed by a gate drive circuit that provides complementary output signals to drive ground referenced N-channel power switches. The voltage slew-rate of each power switch is controlled, and the internal oscillator uses dither to achieve low EMI requirements. The switching clock can also be provided externally for accurate placement of switcher harmonics, or when operating with multiple transformer drivers. The internal protection features include a 2.5Apk (typical) current limiting, undervoltage lockout (UVLO), thermal shutdown, and a dead time generator circuitry for the power switches.

MCP14T0517 includes a soft-start feature that prevents high inrush current during power up with large load capacitors. MCP14T0517A has 150 kHz switching frequency for applications that need to minimize the EMI whereas MCP14T0517B has 450 kHz switching frequency for applications that require compact transformer size.

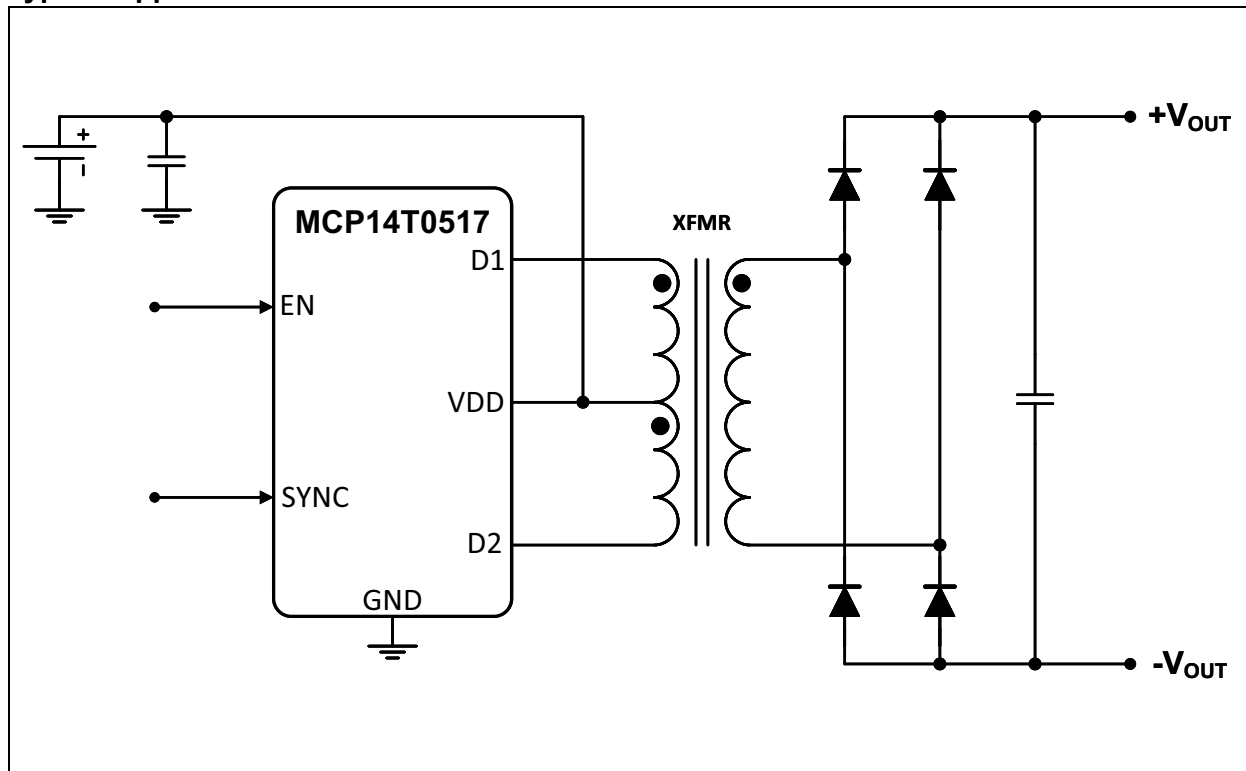
The MCP14T0517 is available in a small 6-pin SOT23-6 package. The device operation is characterized for a temperature range from -40°C to 125°C.

Package Type

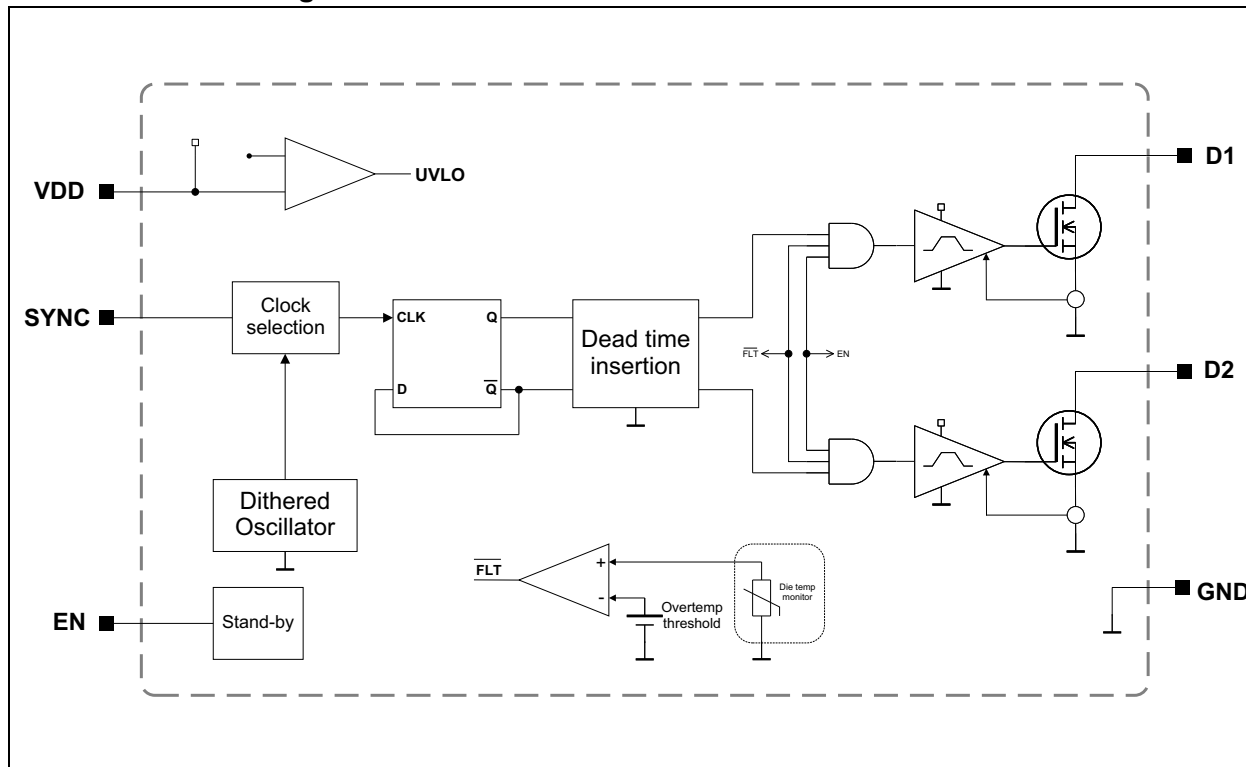


MCP14T0517

Typical Application Circuit



Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Supply Voltage V_{DD}	+6V
Voltage on EN and SYNC.....	-0.3V to ($V_{DD} + 0.3$)V
D1 and D2 Pins Voltage.....	+15V
Maximum Switch Current.....	3.5A _{PEAK}
Storage Temperature (T_S).....	-55°C to +150°C
Power Dissipation	
6-Lead SOT-23	0.5W
ESD Ratings	
HBM, per ANSI/ESDA/JEDEC JS-001, All Pins.....	±5000V
CDM, per JEDEC specification JESD22-C101, All Pins	±2000V

