

## DESCRIPTION

The MP62040-1/MP62041-1 Power Distribution Switch is designed for high-side load switch applications. The switch operates from 1.7V to 5.5V nominal input voltage and includes an 85mΩ Power MOSFET to handle up to 2A continuous load.

The MP62040-1/MP62041-1 has slew rate control with 115μs rise time to limit inrush current when enabling the switch. In addition, the part features a discharge function that provides a resistive discharge path for the external output capacitor when the part is disabled.

The built-in level shift function allows a logic signal on enable input that may be different from the supply voltage to switch the high side P-channel MOSFET ON or OFF.

The MP62040-1/MP62041-1 is available in an ultra-small UTQFN4 package, with ultra-low height (0.55mm typ.).

## FEATURES

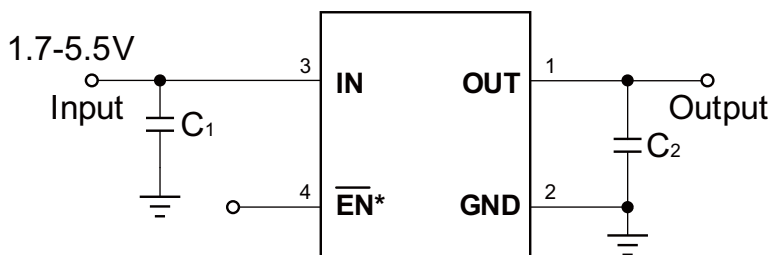
- 2A Continuous Current
- 1.7V to 5.5V Supply Range
- Output Discharge Function
- Soft Start: 115μs
- 1μA Shutdown Current
- 85mΩ MOSFET
- Active High & Active Low Options
- Space Saving 1.6x1.2mm UTQFN4 Package (0.55mm Height)

## APPLICATIONS

- Load Switch in Portable Applications
- Battery Switch-over Circuits

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## TYPICAL APPLICATION



MP62040-1/MP62041-1

(\*: EN is active high for MP62041-1)  
Single Channel

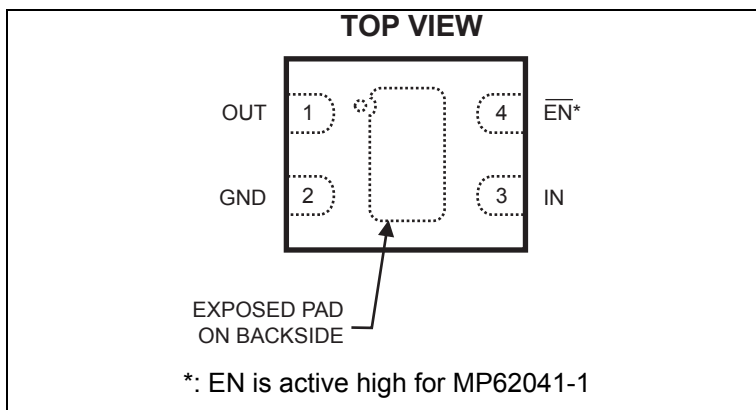
## ORDERING INFORMATION

| Part Number    | Enable      | Switch | Maximum Continuous Load Current | Package | Top Marking | Free Air Temperature (T <sub>A</sub> ) |
|----------------|-------------|--------|---------------------------------|---------|-------------|----------------------------------------|
| MP62040DQFU-1* | Active Low  | Single | 2A                              | UTQFN4  | AFY         | -40°C to +85°C                         |
| MP62041DQFU-1  | Active High |        |                                 | UTQFN4  | 5UY         |                                        |

\* For Tape & Reel, add suffix -Z (e.g. MP62040DQFU-1-Z).

