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# MAX32625PICO Application Platform

## General Description

The MAX32625PICO board is a rapid development platform designed to help engineers quickly implement designs with the MAX32625 ARM® Cortex®-M4 microcontroller with FPU. The board also includes the MAX14750 PMIC to provide all the needed voltages. The form factor is a small: 0.6in x 1.0in dual-row header footprint that is compatible with breadboards and can also be soldered down SMT to another board. The board includes a 10-pin ARM Cortex debug connector so that it can be used as a DAPLink adapter. Additionally, on board are an RGB indicator LED and pushbutton. This provides a power-optimized flexible platform for quick proofs-of-concept and early software development to enhance time to market.

The MAX32625PICO board ships with a DAPLink image loaded that provides the USB Mass Storage Device (MSD) drag-and-drop programming, USB Communications Device Class (CDC) virtual serial port, and Human Interface Device (HID) CMSIS-DAP interface used by the mbed site. This allows the board to be connected to another target platform to enable the full mbed experience. The microcontroller is also programmed with a bootloader allowing the DAPLink image to be updated or replaced with your own application code.

Get started developing on this board by going to this link: **http://developer.mbed.org/platforms/MAX32625PICO**.

*Ordering Information appears at end of data sheet.*

## Benefits and Features

- Ultra-Compact Development Platform
    - 0.6in x 1.0in, 20-Pin DIP Footprint
    - Cortex Debug Connector (Host)
    - 20 Digital I/O, 4 Analog Inputs
    - 3.3V and 1.8V Supplies
- MAX326325 Microcontroller Features
    - ARM Cortex-M4 Microcontroller with FPU, 96MHz
    - 512KB Flash Memory
    - 160KB SRAM
    - 8KB Instruction Cache
    - Full-Speed USB 2.0
    - Three SPI Masters, One Slave
    - Two $I^2C$ Masters, One Slave
    - Three UARTs
    - 1-Wire Master
    - 40 GPIOs
    - Four Input 10-Bit ADC
- MAX14750 PMIC
    - Micro $I_Q$ 3.3V Buck-Boost Regulator
    - Micro $I_Q$ 1.8V Buck Regulators
    - Micro $I_Q$ 1.2V Linear Regulators
    - High-Side Load Switch
- Expansion Connections
    - Breadboard-Compatible Headers
    - SMT-Compatible Footprint
    - 10-Pin Cortex Debug Header
    - Micro USB Connector
- Integrated Peripherals
    - RGB Indicator LED
    - User Pushbutton
- MAXDAP Programming Adapter
    - DAPLink Over Cortex Debug Cable
    - Drag-and-Drop Programming
    - CMSIS-DAP SWD Debugger
    - USB Virtual UART

