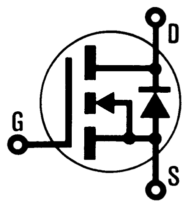
INTERNATIONAL RECTIFIER **I⊘R**

HEXFET® TRANSISTORS IRFH150

N-CHANNEL POWER MOSFETs



100 Volt, 0.06 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and great device ruggedness.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, freedom from second breakdown, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

Features:

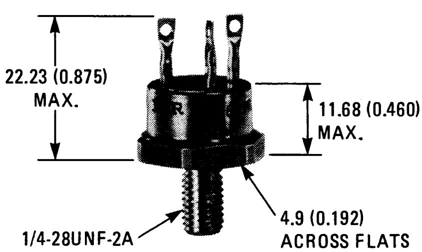
- Fast Switching
- Low Drive Current
- Ease of Paralleling
- No Second Breakdown
- Excellent Temperature Stability

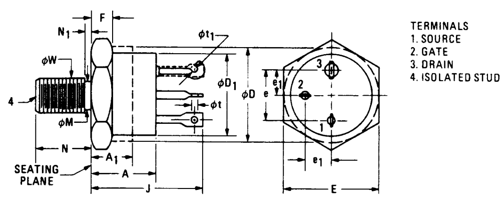
Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFH150	100V	0.06Ω	30A*

*Current limited by pin diameter

CASE STYLE AND DIMENSIONS





Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes	Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes
A	0.325	0.460	8.26	11.68		J	0.640	0.875	16.26	22.23	
A_1		0.270		6.86	2	φM	0.220	0.249	5.59	6.32	
φD	0.610	0.687	15.49	17.45	2	N	0.422	0.455	10.72	11.56	
$φD_1$	0.570	0.610	14.48	15.49		N_1		0.090		2.29	
E	0.667	0.687	16.94	17.45		φt	0.055	0.072	1.19	1.83	
e	0.340	0.415	8.64	10.54	5	$φt_1$	0.046	0.077	1.17	1.96	4
e_1	0.170	0.213	4.32	5.41	5	φW	0.2225	0.2268	5.561	5.761	3
F	0.090	0.150	2.29	3.81	1						

NOTES:

1. DIMENSION DOES NOT INCLUDE SEALING FLANGES.
2. PACKAGE CONTOUR OPTIONAL WITHIN DIMENSIONS SPECIFIED.
3. PITCH DIAMETER – THREAD 1/4-28 UNF-2A (COATED).
   REFERENCE (SCREW THREAD STANDARDS FOR FEDERAL SERVICES – HANDBOOK H-28).
4. THIS TERMINAL CAN BE FLATTENED AND PIERCED OR HOOK TYPE.
5. POSITION OF LEADS IN RELATION TO THE HEXAGON IS NOT CONTROLLED.

Conforms to JEDEC Outline TO-210AC (TO-61)
Dimensions in Millimeters and (Inches)

IRFH150 Device

Absolute Maximum Ratings

Parameter		IRFH150	Units
V_{DS}	Drain - Source Voltage ①	100	V
V_{DGR}	Drain - Gate Voltage (R_{GS} = 20 KΩ) ①	100	V
I_D @ T_C = 25°C	Continuous Drain Current	30*	A
I_D @ T_C = 100°C	Continuous Drain Current	24	A
I_{DM}	Pulsed Drain Current ③	120	A
V_{GS}	Gate - Source Voltage	± 20	V
P_D @ T_C = 25°C	Max. Power Dissipation	150 (See Fig. 13)	W
	Linear Derating Factor	1.2 (See Fig. 13)	W/K
I_{LM}	Inductive Current, Clamped	(See Fig. 14 and 15) L = 100µH 120	A
T_J T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150	°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	°C

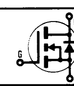
Electrical Characteristics @T_C = 25°C (Unless Otherwise Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain - Source Breakdown Voltage	IRFH150	100	–	–	V	V_{GS} = 0V, I_D = 250µA
$V_{GS(th)}$	Gate Threshold Voltage	IRFH150	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 250µA
I_{GSS}	Gate - Source Leakage Forward	IRFH150	–	–	100	nA	V_{GS} = 20V
I_{GSS}	Gate - Source Leakage Reverse	IRFH150	–	–	-100	nA	V_{GS} = -20V
I_{DSS}	Zero Gate Voltage Drain Current	IRFH150	–	–	250	µA	V_{DS} = Max. Rating, V_{GS} = 0V
			–	–	1000	µA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_C = 125°C
$V_{DS(on)}$	On-State Voltage ②	IRFH150	–	–	1.80	V	V_{GS} = 10V, I_D = 30A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ②	IRFH150	–	0.045	0.06	Ω	V_{GS} = 10V, I_D = 24A
g_{fs}	Forward Transconductance ②	IRFH150	9.0	13	–	S (℧)	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 24A
C_{iss}	Input Capacitance	IRFH150	–	2000	3000	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	IRFH150	–	1000	1500	pF	
C_{rss}	Reverse Transfer Capacitance	IRFH150	–	350	500	pF	
C_{dc}	Drain-to-Case Capacitance	IRFH150	–	9.0	12	pF	V_{DC} = 25V, f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time	IRFH150	–	–	35	ns	V_{DD} ≃ 25V, I_D = 24A, Z_o = 4.7Ω See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
t_r	Rise Time	IRFH150	–	–	100	ns	
$t_{d(off)}$	Turn-Off Delay Time	IRFH150	–	–	125	ns	
t_f	Fall Time	IRFH150	–	–	100	ns	

Thermal Resistance

R_{thJC}	Junction-to-Case	IRFH150	–	–	0.83	K/W	
R_{thCS}	Case-to-Sink	IRFH150	–	0.4	–	K/W	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	IRFH150	–	–	40	K/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFH150	–	–	30	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
I_{SM}	Pulse Source Current (Body Diode) ③	IRFH150	–	–	120	A	
V_{SD}	Diode Forward Voltage ②	IRFH150	–	–	1.9	V	T_C = 25°C, I_S = 30A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	IRFH150	–	600	–	ns	T_J = 150°C, I_F = 30A, dI_F/dt = 100A/µs
Q_{RR}	Reverse Recovered Charge	IRFH150	–	3.3	–	µC	T_J = 150°C, I_F = 30A, dI_F/dt = 100A/µs
t_{on}	Forward Turn-on Time	IRFH150	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

①T_J = 25°C to 150°C. ②Pulse Test: Pulse width ≤ 300µs, Duty Cycle ≤ 2%. ③Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

*Current limited by pin diameter.