For RoHS compliant packaging, add suffix -LF (e.g. MP62040DQFU-1-LF-Z)

## PACKAGE REFERENCE

ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

|                                                                      |                 |
|----------------------------------------------------------------------|-----------------|
| IN .....                                                             | -0.3V to +6.0V  |
| EN, OUT to GND .....                                                 | -0.3V to +6.0V  |
| Continuous Power Dissipation (T <sub>A</sub> = +25°C) <sup>(2)</sup> |                 |
| UTQFN4.....                                                          | 0.7W            |
| Junction Temperature .....                                           | 150°C           |
| Lead Temperature .....                                               | 260°C           |
| Storage Temperature.....                                             | -65°C to +150°C |
| Maximum Junction Temp. (T <sub>J</sub> ).....                        | +125°C          |

Thermal Resistance <sup>(3)</sup>

|              |               |               |
|--------------|---------------|---------------|
|              | $\theta_{JA}$ | $\theta_{JC}$ |
| UTQFN4 ..... | 173 ....      | 127.. °C/W    |

## Notes:

- Exceeding these ratings may damage the device.
- The maximum allowable power dissipation is a function of the maximum junction temperature T<sub>J</sub>(MAX), the junction-to-ambient thermal resistance  $\theta_{JA}$ , and the ambient temperature T<sub>A</sub>. The maximum allowable continuous power dissipation at any ambient temperature is calculated by P<sub>D</sub>(MAX)=(T<sub>J</sub>(MAX)-T<sub>A</sub>)/ $\theta_{JA}$ . Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.
- Measured on JESD51-7, 4-layer PCB.

## ELECTRICAL CHARACTERISTICS

$V_{IN}=3.6V$ ,  $T_A=+25^{\circ}C$ , unless otherwise noted.

| Parameter                             | Symbol    | Condition                                          | Min | Typ | Max | Units     |
|---------------------------------------|-----------|----------------------------------------------------|-----|-----|-----|-----------|
| IN Voltage Range                      | $V_{IN}$  |                                                    | 1.7 |     | 5.5 | V         |
| Supply Current                        |           | Device active, $V_{IN}=3.6V$ , $I_{OUT}=0$         |     | 2   |     | $\mu A$   |
| Shutdown Current                      |           | Device disable, $V_{IN}=5.5V$ , $V_{OUT}=float$    |     |     | 1   | $\mu A$   |
| FET On_Resistance                     |           | $V_{IN}=1.7V$ , $I_{OUT}=100mA$                    |     | 165 | 225 | $m\Omega$ |
|                                       |           | $V_{IN}=1.8V$ , $I_{OUT}=100mA$                    |     | 155 | 215 | $m\Omega$ |
|                                       |           | $V_{IN}=2.5V$ , $I_{OUT}=100mA$                    |     | 130 | 200 | $m\Omega$ |
|                                       |           | $V_{IN}=3.6V$ , $I_{OUT}=100mA$                    |     | 100 | 140 | $m\Omega$ |
|                                       |           | $V_{IN}=4.5V$ , $I_{OUT}=100mA$                    |     | 85  | 115 | $m\Omega$ |
| EN Input Logic High Voltage           |           | $V_{IN} = 1.7V$ to $4.5V$ , $I_D = -250\mu A$      | 1.2 |     |     | V         |
| EN Input Logic Low Voltage            |           | $V_{IN} = 1.7V$ to $4.5V$ , $I_D = -250\mu A$      |     |     | 0.4 | V         |
| EN Input Current                      |           | Device active, $V_{IN} = 5.5V$                     |     | 2   | 4   | $\mu A$   |
| Discharge Resistance                  |           | Device disable, $V_{IN} = 3.6V$ , $I_{TEST} = 1mA$ |     | 200 | 300 | $\Omega$  |
| $V_{OUT}$ Rising Time <sup>(4)</sup>  | $T_r$     | $V_{IN}=3.6V$ , $I_{OUT}=100mA$ , $C_L=1\mu F$     | 75  | 115 | 200 | $\mu s$   |
| $V_{OUT}$ Falling Time <sup>(5)</sup> | $T_f$     | $V_{IN}=3.6V$ , $I_{OUT}=100mA$ , $C_L=1\mu F$     | 65  | 75  | 100 | $\mu s$   |
| Turn On_Time <sup>(6)</sup>           | $T_{on}$  | $V_{IN}=3.6V$ , $I_{OUT}=100mA$ , $C_L=1\mu F$     |     | 235 | 350 | $\mu s$   |
| Turn Off_Time <sup>(7)</sup>          | $T_{off}$ | $V_{IN}=3.6V$ , $I_{OUT}=100mA$ , $C_L=1\mu F$     |     | 100 | 200 | $\mu s$   |

### Notes:

4) Measured from 10% to 90%.

