

Data Sheet July 1999 File Number 2879.2

4.3A, 1000V, 3.500 Ohm, N-Channel Power MOSFET

This N-Channel enhancement mode silicon gate power field effect transistor is an advanced power MOSFET designed, tested, and guaranteed to withstand a specified level of energy in the breakdown avalanche mode of operation. All of these power MOSFETs are designed for applications such as switching regulators, switching convertors, motor drivers, relay drivers, and drivers for high power bipolar switching transistors requiring high speed and low gate drive power. These types can be operated directly from integrated circuits.

Formerly developmental type TA09850.

Ordering Information

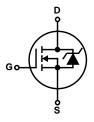
PART NUMBER	PACKAGE	BRAND
IRFPG40	TO-247	IRFPG40

NOTE: When ordering, include the entire part number.

Features

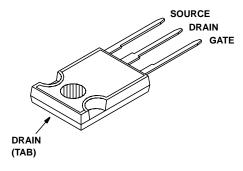
- 4.3A, 1000V
- $r_{DS(ON)} = 3.500\Omega$
- UIS SOA Rating Curve (Single Pulse)
- -55°C to 150°C Operating and Storage Temperature

Symbol



Packaging

JEDEC STYLE TO-247



Absolute Maximum Ratings $T_C = 25^{\circ}C$, Unless Otherwise Specified

	IRFPG40	UNITS
Drain to Source Voltage (Note 1)V _{DSS}	1000	V
Drain to Gate Voltage (Note 1)V _{DGR}	1000	V
Continuous Drain Current	4.3	Α
Pulsed Drain Current (Note 3)	17	Α
Gate to Source VoltageV _{GS}	±20	V
Maximum Power Dissipation	150	W
Linear Derating Factor	1.2	W/ °C
Single Pulse Avalanche Energy Rating (Note 4)	490	mJ
Operating and Storage Temperature Range	-55 to 150	°C
Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10s	300 260	°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. $T_J = 25^{\circ}C$ to $125^{\circ}C$.

$\textbf{Electrical Specifications} \hspace{0.5cm} \textbf{T}_{C} = 25^{o}\text{C}, \hspace{0.1cm} \textbf{Unless Otherwise Specified}$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS
Drain to Source Breakdown Voltage	BV _{DSS}	$I_D = 250\mu A, V_{GS} = 0V \text{ (Figure 9)}$		-	V
Gate Threshold Voltage	V _{GS(TH)}	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0	4.0	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = Rated BV _{DSS} , V _{GS} = 0V	-	25	μΑ
		$V_{DS} = 0.8 \text{ x Rated BV}_{DSS}, V_{GS} = 0V, T_{J} = 150^{\circ}\text{C}$	-	250	μА
Gate to Source Leakage Current	I _{GSS}	V _{GS} = ±20V	-	±100	nA
Drain to Source On Resistance (Note 2)	r _{DS(ON)}	I _D = 2.5A, V _{GS} = 10V (Figures 7, 8)		3.5	Ω
Forward Transconductance (Note 2)	9 _{fs}	I _D = 2.5A, V _{DS} = 100V (Figure 11)	3.5	-	S
Turn-On Delay Time	t _{d(ON)}	$V_{DD} = 500V$, $I = 3.9A$, $R_{GS} = 9.1\Omega$, $R_{L} = 120\Omega$ $V_{GS} = 10V$		30	ns
Rise Time	t _r			50	ns
Turn-Off Delay Time	t _{d(OFF)}			170	ns
Fall Time	t _f			50	ns
Total Gate Charge	Q _{g(TOT)}	I _D = 3.9A, V _{DS} = 800V, V _{GS} = 10V (Figure 13)	-	120	nC
Thermal Resistance Junction to Case	$R_{\theta JC}$		-	0.83	°C/W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	Free Air Operation	-	40	°C/W

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNITS
Source to Drain Diode Voltage	V_{SD}	I _{SD} = 4.3A (Figure 12)	-	1.8	V
Reverse Recovery Time	t _{rr}	$I_{SD} = 3.9A$, $dI_{SD}/dt = 100A/\mu s$	-	1000	ns

NOTES:

- 2. Pulse test: pulse width $\leq 300 \mu s$, duty cycle $\leq 2\%$.
- 3. Repetitive rating: pulse width limited by Max junction temperature.
- 4. V_{DD} = 25V, starting T_J = 25 o C, L = 640 μ H, R_G = 25 Ω , peak I_{AS} = 9.2A (Figure 3).