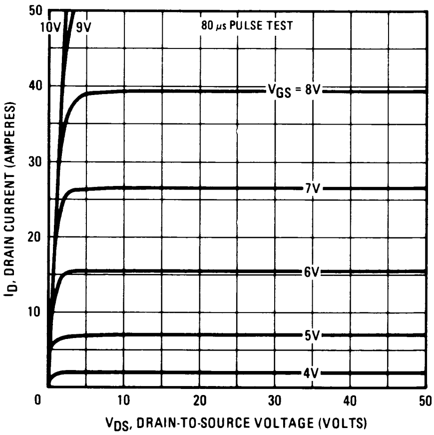


Fig. 1 — Typical Output Characteristics

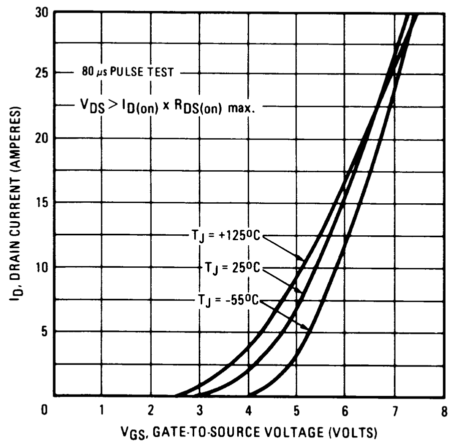


Fig. 2 — Typical Transfer Characteristics

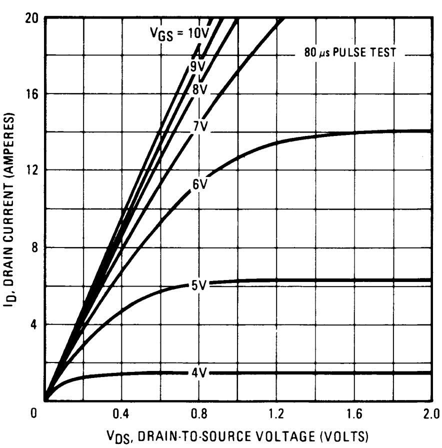


Fig. 3 — Typical Saturation Characteristics

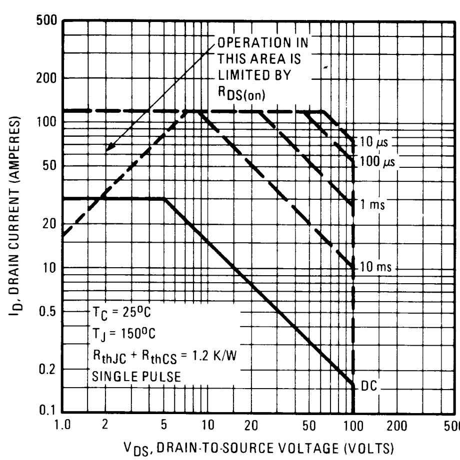


Fig. 4 — Maximum Safe Operating Area

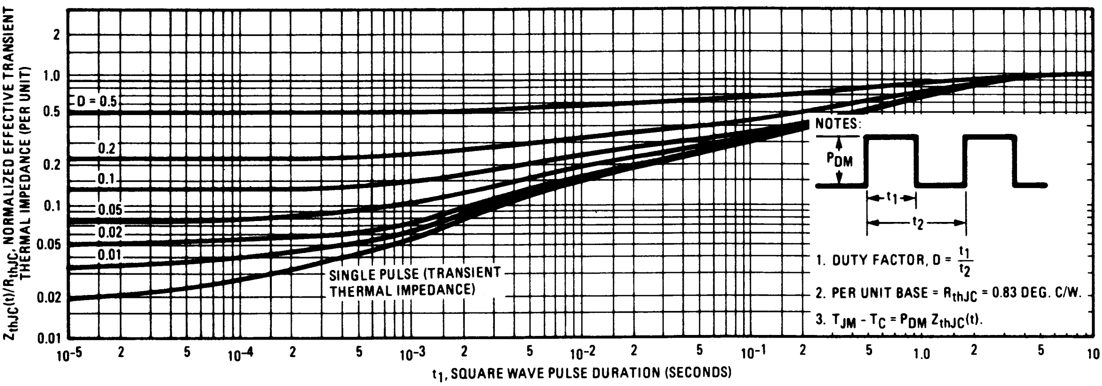


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

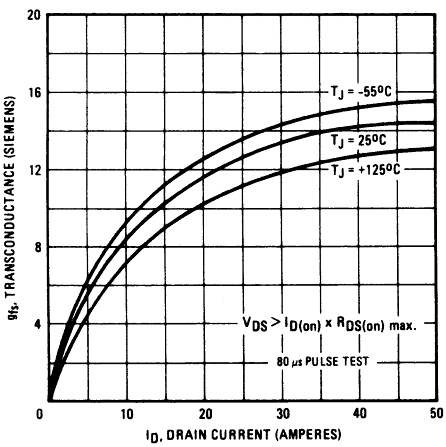


Fig. 6 — Typical Transconductance Vs. Drain Current

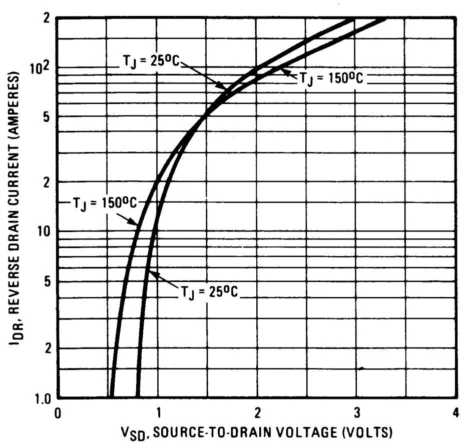


Fig. 7 — Typical Source-Drain Diode Forward Voltage

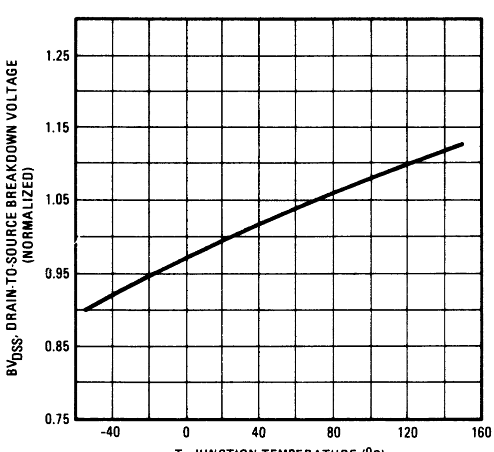


Fig. 8 — Breakdown Voltage Vs. Temperature

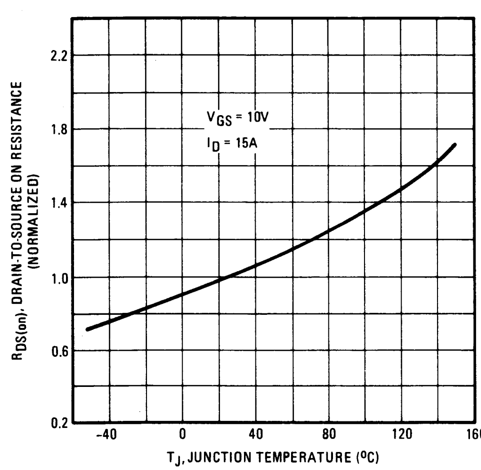


Fig. 9 — Normalized On-Resistance Vs. Temperature

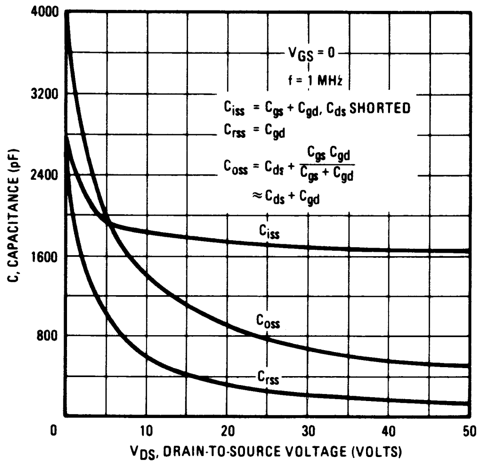


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

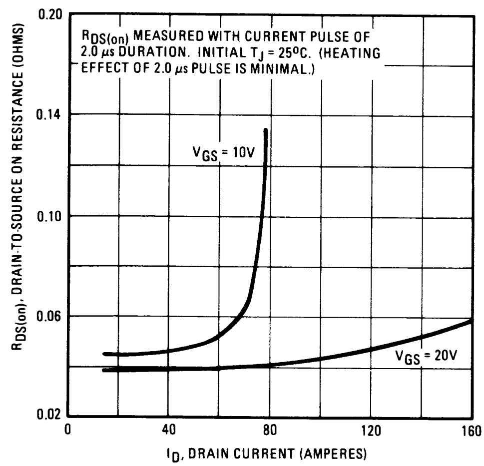


Fig. 11 — Typical On-Resistance Vs. Drain Current

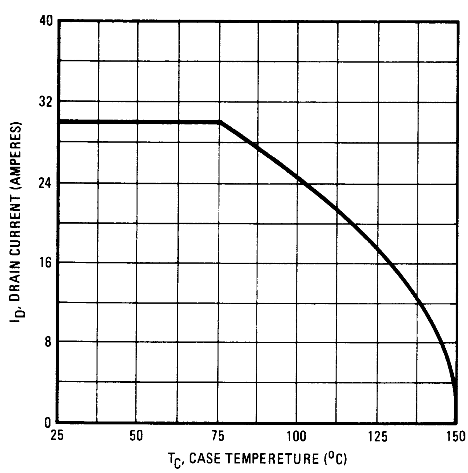


Fig. 12 — Maximum Drain Current Vs. Case Temperature

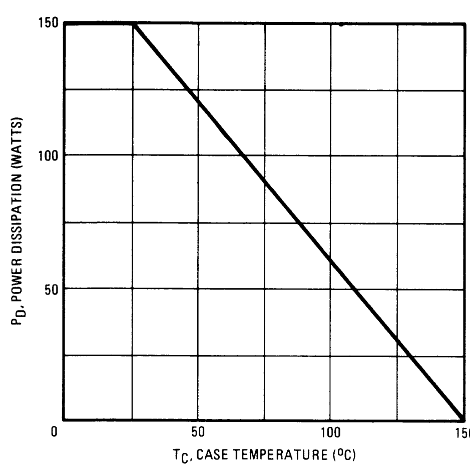


Fig. 13 — Power Vs. Temperature Derating Curve

IRFH150 Device

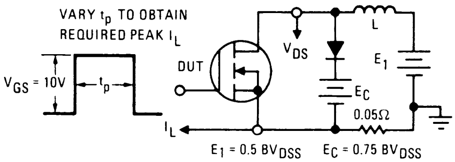


Fig. 14 — Clamped Inductive Test Circuit

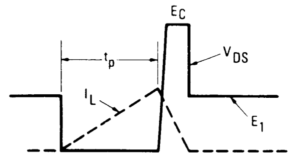


Fig. 15. — Clamped Inductive Waveforms

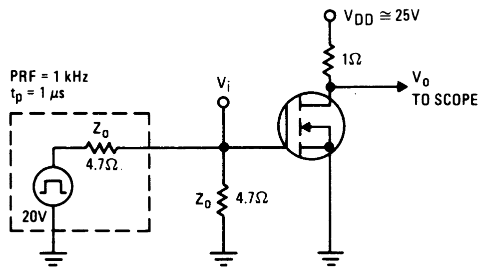


Fig. 16 — Switching Time Test Circuit

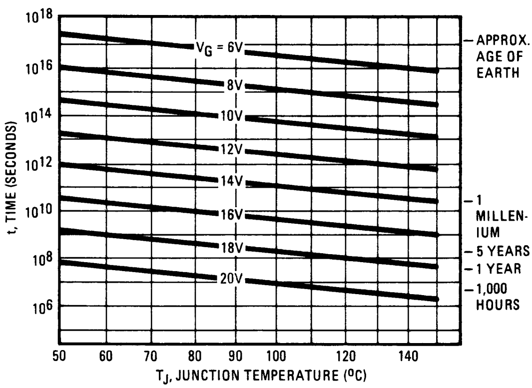


***Fig. 17 — Typical Time to Accumulated 1% Failure**

*The data shown is correct as of April 15, 1984. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.