Operating Ratings‡

VDD Supply Voltage (V_{DD}).....	3V to 5.5V
Output Switch Current (I_{D1} , I_{D2}).....	1.5A
Junction Temperature (T_J).....	-40°C to +125°C

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating 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.

‡ **Notice:** The device is not guaranteed to function outside its operating ratings.

TABLE 1-1: ELECTRICAL CHARACTERISTICS

Electrical Characteristics: $V_{DD} = 5V$, $T_A = 25^\circ C$, unless otherwise specified.						
Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Inputs						
Bias Voltage Range	V_{DD}	3	—	5.5	V	
Bias Current (MCP14T0517A)	I_{VDD}	—	4.5	7	mA	D1 and D2 are floating.
Bias Current (MCP14T0517B)		—	7	9		
Sleep Current	I_{VDD_sleep}	—	—	1	μA	EN pin connected to GND.
Positive-Going UVLO Threshold	$V_{DD_UVLO_UP}$	—	—	2.95	V	V_{DD} voltage rising.
Negative-Going UVLO Threshold	$V_{DD_UVLO_DN}$	2.65	—	—	V	V_{DD} voltage falling.
UVLO Threshold Hysteresis	$V_{DD_UVLO_HYST}$	75	100	125	mV	
EN, SYNC Pin Logic Level “High”	V_{IN_ON}	—	—	0.7	V	
EN, SYNC Pin Logic Level “Low”	V_{IN_OFF}	0.3	—	—	V	
Leakage Current on EN Pin	I_{LEAK_EN}	—	—	15	μA	EN pin is connected to V_{DD} .
Leakage Current on SYNC Pin	I_{LEAK_SYNC}	—	—	1	μA	SYNC pin is connected to V_{DD} . EN = 0V
Leakage Current on D1 and D2 Pins	$I_{LEAK_D1_D2}$	—	—	1	μA	D1 and D2 are connected to V_{DD} .
Integrated Power Switches						
Switch ON-Resistance	R_{DS_ON}	—	—	200	mΩ	$V_{DD} = 5V$, $I_D = 0.5A$
		—	—	350		$V_{DD} = 3V$, $I_D = 0.5A$
Current Limit	I_{LIM}	1.7	2.5	3.5	A	
Voltage Slew-Rate on D1 and D2	V_{SR}	—	60	—	V/μs	D1 and D2 are connected to V_{DD} via 50Ω resistors. Refer to Figure 2-1 for details.
Dead Time	t_{DT}	—	50	—	ns	Measured using the setup depicted in Figure 2-1 .

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TABLE 1-1: ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: $V_{DD} = 5V$, $T_A = 25^{\circ}C$, unless otherwise specified.						
Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Oscillator						
Switching Frequency (MCP14T0517A)	F_{SW}	140	150	160	kHz	Average values measured on D1 and D2 pins using the setup depicted in Figure 2-1 .
Switching Frequency (MCP14T0517B)		420	450	480		
External Synchronization Signal Frequency on SYNC Pin	F_{SYNC}	60	—	1200	kHz	
External Synchronization Signal Duty Cycle on SYNC Pin	D_{SYNC}	10	—	90	%	
Thermal Shutdown						
Thermal Shutdown Temperature	T_{SHD}	—	170	—	$^{\circ}C$	
Thermal Shutdown Hysteresis	T_{SHDN_HYS}	—	20	—	$^{\circ}C$	

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Range						
Junction Temperature	T_J	-40	—	+125	$^{\circ}C$	
Storage Temperature	T_S	-55	—	+150	$^{\circ}C$	
Package Thermal Resistances						
6-Lead SOT-23	θ_{JA}	—	190.5	—	$^{\circ}C$	EIA/JESD51-3 Standard

2.0 TYPICAL CHARACTERISTIC CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore, outside the warranted range.

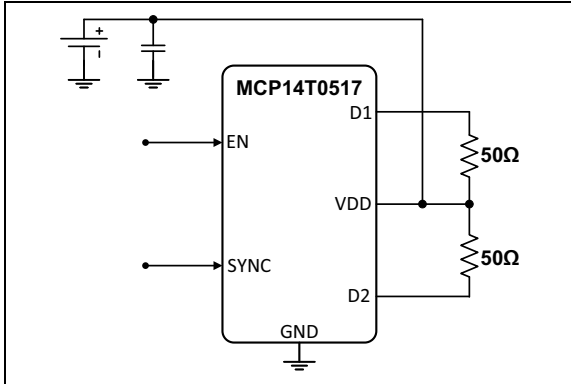


FIGURE 2-1: Test Circuit.

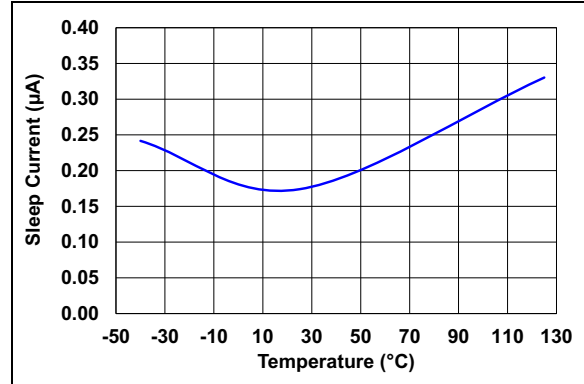


FIGURE 2-4: Sleep Current vs. Temperature.

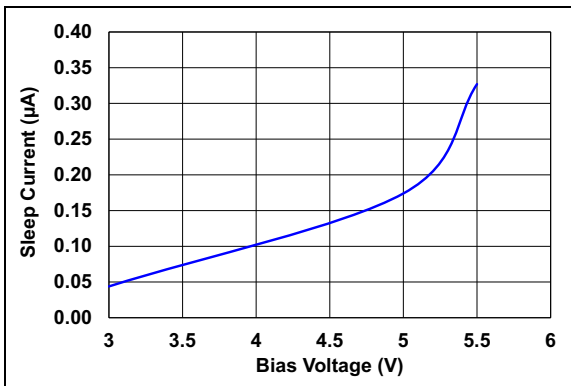


FIGURE 2-2: Sleep Current vs. Bias Voltage (at 25°C).

