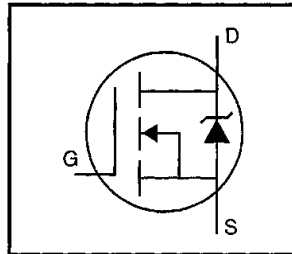


# IRFD024

## HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- For Automatic Insertion
- End Stackable
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DSS} = 60V$$

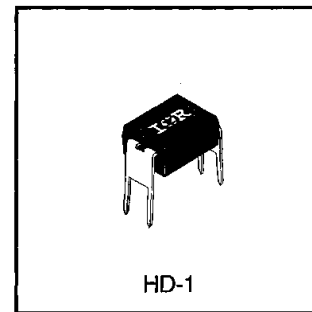
$$R_{DS(on)} = 0.10\Omega$$

$$I_D = 2.5A$$

### Description

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

The 4-pin DIP package is a low cost machine-insertable case style which can be stacked in multiple combinations on standard 0.1 inch pin centers. The dual drain serves as a thermal link to the mounting surface for power dissipation levels up to 1 watt.



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	2.5	A
$I_D @ T_A = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	1.8	
$I_{DM}$	Pulsed Drain Current ①	20	
$P_D @ T_A = 25^\circ C$	Power Dissipation	1.3	W
	Linear Derating Factor	0.0083	W/°C
$V_{GS}$	Gate-to-Source Voltage	1.6	V
$E_{AS}$	Single Pulse Avalanche Energy ②	91	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10sec		

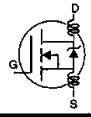
### Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient	—	120	°C/W

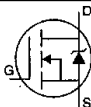
# IRFD024

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IR Rectifier

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

	Parameter	Min.	Typ.	Max.	Units	Test 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	—	0.061	—	V/°C	Reference to $25^\circ\text{C}, I_D=1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.10	$\Omega$	$V_{GS}=10V, I_D=1.5A$ 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	0.90	—	—	S	$V_{DS}=25V, I_D=1.5A$ ④
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS}=60V, V_{GS}=0V$
		—	—	250		$V_{DS}=48V, V_{GS}=0V, T_J=150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS}=20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS}=-20V$
$Q_g$	Total Gate Charge	—	—	25	nC	$I_D=17A$
$Q_{gs}$	Gate-to-Source Charge	—	—	5.8		$V_{DS}=48V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	11		$V_{GS}=10V$ See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	13	—	ns	$V_{DD}=30V$
$t_r$	Rise Time	—	58	—		$I_D=17A$
$t_{d(off)}$	Turn-Off Delay Time	—	25	—		$R_G=18\Omega$
$t_f$	Fall Time	—	42	—		$R_D=1.7\Omega$ See Figure 10 ④
$L_D$	Internal Drain Inductance	—	4.0	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact 
$L_S$	Internal Source Inductance	—	6.0	—		
$C_{iss}$	Input Capacitance	—	640	—	pF	$V_{GS}=0V$
$C_{oss}$	Output Capacitance	—	360	—		$V_{DS}=25V$
$C_{rss}$	Reverse Transfer Capacitance	—	79	—		$f=1.0\text{MHz}$ See Figure 5

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	2.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	20		
$V_{SD}$	Diode Forward Voltage	—	—	1.5	V	$T_J=25^\circ\text{C}, I_S=2.5A, V_{GS}=0V$ ④
$t_{rr}$	Reverse Recovery Time	—	88	180	ns	$T_J=25^\circ\text{C}, I_F=17A$
$Q_{rr}$	Reverse Recovery Charge	—	0.29	0.64	$\mu C$	$di/dt=100A/\mu s$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ )				

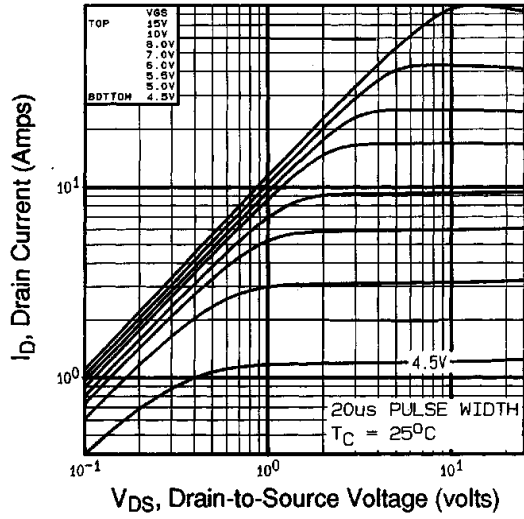
### Notes:

① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)