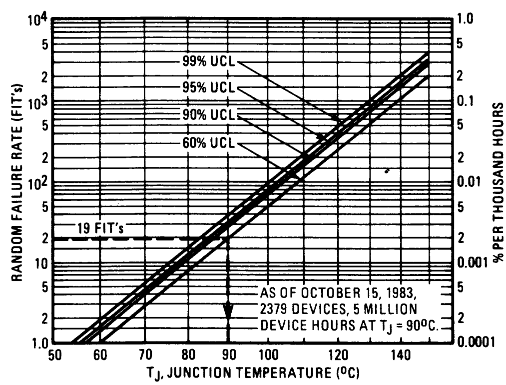
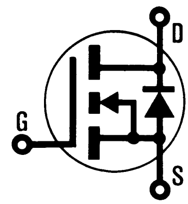


Fig. 18 — Typical High Temperature Reverse Bias (HTRB) Failure Rate

INTERNATIONAL RECTIFIER IOR

HEXFET® TRANSISTORS IRFH250

N-CHANNEL POWER MOSFETs



200 Volt, 0.090 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and great device ruggedness.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, freedom from second breakdown, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

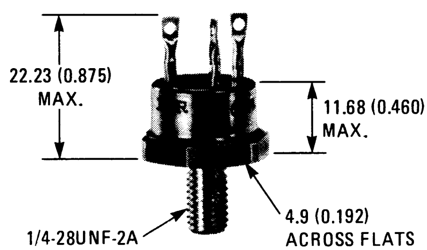
Features:

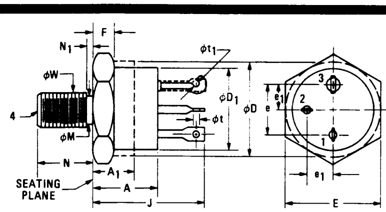
- Fast Switching
- Low Drive Current
- Ease of Paralleling
- No Second Breakdown
- Excellent Temperature Stability

Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFH250	200V	0.090Ω	30A

CASE STYLE AND DIMENSIONS





TERMINALS
1. SOURCE
2. GATE
3. DRAIN
4. ISOLATED STUD

Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes
A	0.325	0.460	8.26	11.68	
A_1		0.270		6.86	2
φD	0.610	0.687	15.49	17.45	2
φD_1	0.570	0.610	14.48	15.49	
E	0.667	0.687	16.94	17.45	
e	0.340	0.415	8.64	10.54	5
e_1	0.170	0.213	4.32	5.41	5
F	0.090	0.150	2.29	3.81	1
J	0.640	0.875	16.26	22.23	
φM	0.220	0.249	5.59	6.32	
N	0.422	0.455	10.72	11.56	
N_1		0.090		2.29	
φt	0.055	0.072	1.19	1.83	
φt_1	0.046	0.077	1.17	1.96	4
φW	0.2225	0.2268	5.561	5.761	3

NOTES:
1. DIMENSION DOES NOT INCLUDE SEALING FLANGES.
2. PACKAGE CONTOUR OPTIONAL WITHIN DIMENSIONS SPECIFIED.
3. PITCH DIAMETER – THREAD 1/4-28 UNF-2A (COATED).
   REFERENCE (SCREW THREAD STANDARDS FOR FEDERAL SERVICES – HANDBOOK H-28).
4. THIS TERMINAL CAN BE FLATTENED AND PIERCED OR HOOK TYPE.
5. POSITION OF LEADS IN RELATION TO THE HEXAGON IS NOT CONTROLLED.