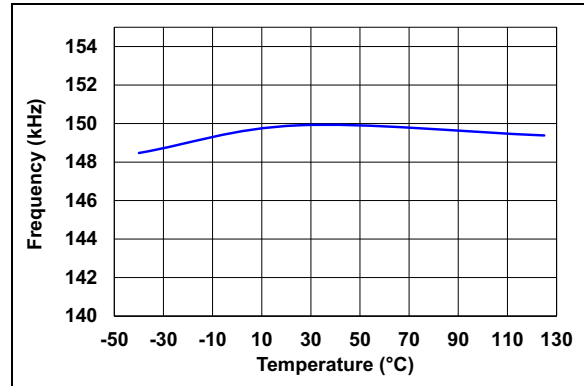


FIGURE 2-5: Average Switching Frequency vs. Temperature (MCP14T0517A, at 25°C).

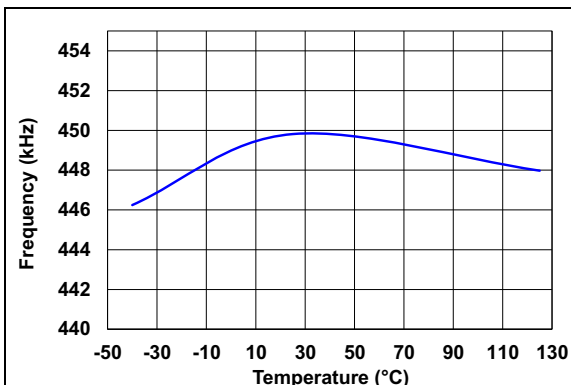


FIGURE 2-3: Average Switching Frequency vs. Temperature (MCP14T0517B, at 25°C).

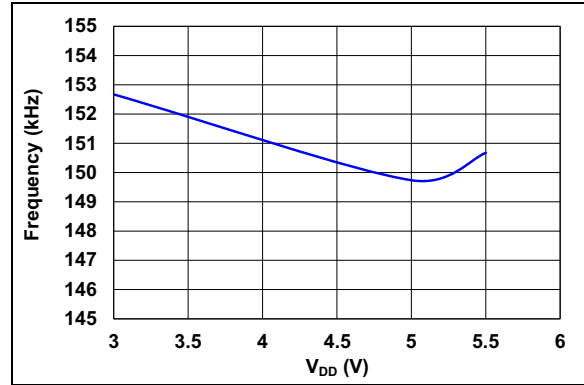


FIGURE 2-6: Average Switching Frequency vs. V_{DD} Voltage (MCP14T0517A, at 25°C).

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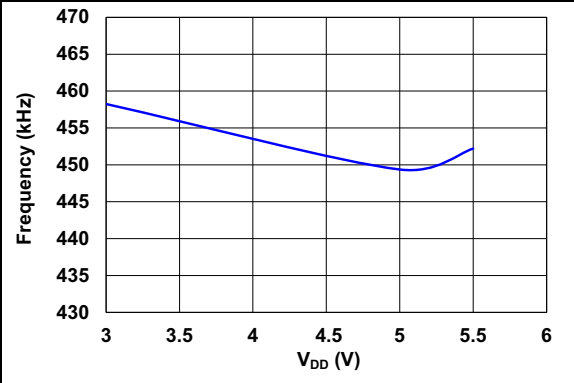


FIGURE 2-7: Average Switching Frequency vs. V_{DD} Voltage (MCP14T0517B, at 25°C).

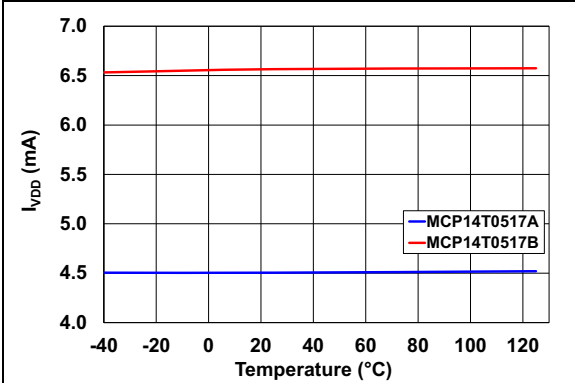


FIGURE 2-10: Operating Current vs. Temperature (at V_{DD} = 5V).

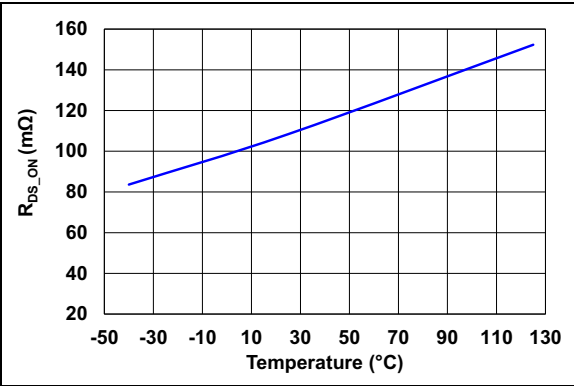


FIGURE 2-8: MOSFETs R_{DS_ON} vs. Temperature (V_{DD} = 5V).

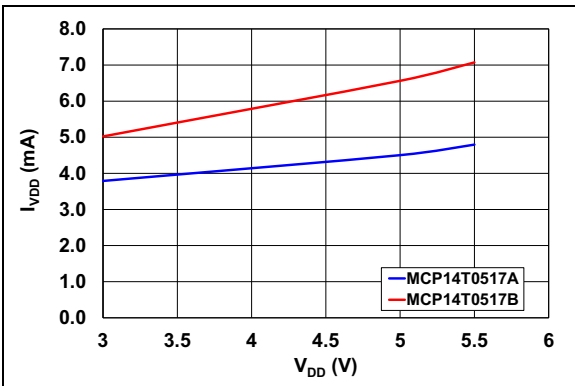


FIGURE 2-11: Operating Current vs. V_{DD} (at 25°C).

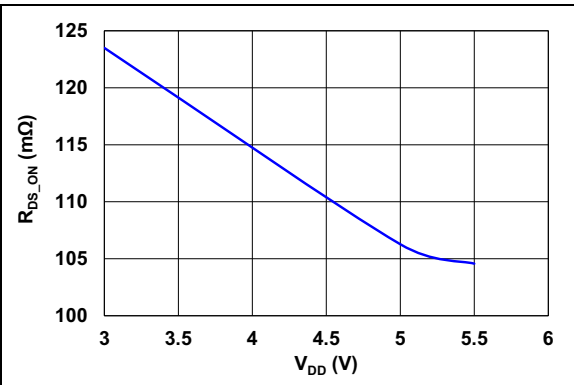


FIGURE 2-9: MOSFETs R_{DS_ON} vs. V_{DD} (at 25°C).

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 3-1](#).

