MP62040/MP62041

1.7V – 5.5V, Ultra-Small, Single-Channel 2A Current-Limited Power Distribution Switch

The Future of Analog IC Technology

DESCRIPTION

The MP62040/MP62041 Power Distribution Switch is designed for high-side load switch. 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/MP62041 has slew rate control with 115µs rising time to limit inrush current when enabling the switch.

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/MP62041 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
- Soft Start: 115µs
- 1µA Shutdown Current
- 85mΩ MOSFET
- Active High & Active Low Options
- Space saving 1.6x1.2 mm UTQFN4 Package (0.55mm Height)

APPLICATIONS

- Load switch in portable applications
- Battery switch-over circuits
- Level translator

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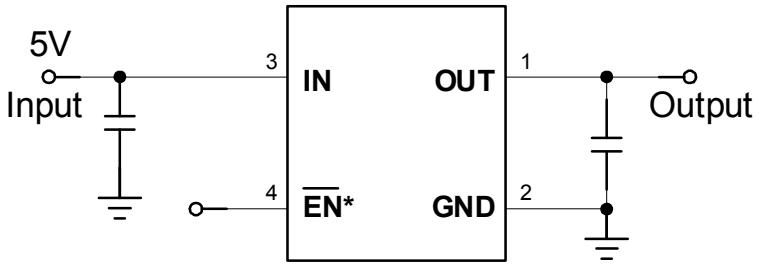
TYPICAL APPLICATION



MP62040 / MP62041

(*: EN is active high for MP62041)

Single-Channel

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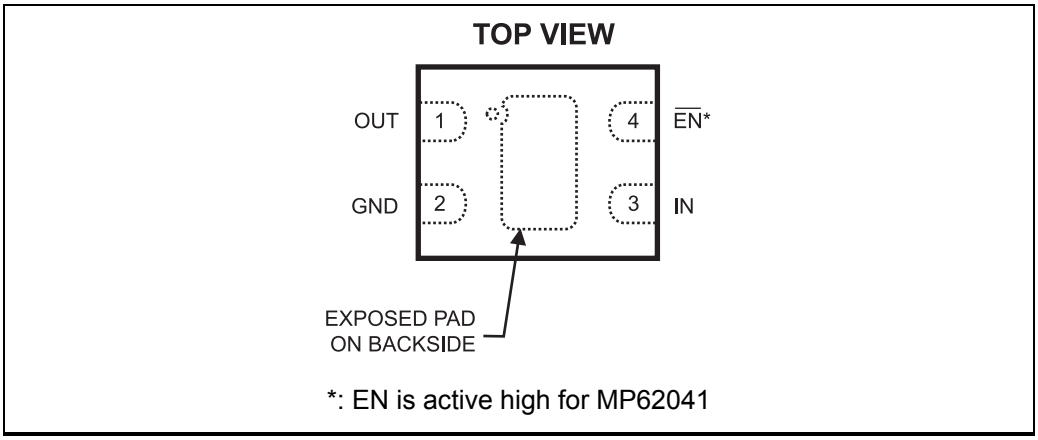
PACKAGE REFERENCE

Part Number	Enable	Switch	Maximum Continuous Load Current	Package	Top Marking	Free Air Temperature (T_A)
MP62040DQFU*	Active Low	Single	2A	UTQFN4	AGY	–40°C to +85°C
MP62041DQFU**	Active High			UTQFN4	AEY	

* For Tape & Reel, add suffix –Z (e.g. MP62040DQFU–Z).
For RoHS compliant packaging, add suffix –LF (e.g. MP62040DQFU-LF–Z)
** For Tape & Reel, add suffix –Z (e.g. MP62041DQFU–Z).
For RoHS compliant packaging, add suffix –LF (e.g. MP62041DQFU-LF–Z)

PACKAGE REFERENCE



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
Continuous Drain Current
T_A = +25°C ..... ±2A
T_A = +85°C ..... ±1.4A
Pulsed Drain Current (3) ..... .±6A
Continuous Diode Current (4) ..... .-50mA
Junction Temperature .....150°C
Lead Temperature .....260°C
Storage Temperature..... -65°C to +150°C
Maximum Junction Temp. (T_J) ..... +125°C

Thermal Resistance (5)	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 TA. The maximum allowable continuous power dissipation at any ambient temperature is calculated by PD(MAX)=(T_J(MAX)-TA)/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) Pulse width <300µs and duty cycle < 2%
4) Continuous body diode conduction (reverse conduction) is not recommended.
5) Measured on JESD51-7, 4-layer PCB.

