MP62040-1/MP62041-1
1.7V- 5.5V, Ultra-Small, Single-Channel 2A Current-Limited Power Distribution Switch with Output Discharge

The Future of Analog IC Technology

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.).
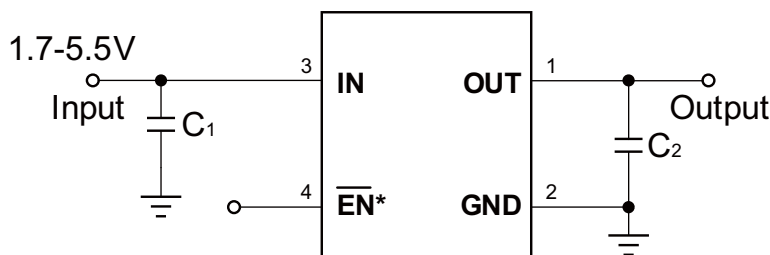
FEATURES

- 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

TYPICAL APPLICATION
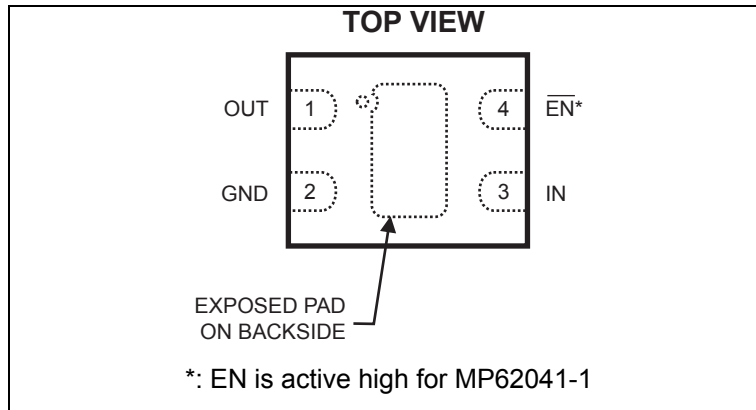

MP62040-1/MP62041-1

(*: 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$_A$)
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

TOP VIEW

OUT | 1 | | 4 | $\overline{EN}$*

GND | 2 | | 3 | IN

EXPOSED PAD ON BACKSIDE

*: EN is active high for MP62041-1

ABSOLUTE MAXIMUM RATINGS [1]

IN ....-0.3V to +6.0V
EN, OUT to GND ....-0.3V to +6.0V
Continuous Power Dissipation   (T$_A$ = +25°C) [2]
UTQFN4………………………………….......0.7W
Junction Temperature...............................150°C
Lead Temperature ....260°C
Storage Temperature............... -65°C to +150°C
Maximum Junction Temp. (T$_J$).............. +125°C

Thermal Resistance [3] θ_{JA} θ_{JC}
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$_J$(MAX), the junction-to-ambient thermal resistance θ_{JA}, and the ambient temperature T$_A$. The maximum allowable continuous power dissipation at any ambient temperature is calculated by P$_D$(MAX)=(T$_J$(MAX)-T$_A$)/θ_{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.
3) Measured on JESD51-7, 4-layer PCB.

ELECTRICAL CHARACTERISTICS
V_{IN}=3.6V, T_A=+25°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		µA
Shutdown Current		Device disable, V_{IN}=5.5V, V_{OUT}=float			1	µA
FET On_Resistance		V_{IN}=1.7V, I_{OUT}=100mA		165	225	mΩ
		V_{IN}=1.8V, I_{OUT}=100mA		155	215	mΩ
		V_{IN}=2.5V, I_{OUT}=100mA		130	200	mΩ
		V_{IN}=3.6V, I_{OUT}=100mA		100	140	mΩ
		V_{IN}=4.5V, I_{OUT}=100mA		85	115	mΩ
EN Input Logic High Voltage		V_{IN} = 1.7V to 4.5V, I_D = -250µA	1.2			V
EN Input Logic Low Voltage		V_{IN} = 1.7V to 4.5V, I_D = -250µA			0.4	V
EN Input Current		Device active, V_{IN} = 5.5V		2	4	µA
Discharge Resistance		Device disable, V_{IN} =3.6V, I_{TEST} = 1mA		200	300	Ω
V_{OUT} Rising Time [4]	Tr	V_{IN}=3.6V, I_{OUT}=100mA, C_L=1µF	75	115	200	µs
V_{OUT} Falling Time [5]	Tf	V_{IN}=3.6V, I_{OUT}=100mA, C_L=1µF	65	75	100	µs
Turn On_Time [6]	Ton	V_{IN}=3.6V, I_{OUT}=100mA, C_L=1µF		235	350	µs
Turn Off_Time [7]	Toff	V_{IN}=3.6V, I_{OUT}=100mA, C_L=1µF		100	200	µs

