

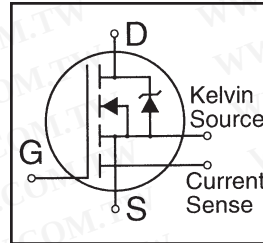
International **IR** Rectifier

PD - 9.529B

IRCZ44

HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Current Sense
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DSS} = 60V$$

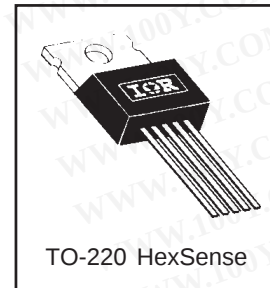
$$R_{DS(on)} = 0.028\Omega$$

$$I_D = 50^*A$$

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device, low on-resistance and cost-effectiveness.

The HEXSense device provides an accurate fraction of the drain current through the additional two leads to be used for control or protection of the device. These devices exhibit similar electrical and thermal characteristics as their IRF-series equivalent part numbers. The provision of a kelvin source connection effectively eliminates problems of common source inductance when the HEXSense is used as a fast, high-current switch in non current-sensing applications.



Absolute Maximum Ratings

Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	50*
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V	37
I_{DM}	Pulsed Drain Current ①	210
P_D @ $T_C = 25^\circ C$	Power Dissipation	150
	Linear Derating Factor	1.0
V_{GS}	Gate-to-Source Voltage	± 20
E_{AS}	Single Pulse Avalanche Energy ②	30
dv/dt	Peak Diode Recovery dv/dt ③	4.5
T_J	Operating Junction and	-55 to + 175
T_{STG}	Storage Temperature Range	
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1 N•m)

Thermal Resistance

Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.0	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

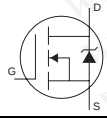
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Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V $V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.060	—	$V/^\circ\text{C}$ Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.028	Ω $V_{GS} = 10V, I_D = 31A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V $V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	18	—	—	S $V_{DS} = 25V, I_D = 31A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	$V_{DS} = 60V, V_{GS} = 0V$
		—	—	250	$V_{DS} = 48V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100	$V_{GS} = -20V$
Q_g	Total Gate Charge	—	—	95	$I_D = 52A$
Q_{gs}	Gate-to-Source Charge	—	—	27	nC $V_{DS} = 48V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	46	$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	19	—	$V_{DD} = 30V$
t_r	Rise Time	—	120	—	$I_D = 52A$
$t_{d(off)}$	Turn-Off Delay Time	—	55	—	$R_G = 9.1\Omega$
t_f	Fall Time	—	86	—	$R_D = 0.54\Omega$, See Fig. 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH Between lead, 6 mm (0.25in.) from package and center of die contact
L_C	Internal Source Inductance	—	7.5	—	
C_{iss}	Input Capacitance	—	2500	—	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1200	—	$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	200	—	$f = 1.0MHz$, See Fig. 5
r	Current Sensing Ratio	2460	—	2720	$I_D = 52A, V_{GS} = 10V$
C_{oss}	Output Capacitance of Sensing Cells	—	9.0	—	$V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz$

Source-Drain Ratings and Characteristics

Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	50*	A MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	210	
V_{SD}	Diode Forward Voltage	—	—	2.5	V $T_J = 25^\circ\text{C}, I_S = 52A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	140	300	ns $T_J = 25^\circ\text{C}, I_F = 52A$
Q_{rr}	Reverse Recovery Charge	—	1.2	2.8	nC $di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)			

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}$, $L = 0.013mH$
 $R_G = 25\Omega$, $I_{AS} = 52A$. (See Figure 12)
- ③ $I_{SD} \leq 52A$, $di/dt \leq 250A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