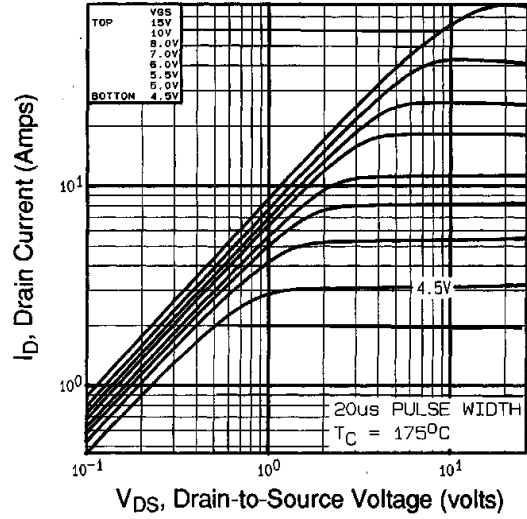
③  $I_{SD} \leq 17A, di/dt \leq 140A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$

②  $V_{DD}=25V, \text{starting } T_J=25^\circ\text{C}, L=16\text{mH}, R_G=25\Omega, I_{AS}=2.5A$  (See Figure 12)

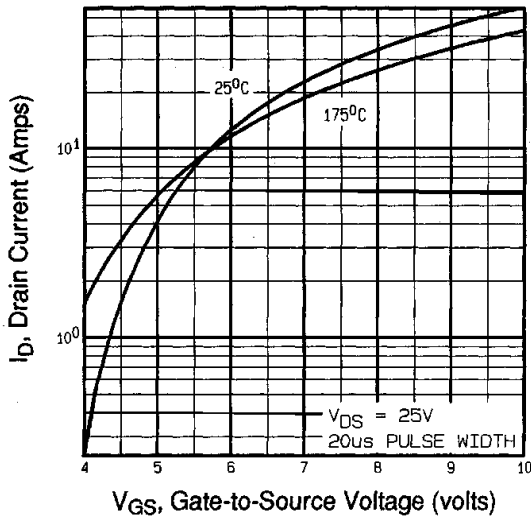
④ Pulse width  $\leq 300 \mu s$ ; duty cycle  $\leq 2\%$ .



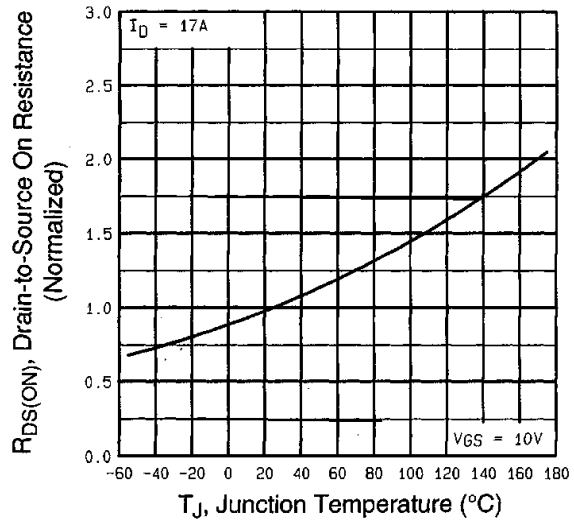
**Fig 1.** Typical Output Characteristics,  
 $T_C=25^\circ\text{C}$



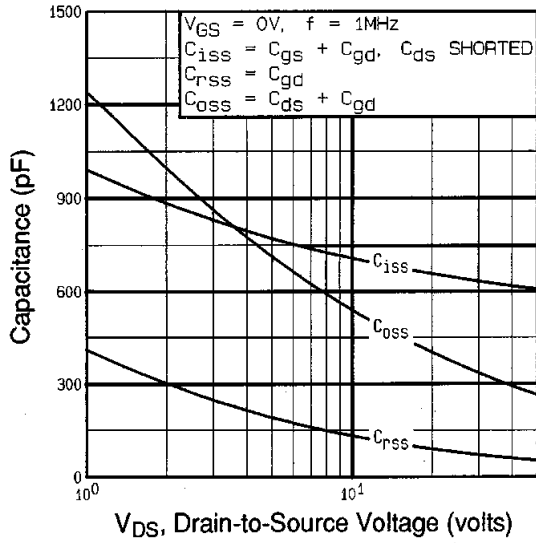
**Fig 2.** Typical Output Characteristics,  
 $T_C=175^\circ\text{C}$