TABLE 3-1: PIN FUNCTION TABLE

Pin Number	Symbol	Type	Description
1	D1	O	Drain of the first power switch
2	V _{DD}	P	Bias voltage
3	D2	O	Drain of the second power switch
4	GND	P	Ground connection
5	EN	I	Enable input
6	SYNC	I	External synchronization clock input

3.1 D1 and D2 Pins

D1 and D2 are the open drains of the internal power switches. Connect these pins to the isolation transformer using thick, short connections.

3.2 GND Pin

This is the ground terminal of the MCP14T0517 driver. Use a short connection to the ground plane of the PCB.

3.3 V_{DD} Pin

V_{DD} is the bias voltage input pin. Connect the input voltage source to the V_{DD} pin. For normal operation, the voltage on the V_{DD} pin should range from +3.0V to +5.5V. A bypass capacitor of at least 0.1 μ F should be connected between the V_{DD} pin and the GND pin. This decoupling capacitor must be located as close as possible to the controller package.

3.4 EN Pin

When this pin is connected to GND (logic “Low”), the chip will go into Shutdown state. A logic “High” enables the normal operation of the MCP14T0517 device. Do not float the EN pin. If not used, connect EN to VDD.

3.5 SYNC Pin

This is the input pin for the external synchronization signal. The actual switching frequency of the MCP14T0517 driver is half the frequency of the external synchronization signal. The device shifts automatically to the internal clock if a valid external clock signal is not present. If the part operates in noisy environments, it is recommended to either use an external pull-down resistor (values from 10k Ω to 50k Ω) connected between the SYNC pin and the GND pin or simply tie the SYNC pin directly to GND. Keep the duty cycle of the external synchronization signal between 10% and 90%.

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4.0 FUNCTIONAL DESCRIPTION

4.1 Overview

MCP14T0517 is a fully integrated transformer driver developed for low-power isolated bias generators that use the push-pull topology. It includes the power switches, internal oscillator with the external synchronization option, appropriate circuitry that generates the drive signals for the power switches and various protections like the UVLO, overcurrent and overtemperature.

4.2 Integrated Power Switches

Two power MOSFET transistors and the associated body diodes are integrated, and the drain terminals are accessible outside the package. The source terminals are connected to the GND terminal of the package. The device uses slew rate control while driving the MOSFETs to improve the EMI performance during switching.

4.3 Internal Oscillator

The MCP14T0517 driver provides two (orderable) switching frequency options: 150 kHz and 450 kHz. The internal oscillator provides a dithered signal that helps to reduce the EMI. The user has the option to modify the switching frequency of the driver by applying an external clock signal on the SYNC pin. The actual switching frequency is half of the SYNC signal frequency, as depicted in [Figure 4-1](#). If the switching frequency must be 150 kHz, the frequency of the external synchronization clock SYNC must be double, 300 kHz. The device will switch automatically between the internal oscillator and the external synchronization signal. When the SYNC signal is used, the dither of the switching frequency is disabled.

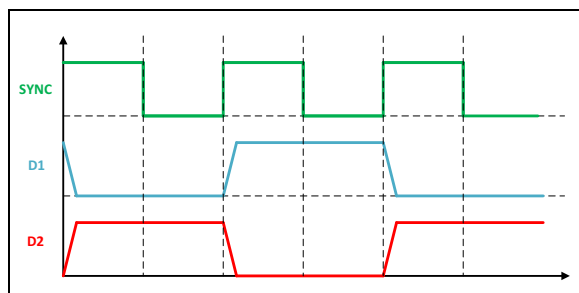


FIGURE 4-1: Relation Between SYNC Signal and D1/2 Signals.

4.4 The Soft Start

The purpose of the soft start mode is to prevent large current inrush owing to the voltage transients on the output rails i.e., during the time required for the output voltages to establish their steady state behavior.

4.5 The Overcurrent Protection

The switches current is limited to a safe value to prevent catastrophic failure of the part. The overcurrent protection operates in cycle-by-cycle mode and limits the switch current to a maximum value of 2.5A (typical). During this operating mode, a large amount of power is dissipated and the MCP14T0517 can enter in thermal shutdown mode.

4.6 The Shutdown Mode

The part can be placed into the Shutdown Mode by applying a logic level low to the EN pin. In this mode the bias current is reduced to a value lower than 1 μ A.

4.7 The Thermal Shutdown

The MCP14T0517 is protected against damage from overtemperature by an integrated circuitry. When the die temperature exceeds 150°C the part is disabled. The driver returns automatically to the normal operating mode if the die temperature falls below 130°C.

5.0 APPLICATION HINTS

The push-pull converter belongs to the family of forward isolated converters, and the typical power train of this converter is presented in Figure 5-1. A center tap transformer is driven by two power switches, Q1 and Q2. The driving signals of Q1 and Q2 are 180° out-of-phase and have a proper dead time inserted to prevent the shoot-through. The secondary side includes a full-wave, current doubler rectifier and a capacitor to eliminate the high-frequency components and sustain the output voltage during the dead-time period. The typical waveforms for the voltages and currents are presented in Figure 5-2. The transfer of the energy from the primary side to the secondary side is done in both switching cycles unlike in the case of Fly-back converter. This topology has multiple advantages, like simplicity (has two low-side power switches and does not require any floating driver), a good transformer core utilization that leads to an increase power density, good efficiency, large conversion ratio (M) and low current ripple for the primary and secondary sides. The disadvantages of this topology include the possibility to saturate the core of the transformer due to the flux imbalance; power switches must be rated for a voltage that is double the input voltage and an increase of the transformer cost due to the presence of the center tap.

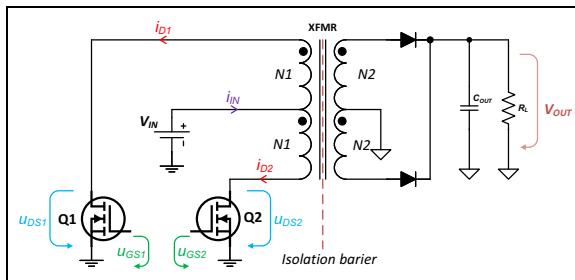


FIGURE 5-1: Typical Power Train of the Push-Pull Converter.

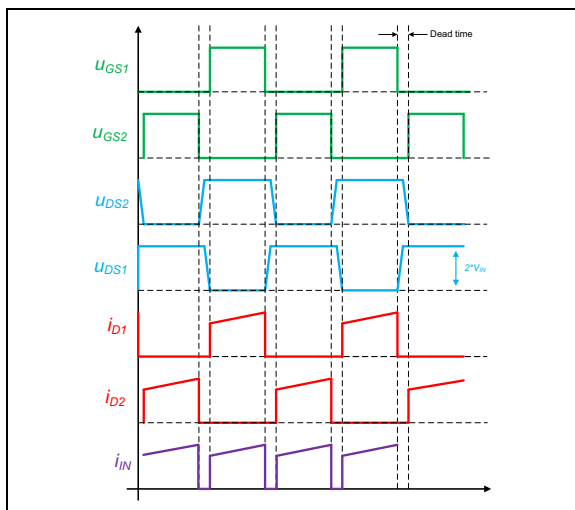


FIGURE 5-2: Typical Waveforms of the Push-Pull Converter.