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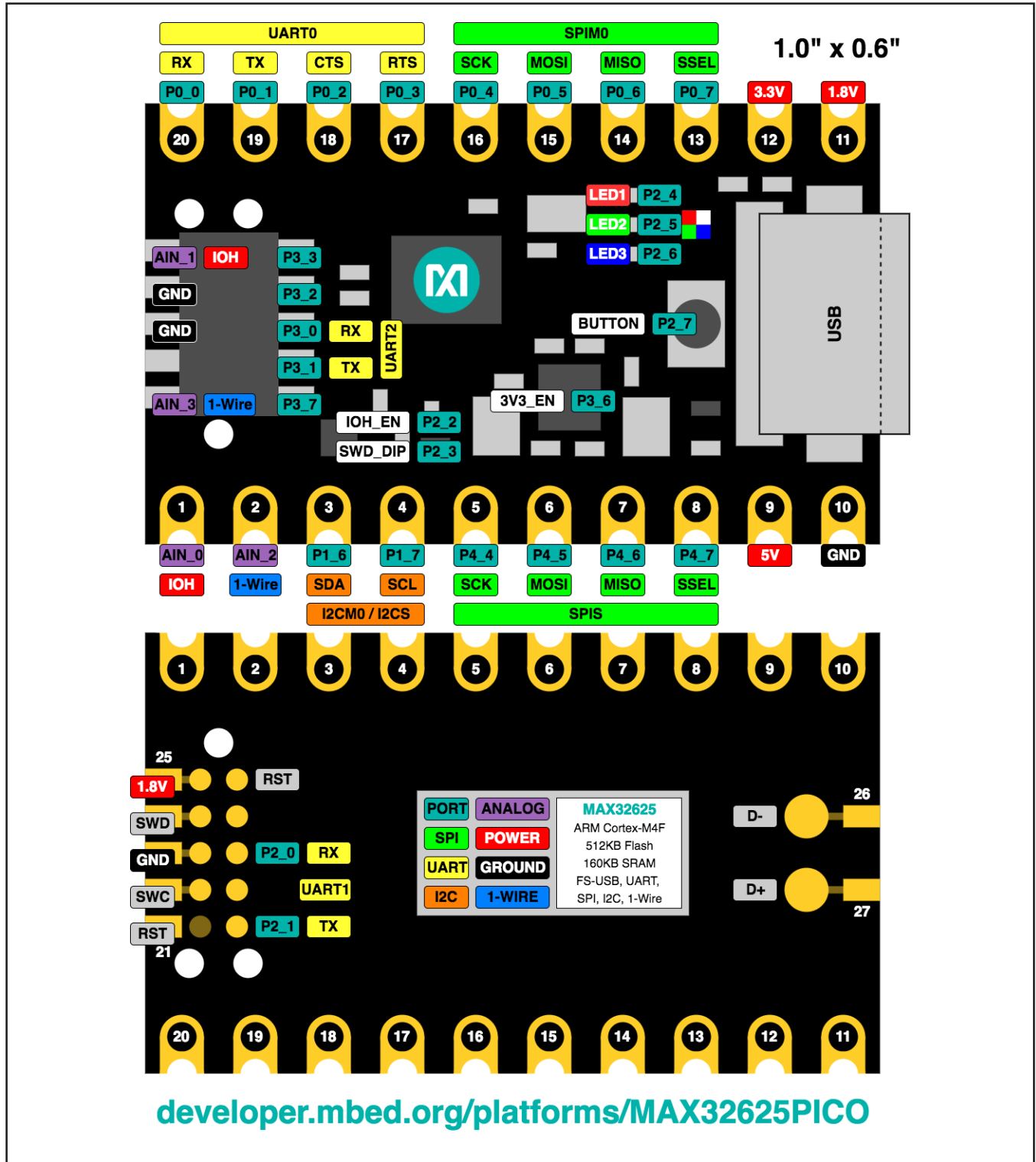
Figure 1. MAX32625 Pinout

## Detailed Description

The MAX32625PICO board is a compact rapid development platform. It is a dense design that packs many features into a tight, but accessible package. It includes everything needed to run the MAX32625 from a single USB cable and provides easy access to many of the peripherals on board. In addition to a breadboard-friendly DIP expansion headers, it also includes a fine pitch 10-pin, dual-row header so that it can be cabled directly to another target with the standard 10-pin SWD header to act as a programming/debug adapter. The backside of the board has no components. The pads for the DIP pins extend to the edge of the board so that the MAX32625PICO can be soldered as a surface mount module on another board. The resources available on the MAX32625PICO board allow for the addition of a USB interface to even the most space-constrained projects.

### Power Architecture

The power architecture of the MAX32625PICO board is designed to be simple and flexible. The on-board MAX14750 PMIC provides all the rails needed from a single +5V supply, which can be provided from the USB connector or the +5V pin in the DIP header. The +5V pin on the DIP header can be used as an input to power the board, or as an output from the USB VBUS supply. A diode is placed in line with the supply from USB VBUS so that the +5V pin cannot back feed the USB cable, and a resettable polyswitch fuse is placed in line with the +5V pin to limit the power into or out of the board.

The MAX14750 provides 3.3V, 1.8V, and 1.2V for the MAX32625. 3.3V and 1.8V are available at DIP header pins for powering external devices. The 3.3V supply is provided by a buck-boost regulator so the MAX32625 PICO board can operate with as little as 2.0V at the input of the PMIC.