5) Measured from 90% to 10%.

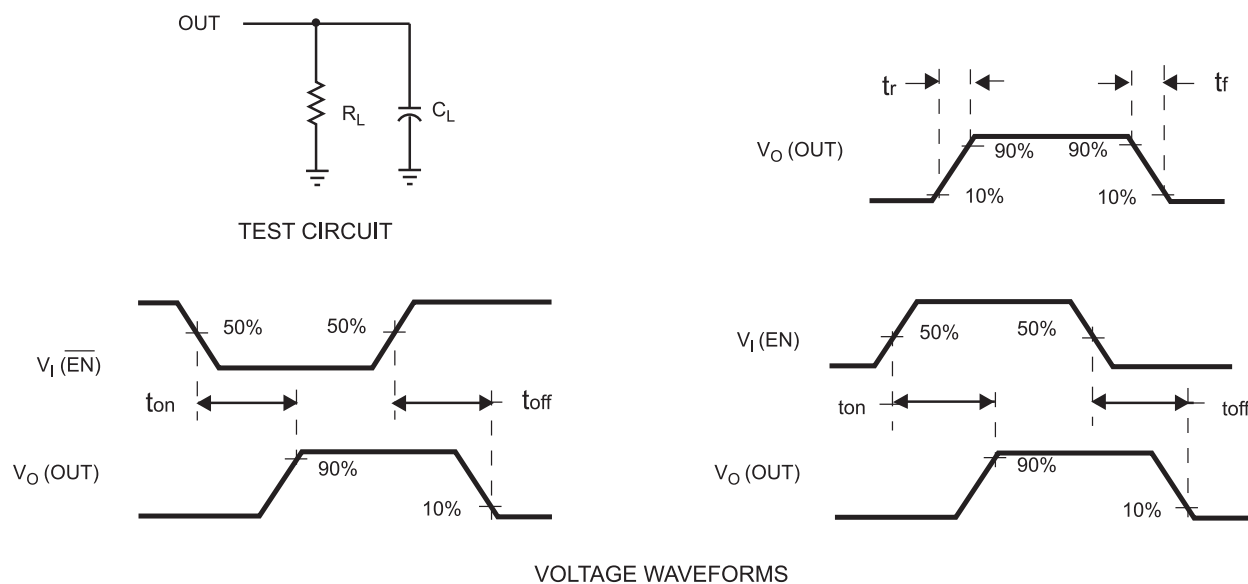
6) Measured from (50%) EN signal to (90%) output signal.

7) Measured from (50%) EN signal to (10%) output signal.

## PIN FUNCTIONS

| UTQFN | Name                   | Description                                                               |
|-------|------------------------|---------------------------------------------------------------------------|
| 1     | OUT                    | IN-to-OUT Power-Distribution Output                                       |
| 2     | GND                    | Ground and the thermal pad should both be connected to electrical ground. |
| 3     | IN                     | Input Voltage. Accepts 1.7V to 5.5V input.                                |
| 4     | $\overline{\text{EN}}$ | Active Low: (MP62040-1), Active High: (MP62041-1)                         |

## PARAMETER MEASUREMENT INFORMATION



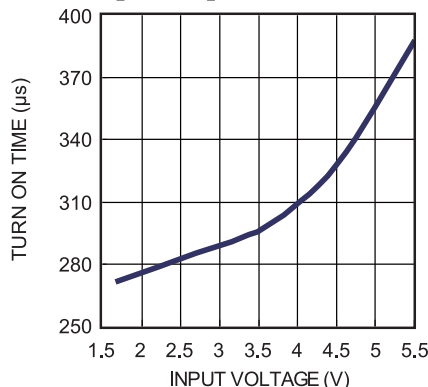
**Figure 1 — Definition of Tr, Tf, Ton and Toff**

# TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{EN} = 3.6V$ ,  $C_L = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