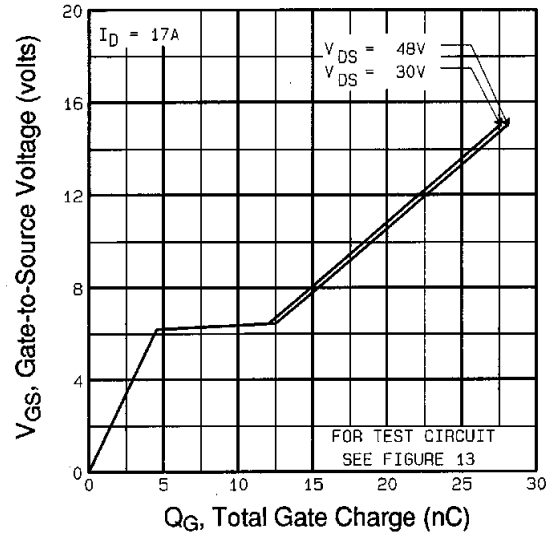
**Fig 3.** Typical Transfer Characteristics



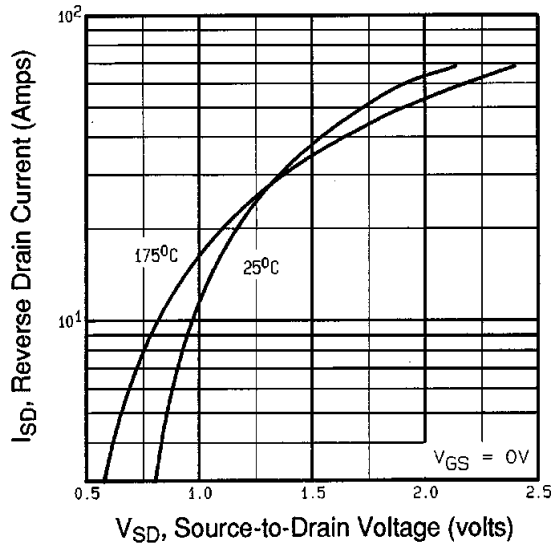
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



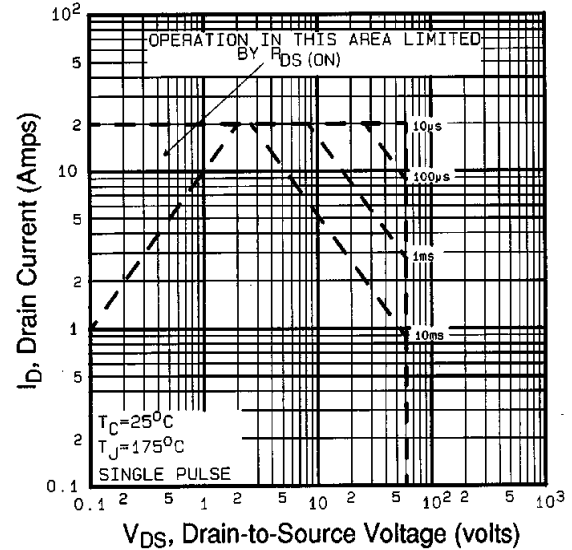
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



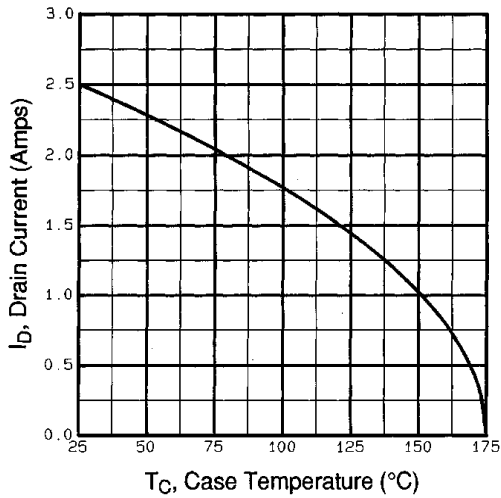
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



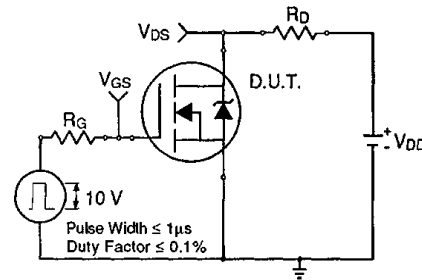
**Fig 7.** Typical Source-Drain Diode Forward Voltage



