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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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MIC94030/94031

TinyFET® P-Channel MOSFET

General Description

The MIC94030 and MIC94031 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 MIC94030/1 exhibits an on-resistance of typically 0.75Ω at 4.5V gate-to-source voltage. The MIC94030/1 also operates with only 2.7V gate-to-source voltage.

The MIC94030 is the basic 4-lead P-channel MOSFET. The MIC94031 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 analog switch applications practical.

The small size, low threshold, and low $R_{DS(on)}$ make the MIC94030/1 the ideal choice for PCMCIA card sleep mode or distributed power management applications.

Features

- 13.5V minimum drain-to-source breakdown
- 0.75Ω typical on-resistance
  - at 4.5V gate-to-source voltage
- 0.45Ω typical on-resistance
  - at 10V gate-to-source voltage
- Operates with 2.7V gate-to-source voltage
- Separate substrate connection for added control
- Industry's smallest surface mount package

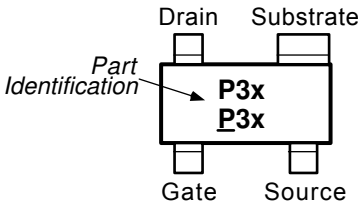
Applications

- Distributed power management
- PCMCIA card power management
- Battery-powered computers, peripherals
- Hand-held bar-code scanners
- Portable communications equipment

Ordering Information

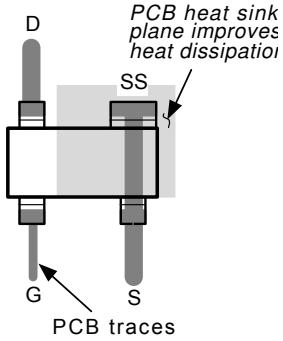
Part Number				Junction Temp. Range	Package
Standard	Marking	Pb-Free	Marking		
MIC94030BM4	P30	MIC94030YM4	P30	–55° to +150°C	SOT-143
MIC94031BM4	P31	MIC94031YM4	P31	–55° to +150°C	SOT-143

Pin Configuration



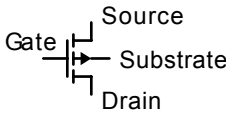
SOT-143 (M4)

Typical PCB Layout



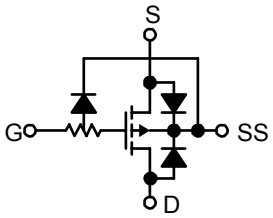
TinyFET is a registered trademark of Micrel, Inc.

Schematic Symbol

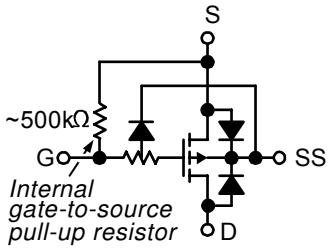


Schematic Symbol

Functional Diagrams



MIC94030



MIC94031

Absolute Maximum Ratings[1]

Voltage and current values are negative. Signs not shown for clarity.

Drain-to-Source Voltage (pulse)..... 16V
Gate-to-Source Voltage (pulse). 16V
Continuous Drain Current
T_A = 25°C..... 1A
T_A = 100°C..... 0.5A
Operating Junction Temperature ..... –55°C to +150°C
Storage Temperature..... –55°C to +150°C

Total Power Dissipation
T_A = 25°C..... 568mW
T_A = 100°C..... 227mW
Thermal Resistance
θ_{JA}..... 220°C/W
θ_{JC}..... 130°C/W
Lead Temperature
1/16" from case, 10s..... +300°C

Electrical Characteristics

Voltage and current values are negative. Signs not shown for clarity.