The MAX32625 has dual I/O supply rails and all the general-purpose digital I/O ports can be set individually to use either rail. The primary VDDIO rail is supplied from the 1.8V supply, and the VDDIOH rail is connected to several analog switches so that the application can configure it to use the 3.3V supply, or DIP pin 1, or from the SWD header pin 1. This allows the board to adapt its I/O voltage to a supply provided externally.

## Loading and Debugging Applications

The MAX32625 is programmed at the factory with a bootloader and DAPLink application firmware loaded so that it can be used out of the box as programming/debug adapter for other boards. The included bootloader can be enabled by holding the lone button while powering on the board.

In addition to the preinstalled bootloader, the SWD signals are available at surface pads on the back side of the board, allowing the board to be programmed or debugged with the TC2050 series of cable adapters from Tag-Connect (such as the TC2050-IDC-NL-050-ALL). The surface pads are hidden if the board is permanently mounted to another board. The suggested footprints provided for using the MAX3265PICO as a module include two options for exposing the SWD signals when mounted:

- Connect to the SWD signals with the edge pads provided.
- Add the specified cutout to the board to expose the tag-connect TC2050 footprint.

### Implementing DAPLink

The MAX32625 contains all the resources needed to implement the DAPLink interface. All the signals needed are available at both the SWD header and the DIP pins. A dedicated port is provided for the SWD, UART, and reset signals at each connector. The board provides the ability to feed the target I/O supply to the VDDIOH supply input that enables support for any I/O voltage from 1.8V up to 3.6V. The VDDIOH connection is enabled and multiplexed through a MAX14689 DPDT analog switch so that the firmware can control when it is connected and which connector is selected. Additionally, the 1-Wire master is also multiplexed through the MAX14689 so that a 1-wire serial EPROM can be used to identify the target through either connector. The connectivity allows implementing the standard Cortex Debug Connector defined by ARM, as well as the additional features of the MAXDAP interface. The MAXDAP interface adds a UART and board identification capabilities to the same 10-pin Cortex SWD header while maintaining backward compatibility. The UART signals are located in place of the TDI/TDO signals and the board ID is done through the GNDDetect pin. A list of the SWD connections is provided in Table 1.

## Table 1. DAPLink Signals

| SWD HEADER | | DIP PINS | | DESCRIPTION |
| --- | --- | --- | --- | --- |
| NO. | PORT | NO. | PORT | |
| 1 | VDDIOH | 1 | VDDIOH | Target VCC |
| 2 | P3_3 | 17 | P0_3 | Target SWDIO |
| 3 | GND | 10 | GND | Ground |
| 4 | P3_2 | 18 | P0_2 | Target SWDCLK |
| 5 | GND | 10 | GND | Ground |
| 6 | P3_0 | 20 | P0_0 | Target Tx |
| 7 | NC | NA | | Key |
| 8 | P3_1 | 19 | P0_1 | Target Rx |
| 9 | P4_0 | 2 | P4_0 | Board ID/Ground Detect |
| 10 | P3_7 | 16 | P0_4 | Target RESET |

## Table 2. VDDIOH/1-Wire Configuration

| P3_6 | P2_2 | P2_3 | DIP(1,2) | SWD(1,9) | VDDIOH | DESCRIPTION |
| --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | X | AIN(0,2) | AIN(1,3) | Off | No VDDIOH |
| 0 | 1 | 0 | IOH,1W | AIN(1,3) | External | VDDIOH from DIP pin 1 |
| 0 | 1 | 1 | AIN(0,2) | IOH,1W | External | VDDIOH from SWD pin 1 |
| 1 | 0 | X | AIN(0,2) | AIN(1,3) | +3.3V | Onboard +3.3V |
| 1 | 1 | 0 | +3.3V,1W | AIN(1,3) | +3.3V | +3.3V out DIP pin 1 |
| 1 | 1 | 1 | AIN(0,2) | +3.3V,1W | +3.3V | +3.3V out SWD pin 1 |