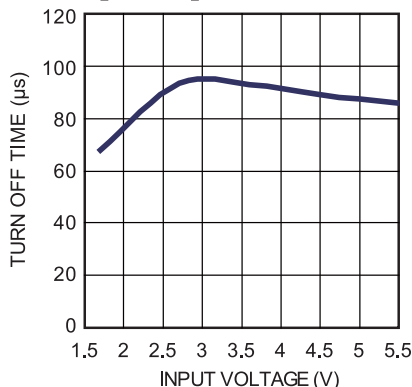
**Turn\_on Time vs. Input Voltage**

$C_L = 10\mu F$ ,  $R_L = 2.75\Omega$



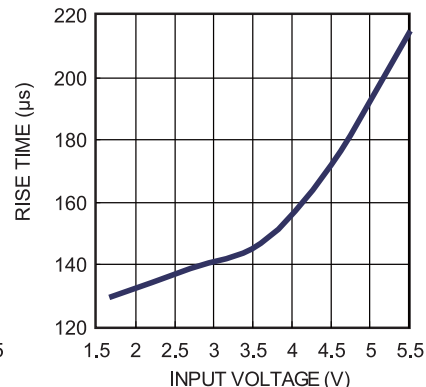
**Turn\_off Time vs. Input Voltage**

$C_L = 10\mu F$ ,  $R_L = 2.75\Omega$



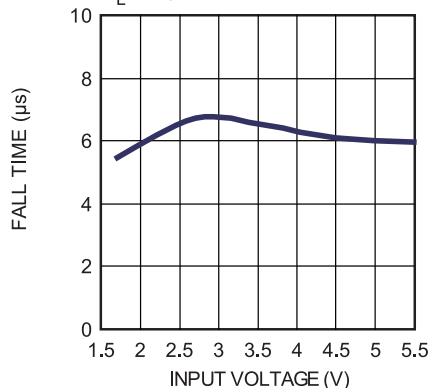
**Rise Time vs. Input Voltage**

$R_L = 2.75\Omega$

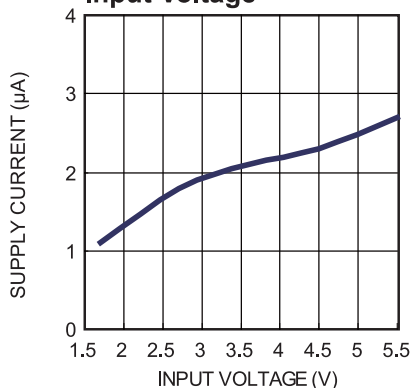


**Fall Time vs. Input Voltage**

$R_L = 2.75\Omega$

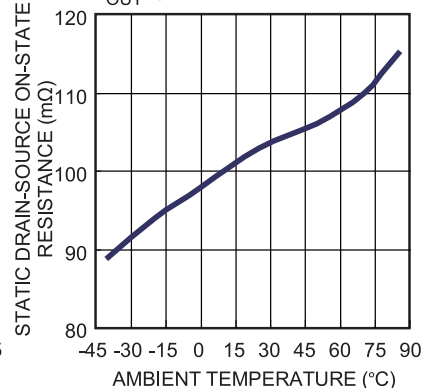


**Supply Current, Output Enabled vs. Input Voltage**

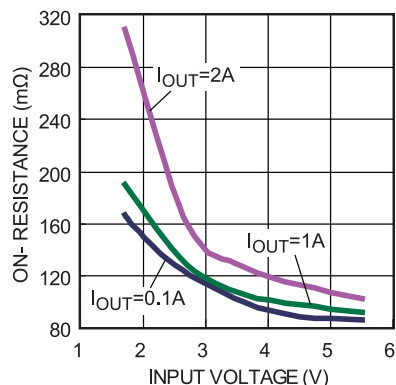


**On- Resistance vs. Ambient Temperature**

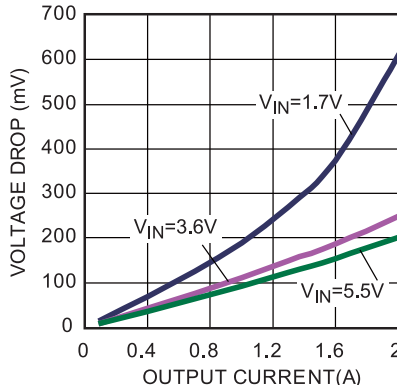
$I_{OUT} = 0.1A$



**On- Resistance vs Input Voltage**



**Input to Output Voltage vs. Load Current**

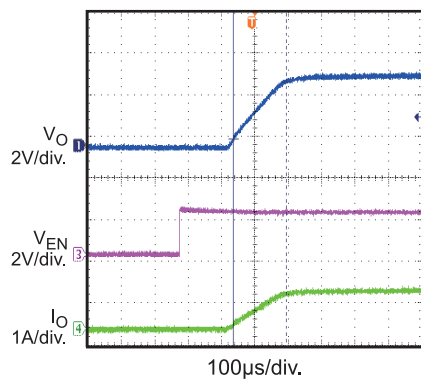


## TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

$V_{IN} = V_{EN} = 3.6V$ ,  $C_L = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