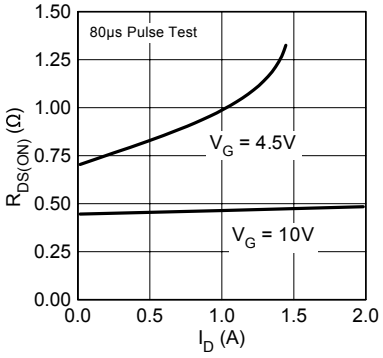
Symbol	Parameter	Condition (Note 1)	Min	Typ	Max	Units
V_{BDSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250µA	13.5			V
V_{GS}	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	0.6	1.0	1.4	V
I_{GSS}	Gate-Body Leakage	V_{DS} = 0V, V_{GS} = 12V, **Note 2, Note 3**			1	µA
R_{GS}	Gate-Source Resistor	V_{DS} = 0V, V_{GS} = 12V, **Note 2, Note 4**	500	750	1000	kΩ
C_{ISS}	Input Capacitance	V_{GS} = 0V, V_{DS} = 12V		100		pF
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 12V, V_{GS} = 0V			25	µA
		V_{DS} = 12V, V_{GS} = 0V, T_J = 125°C		0.010	250	µA
$I_{D(ON)}$	On-State Drain Current	V_{DS} = 10V, V_{GS} = 10V, **Note 5**		6.3		A
$R_{DS(ON)}$	Drain-Source On-State Resist	V_{GS} = 10V, I_D = 100mA V_{GS} = 4.5V, I_D = 100mA V_{GS} = 2.7V, I_D = 100mA		0.45 0.75 1.20	1.00	Ω Ω Ω
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 200mA, **Note 5**		480		mS

Notes:

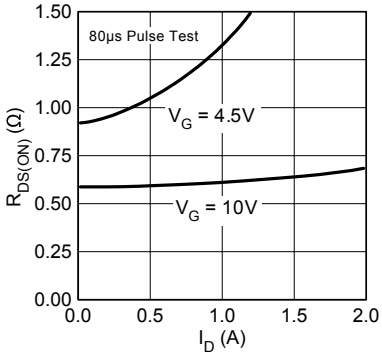
1. T_A = 25°C unless noted. Substrate connected to source for all conditions.
2. ESD gate protection diode conducts during positive gate-to-source voltage excursions.
3. MIC94030 only.
4. MIC94031 only.
5. Pulse Test: Pulse Width ≤ 80µsec, Duty Cycle ≤ 0.5%.

Typical Characteristics

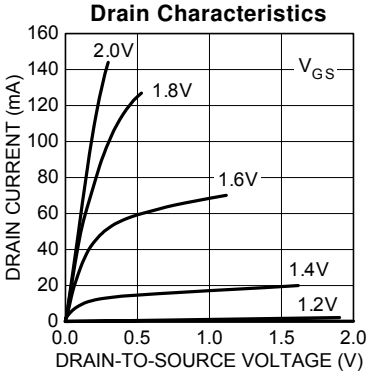
On Resistance vs. Drain Current at 25°C



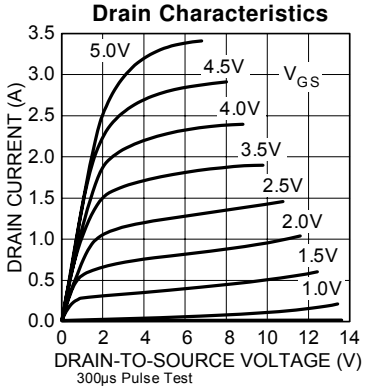
On Resistance vs. Drain Current at 125°C