Conforms to JEDEC Outline TO-210AC (TO-61)
Dimensions in Millimeters and (Inches)

IRFH250 Device

Absolute Maximum Ratings

Parameter		IRFH250	Units
V_{DS}	Drain - Source Voltage ①	200	V
V_{DGR}	Drain - Gate Voltage (R_{GS} = 20 KΩ) ①	200	V
I_D @ T_C = 25°C	Continuous Drain Current	30	A
I_D @ T_C = 100°C	Continuous Drain Current	18	A
I_{DM}	Pulsed Drain Current ③	120	A
V_{GS}	Gate - Source Voltage	± 20	V
P_D @ T_C = 25°C	Max. Power Dissipation	150 (See Fig. 13)	W
	Linear Derating Factor	1.2 (See Fig. 13)	W/K
I_{LM}	Inductive Current, Clamped	(See Fig. 14 and 15) L = 100μH 120	A
T_J T_{stg}	Operating Junction and Storage Temperature Range	−55 to 150	°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	°C

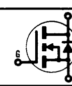
Electrical Characteristics @T_C = 25°C (Unless Otherwise Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain - Source Breakdown Voltage	IRFH250	200	—	—	V	V_{GS} = 0V, I_D = 250μA
$V_{GS(th)}$	Gate Threshold Voltage	IRFH250	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 250μ
I_{GSS}	Gate - Source Leakage Forward	IRFH250	—	—	100	nA	V_{GS} = 20V
I_{GSS}	Gate - Source Leakage Reverse	IRFH250	—	—	−100	nA	V_{GS} = −20V
I_{DSS}	Zero Gate Voltage Drain Current	IRFH250	—	—	250	μA	V_{DS} = Max. Rating, V_{GS} = 0V
			—	—	1000	μA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_C = 125°C
$V_{DS(on)}$	On-State Voltage ②	IRFH250	—	—	2.7	V	V_{GS} = 10V, I_D = 30A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ②	IRFH250	—	0.075	0.090	Ω	V_{GS} = 10V, I_D = 19A
g_{fs}	Forward Transconductance ②	IRFH250	9.0	15.5	—	S (℧)	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 19A
C_{iss}	Input Capacitance	IRFH250	—	2000	3000	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	IRFH250	—	800	1200	pF	
C_{rss}	Reverse Transfer Capacitance	IRFH250	—	300	500	pF	
C_{dc}	Drain-to-Case Capacitance	IRFH250	—	9.0	12	pF	V_{DC} = 25V, f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time	IRFH250	—	—	35	ns	V_{DD} ≅ 95V, I_D = 19A, Z_o = 4.7Ω See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
t_r	Rise Time	IRFH250	—	—	100	ns	
$t_{d(off)}$	Turn-Off Delay Time	IRFH250	—	—	125	ns	
t_f	Fall Time	IRFH250	—	—	100	ns	

Thermal Resistance

R_{thJC}	Junction-to-Case	IRFH250	—	—	0.83	K/W	
R_{thCS}	Case-to-Sink	IRFH250	—	0.4	—	K/W	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	IRFH250	—	—	40	K/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFH250	—	—	30	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
I_{SM}	Pulse Source Current (Body Diode) ③	IRFH250	—	—	120	A	
V_{SD}	Diode Forward Voltage ②	IRFH250	—	—	1.8	V	T_C = 25°C, I_S = 30A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	IRFH250	—	750	—	ns	T_J = 150°C, I_F = 30A, dI_F/dt = 100A/μs
Q_{RR}	Reverse Recovered Charge	IRFH250	—	4.7	—	μC	T_J = 150°C, I_F = 30A, dI_F/dt = 100A/μs
t_{on}	Forward Turn-on Time	IRFH250	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

①T_J = 25°C to 150°C. ②Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%. ③Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

