

MIC94052/94053

84mΩ P-Channel MOSFET in SC-70-6

General Description

The MIC94052/94053 are low on-resistance, $84m\Omega(max)$ P-channel MOSFETs. They are housed in a *Teeny*TM SC-70-6 package.

Designed for high-side switch applications where space is critical, the MIC94052/3 exhibit a typical on-resistance of $70 m\Omega$ at 4.5V gate-to-source voltage. The devices operate down to 1.8V gate-to-source voltage. Their operating voltage range makes the MIC94052/3 ideal for Li Ion applications as well as other sub-5V load switch applications.

The MIC94053 is an option that includes an internal gate pullup resistor. The pull-up resistor ensures that the P-channel MOSFET is OFF until actively pulled down. Integrating the pull-up resistor saves valuable board space and reduces component placement cost.

The MIC94052/3 have a junction temperature range of -40° C to $+150^{\circ}$ C.

Features

- 1.8V to 5.5V input voltage range
- Low on-resistance P-channel MOSFET: 70mΩ at V_{GS} = 4.5V (typ) 2A continuous current
- V_{GS} pull-up resistor (MIC94053)
- Teeny™ SC-70-6 package
- -40°C to +150°C junction temperature range

Applications

· Load switch in portable applications:

Cellular phones

PDAs

MP3 players

Notebook PCs

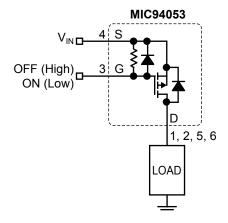
Barcode scanners

Ordering Information

Part Number			Gate-Source Pull Up	Junction Temp Range	Package	
Standard	Marking	Pb-Free	Marking*			
MIC94052BC6	P52	MIC94052YC6	<u>P</u> 52	NO	-40°C to +150°C	SC-70-6
MIC94053BC6	P53	MIC94053YC6	<u>P</u> 53	YES	-40°C to +150°C	SC-70-6

^{*} Under bar symbol may not be to scale.

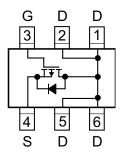
Typical Application



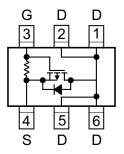
Load Switch Application

MIC94052/53 Micrel, Inc.

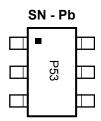
Pin Configuration

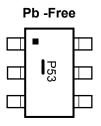


MIC94052 SC-70-6 (C6)



MIC94053 SC-70-6 (C6)





Package Marking - Top View

Pin Description

Pin Number	Pin Name	Pin Function
1, 2, 5, 6	D	Drain. Ensure that all drain pins are connected together to optimize R _{DS(ON)} performance.
3	G	Gate
4	S	Source

Absolute Maximum Ratings (Note 1)

, 10001010 11101111 1 101111 go (11010 1)
Drain-Source Voltage (V _{DS})6V
Gate-Source Voltage (V _{GS})6V
Continuous Drain Current (ID) Note 3
T _A = 25°C±2A
T _A = 85°C±1.4A
Pulsed Drain Current (I _{DP}) Note 3 ±6A
Continous Diode Current (I _S) Note 7 –50mA
Power Dissipation Note 3
SC-70-6 lead (T _A = 85°C)270mW
Ambient Storage Temperature (T _S)55°C to +150°C
ESD Rating Note 4

Operating Ratings (Note 2)

Input Voltage Range1.8V to 5.5	5\
Junction Temperature Range (T _J)40°C to +150°	°(
Package Thermal Impedance Note 3	
θ _{JA} SC-70-6 lead240°C/	/ \/

Electrical Characteristics

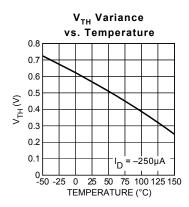
 T_{Δ} = 25°C, unless otherwise specified. **Bold** values indicate -40°C \le T₁ \le +150°C.

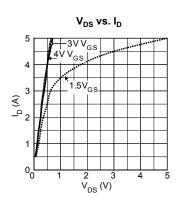
Symbol	Parameter	Condition	Min	Тур	Max	Units
Static	•		I			
$\overline{V_{GS(th)}}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-0.5		-1.2	V
I _{GSS}	Gate Body Leakage (MIC94052 only)	$V_{DS} = 0V, V_{GS} = -5.5V$			100	nA
R _{GS}	Gate-Source Resistance (MIC94053 only)	$V_{DS} = 0V, V_{GS} = -5.5V$	250	400	550	kΩ
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -5.5V, V_{GS} = 0V$ $T_{J} = +85^{\circ}C$			_1 _5	μA μA
R _{DS(ON)}	Drain-Source On-Resistance Note 8	$V_{GS} = -4.5V$, $I_{DS} = -100$ mA $V_{GS} = -3.6V$, $I_{DS} = -100$ mA $V_{GS} = -2.5V$, $I_{DS} = -100$ mA $V_{GS} = -1.8V$, $I_{DS} = -100$ mA		70 76 92 125	84 110 130 180	$\begin{array}{c} \text{m}\Omega\\ \text{m}\Omega\\ \text{m}\Omega\\ \text{m}\Omega \end{array}$
Dynamic, N	Note 6					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = -5V, I_{D} = -0.5A, V_{GS} = -4.5V,$ $R_{GEN} = 50\Omega$		15		ns
t _r	Turn-On Rise Time	$V_{DD} = -5V, I_{D} = -0.5A, V_{GS} = -4.5V,$ $R_{GEN} = 50\Omega$		15		ns
t _{d(off)}	Turn-Off Delay Time	$V_{DD} = -5V, I_{D} = -0.5A, V_{GS} = -4.5V,$ $R_{GEN} = 50\Omega$		60		ns
t _f	Turn-Off Fall Time	$V_{DD} = -5V, I_{D} = -0.5A, V_{GS} = -4.5V,$ $R_{GEN} = 50\Omega$		20		ns

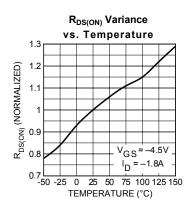
- Note 1. T_A = 25°C unless otherwise noted. Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings.
- Note 2. This device is not guaranteed to operate beyond its specified operating rating.
- Note 3. Mounted on 1 square-inch pad of 2 oz. copper.
- Note 4. IC devices are inherently ESD sensitive. Handling precautions required.
- **Note 5.** Pulse test; pulse width = 300μ s, duty cycle = 2%.
- Note 6. Guaranteed by design.
- Note 7. Body diode current conduction is not recommended.
- **Note 8.** Ensure that all drain pins are connected together to optimize $R_{DS(ON)}$ perfomance.

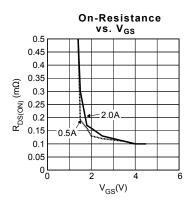
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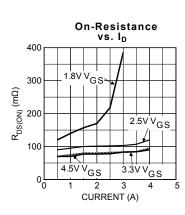
Typical Characteristics



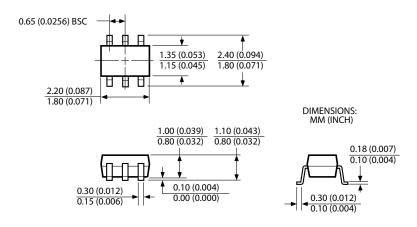








Package Information



SC-70-6 Pin (C6)

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