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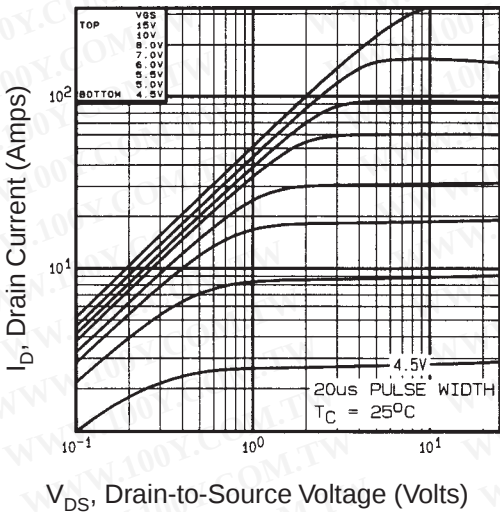


Fig. 1 Typical Output Characteristics,
 $T_C=25^\circ\text{C}$

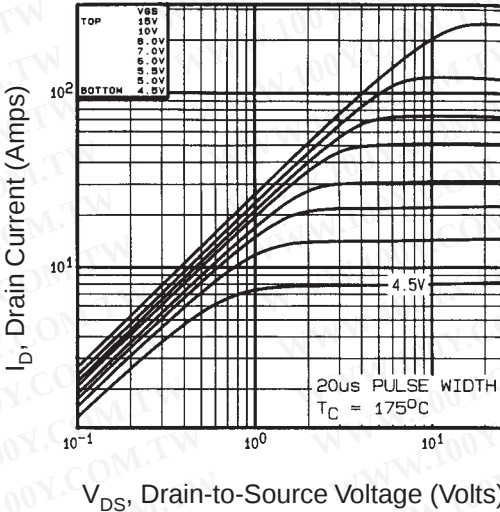


Fig. 2 Typical Output Characteristics,
 $T_C=175^\circ\text{C}$

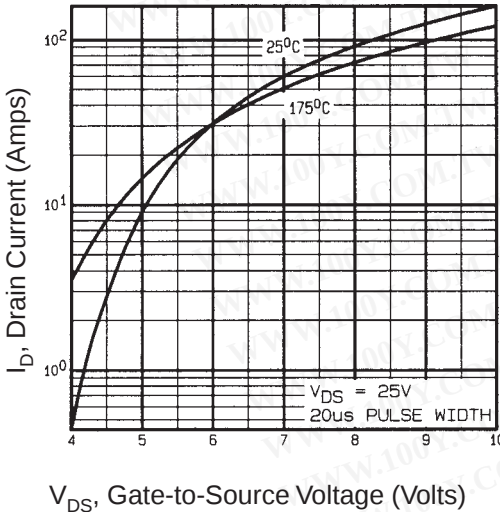


Fig. 3 Typical Transfer Characteristics

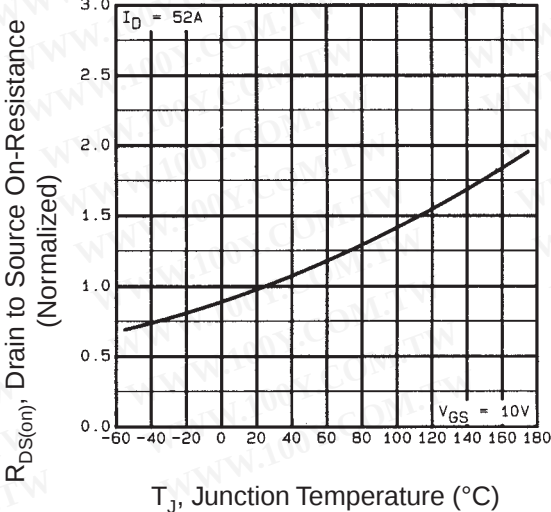


Fig. 4 Normalized On-Resistance vs.
Temperature

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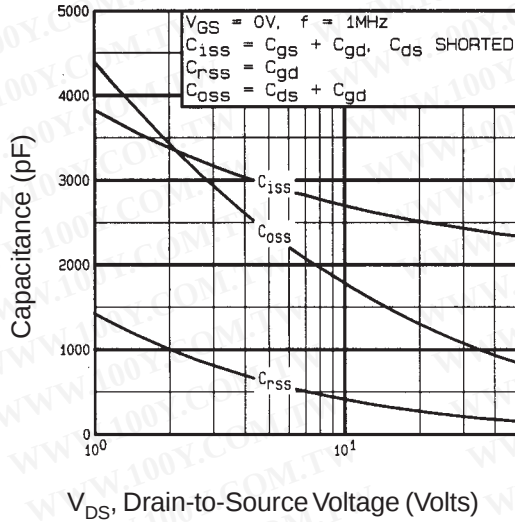