Typical Performance Curves Unless Otherwise Specified

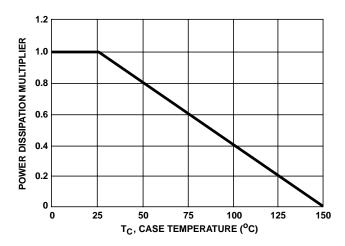


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

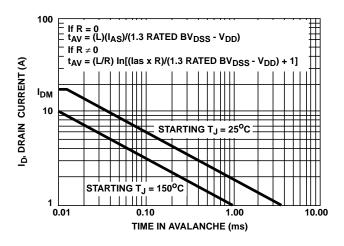


FIGURE 3. UNCLAMPED INDUCTIVE SWITCHING SOA

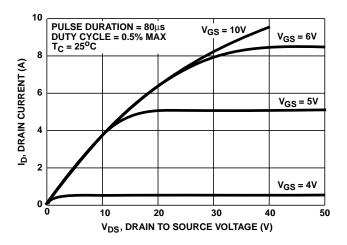


FIGURE 5. SATURATION CHARACTERISTICS

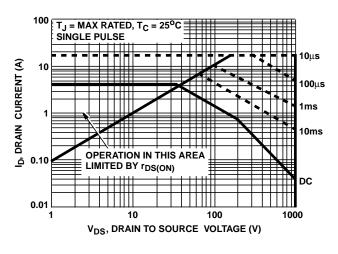


FIGURE 2. FORWARD BIAS SAFE OPERATING AREA

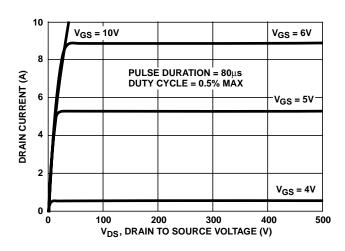


FIGURE 4. OUTPUT CHARACTERISTICS

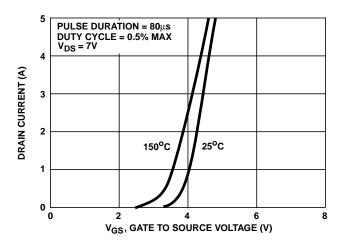


FIGURE 6. TRANSFER CHARACTERISTICS

Typical Performance Curves Unless Otherwise Specified (Continued)

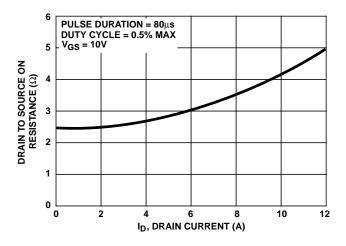


FIGURE 7. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

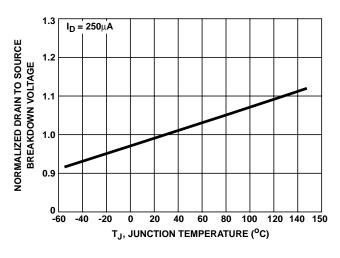


FIGURE 9. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs. JUNCTION TEMPERATURE