## Table 3. DIP Header Pinout

| PIN | NAME | DESCRIPTION |
| --- | --- | --- |
| 1 | AIN_0 | Analog Input 0. Can also be enabled as VDDIOH input/output. |
| 2 | AIN_2 | Analog Input 2. Can also be enabled as 1-Wire master (P4_0). |
| 3 | P1_6 | Port 1 Bit 6, I2C Master 0 SDA |
| 4 | P1_7 | Port 1 Bit 7, I2C Master 0 SCL |
| 5 | P4_4 | Port 4 Bit 4, SPI Slave SCK |
| 6 | P4_5 | Port 4 Bit 5, SPI Slave MOSI |
| 7 | P4_6 | Port 4 Bit 6, SPI Slave MISO |
| 8 | P4_7 | Port 4 Bit 7, SPI Slave SSEL |
| 9 | 5V | +5V Input/Output (up to 350mA) |
| 10 | GND | Ground |
| 11 | 1.8V | +1.8V Output (up to 150mA) |
| 12 | 3.3V | +3.3V Output (up to 75mA) |
| 13 | P0_7 | Port 0 Bit 7, SPI Master 0 SCK |

## Table 3. DIP Header Pinout (continued)

| PIN | NAME | DESCRIPTION |
|---|---|---|
| 14 | P0_6 | Port 0 Bit 6, SPI Master 0 SSEL |
| 15 | P0_5 | Port 0 Bit 5, SPI Master 0 MISO |
| 16 | P0_4 | Port 0 Bit 4, SPI Master 0 MOSI |
| 17 | P0_3 | Port 0 Bit 3, UART 0 RTS |
| 18 | P0_2 | Port 0 Bit 2, UART 0 CTS |
| 19 | P0_1 | Port 0 Bit 1, UART 0 Tx |
| 20 | P0_0 | Port 0 Bit 0, UART 0 Rx |

## Table 4. Edge Surface Mount Contacts

| PIN | NAME | DESCRIPTION |
|---|---|---|
| 21 | RST | System Reset (This pad is grounded on early units.) |
| 22 | SWC | SWD Clock |
| 23 | GND | Ground |
| 24 | SWD | SWD Data I/O |
| 25 | 1.8V | +1.8V Output |
| 26 | DM | USB D- (This pad is not present on early units.) |
| 27 | DP | USB D+ (This pad is not present on early units.) |

## Table 5. SWD Header Pinout

| PIN | NAME | DESCRIPTION |
|---|---|---|
| 1 | VIO | Analog Input 1. Can also be enabled as VDDIOH input/output. |
| 2 | DIO | Port 3 Bit 3. For SWDIO. |
| 3 | GND | Ground |
| 4 | CLK | Port 3 Bit 2. For SWDCLK. |
| 5 | GND | Ground |
| 6 | TGT_TX | Port 3 Bit 0, UART 2 Rx for Debug Console |
| 7 | N.C. | Key |
| 8 | TGT_RX | Port 3 Bit 1, UART 2 Tx for Debug Console T |
| 9 | DETECT | Analog Input 3. Can also be enabled as 1-Wire master (P4_0). |
| 10 | RST | Port 3 Bit 7. For SRST#. |

## Table 6. On-Board Resources

| PORT | NAME | DESCRIPTION |
|---|---|---|
| P2_0 | DBG_RX | Debug Console Rx |
| P2_1 | DBG_TX | Debug Console Tx |
| P2_2 | IOH_1W_EN | Enables IOH/1-Wire Mux |
| P2_3 | SWD_DIP_SEL | Selects IOH/1-Wire between the SWD header (0) or DIP header (1) |
| P2_4 | LED1 | Red LED |
| P2_5 | LED2 | Green LED |
| P2_6 | LED3 | Blue LED |
| P2_7 | BUTTON | Button Input. Requires internal pullup to be enabled. |
| P3_6 | 3V3_IOH_EN | Enables Power Switch Connecting +3.3V Supply to VDDIOH. Enables +3.3V I/O option and turns IOH into a +3.3V output if mux is enabled (IOH_1W_EN = 1). |
| P4_0 | OWM_IO | 1-Wire Master I/O |
| P4_1 | OWM_PUPEN | 1-Wire Master Pullup Enable |