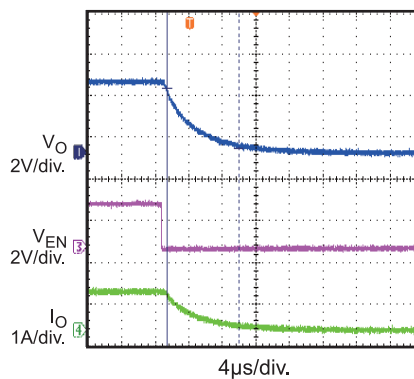
**Turn\_on Delay and Rise Time  
with 1 $\mu F$  Load**

$R_L = 3.6\Omega$



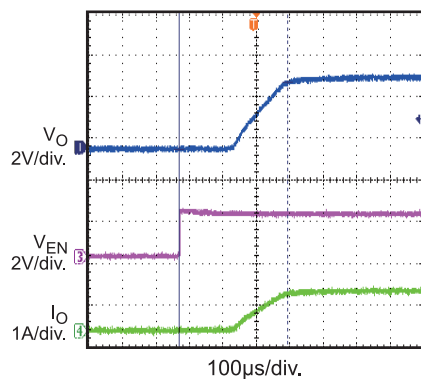
**Turn\_off Delay and Fall Time  
with 1 $\mu F$  Load**

$R_L = 3.6\Omega$



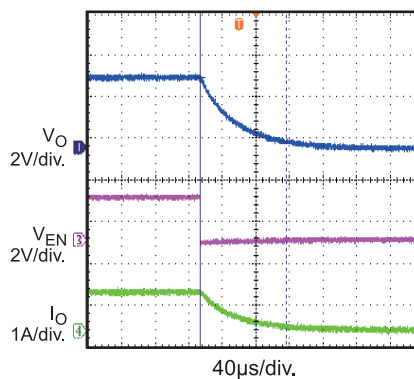
**Turn\_on Delay and Rise Time  
with 10 $\mu F$  Load**

$C_{OUT} = 10\mu F$ ,  $R_L = 3.6\Omega$

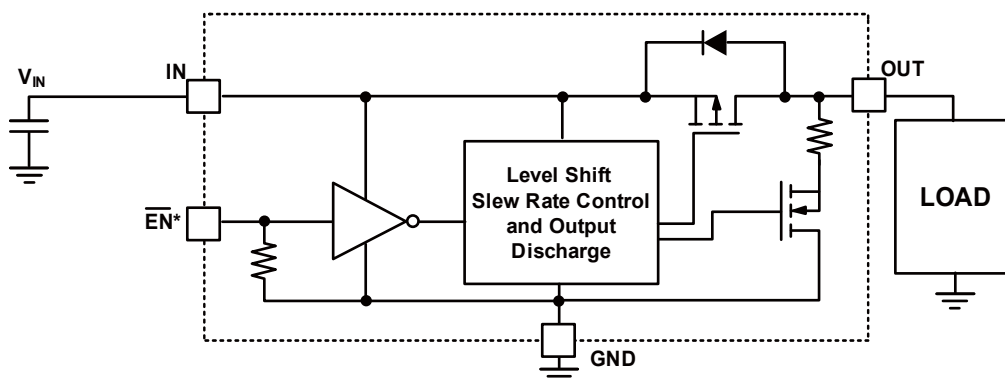


**Turn\_off Delay and Fall Time  
with 10 $\mu F$  Load**

$C_{OUT} = 10\mu F$ ,  $R_L = 3.6\Omega$



## FUNCTION BLOCK DIAGRAM



(\*: EN is active high for MP62041-1)

Figure 2—Function Block Diagram

## DETAILED DESCRIPTION

The MP62040-1/MP62041-1 Power Distribution Switch is designed for high-side load switch. The switch operates from 1.7V to 5.5V nominal input voltage and can handle up to 2A continuous load.