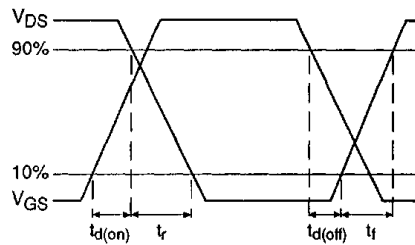
**Fig 8.** Maximum Safe Operating Area



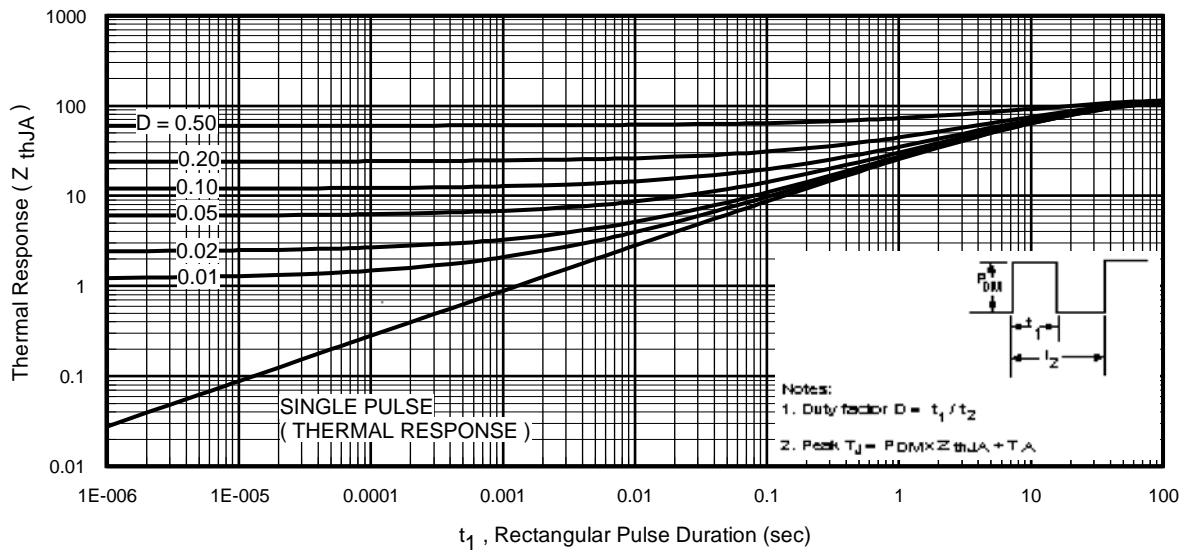
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit



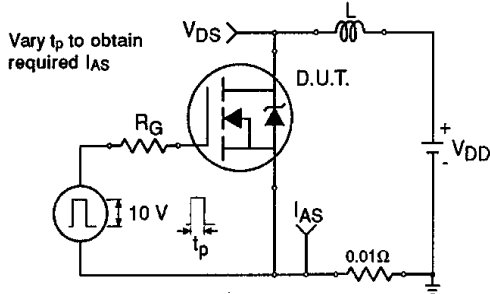
**Fig 10b.** Switching Time Waveforms



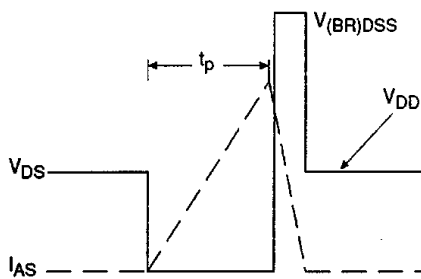
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

# IRFD024

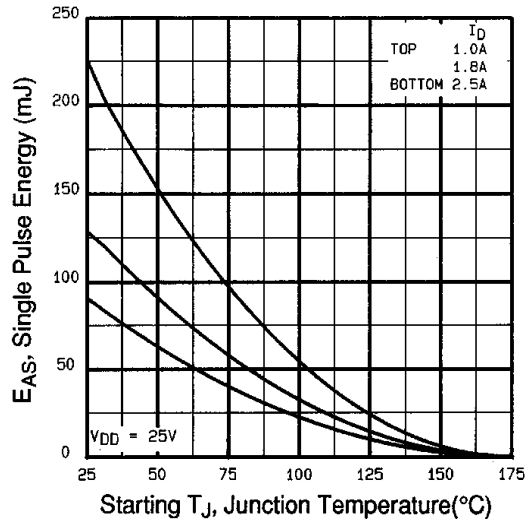
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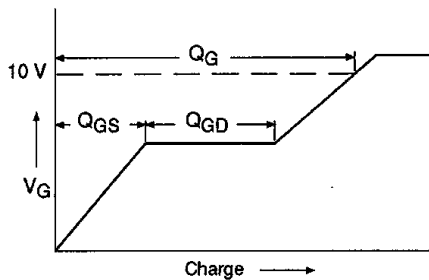
**Fig 12a.** Unclamped Inductive Test Circuit



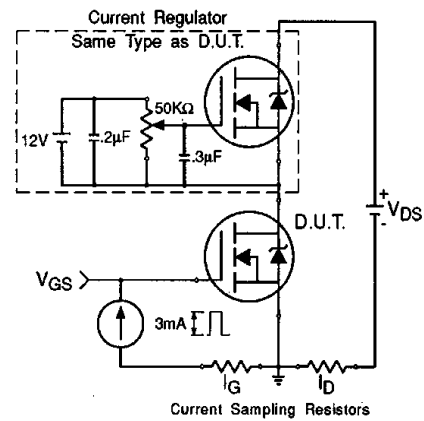
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit

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