## Surface Mount Footprints

The following footprints are suggestions for surface mounting the board as a module onto another board. These footprints offer two ways to provide access to debug/test signals on the MAX32625 if access is desired. Without access to the SWD signals, it might not be possible to recover a corrupted bootloader. The first footprint includes edge pads for soldering to the debug/test signals and the second footprint shows where to put cutouts for access.
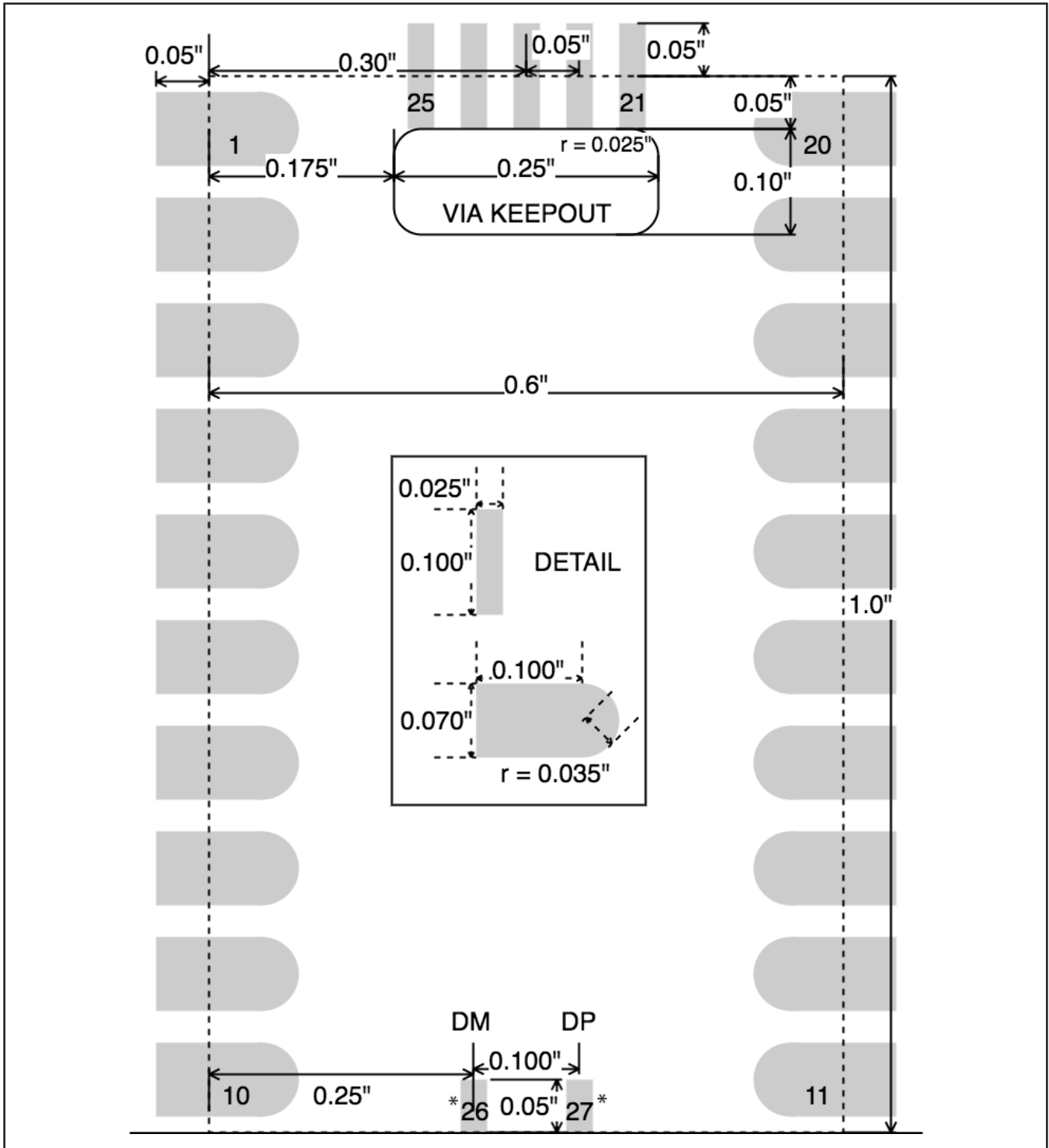
Figure 2. MAX32625PICO Surface Mount Footprint, Edge Pads