### Enable

The logic pin disables the switch to reduce overall supply current. Once the EN pin reaches logic enable threshold, the MP62040-1/MP62041-1 is enabled and the supply current is very small, only 2μA.

### Output Discharge

The part includes a discharge function that provides a resistive discharge path for the external output capacitor. This function allows the device to quickly discharge the output voltage when it's disabled.

## APPLICATION INFORMATION

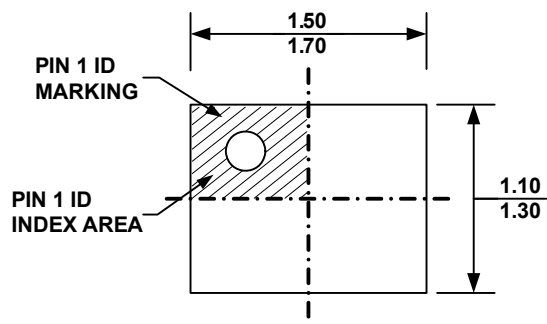
### Power-Supply Considerations

Over 10μF capacitor between IN and GND is recommended. This precaution reduces power-supply transients that may cause ringing on the input.

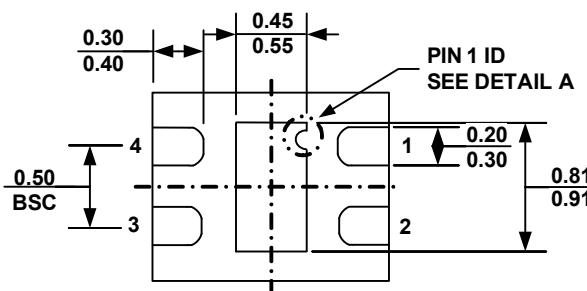
In order to achieve smaller output load transient ripple, placing a high-value electrolytic capacitor on the output pin(s) is recommended when the load is heavy.

# PACKAGE INFORMATION

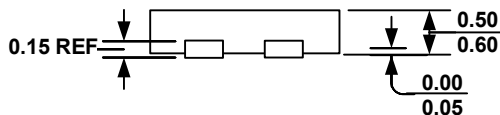
## UTQFN (1.6x1.2mm)



**TOP VIEW**

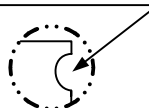


**BOTTOM VIEW**

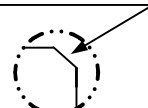


**SIDE VIEW**

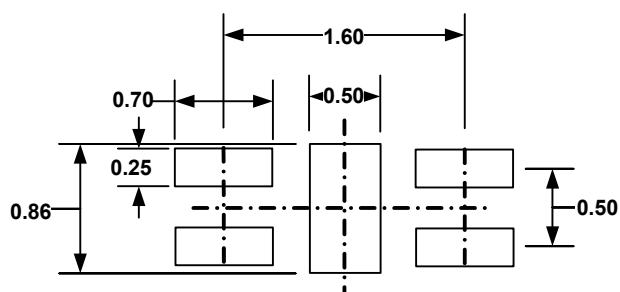
**PIN 1 ID OPTION A**  
R 0.10 TYP.



**PIN 1 ID OPTION B**  
0.20x45° TYP.



**DETAIL A**



**RECOMMENDED LAND PATTERN**

### NOTE:

- 1) ALL DIMENSIONS ARE IN MILLIMETERS
- 2) EXPOSED PADDLE SIZE DOES NOT INCLUDE MOLD FLASH
- 3) LEAD COPLANARITY SHALL BE 0.10 MILLIMETER MAX
- 4) JEDEC REFERENCE IS MO-229.
- 5) DRAWING IS NOT TO SCALE

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