MIC94050/94051

4-Terminal SymFET™ P-Channel MOSFET

General Description

The MIC94050 and MIC94051 are 4-terminal silicon gate P-channel MOSFETs that provide low on-resistance in a very small package.

Designed for high-side switch applications where space is critical, the MIC94050/1 exhibits an on-resistance of typically 0.125Ω at 4.5V gate-to-source voltage. The MIC94050/1 also operates with only 1.8V gate-to-source voltage.

The MIC94050 is the basic 4-lead P-channel MOSFET. The MIC94051 is a variation that includes an internal gate pull-up resistor that can reduce the system parts count in many applications.

The 4-terminal SOT-143 package permits a substrate connection separate from the source connection. This 4-terminal configuration improves the θ_{JA} (improved heat dissipation) and makes reverse-blocking switch applications practical.

The small size, low threshold, and low $R_{DS(on)}$ make the MIC94050/1 the ideal choice for PCMCIA, USB, back-up battery-power, and distributed power management applications.

SymFET™

Features

- 0.125Ω typical on-resistance at 4.5V gate-to-source voltage
- Operates with 1.8V gate-to-source voltage
- Separate substrate connection allows reverse-blocking

Applications

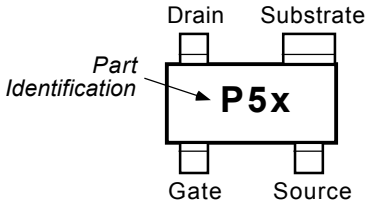
- Distributed power management
- PCMCIA card power management
- USB ports
- Battery-powered computers, peripherals
- Handheld bar-code scanners
- Portable communications equipment
- Reverse blocking battery management

Ordering Information

Part Number	Temp. Range*	Package	Pb-FREE
MIC94050BM4	–40°C to +150°C	SOT-143	NO
MIC94051BM4	–40°C to +150°C	SOT-143	NO
MIC94050YM4	–40°C to +150°C	SOT-143	YES
MIC94051YM4	–40° to +150°C	SOT-143	YES

* Operating Junction Temperature

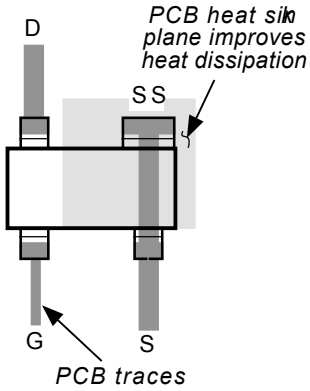
Pin Configuration



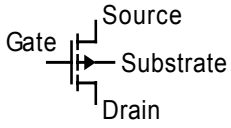
Part Number	Identification
MIC94050BM4	P50
MIC94051BM4	P51
MIC94050YM4	P50
MIC94051YM4	P51

SOT-143 Package (M4)

Typical PCB Layout

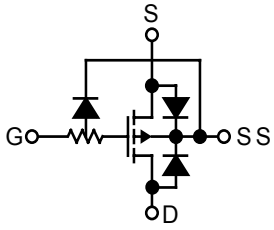


Schematic Symbol

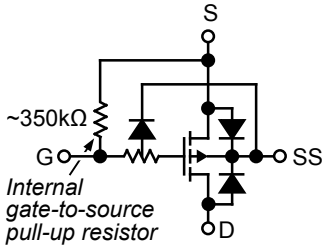


Schematic Symbol

Functional Diagrams



MIC94050



MIC94051

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Absolute Maximum Ratings

Drain-to-Source Voltage ..... –6V
Gate-to-Source Voltage ..... –6V
Continuous Drain Current
T_A = 25°C (V_{GS} = 4.5V) 1.8A
T_A = 100°C (V_{GS} = 4.5V) 1.2A
Total Power Dissipation
T_A = 25°C 568mW
T_A = 100°C 227mW
Operating Junction Temperature ..... –40°C to +150°C
Storage Temperature ..... –55°C to +150°C
ESD Rating, **Note 2**

Operating Ratings

Thermal Resistance
θ_{JA} ..... 220°C/W
θ_{JC} ..... 130°C/W

Electrical Characteristics (Note 1)