The push-pull topology is also used for DC-DC converters that operate in open-loop mode like those used for isolated bias generators. Si and SiC MOSFETs that are part of high-voltage power converters often require isolated drivers. As the driving voltage for high-voltage MOSFETs is between 15V and 25V and the input voltage rail is usually 5V (regulated), the push-pull topology is well suited for isolated bias generators for such high-voltage applications.

The MCP14T0517 is ideally suited for low-power bias generators and includes the power switches and the control circuitry. To complete the application the user must place the center tap transformer, output rectifier, the input and output capacitors and a post-regulator (if necessary).

5.1 The Push-Pull Transformer

The push-pull transformer is a key component and must be carefully chosen by the designer for optimum performance of the converter. A model of a real transformer includes an ideal transformer and an inductor that is placed in parallel with the primary winding, as depicted in Figure 5-3. This additional inductor, called the magnetizing inductor, L_m , produces ripple on the transformer current and can experience saturation. The ripple of the magnetizing current i_{Lm} must be minimized to avoid excessive hysteresis losses, saturation of the magnetic core of the transformer and an increase of the losses of the power switches. The effect of the magnetizing inductance L_m on the switch current is presented in Figure 5-4.

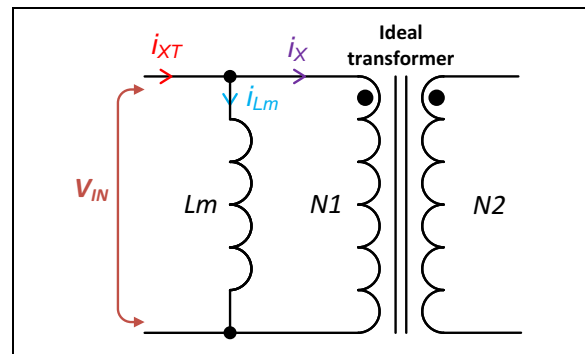


FIGURE 5-3: The Model of a Real Transformer.

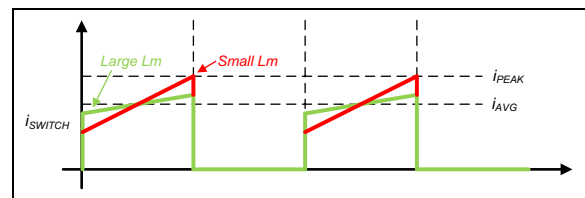


FIGURE 5-4: The Effect of L_m on the Switch Current.

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As the ripple of the magnetizing current is proportional with the applied voltage and time, the transformers manufacturers usually specify the maximum $V \times t$ product (volt-second product) for a specific transformer. The minimum $V \times t$ product for a particular push-pull transformer can be calculated using the Equation 5-1:

EQUATION 5-1:

$$V \times t \geq V_{INmax} \frac{I}{2 \times f_{sw_min}}$$

Where:

- $V \times t$ = the volt-second product, in $V \times \mu s$.
- V_{INmax} = the maximum input voltage, in V.
- f_{sw_min} = the minimum switching frequency, in Hz.

For the MCP14T0517A operating with a maximum input voltage of 5.5V and a minimum switching frequency of 135 kHz, the minimum $V \times t$ of the push-pull transformer is approximative $20V \times \mu s$. For the MCP14T0517B operating with a maximum input voltage of 5.5V and a minimum switching frequency of 400 kHz, the minimum $V \times t$ of the push-pull transformer is approximative $7V \times \mu s$.

The next step is to determine the transformation ratio. To do this, the designer must choose the output configuration of the converter. The possible configurations of the output rectifier stage are presented in Figure 5-5. Option **a)** is a full-wave rectifier that uses a diode bridge. In this case the output voltage ripple is low, the transformer has a simple secondary winding, but the voltage drop on the rectifier is high, as there are two diodes in conduction, simultaneously, per each switching cycle. Option **b)** is used when a dual, symmetric output voltage is necessary as in the case of sensing circuitry using operational amplifiers. In this case, the transformer secondary winding has a tap, and the rectifier voltage drop is high (two diodes are in conduction simultaneously). Option **c)** is a full-wave, current doubler rectifier and is recommended for low voltage, high current output. In this case, the transformer secondary winding has a center tap, the rectifier voltage drop is low (only one diode is in conduction per each switching cycle), but the diodes must be able to sustain a reverse voltage that is double the output voltage. Option **d)** is a voltage doubler and can be used for applications that require high conversion ratio. In this case, the transformer has a simple secondary winding, the rectifier is implemented with only two diodes, but the output capacitor is split in two. Output voltage ripple is higher in this case.

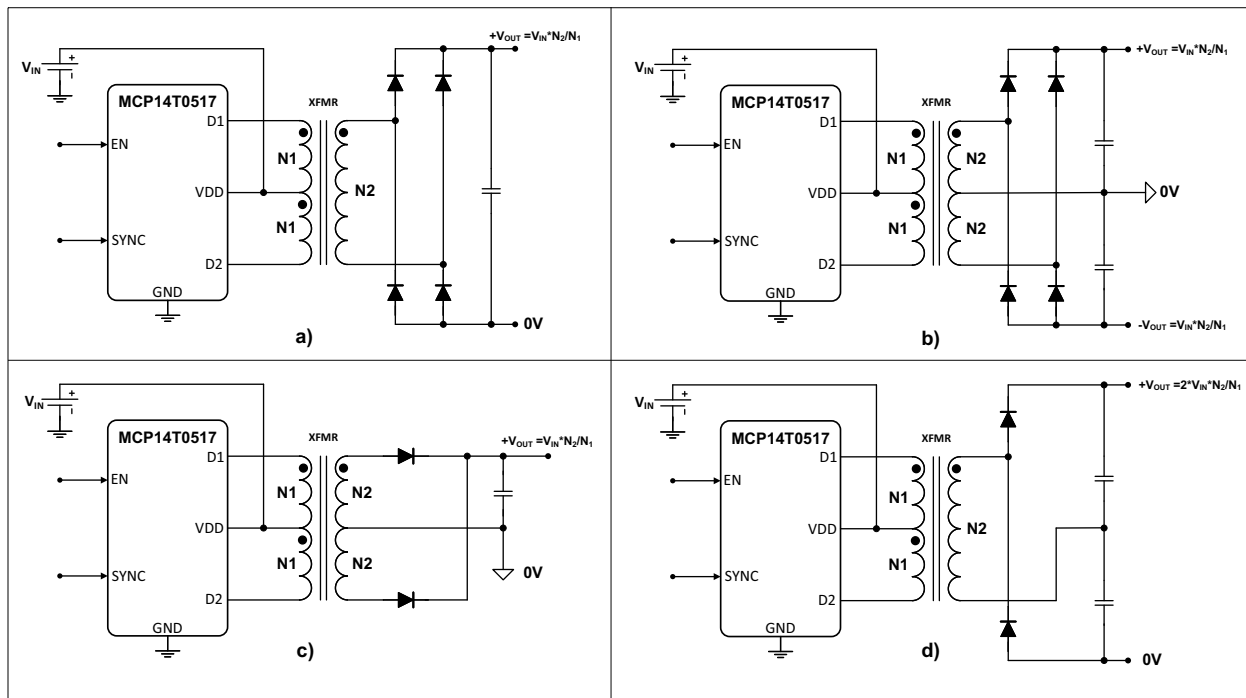


FIGURE 5-5: Possible Output Configurations.

