

### 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

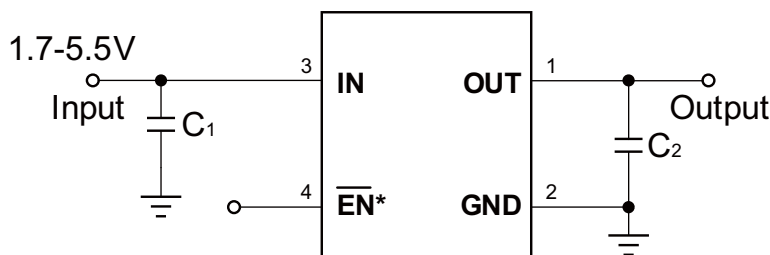
- 2A Continuous Current
- 1.7V to 5.5V Supply Range
- Output Discharge Function
- Soft Start: 115µs
- 1µA Shutdown Current
- 85mΩ MOSFET
- Active High & Active Low Options
- Space Saving 1.6x1.2mm UTQFN4 Package (0.55mm Height)

### APPLICATIONS

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

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### TYPICAL APPLICATION



MP62040-1/MP62041-1

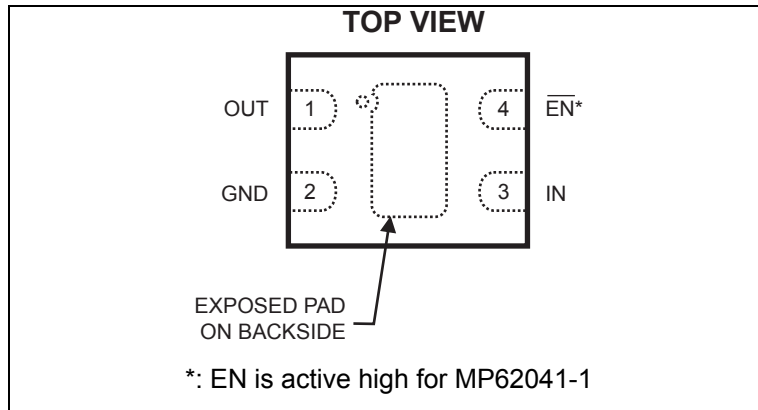
(\*: EN is active high for MP62041-1)  
Single Channel

### 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

<b>Thermal Resistance <sup>(3)</sup></b>	<b>θ<sub>JA</sub></b>	<b>θ<sub>JC</sub></b>
UTQFN4 .....	173 .....	127.. °C/W

**Notes:**

- 1) Exceeding these ratings may damage the device.
- 2) The maximum allowable power dissipation is a function of the maximum junction temperature T<sub>J</sub>(MAX), the junction-to-ambient thermal resistance θ<sub>JA</sub>, 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>)/θ<sub>JA</sub>. 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.
- 3) 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	$\mu s$