Symbol	Parameter	Condition (Note 1)	Min	Typ	Max	Units
V_{GS}	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = –250µA	0.5		1.2	V
I_{GSS}	Gate-Body Leakage	V_{DS} = 0V, V_{GS} = –4.5V, **Note 2**, **Note 3**			1	µA
R_{GS}	Gate-Source Resistance	V_{DS} = 0V, V_{GS} = –4.5V, **Note 2**, **Note 4**	200	350	500	kΩ
C_{ISS}	Input Capacitance	V_{GS} = 0V, V_{DS} = –5.5V		600		pF
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –5.5V, V_{GS} = 0V			1	µA
		V_{DS} = –5.5V, V_{GS} = 0V, T_J = 85°C			5	µA
$R_{DS(ON)}$	Drain-Source On-Resistance	V_{GS} = –4.5V, I_D = –100mA		0.125	0.160	Ω
		V_{GS} = –3.6V, I_D = –100mA		0.135	0.180	Ω
		V_{GS} = –2.5V, I_D = –100mA		0.165	0.200	Ω
		V_{GS} = –1.8V, I_D = –100mA		0.225	0.320	Ω
g_{FS}	Forward Transconductance	V_{DS} = –5.5V, I_D = –200mA, **Note 5**		3		S

Note 1. T_A = 25°C unless noted. Substrate connected to source for all conditions.

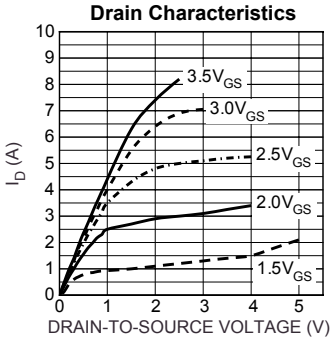
Note 2. ESD gate precautions required

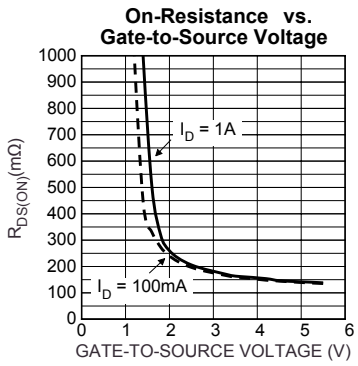
Note 3. MIC94050 only.

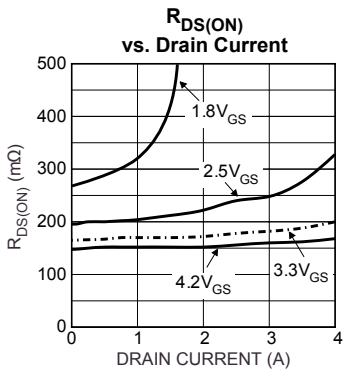
Note 4. MIC94051 only.

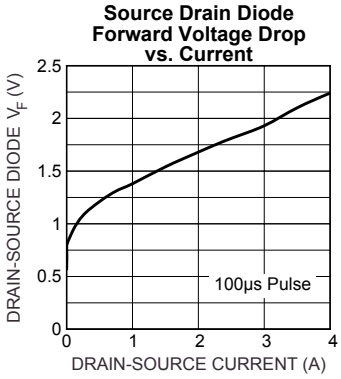
Note 5. Pulse Test: Pulse Width ≤ 80µs, Duty Cycle ≤ 0.5%.