Low power push-pull converters implemented using the MCP14T0517 drivers operate in the open-loop mode; that is, the output voltage is not regulated and depends on the input voltage, transformation ratio of the transformer and the load current. To prevent a large

variation of the output voltage with the load current, the designer can place a post-regulator at the output of the push-pull converter or can load the converter using a resistor, as shown in Figure 5-6. For applications where the value of the output voltage is not critical and the

load current has a small variation, a resistor placed on the output of the converter (option **a**) as a fix load will help to reduce the output voltage variation at the expense of efficiency (this resistor will dissipate some amount of power). For applications where the output voltage is critical, a post-regulator will be the only option (option **b**). The post-regulator can be imple-

mented using a **Low-Dropout Regulator (LDO)** (in this case, the efficiency will be maximized) or using other types of voltage regulators. If a post-regulator is used, the output rectifier voltage (V_R) must be higher than the output voltage to allow the post-regulator to operate properly.

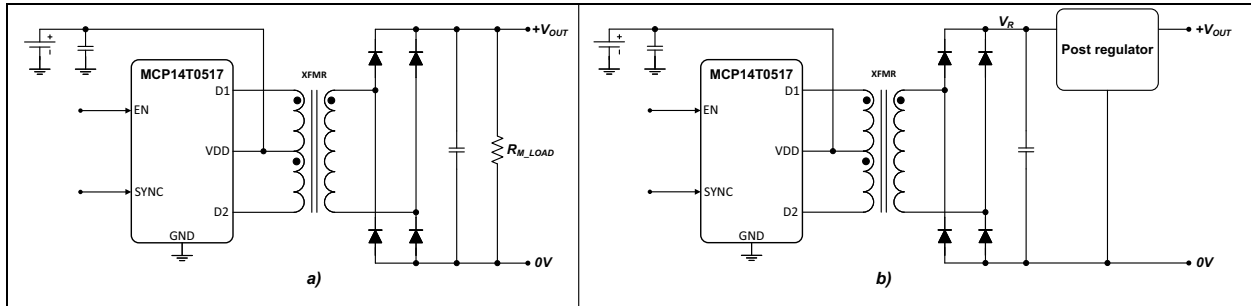


FIGURE 5-6: Recommended Methods to Regulate the Output Voltage.

For option **a**) the transformation ratio of the push-pull transformer can be determined using [Equation 5-2](#):

EQUATION 5-2:

$$\frac{N_2}{N_1} = \frac{V_{OUT} + V_{DIODE}}{V_{IN_MIN} - V_{SWITCH}}$$

Where:

- N_1, N_2 = the number of turns of the primary and secondary of the transformer
- V_{out} = the output voltage of the converter
- V_{DIODE} = the voltage drop on the rectifier diodes; this is typically 0.8V for a Si diode and 0.5V for a Schottky diode
- V_{IN_MIN} = the minimum input voltage of the converter
- V_{SWITCH} = the voltage drop on the power switches; typical is 0.3V for a switch current of 1A

For option **b**) the transformation ratio of the push-pull transformer can be determined using [Equation 5-3](#):

EQUATION 5-3:

$$\frac{N_2}{N_1} = \frac{V_R + V_{DIODE}}{V_{IN_MIN} - V_{SWITCH}}$$

Where:

- N_1, N_2 = the number of turns of the primary and secondary of the transformer
- V_R = the output voltage at the output of the rectifier; this voltage must be higher than the output voltage with a value that depends on the type of the post-regulator
- V_{DIODE} = the voltage drop on the rectifier diodes; this is typically 0.8V for a Si diode and 0.5V for a Schottky diode
- V_{IN_MIN} = the minimum input voltage of the converter
- V_{SWITCH} = the voltage drop on the power switches; typical is 0.3V for a switch current of 1A

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The calculated transformation ratio must be increased with up to 10%-15% to compensate for the imperfect coupling between the primary and secondary windings and the dead-time introduced by the transformer driver. The voltage drop on the rectifier depends on the output topology; check Figure 5-5 for details.

For applications such as the isolated Si/SiC MOSFET drivers, the capacity between primary and secondary sides of the transformer must be minimized to avoid large current spikes induced by the fast common mode voltage variation between the isolated side (primary side) and the high-voltage side (secondary side). Figure 5-7 shows the typical parasitic capacitors of the push-pull transformer. The primary-secondary parasitic capacitor C_{PS} must be minimized to reduce the common mode current i_{CM} . The inter-primary windings capacitors C_{IP} must be made equal; twisting of the primary windings helps to do this at the expense of cost of the transformer and DC resistance of the primary windings.

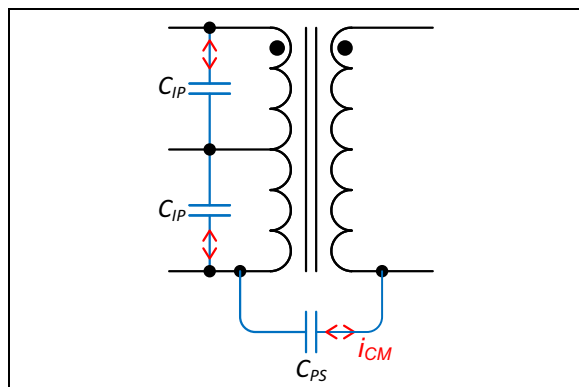


FIGURE 5-7: Relevant Parasitic Capacitors of the Push-Pull Transformer.

5.2 The Rectifier Diodes

The rectifier diodes must be fast and must have a low forward voltage. Schottky diodes with their low forward voltage and very short reverse recovery time are well suited for this application. However, the leakage current of Schottky diodes increases exponentially with the temperature. For high ambient temperature

applications, low leakage current Schottky diodes must be used. Small signal diodes like the 1N4148 can be used for low current (< 50 mA) applications but the voltage drop on these diodes is higher.