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ELECTRICAL CHARACTERISTICS (6)

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, 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
V_{OUT} Rising Time (7)	Tr	V_{IN}=3.6V, I_{OUT}=100mA	75	115	200	μs
V_{OUT} Falling Time (8)	Tf	V_{IN}=3.6V, I_{OUT}=100mA	65	75	100	μs
Turn On_Time (9)	Ton	V_{IN}=3.6V, I_{OUT}=100mA		235	350	μs
Turn Off_Time (10)	Toff	V_{IN}=3.6V, I_{OUT}=100mA		100	200	μs

Notes:

6) Production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.
7) Measured from 10% to 90%.
8) Measured from 90% to 10%.
9) Measured from (50%) EN signal to (90%) output signal.
10) Measured from (50%) EN signal to (10%) output signal.

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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), Active High: (MP62041)

PARAMETER MEASUREMENT INFORMATION

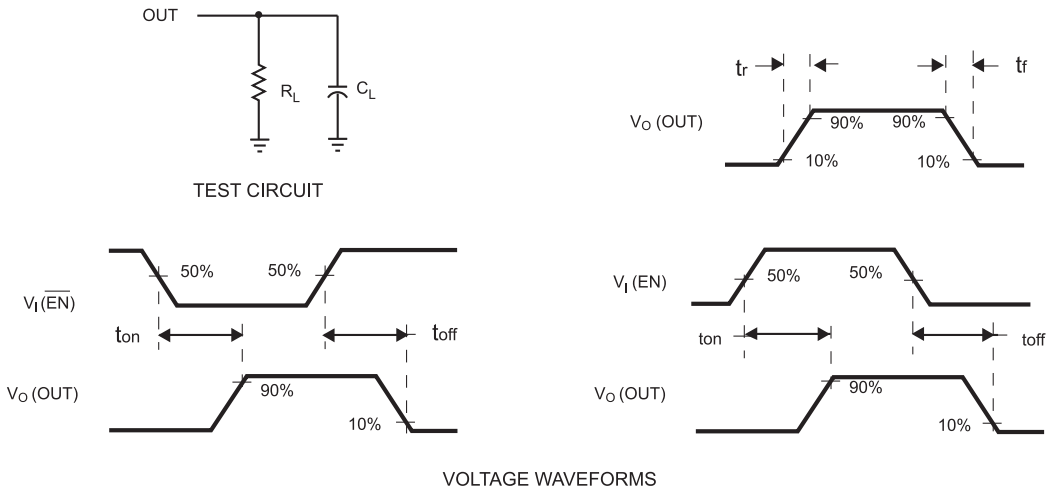

Figure1 — Definition of Tr, Tf, Ton, and Toff

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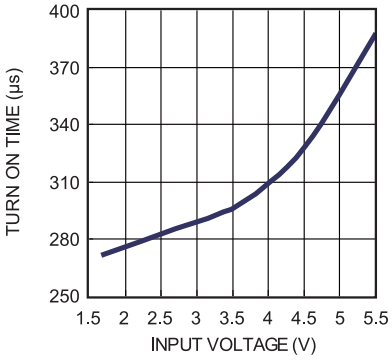
TYPICAL PERFORMANCE CHARACTERISTICS