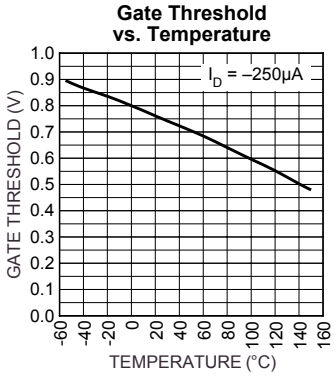
Typical Characteristics

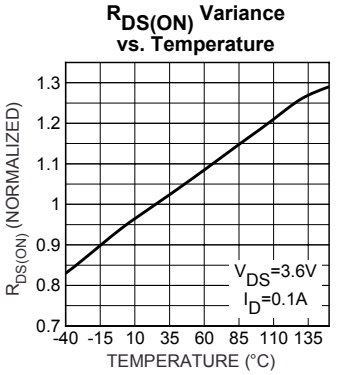












Typical Applications

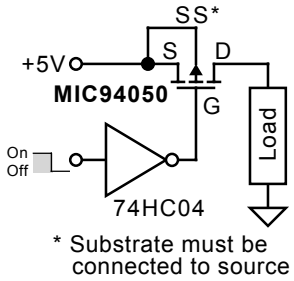


Figure 1. Load Switch Application

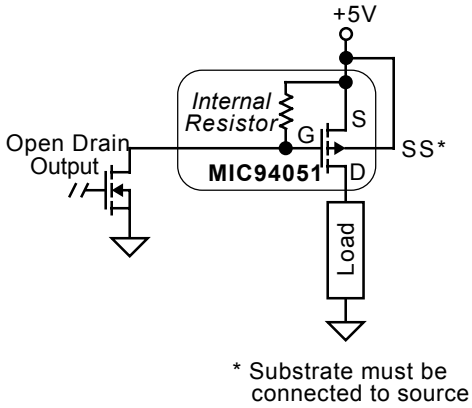
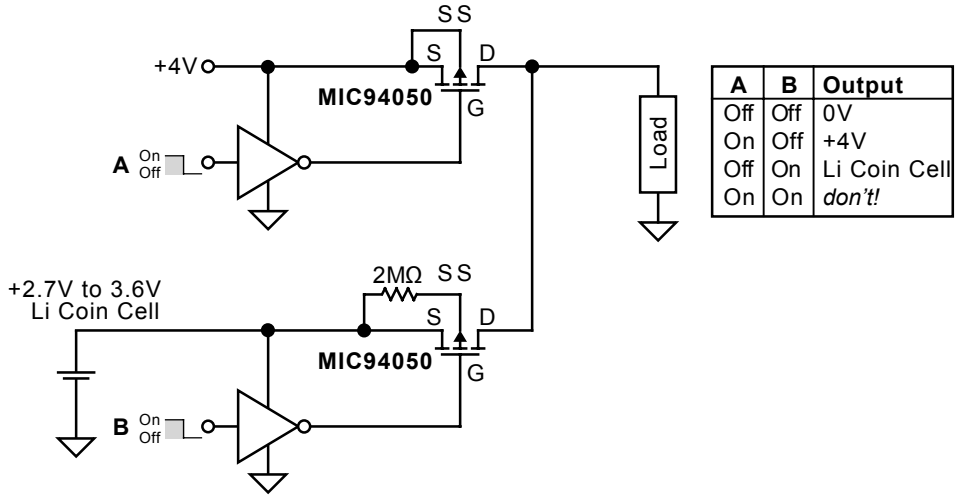


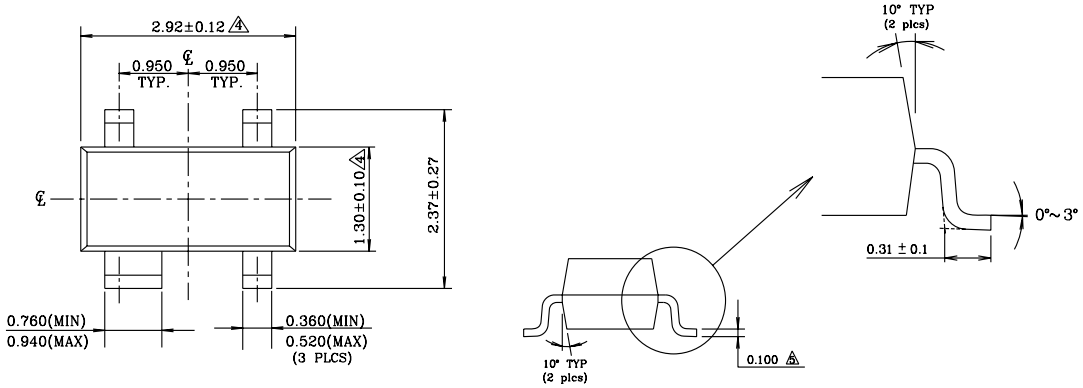
Figure 2. Load Switch Application (with internal gate-source pull-up)



A	B	Output
Off	Off	0V
On	Off	+4V
Off	On	Li Coin Cell
On	On	*don't!*

Figure 3. Reverse-Blocking Battery Back-Up Application

Package Information



NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1982.
2. Package surface to be mirror finish.
3. Die is facing up for mold & trim/form.
4. Dimension are exclusive of mold flash and gate burr.
5. Dimension are exclusive of solder plating.

SOT-143 (M4)

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