5.3 The Input and Output Capacitors

The recommended input and output capacitors are SMD, multi-layer ceramic chip (MLCC) capacitors with X7R dielectric. The input capacitor sustains the input current ripple and must be of low ESR type with a recommended value between 2.2 μF and 4.7 μF at 16V. This capacitor must be placed close to the center tap of the push-pull transformer. The VDD pin of the MCP14T0517 driver is recommended to be decoupled to GND with a 100 nF ceramic capacitor. The output capacitor must be of low ESR type with a recommended value between 1 μF and 4.7 μF at a rated voltage greater than the output voltage of the converter. The capacity of MLCC capacitor decreases with the applied voltage and this phenomenon must be considered by the designer. For example, if the output voltage of the push-pull converter is 25V, the minimum recommended voltage for the output capacitor is 50V. If the application uses a post-regulator, please consult the design recommendation of this post-regulator for the required additional decoupling capacitors.

5.4 The PCB Layout Guidelines

The push-pull converter implemented using the MCP14T0517 driver is a switch-mode power supply; a careful PCB layout is critical to achieve a good and repeatable performance. Figure 5-8 presents a typical PCB layout. It is recommended to use a two-layer PCB and to place all components on one side. The connections between D1, D2 pins of the MCP14T0517 and the transformers must be short and wide. The decoupling input capacitor must be located close to the transformer and MCP14T0517 driver. The rectifier diodes must be placed close to the transformer and the connections with these diodes must be short and wide. The bottom layer of the PCB is recommended to be a ground plane; this plane will help to minimize the radiated EMI.

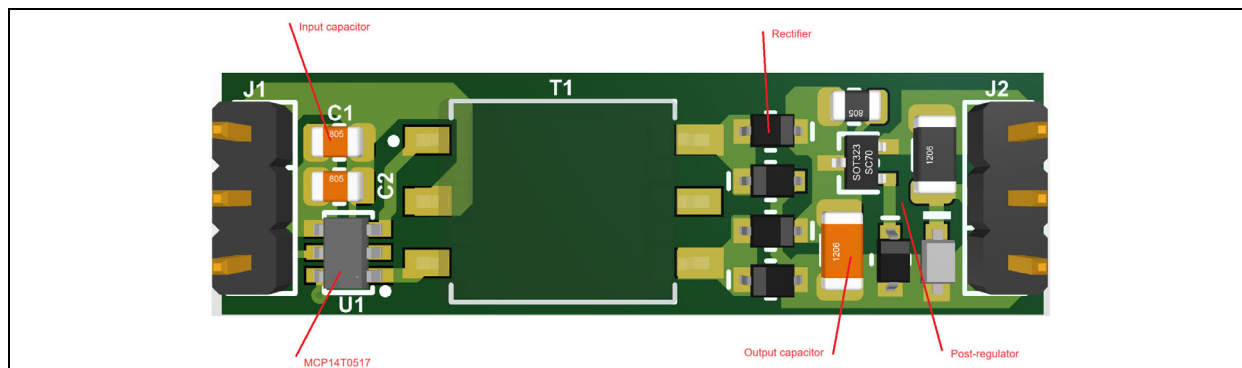
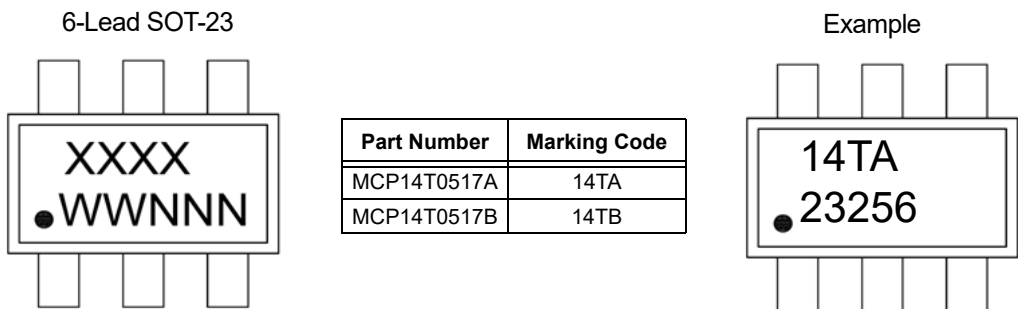


FIGURE 5-8: PCB Layout (Example).

6.0 PACKAGING INFORMATION

6.1 Package Marking Information



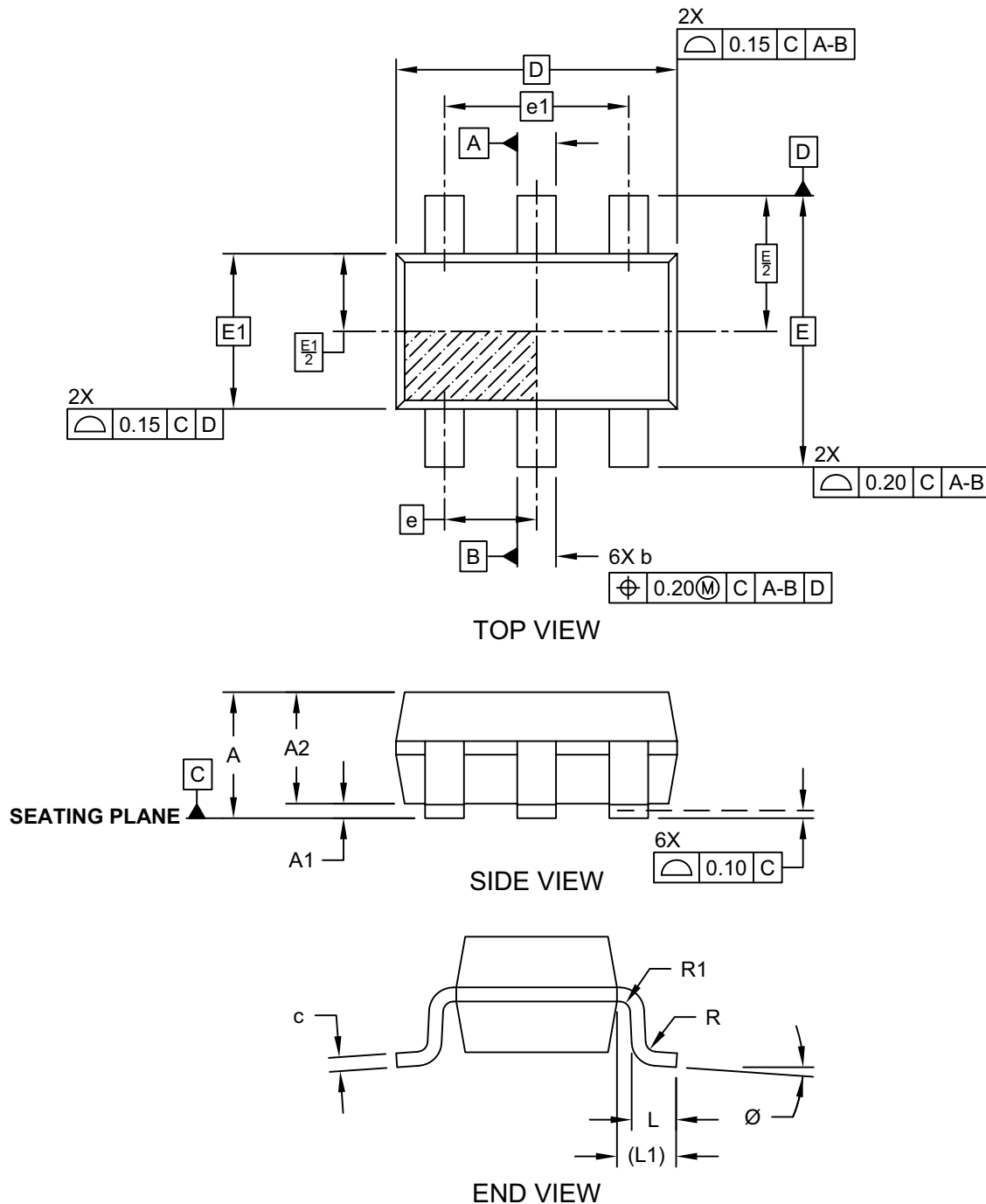
Legend: XX...X Customer-specific information
Y Year code (last digit of calendar year)
YY Year code (last 2 digits of calendar year)
WW Week code (week of January 1 is week '01')
NNN Alphanumeric traceability code
Ⓔ3 Pb-free JEDEC designator for Matte Tin (Sn)
* This package is Pb-free. The Pb-free JEDEC designator (Ⓔ3) can be found on the outer packaging for this package.

