



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.

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

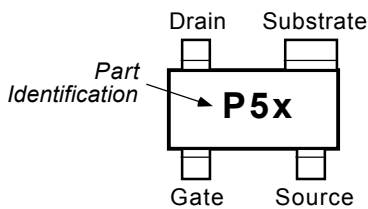
- Distributed power management
- PCMCIA card power management
- USB ports
- Battery-powered computers, peripherals
- Handheld bar-code scanners
- Portable communications equipment
- Reverse blocking battery management

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°C to +150°C	SOT-143	YES

* Operating Junction Temperature

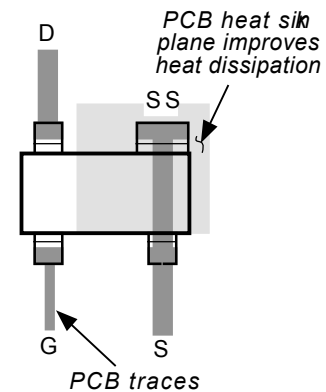
Pin Configuration



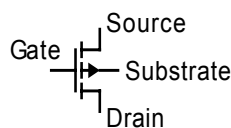
Part Number	Identification
MIC94050BM4	P50
MIC94051BM4	P51
MIC94050YM4	P50
MIC94051YM4	P51

SOT-143 Package (M4)

Typical PCB Layout

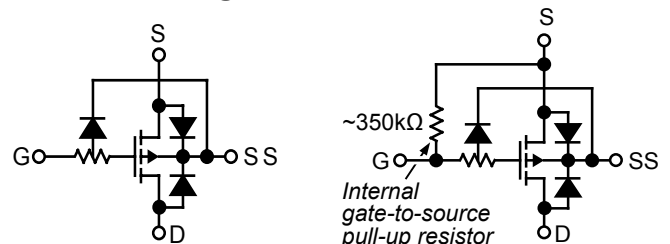


Schematic Symbol



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	
$T_A = 25^\circ\text{C}$ ($V_{GS} = 4.5\text{V}$)	1.8A
$T_A = 100^\circ\text{C}$ ($V_{GS} = 4.5\text{V}$)	1.2A
Total Power Dissipation	
$T_A = 25^\circ\text{C}$	568mW
$T_A = 100^\circ\text{C}$	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	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$	0.5		1.2	V
I_{GSS}	Gate-Body Leakage	$V_{DS} = 0\text{V}$, $V_{GS} = -4.5\text{V}$, Note 2, Note 3			1	μA
R_{GS}	Gate-Source Resistance	$V_{DS} = 0\text{V}$, $V_{GS} = -4.5\text{V}$, Note 2, Note 4	200	350	500	k Ω
C_{ISS}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = -5.5\text{V}$		600		pF
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -5.5\text{V}$, $V_{GS} = 0\text{V}$			1	μA
		$V_{DS} = -5.5\text{V}$, $V_{GS} = 0\text{V}$, $T_J = 85^\circ\text{C}$			5	μA
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS} = -4.5\text{V}$, $I_D = -100\text{mA}$		0.125	0.160	Ω
		$V_{GS} = -3.6\text{V}$, $I_D = -100\text{mA}$		0.135	0.180	Ω
		$V_{GS} = -2.5\text{V}$, $I_D = -100\text{mA}$		0.165	0.200	Ω
		$V_{GS} = -1.8\text{V}$, $I_D = -100\text{mA}$		0.225	0.320	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -5.5\text{V}$, $I_D = -200\text{mA}$, Note 5		3		S

Note 1. $T_A = 25^\circ\text{C}$ unless noted. Substrate connected to source for all conditions.

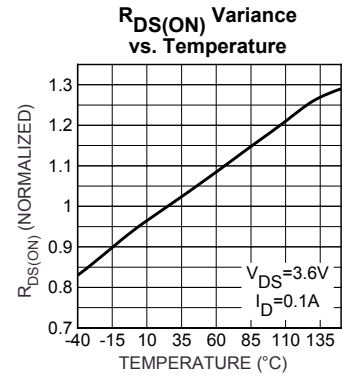
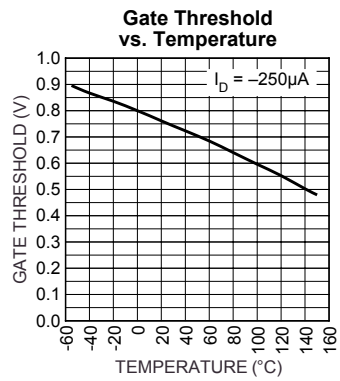
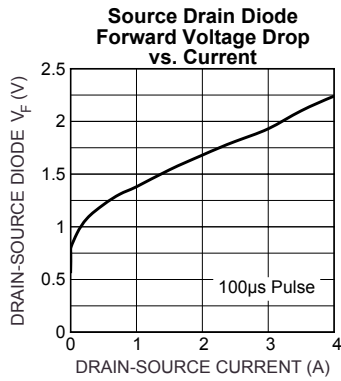
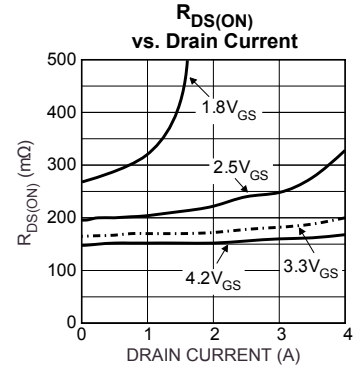
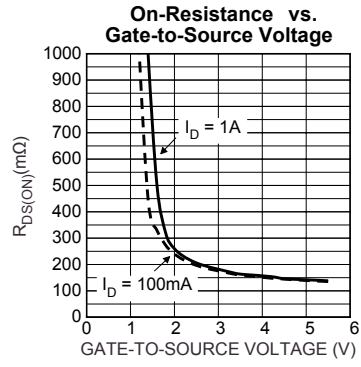
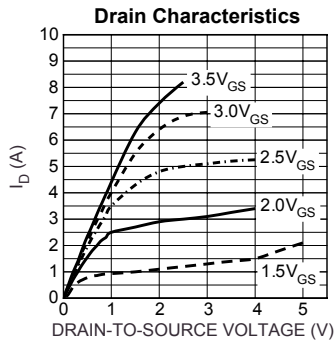
Note 2. ESD gate \square
precautions required

Note 3. MIC94050 only.