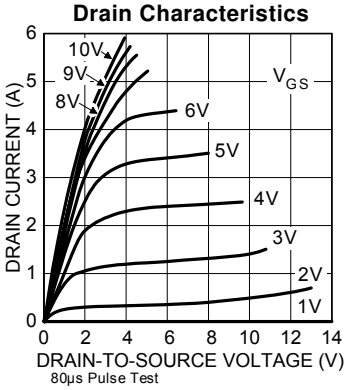
Drain Characteristics



Drain Characteristics



Drain Characteristics



Typical Applications

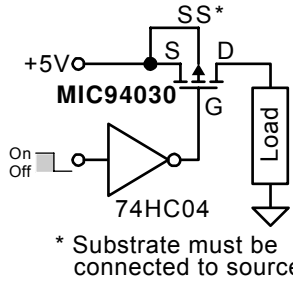


Figure 1. Power Switch Application

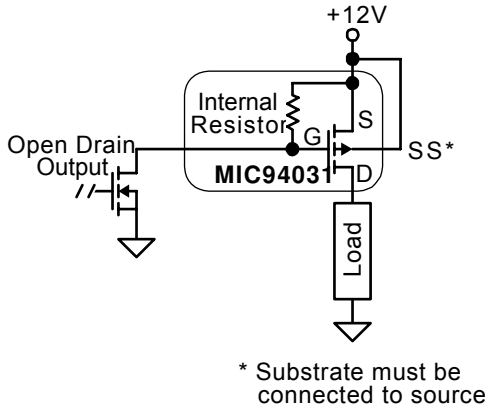
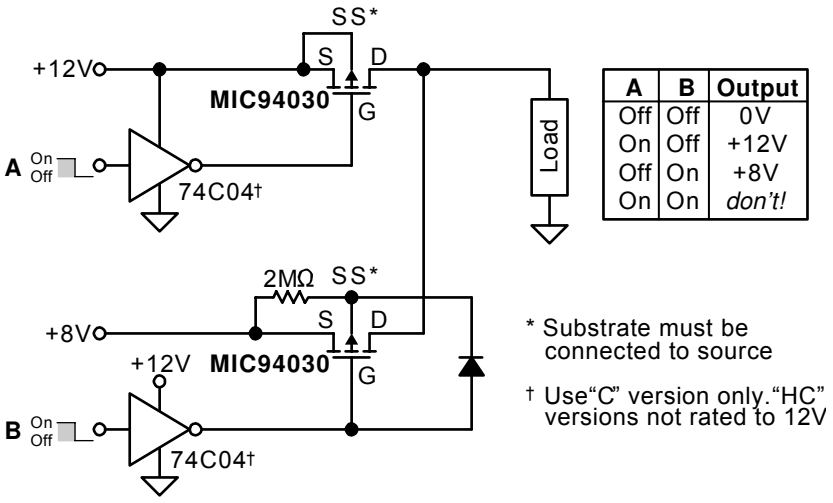


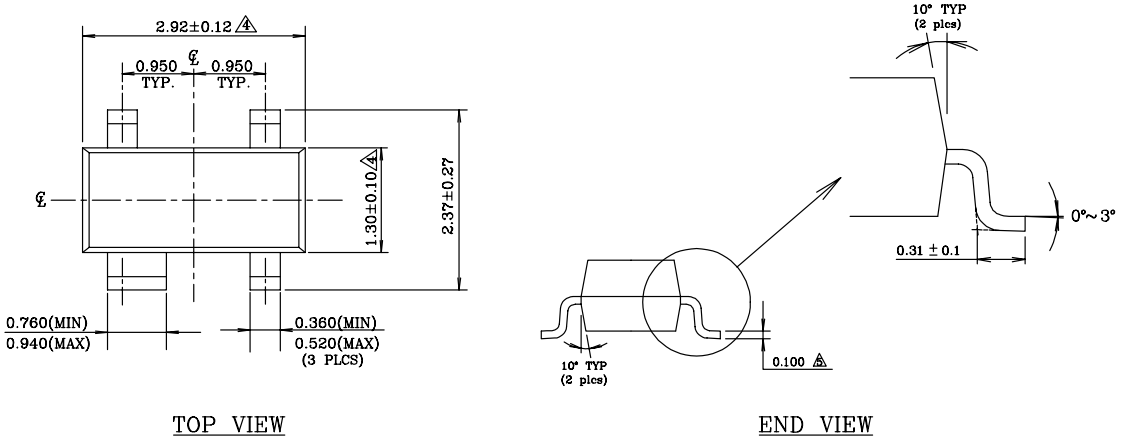
Figure 2. Power Control Application



A	B	Output
Off	Off	0V
On	Off	+12V
Off	On	+8V
On	On	*don't!*

Figure 3. Analog Switch 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)

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA
TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB http:/www.micrel.com