Note: 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.

MCP14T0517

6-Lead Plastic Small Outline Transistor (6AX) [SOT-23]

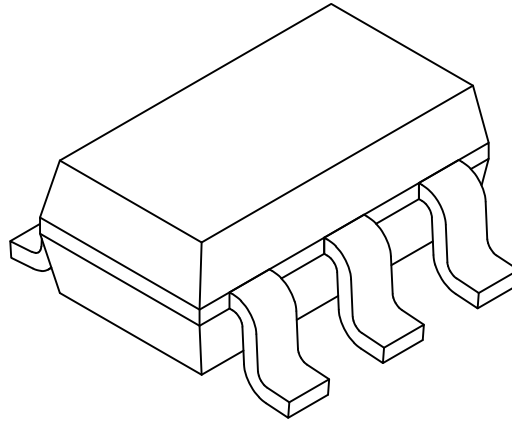
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Microchip Technology Drawing C04-028-6AX Rev. F Sheet 1 of 2

6-Lead Plastic Small Outline Transistor (6AX) [SOT-23]

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



		Units	MILLIMETERS		
Dimension Limits			MIN	NOM	MAX
Number of Leads	N		6		
Pitch	e		0.95 BSC		
Outside lead pitch	e1		1.90 BSC		
Overall Height	A		0.90	-	1.45
Molded Package Thickness	A2		0.89	1.15	1.30
Standoff	A1		0.00	-	0.15
Overall Width	E		2.80 BSC		
Molded Package Width	E1		1.60 BSC		
Overall Length	D		2.90 BSC		
Foot Length	L		0.30	0.45	0.60
Footprint	L1		0.60 REF		
Foot Angle	Ø		0°	-	10°
Lead Thickness	c		0.08	-	0.26
Lead Width	b		0.20	-	0.51

Notes:

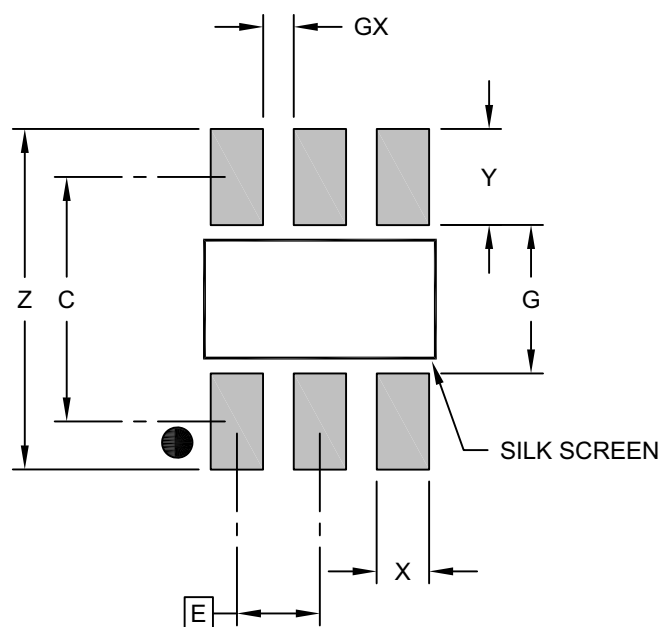
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
- Dimensioning and tolerancing per ASME Y14.5M
 - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
 - REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-028-6AX Rev. F Sheet 2 of 2

MCP14T0517

6-Lead Plastic Small Outline Transistor (6AX) [SOT-23]

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.95 BSC		
Contact Pad Spacing	C		2.80	
Contact Pad Width (X6)	X			0.60
Contact Pad Length (X6)	Y			1.10
Distance Between Pads	G	1.70		
Distance Between Pads	GX	0.35		
Overall Width	Z			3.90

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2028-6AX Rev.F

APPENDIX A: REVISION HISTORY

Revision A (December 2025)

- Original release of this document.

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>PART NO.</u>	<u>X</u>	<u>I</u>	<u>-X</u>	<u>/XX</u>	<u>XXX</u>
Device	Switching Frequency	Shipping Media Option	Temperature Range	Package	Qualification
Device: MCP14T0517A: Push-pull Transformer Driver					
Switching Frequency:	A	=	150 kHz		
	B	=	450 kHz		
Shipping Media Option:	T	=	Tape and Reel		
Temperature Range:	E	=	-40°C to +125°C		
Package:	CH	=	6-Lead SOT-23		
Qualification:	Blank	=	Industrial		
	VAO	=	AEC-Q100		

Examples:
 a) MCP14T0517AT-E/CH: Switching frequency: 150 kHz
 Tape and Reel,
 Temperature Range:
 -40°C to +125°C
 Package: 6-Lead SOT-23
 Qualification: Industrial
 b) MCP14T0517BT-E/CH: Switching frequency: 450 kHz,
 Tape and Reel,
 Temperature range:
 -40°C to +125°C
 Package: 6-Lead SOT-23
 Qualification: Industrial
 c) MCP14T0517AT-E/CHVAO: Switching frequency: 150 kHz,
 Tape and Reel,
 Temperature range:
 -40°C to +125°C
 Package: 6-Lead SOT-23
 Qualification: AEC-Q100
 Automotive Qualified
 d) MCP14T0517BT-E/CHVAO: Switching frequency: 450 kHz,
 Tape and Reel,
 Temperature range:
 -40°C to +125°C
 Package: 6-Lead SOT-23
 Qualification: AEC-Q100
 Automotive Qualified

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