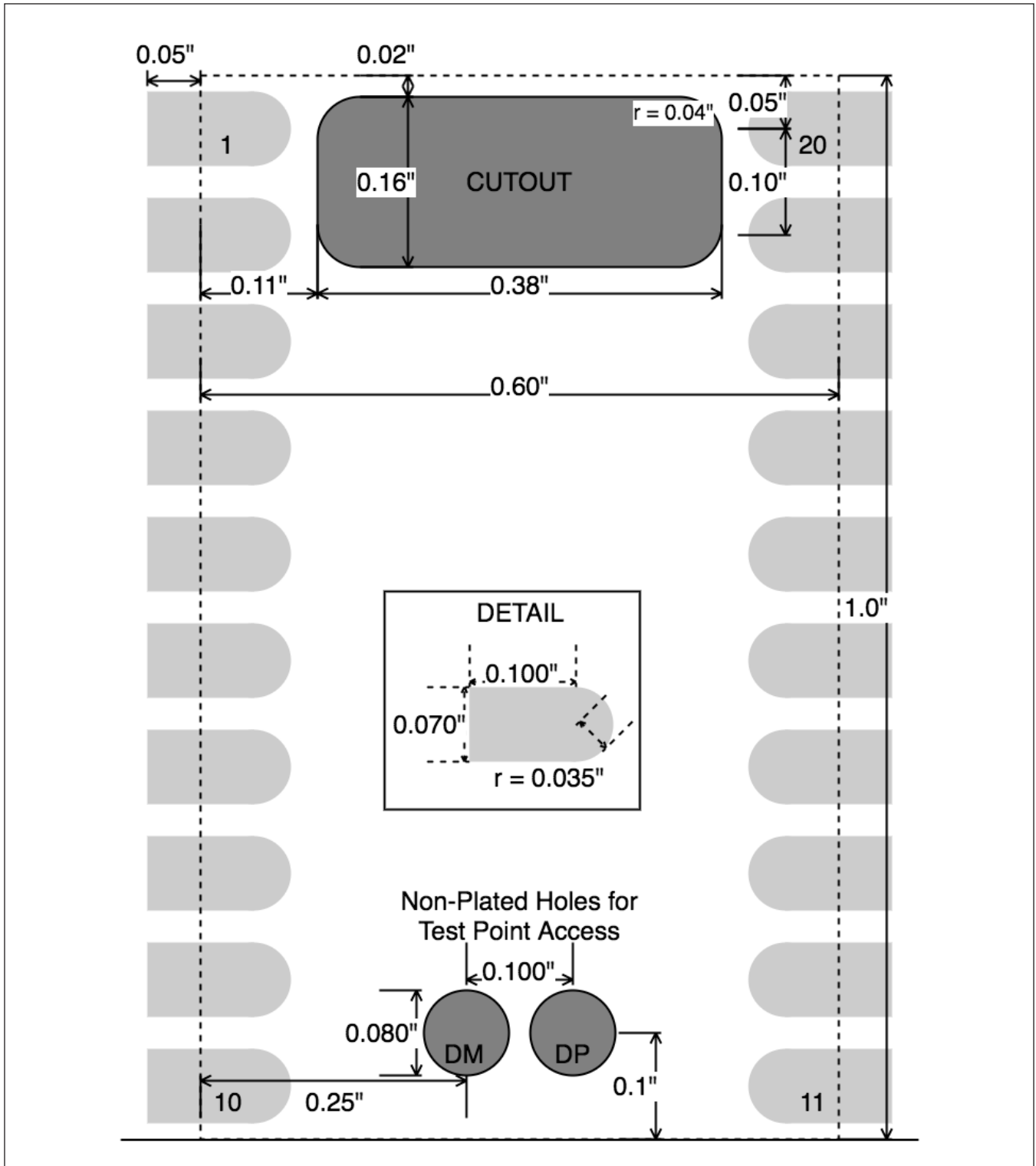*These pads are not present on early units.