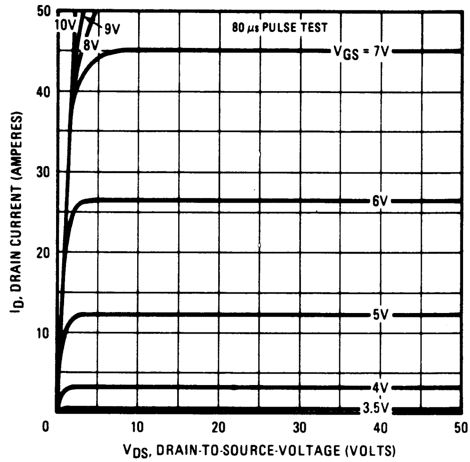


Fig. 1 — Typical Output Characteristics

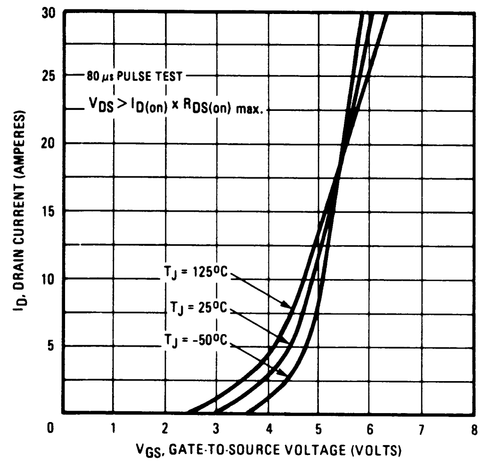


Fig. 2 — Typical Transfer Characteristics

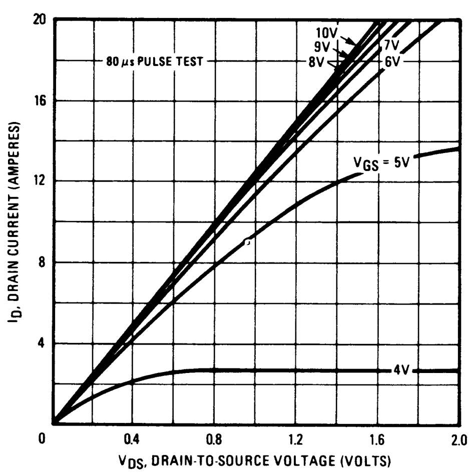


Fig. 3 — Typical Saturation Characteristics

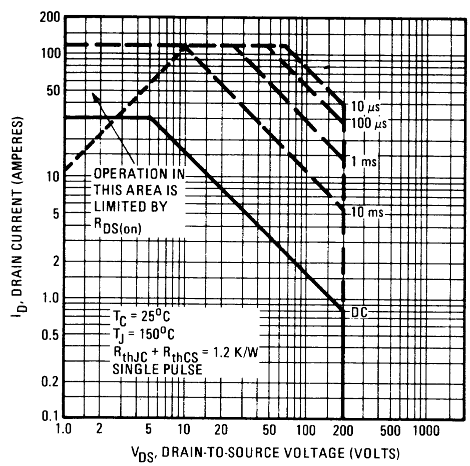


Fig. 4 — Maximum Safe Operating Area

IRFH250 Device

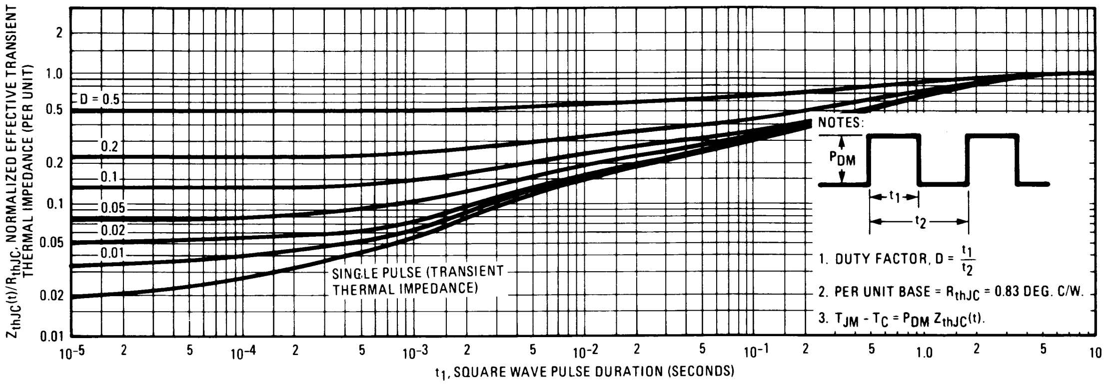


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

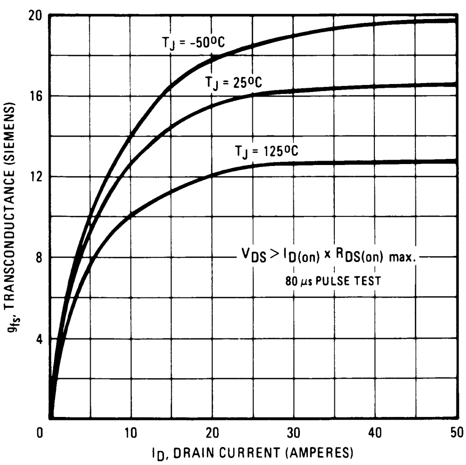


Fig. 6 — Typical Transconductance Vs. Drain Current

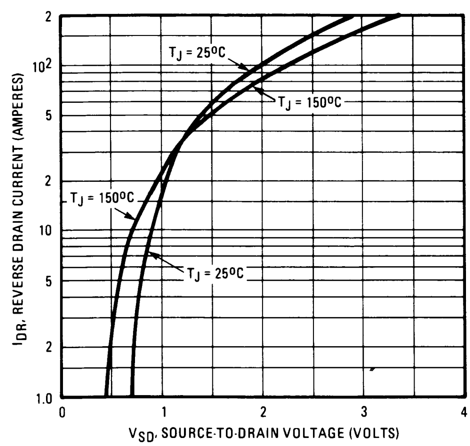


Fig. 7 — Typical Source-Drain Diode Forward Voltage

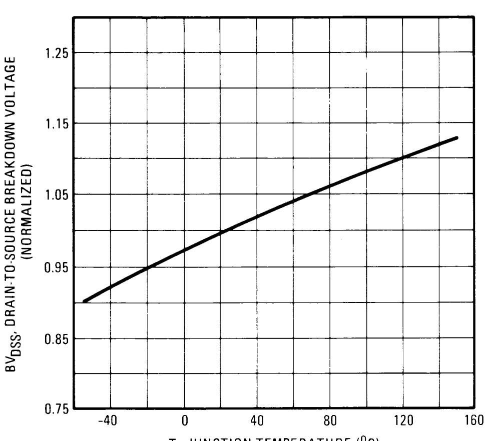


Fig. 8 — Breakdown Voltage Vs. Temperature

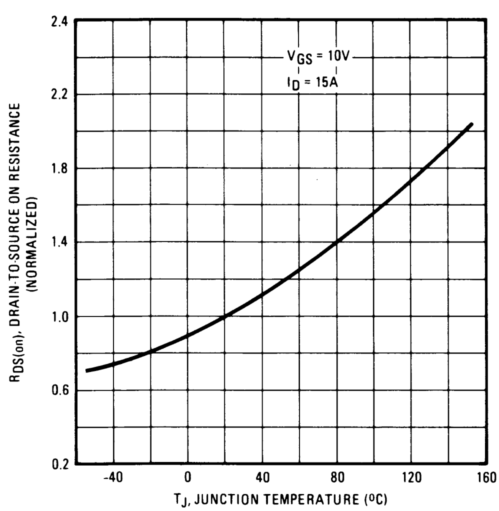


Fig. 9 — Normalized On-Resistance Vs. Temperature

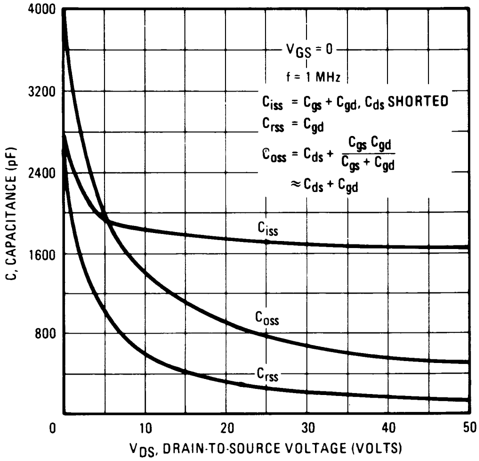


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

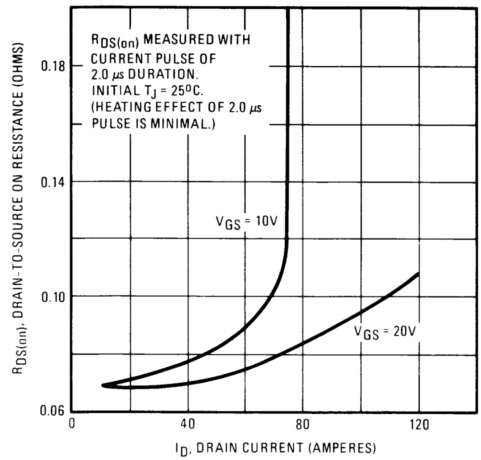


Fig. 11 — Typical On-Resistance Vs. Drain Current

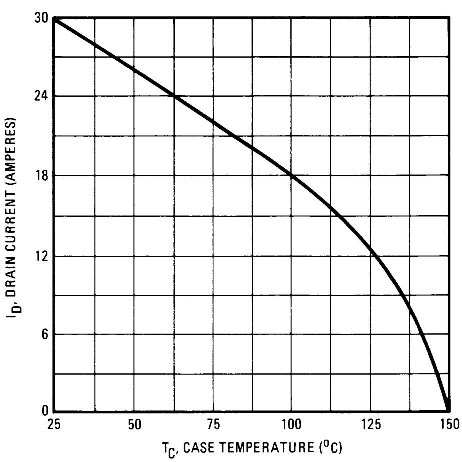


Fig. 12 — Maximum Drain Current Vs. Case Temperature

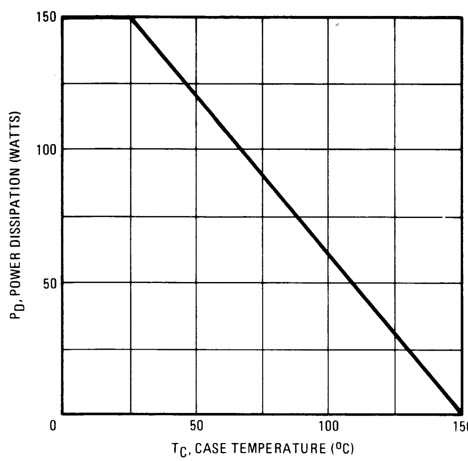


Fig. 13 — Power Vs. Temperature Derating Curve

IRFH250 Device

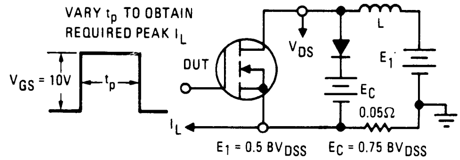


Fig. 14 — Clamped Inductive Test Circuit

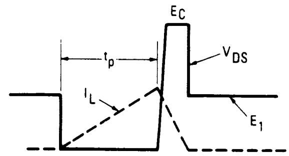


Fig. 15. — Clamped Inductive Waveforms

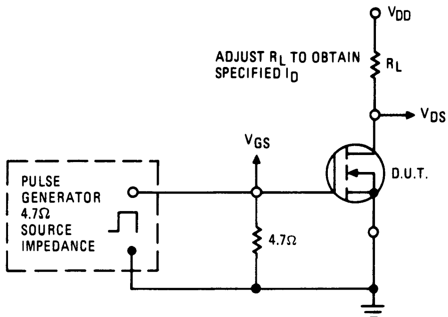


Fig. 16 — Switching Time Test Circuit

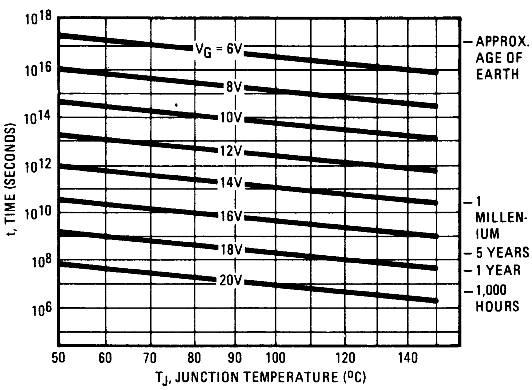


***Fig. 17 — Typical Time to Accumulated 1% Failure**

*The data shown is correct as of April 15, 1984. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.

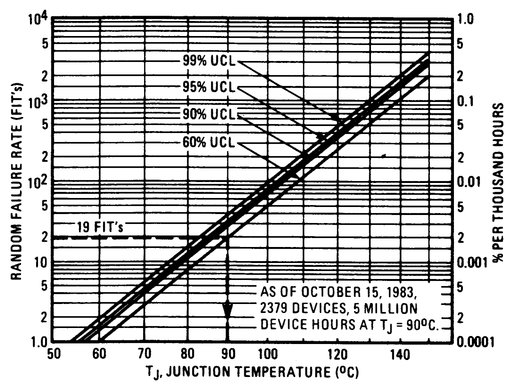


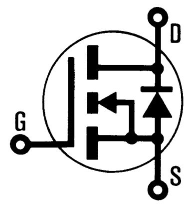
Fig. 18 — Typical High Temperature Reverse Bias (HTRB) Failure Rate

Data Sheet No. PD-9.412

INTERNATIONAL RECTIFIER IOR

HEXFET® TRANSISTORS IRFH350

N-CHANNEL POWER MOSFETs



400 Volt, 0.3 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and great device ruggedness.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, freedom from second breakdown, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

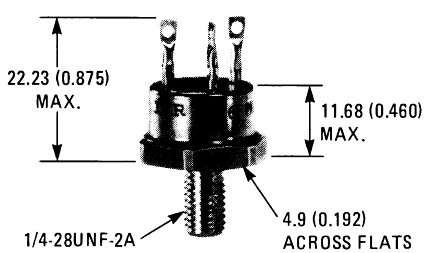
Features:

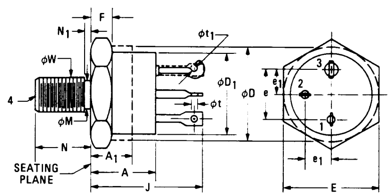
- Fast Switching
- Low Drive Current
- Ease of Paralleling
- No Second Breakdown
- Excellent Temperature Stability

Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFH350	400V	0.3Ω	15A

CASE STYLE AND DIMENSIONS





TERMINALS
1. SOURCE
2. GATE
3. DRAIN
4. ISOLATED STUD

Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes	Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes
A	0.325	0.460	8.26	11.68		J	0.640	0.875	16.26	22.23	
A_1		0.270		6.86	2	φM	0.220	0.249	5.59	6.32	
φD	0.610	0.687	15.49	17.45	2	N	0.422	0.455	10.72	11.56	