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

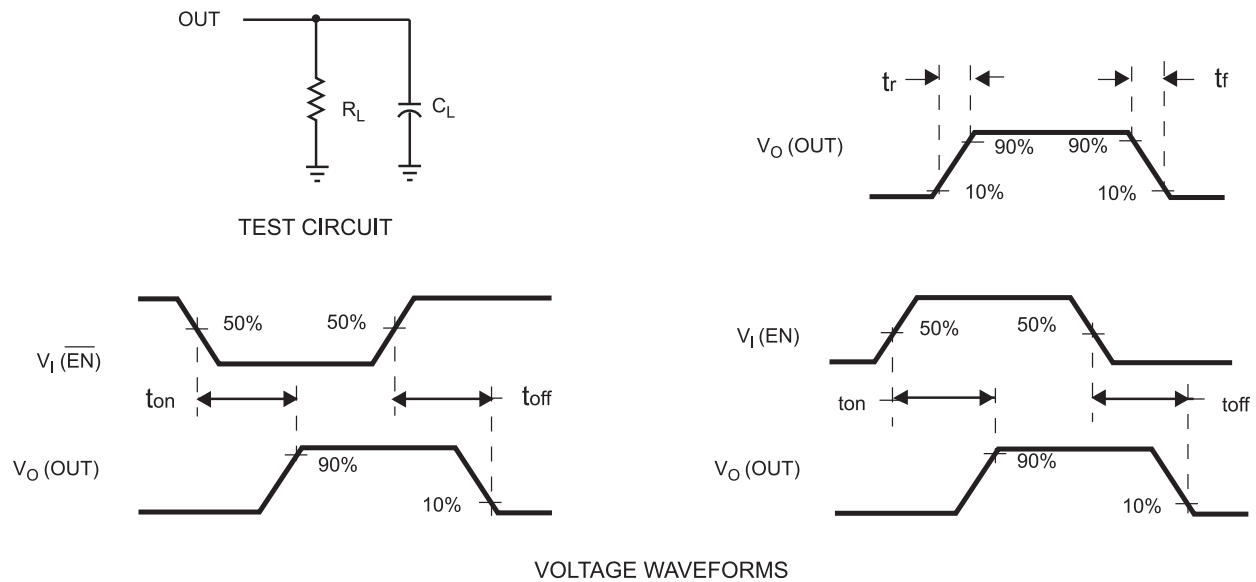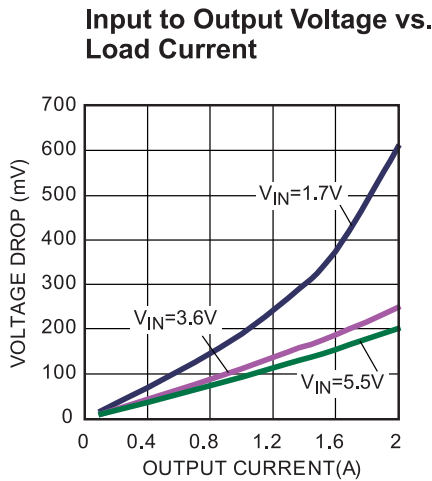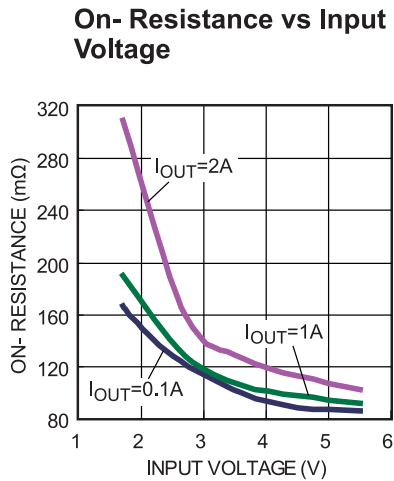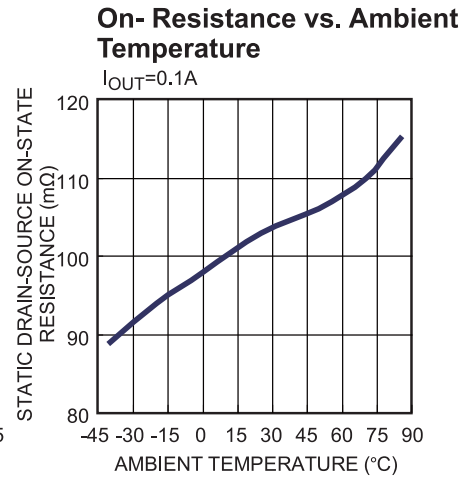| UTQFN	Name	Description
1	OUT	IN-to-OUT Power-Distribution Output
2	GND	Ground and the thermal pad should both be connected to electrical ground.
3	IN	Input Voltage. Accepts 1.7V to 5.5V input.
4	$\overline{EN}$	Active Low: (MP62040-1), Active High: (MP62041-1)