Fig. 5 Typical Capacitance vs. Drain-to-Source Voltage

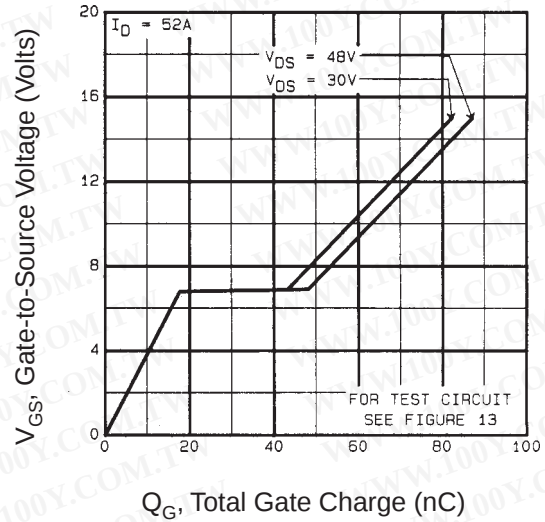


Fig. 6 Typical Gate Charge vs. Gate-to-Source Voltage

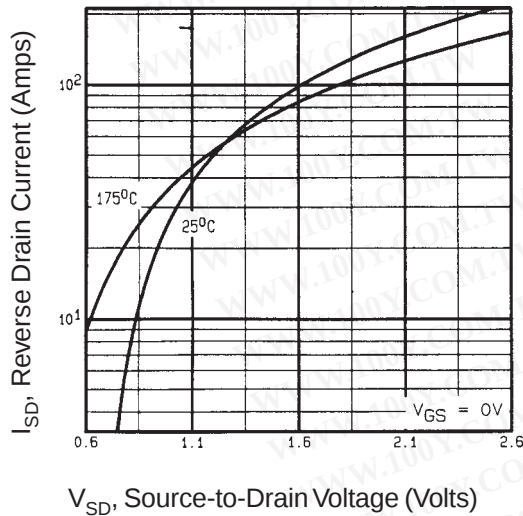


Fig. 7 Typical Source-Drain Diode Forward Voltage

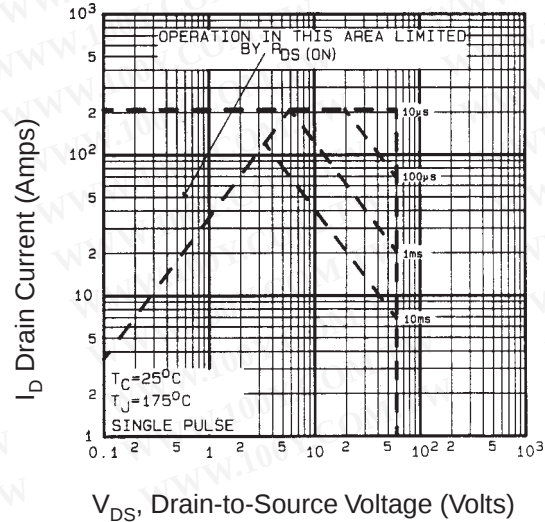


Fig. 8 Maximum Safe Operating Area

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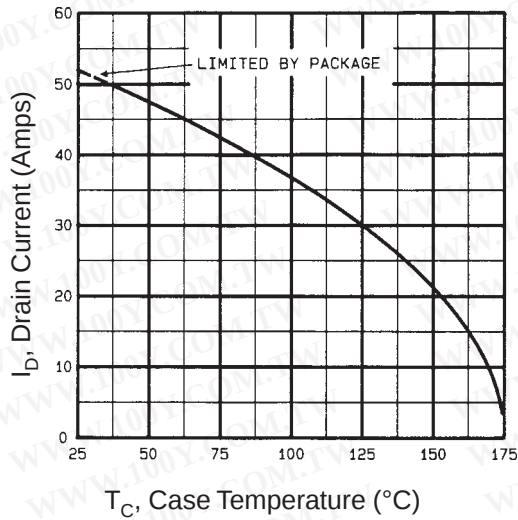