Note 4. MIC94051 only.

Note 5. Pulse Test: Pulse Width $\leq 80\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

Typical Characteristics



Typical Applications

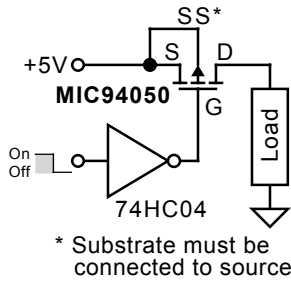


Figure 1. Load Switch Application

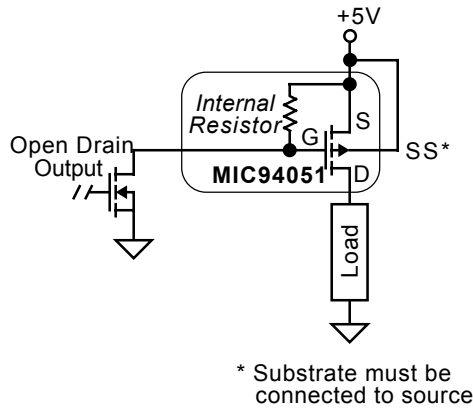


Figure 2. Load Switch Application (with internal gate-source pull-up)

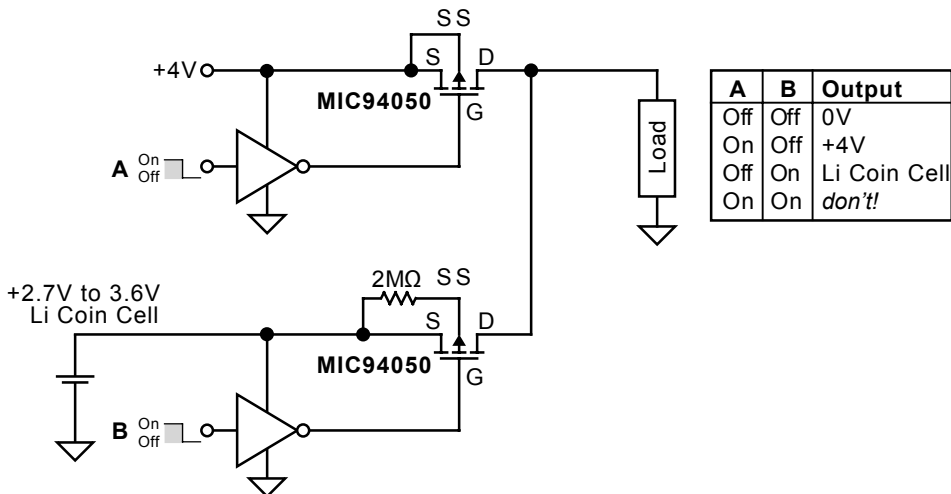
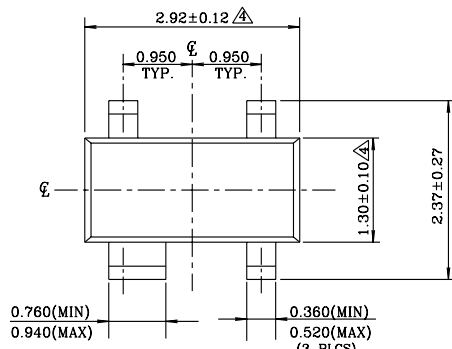
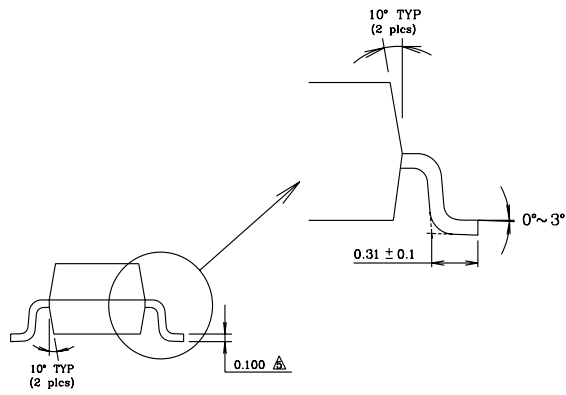


Figure 3. Reverse-Blocking Battery Back-Up Application

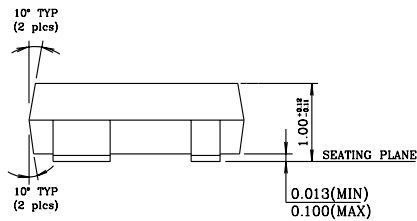
Package Information



TOP VIEW



END VIEW



SIDE VIEW

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.
- △ Dimension are exclusive of mold flash and gate burr.
 - △ Dimension are exclusive of solder plating.

SOT-143 (M4)

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[DMN1006UCA6-7](#) [DMN16M9UCA6-7](#)