$φD_1$	0.570	0.610	14.48	15.49		N_1		0.090		2.29	
E	0.667	0.687	16.94	17.45		φt	0.055	0.072	1.19	1.83	
e	0.340	0.415	8.64	10.54	5	$φt_1$	0.046	0.077	1.17	1.96	4
e_1	0.170	0.213	4.32	5.41	5	φW	0.2225	0.2268	5.561	5.761	3
F	0.090	0.150	2.29	3.81	1						

NOTES:
1. DIMENSION DOES NOT INCLUDE SEALING FLANGES.
2. PACKAGE CONTOUR OPTIONAL WITHIN DIMENSIONS SPECIFIED.
3. PITCH DIAMETER – THREAD 1/4-28 UNF-2A (COATED). REFERENCE (SCREW THREAD STANDARDS FOR FEDERAL SERVICES – HANDBOOK H-28).
4. THIS TERMINAL CAN BE FLATTENED AND PIERCED OR HOOK TYPE.
5. POSITION OF LEADS IN RELATION TO THE HEXAGON IS NOT CONTROLLED.

Conforms to JEDEC Outline TO-210AC (TO-61)
Dimensions in Millimeters and (Inches)

IRFH350 Device

Absolute Maximum Ratings

Parameter		IRFH350	Units
V_{DS}	Drain - Source Voltage ①	400	V
V_{DGR}	Drain - Gate Voltage (R_{GS} = 20 KΩ) ①	400	V
I_D @ T_C = 25°C	Continuous Drain Current	15	A
I_D @ T_C = 100°C	Continuous Drain Current	9.5	A
I_{DM}	Pulsed Drain Current ③	60	A
V_{GS}	Gate - Source Voltage	± 20	V
P_D @ T_C = 25°C	Max. Power Dissipation	150 (See Fig. 13)	W
	Linear Derating Factor	1.2 (See Fig. 13)	W/K
I_{LM}	Inductive Current, Clamped	(See Fig. 14 and 15) L = 100μH 60	A
T_J T_{stg}	Operating Junction and Storage Temperature Range	−55 to 150	°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	°C

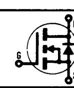
Electrical Characteristics @T_C = 25°C (Unless Otherwise Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain - Source Breakdown Voltage	IRFH350	400	–	–	V	V_{GS} = 0V, I_D = 250μA
$V_{GS(th)}$	Gate Threshold Voltage	IRFH350	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{GSS}	Gate - Source Leakage Forward	IRFH350	–	–	100	nA	V_{GS} = 20V
I_{GSS}	Gate - Source Leakage Reverse	IRFH350	–	–	-100	nA	V_{GS} = −20V
I_{DSS}	Zero Gate Voltage Drain Current	IRFH350	–	–	250	μA	V_{DS} = Max. Rating, V_{GS} = 0V
			–	–	1000	μA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_C = 125°C
$V_{DS(on)}$	On-State Voltage ②	IRFH350	–	–	4.5	V	V_{GS} = 10V, I_D = 15A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ②	IRFH350	–	0.25	0.3	Ω	V_{GS} = 10V, I_D = 9.0A
g_{fs}	Forward Transconductance ②	IRFH350	8.0	11	–	S (℧)	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 9.0A
C_{iss}	Input Capacitance	IRFH350	–	2000	3000	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	IRFH350	–	400	600	pF	
C_{rss}	Reverse Transfer Capacitance	IRFH350	–	100	200	pF	
C_{dc}	Drain-to-Case Capacitance	IRFH350	–	9.0	12	pF	V_{DC} = 25V, f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time	IRFH350	–	–	35	ns	V_{DD} ≃ 180V, I_D = 9.0A, Z_o = 4.7Ω See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
t_r	Rise Time	IRFH350	–	–	65	ns	
$t_{d(off)}$	Turn-Off Delay Time	IRFH350	–	–	150	ns	
t_f	Fall Time	IRFH350	–	–	75	ns	