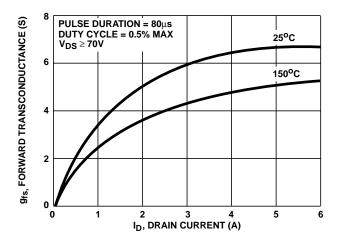


FIGURE 11. TRANSCONDUCTANCE vs DRAIN CURRENT

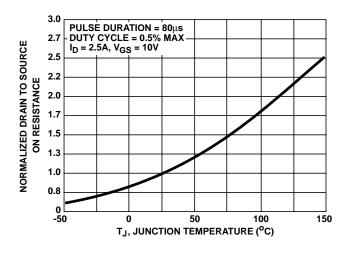


FIGURE 8. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

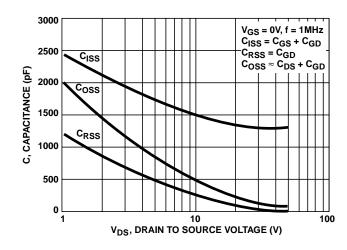


FIGURE 10. CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

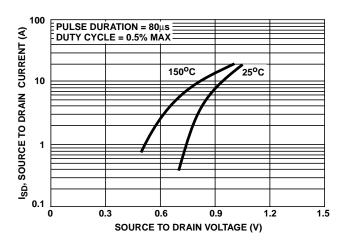


FIGURE 12. SOURCE TO DRAIN DIODE VOLTAGE

Typical Performance Curves Unless Otherwise Specified (Continued)

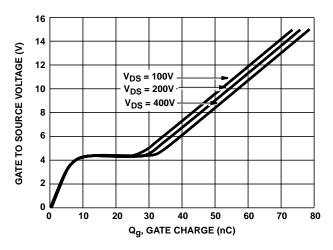


FIGURE 13. GATE TO SOURCE VOLTAGE vs GATE CHARGE

Test Circuits and Waveforms

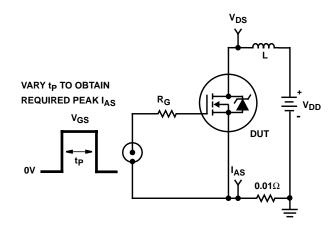


FIGURE 14. UNCLAMPED ENERGY TEST CIRCUIT

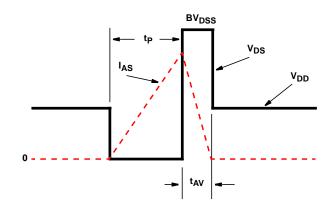


FIGURE 15. UNCLAMPED ENERGY WAVEFORMS

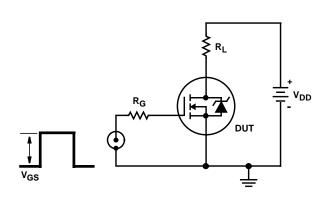


FIGURE 16. SWITCHING TIME TEST CIRCUIT

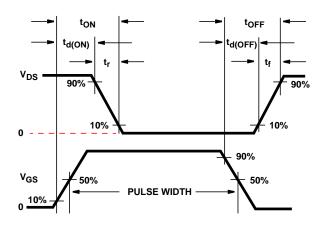


FIGURE 17. RESISTIVE SWITCHING WAVEFORMS

Test Circuits and Waveforms (Continued)

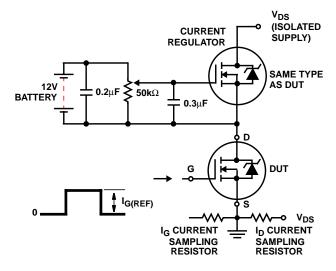


FIGURE 18. GATE CHARGE TEST CIRCUIT

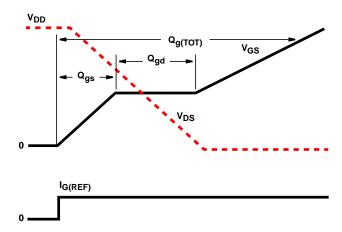


FIGURE 19. GATE CHARGE WAVEFORMS

All Intersil semiconductor products are manufactured, assembled and tested under ISO9000 quality systems certification.

Intersil semiconductor products are sold by description only. Intersil Corporation reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Intersil is believed to be accurate and reliable. However, no responsibility is assumed by Intersil or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Intersil or its subsidiaries.

For information regarding Intersil Corporation and its products, see web site http://www.intersil.com

Sales Office Headquarters

NORTH AMERICA

Intersil Corporation
P. O. Box 883, Mail Stop 53-204
Melbourne, FL 32902

TEL: (407) 724-7000 FAX: (407) 724-7240 **EUROPE**

Intersil SA Mercure Center 100, Rue de la Fusee 1130 Brussels, Belgium TEL: (32) 2.724.2111

FAX: (32) 2.724.2111

ASIA

Intersil (Taiwan) Ltd. 7F-6, No. 101 Fu Hsing North Road Taipei, Taiwan

Republic of China TEL: (886) 2 2716 9310 FAX: (886) 2 2715 3029