Figure 3. MAX32625PICO Surface Mount Footprint, Cutouts

Figure 4. MAX32625PICO Schematic

**MAX32625PICO EV Schematic**



MAXIM INTEGRATED

TITLE: max32625pico_A

Document Number: | REV:

Date: 3/21/17 4:28 PM | Sheet: 1/1

## MAX32625PICO EV Bill of Materials

| QTY | SCHEMATIC REFERENCE | DESCRIPTION | MANUFACTURER | MPN |
|---|---|---|---|---|
| 2 | C1, C9 | Capacitors, 0402, X5R, 10V, 10µF | Samsung | CL05A106MP5NUNC |
| 2 | C2, C6 | Capacitors, 0402, X5R, 6.3V, 22µF | Samsung | CL05A226MQ5QUNC |
| 7 | C3, C4, C5, C7, C10, C11, C12 | Capacitors, 0402, X5R, 6.3V, 1µF | TDK | C1005X5R0J105K050BB |
| 1 | C8 | Capacitor, 0402, X5R, 10V, 0.1µF | TDK | C1005X5R1A104K050BA |
| 1 | D2 | RGB LED, common anode | Lumex | SML-LX0404SIUPGUSB |
| 1 | D3 | Schottky diode | Panasonic | DB2G32600L1 |
| 1 | F1 | Resettable fuse PTC | Bourns | MF-FSMF035X-2 |
| 1 | J1 | CONN USB MICRO B RECPT SMT R/A | FCI | 10118193-0001LF |
| 1 | J3 | Cortex debug connector | Samtec | FTSH-105-01-F-DV-K-P-TR |
| 1 | L1 | Inductor, 2016, 4.7µH | TDK | VLS201612CX-4R7M |
| 1 | L2 | Inductor, 2016, 2.2µH | TDK | VLS201612CX-2R2M |
| 1 | Q1 | 32.768kHz crystal | ECS International | ECS-.327-6-12-TR |
| 1 | Q2 | MOSFET, P-CH, DFN1006, $0.5\Omega$ | Diodes Inc. | DMP21D0UFB4-7B |
| 2 | R2, R3 | Resistors, thick film, 0402, 0.1W, 1%, 3.09kΩ | Panasonic | ERJ-2RKF3091X |
| 1 | R4 | Resistor, thick film, 0402, 0.1W, 1%, 1.1kΩ | Panasonic | ERJ-2RKF1101X |
| 1 | R5 | Resistor, thick film, 0402, 0.1W, 1%, 1.4kΩ | Panasonic | ERJ-2RKF1401X |
| 1 | R6 | Resistor, thick film, 0402, 0.1W, 1%, 10Ω | Panasonic | ERJ-2RKF10R0X |
| 1 | R7 | Resistor, thick film, 0402, 0.1W, 1%, 100kΩ | Panasonic | ERJ-2RKF1003X |
| 1 | SW1 | SWITCH TACTILE SPST-NO 0.05A 12V | OMRON | B3U-1000P |
| 1 | U1 | PMIC, MAX14750B | | |
| 1 | U4 | Analog switch, DPDT, MAX14689 | Maxim Integrated | MAX14689EWL+T |
| 1 | U5 | ARM Cortex-M4 microcontroller with FPU, MAX32625 | Maxim Integrated | MAX32625IWY+ |

## Ordering Information

| PART | TYPE |
|---|---|
| MAX32625PICO# | Adapter Platform |

*#Denotes RoHS compliant.*

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 4/17 | Initial release | — |