Fig. 9 Maximum Drain Current vs. Case Temperature

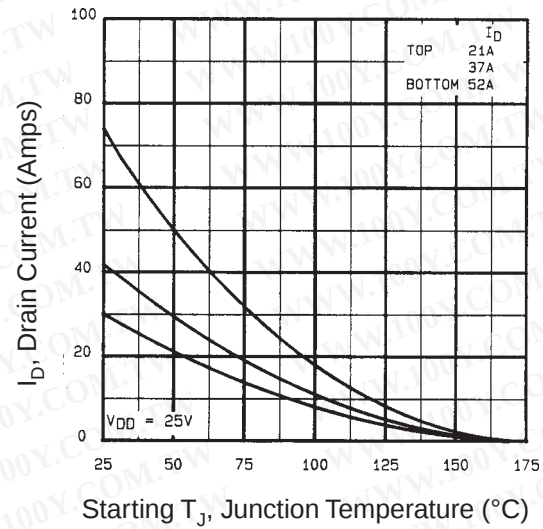


Fig. 12c Maximum Avalanche Energy vs. Drain Current

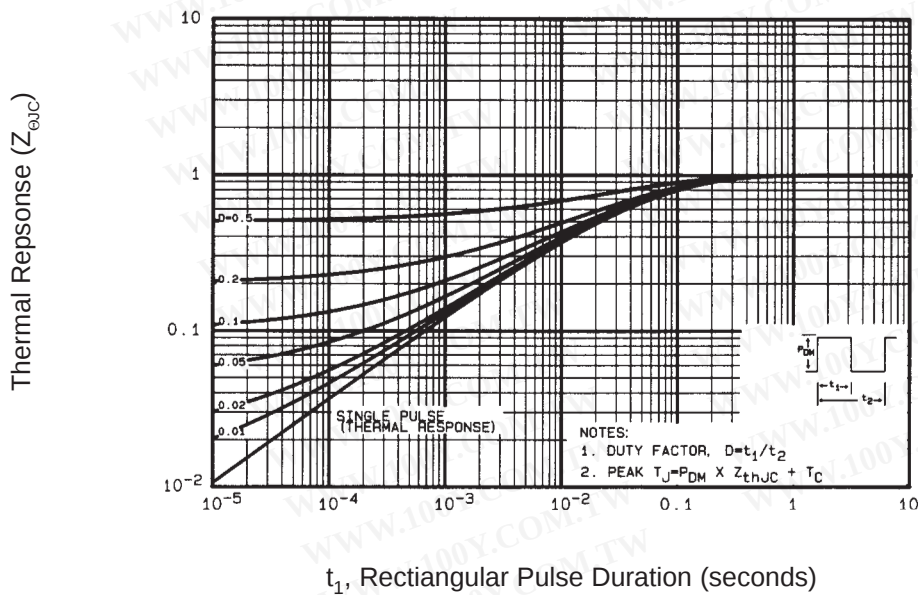


Fig. 11 Maximum Effective Transient Thermal Impedance, Junction-to-Case

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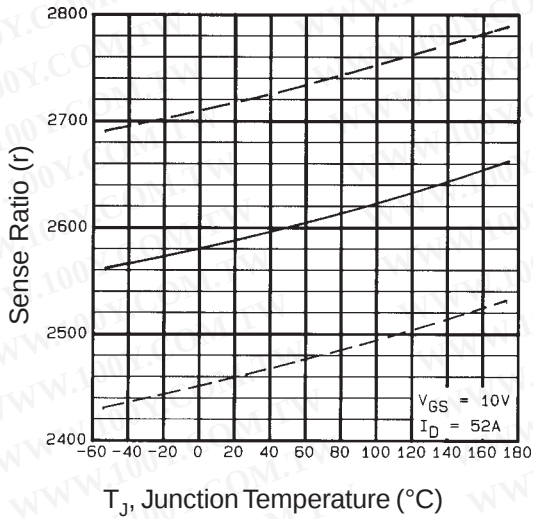


Fig. 15 Typical HEXSense Ratio vs. Junction Temperature

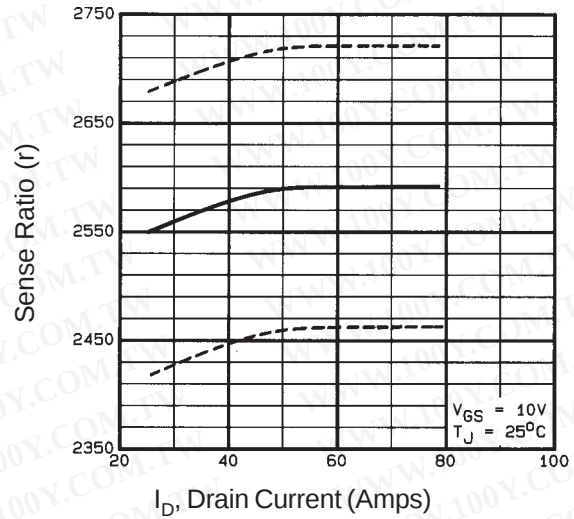