PARAMETER MEASUREMENT INFORMATION

TEST CIRCUIT

VOLTAGE WAVEFORMS

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

TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{EN} = 3.6V$, $C_L = 1\mu F$, $T_A = +25°C$, 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
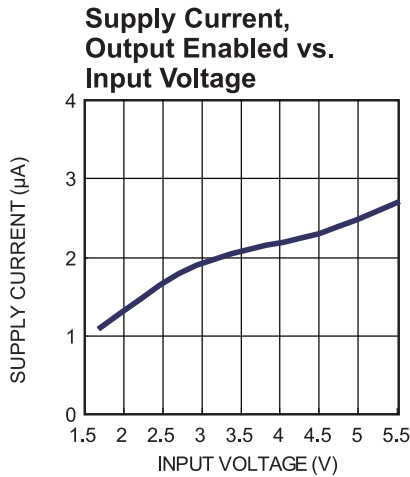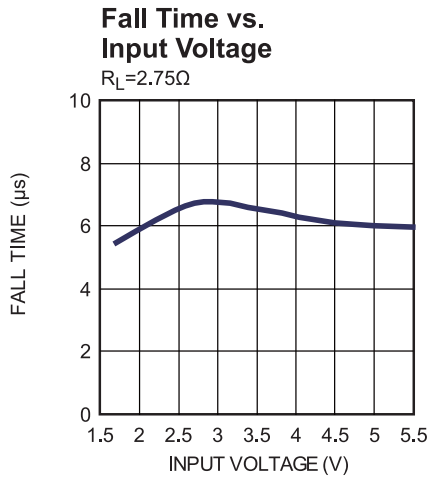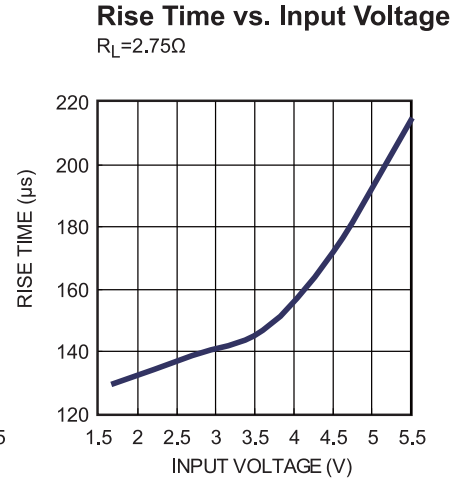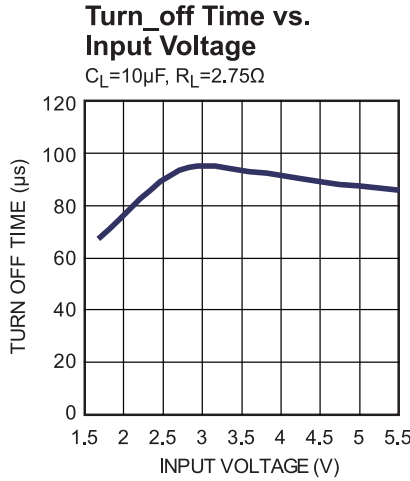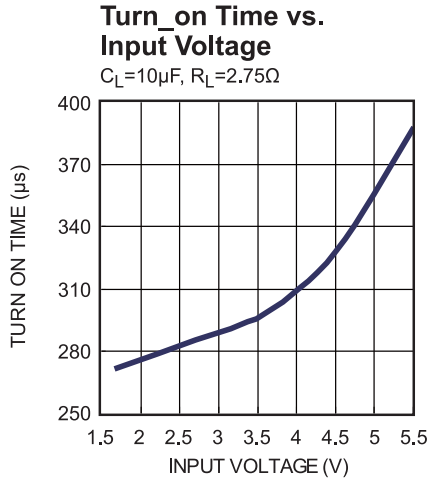
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