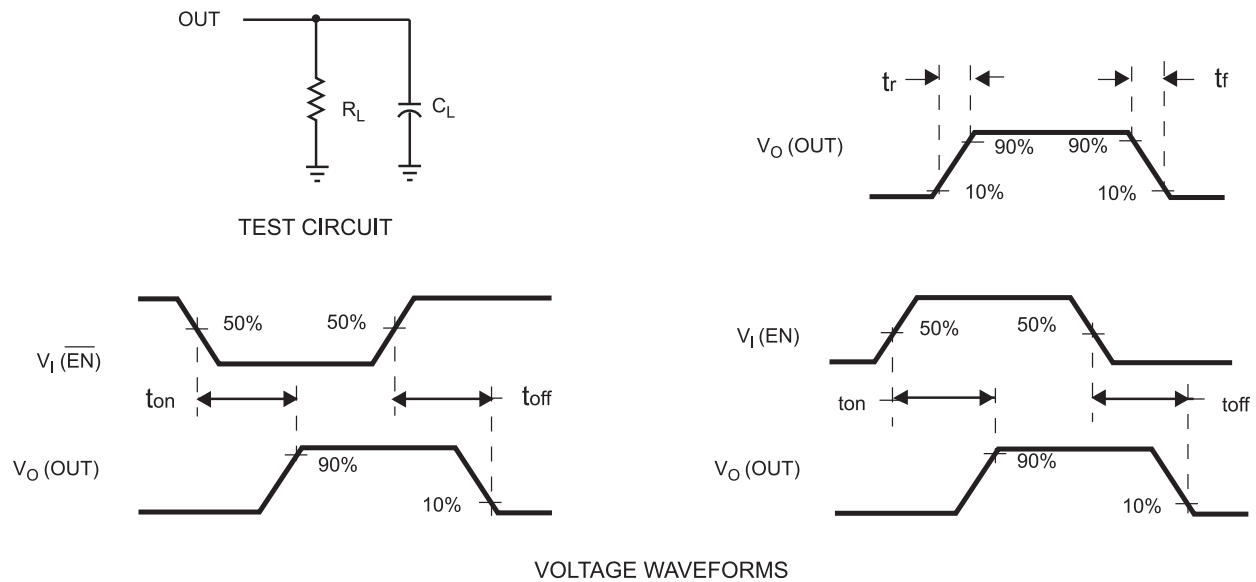
**Notes:**

- 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)

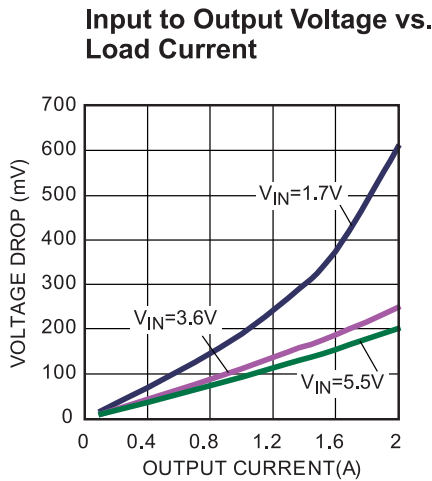
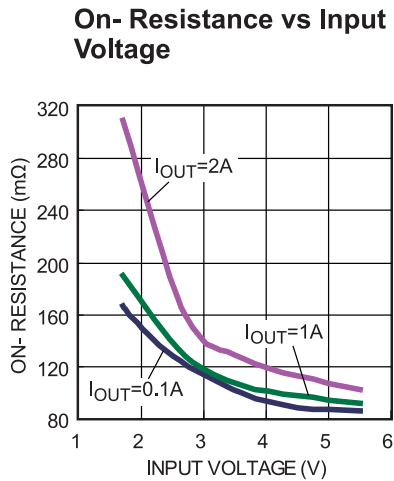
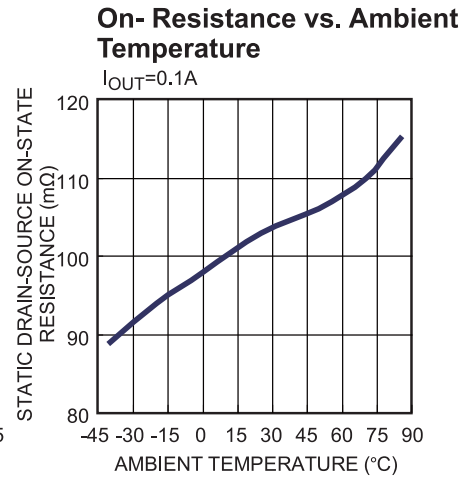
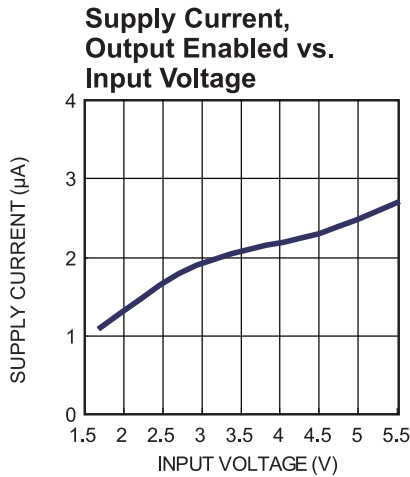
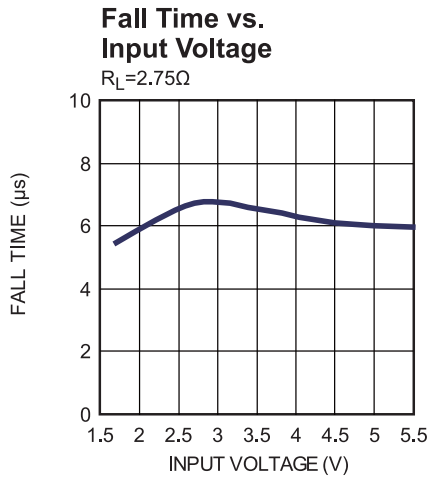
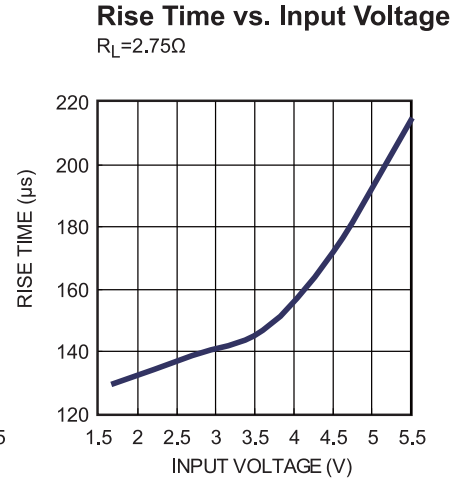
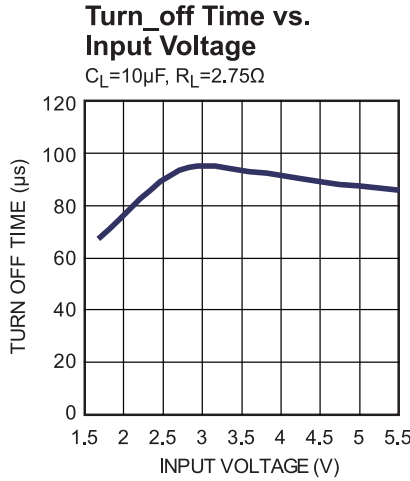
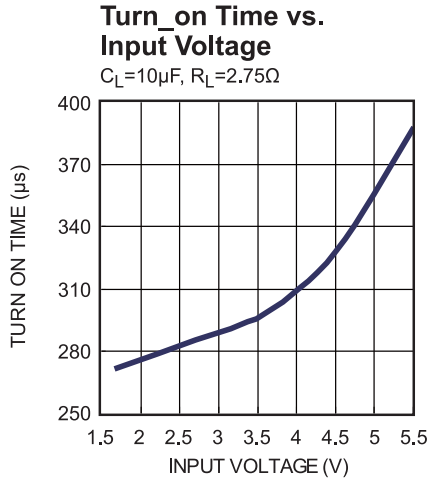
## PARAMETER MEASUREMENT INFORMATION