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

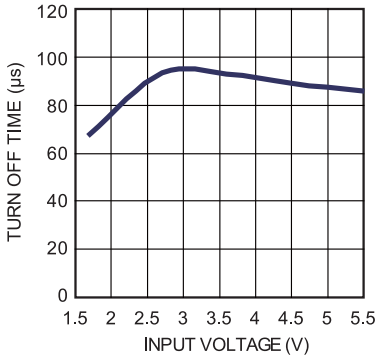
Turn_on Time vs. Input Voltage

C_L=10µF, R_L=2.75Ω



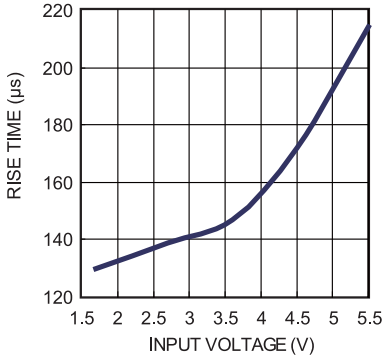
Turn_off Time vs. Input Voltage

C_L=10µF, R_L=2.75Ω



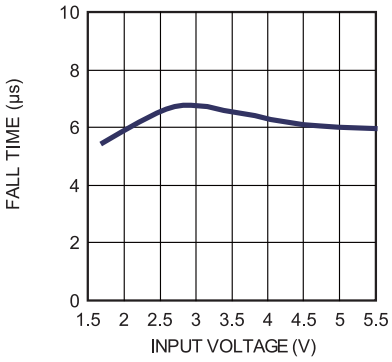
Rise Time vs. Input Voltage

R_L=2.75Ω

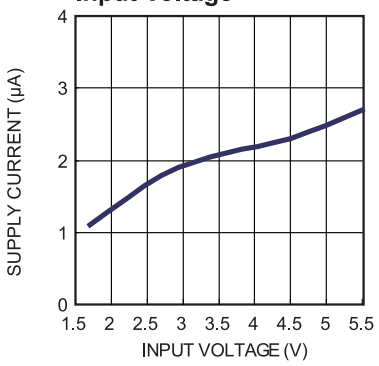


Fall Time vs. Input Voltage

R_L=2.75Ω

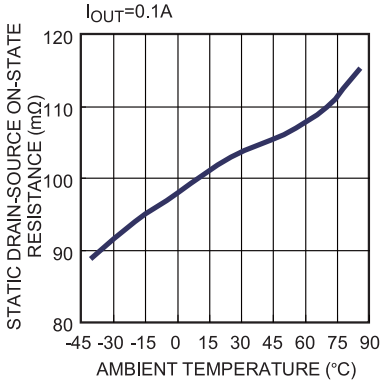


Supply Current, Output Enabled vs. Input Voltage

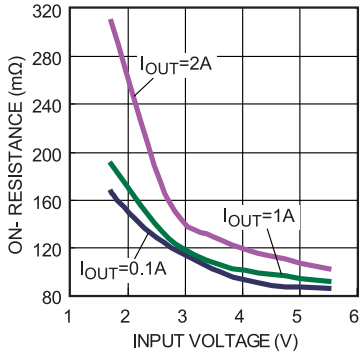


On- Resistance vs. Ambient Temperature

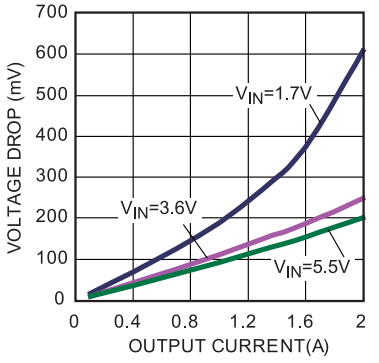
I_{OUT}=0.1A



On- Resistance vs Input Voltage



Input to Output Voltage vs. Load Current



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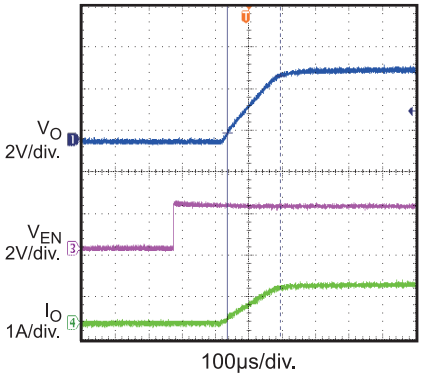
TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

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

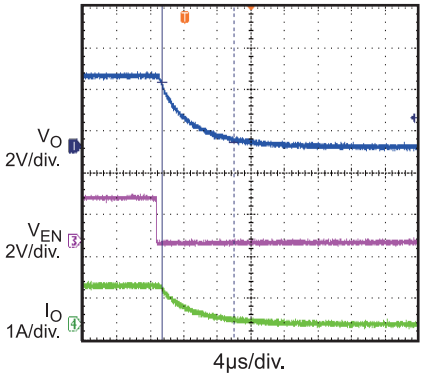
Turn_on Delay and Rise Time with 1µF Load

R_L = 3.6Ω



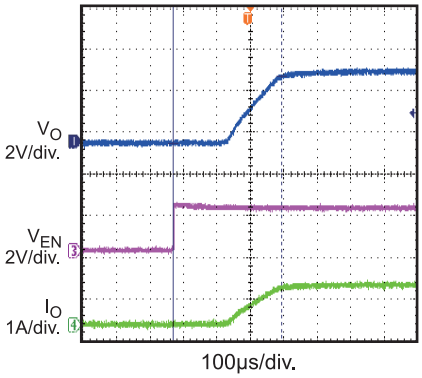
Turn_off Delay and Fall Time with 1µF Load