Thermal Resistance

R_{thJC}	Junction-to-Case	IRFH350	–	–	0.83	K/W	
R_{thCS}	Case-to-Sink	IRFH350	–	0.4	–	K/W	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	IRFH350	–	–	40	K/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFH350	–	–	15	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
I_{SM}	Pulse Source Current (Body Diode) ③	IRFH350	–	–	56	A	
V_{SD}	Diode Forward Voltage ②	IRFH350	–	–	1.7	V	T_C = 25°C, I_S = 15A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	IRFH350	–	1000	–	ns	T_J = 150°C, I_F = 15A, dI_F/dt = 100A/μs
Q_{RR}	Reverse Recovered Charge	IRFH350	–	6.6	–	μC	T_J = 150°C, I_F = 15A, dI_F/dt = 100A/μs
t_{on}	Forward Turn-on Time	IRFH350	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

①T_J = 25°C to 150°C. ②Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%. ③Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

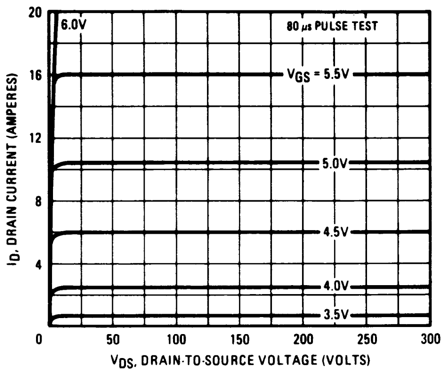


Fig. 1 — Typical Output Characteristics

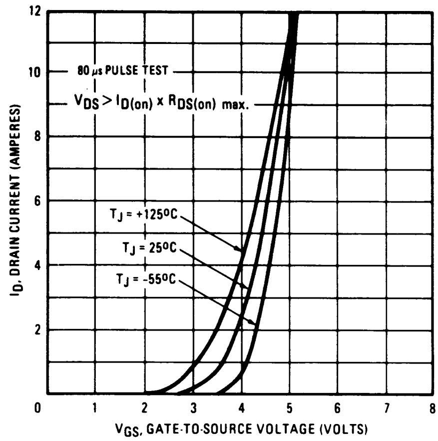


Fig. 2 — Typical Transfer Characteristics

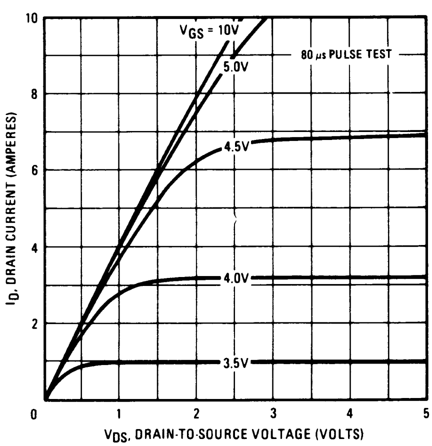


Fig. 3 — Typical Saturation Characteristics

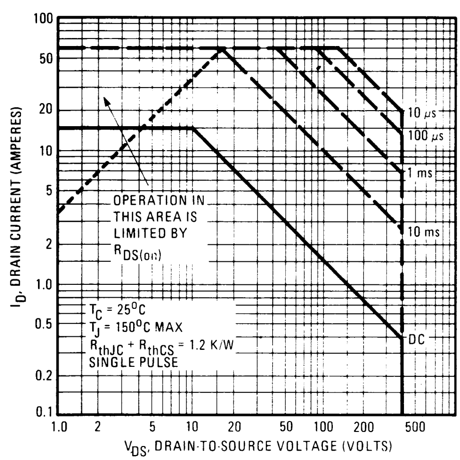


Fig. 4 — Maximum Safe Operating Area

IRFH350 Device

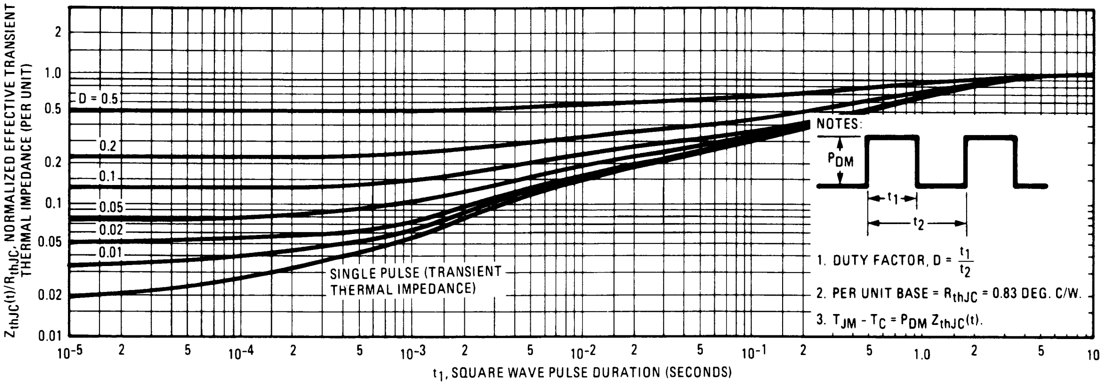


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

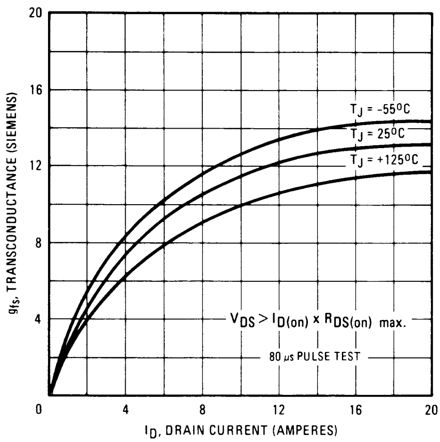


Fig. 6 — Typical Transconductance Vs. Drain Current

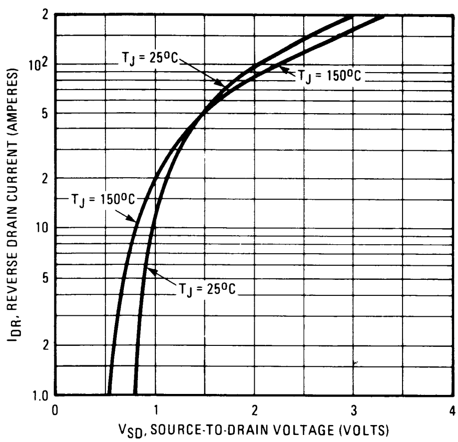


Fig. 7 — Typical Source-Drain Diode Forward Voltage

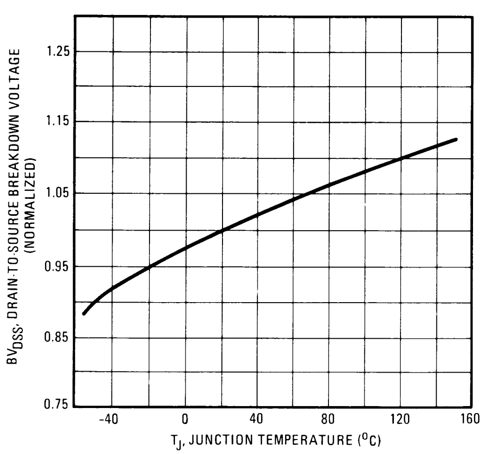


Fig. 8 — Breakdown Voltage Vs. Temperature