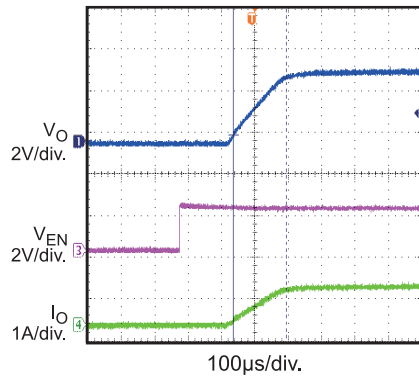
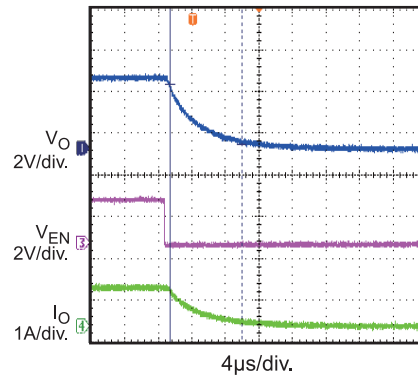
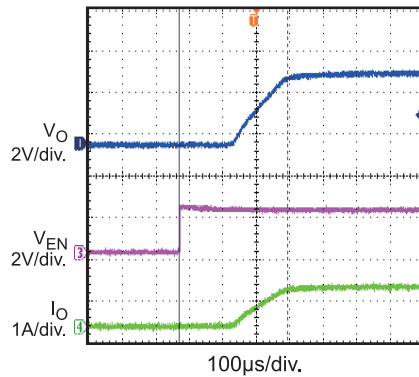
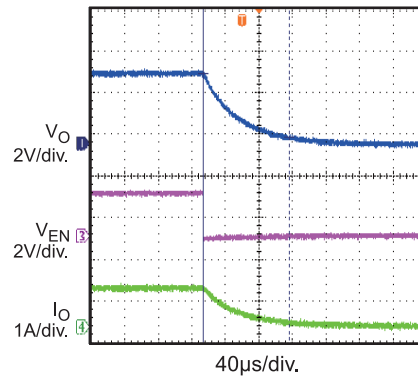
**Figure 1 — Definition of Tr, Tf, Ton and Toff**