R_L = 3.6Ω



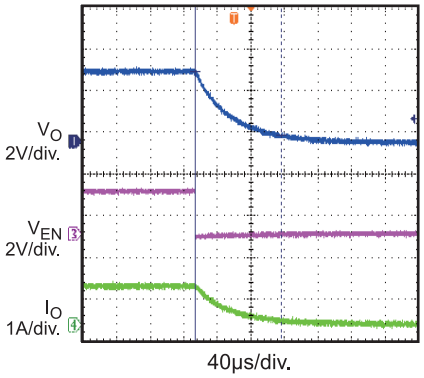
Turn_on Delay and Rise Time with 10µF Load

C_{OUT} = 10µF, R_L = 3.6Ω



Turn_off Delay and Fall Time with 10µF Load

C_{OUT} = 10µF, R_L = 3.6Ω



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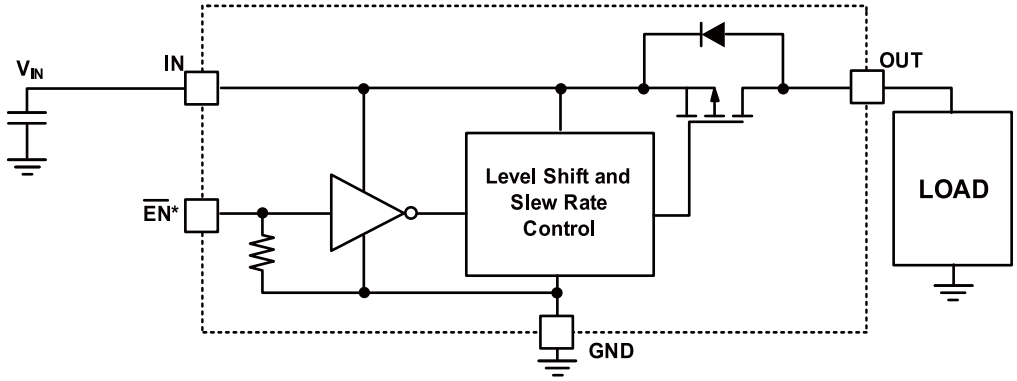
FUNCTION BLOCK DIAGRAM



(*: EN is active high for MP62041)

Figure 2 — Functional Block Diagram

DETAILED DESCRIPTION

The MP62040/MP62041 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/MP62041 is enabled and the supply current is very small, only 2μA.

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.

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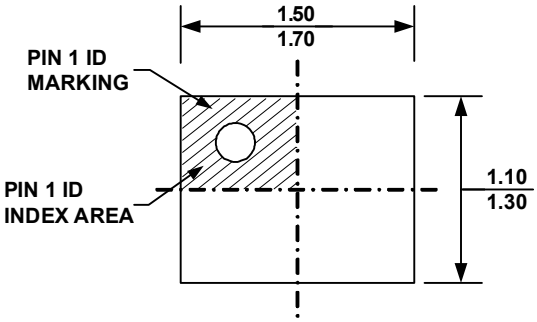
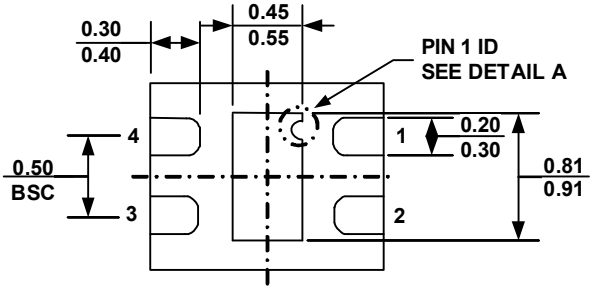
PACKAGE INFORMATION

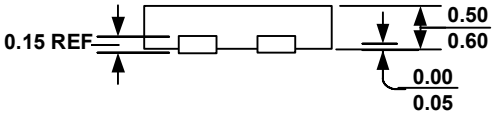
UTQFN (1.6x1.2mm)



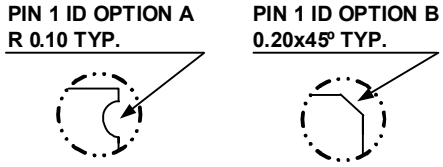
TOP VIEW



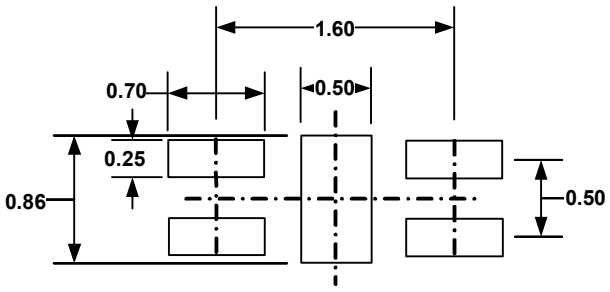
BOTTOM VIEW



SIDE VIEW



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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