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

**Turn_on Delay and Rise Time
with 1µF Load**
$R_L = 3.6\Omega$
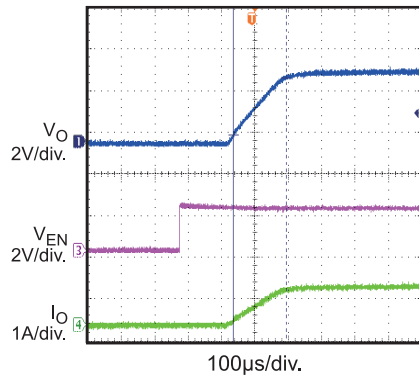
**Turn_off Delay and Fall Time
with 1µF Load**
$R_L = 3.6\Omega$
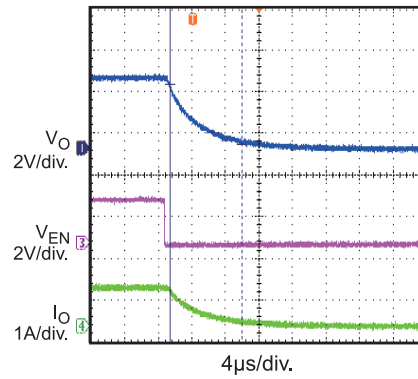
**Turn_on Delay and Rise Time
with 10µF Load**
$C_{OUT} = 10\mu F$, $R_L = 3.6\Omega$
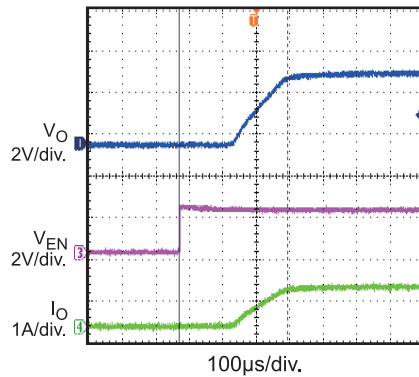
**Turn_off Delay and Fall Time
with 10µF Load**
$C_{OUT} = 10\mu F$, $R_L = 3.6\Omega$
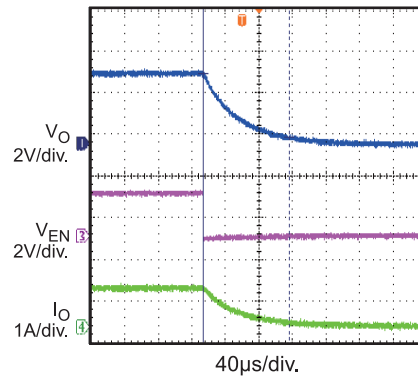
FUNCTION BLOCK DIAGRAM
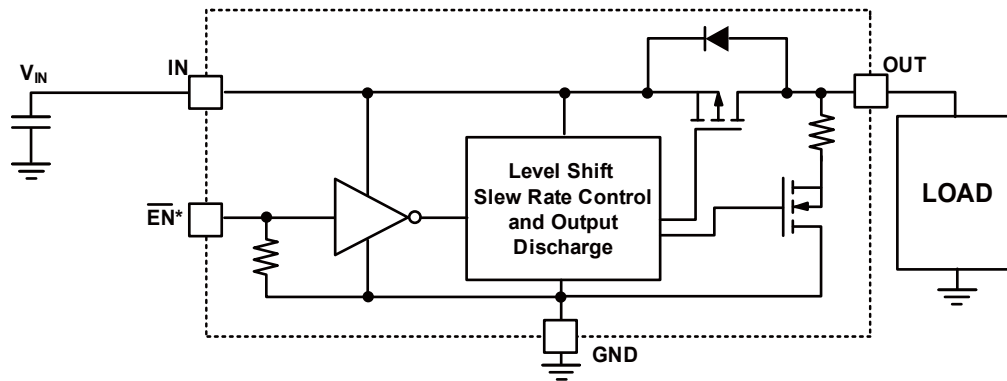
(*: EN is active high for MP62041-1)