## TYPICAL PERFORMANCE CHARACTERISTICS

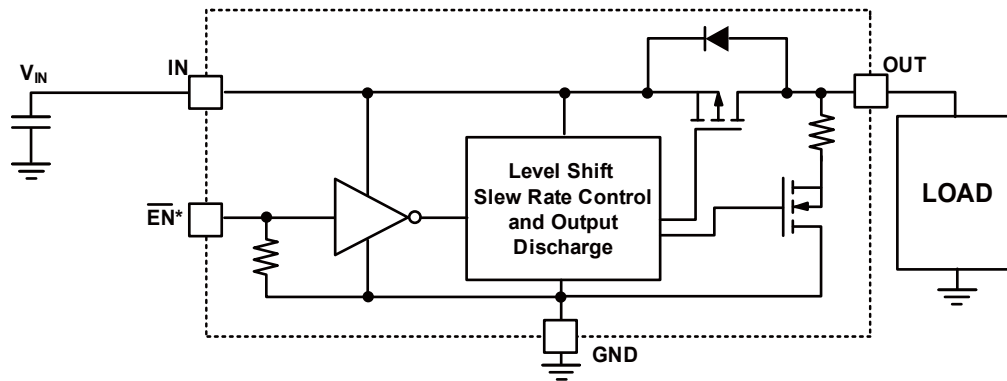
$V_{IN} = V_{EN} = 3.6V$ ,  $C_L = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.



**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 2 $\mu$ A.

### 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

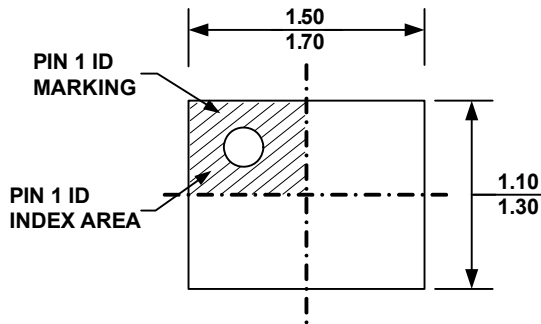
### Power-Supply Considerations

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

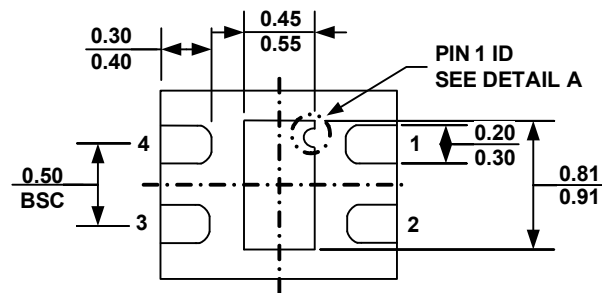
In order to achieve smaller output load transient ripple, placing a high-value electrolytic capacitor on the output pin(s) is recommended when the load is heavy.

## PACKAGE INFORMATION

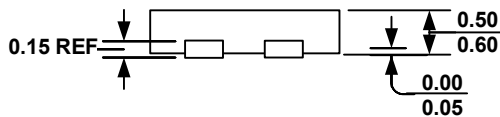
### UTQFN (1.6x1.2mm)



**TOP VIEW**

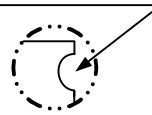


**BOTTOM VIEW**

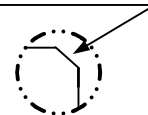


**SIDE VIEW**

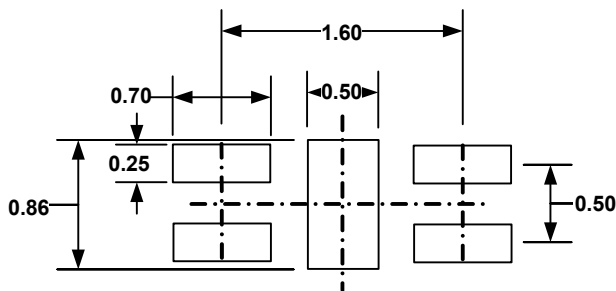
**PIN 1 ID OPTION A**  
R 0.10 TYP.



**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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