Fig. 16 Typical HEXSense Ratio vs. Drain Current

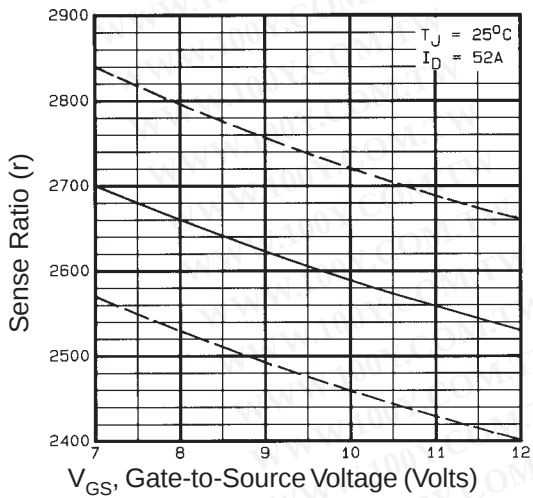


Fig. 17 Typical HEXSense Ratio vs. Gate Voltage

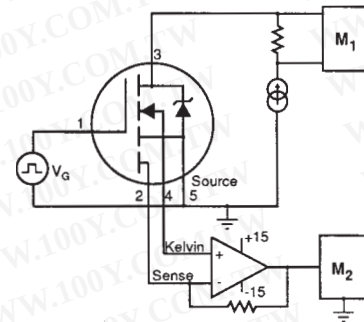


Fig. 18 HEXSense Ratio Test Circuit

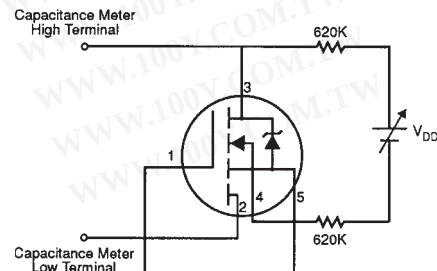


Fig. 19 HEXSense Sensing Cell Output Capacitance Test Circuit

Mechanical drawings, Appendix A
 Part marking information, Appendix B
 Test Circuit diagrams, Appendix C