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.
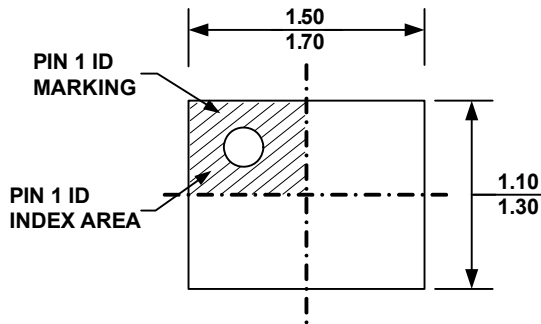
APPLICATION INFORMATION

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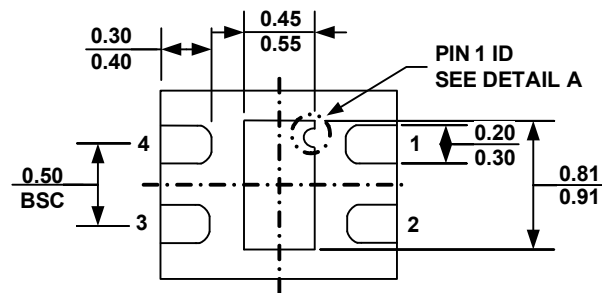
In order to achieve smaller output load transient ripple, placing a high-value electrolytic capacitor on the output pin(s) is recommended when the load is heavy.
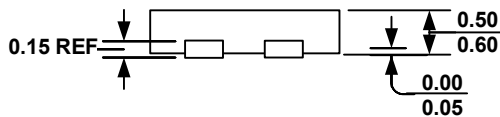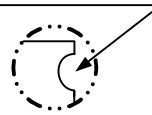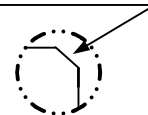
PACKAGE INFORMATION

UTQFN (1.6x1.2mm)

1.50
1.70

PIN 1 ID
MARKING

1.10
1.30

PIN 1 ID
INDEX AREA

TOP VIEW

0.30
0.40

0.45
0.55

PIN 1 ID
SEE DETAIL A

0.50
BSC

4

3

1

2

0.20
0.30

0.81
0.91

BOTTOM VIEW

0.15 REF

0.50
0.60

0.00
0.05

SIDE VIEW

PIN 1 ID OPTION A
R 0.10 TYP.

PIN 1 ID OPTION B
0.20x45º TYP.

DETAIL A

1.60

0.70

0.50

0.25

0.86

0.50
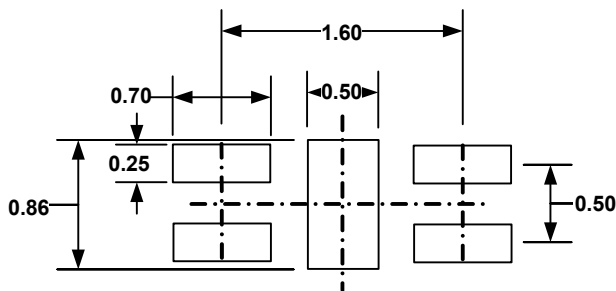
RECOMMENDED LAND PATTERN

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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