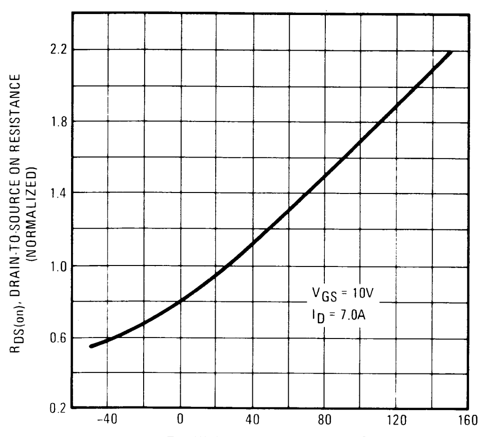


Fig. 9 — Normalized On-Resistance Vs. Temperature

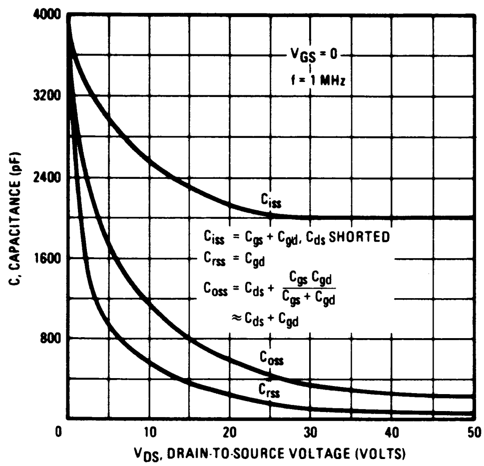


Fig. 10 – Typical Capacitance Vs. Drain-to-Source Voltage

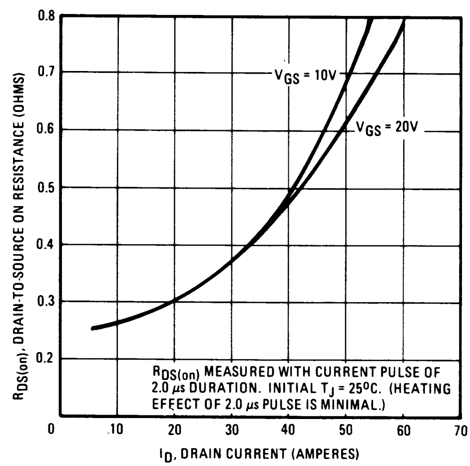


Fig. 11 – Typical On-Resistance Vs. Drain Current

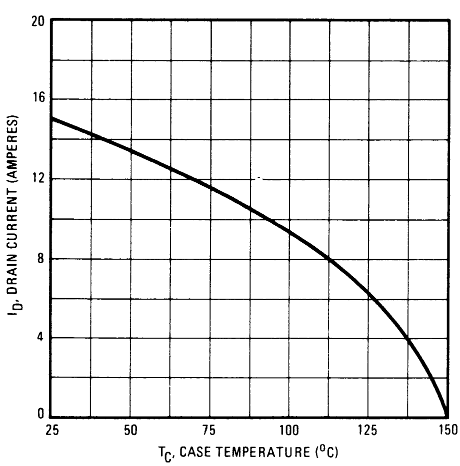


Fig. 12 – Maximum Drain Current Vs. Case Temperature

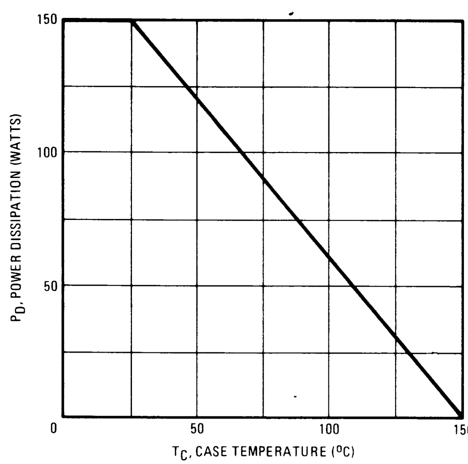


Fig. 13 – Power Vs. Temperature Derating Curve

IRFH350 Device

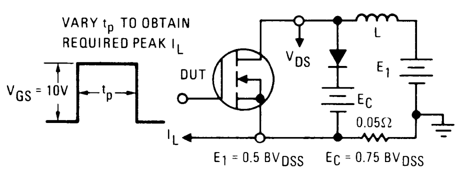


Fig. 14 — Clamped Inductive Test Circuit

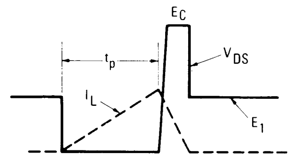


Fig. 15 — Clamped Inductive Waveforms

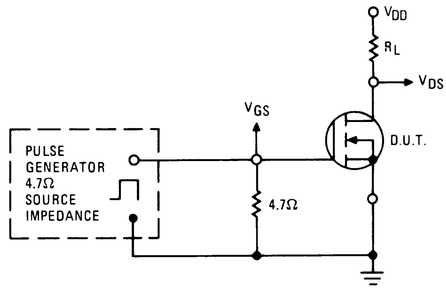


Fig. 16 — Switching Time Test Circuit

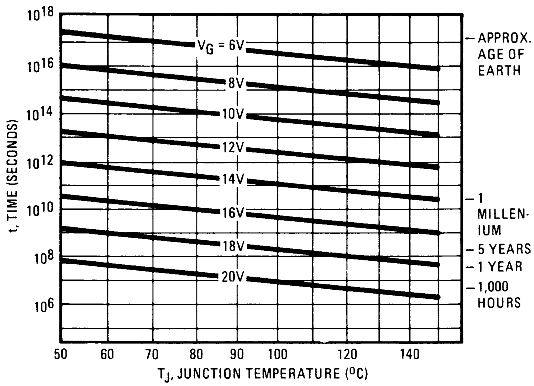


***Fig. 17 — Typical Time to Accumulated 1% Failure**

*The data shown is correct as of April 15, 1984. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.

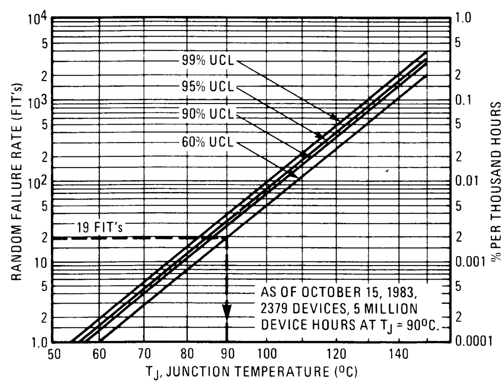


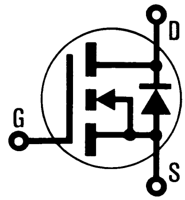
Fig. 18 — Typical High Temperature Reverse Bias (HTRB) Failure Rate

Data Sheet No. PD-9.413

INTERNATIONAL RECTIFIER IOR

HEXFET® TRANSISTORS IRFH450

N-CHANNEL POWER MOSFETs



500 Volt, 0.4 Ohm HEXFET

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and great device ruggedness.

The HEXFET transistors also feature all of the well established advantages of MOSFETs such as voltage control, freedom from second breakdown, very fast switching, ease of paralleling, and temperature stability of the electrical parameters.

They are well suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

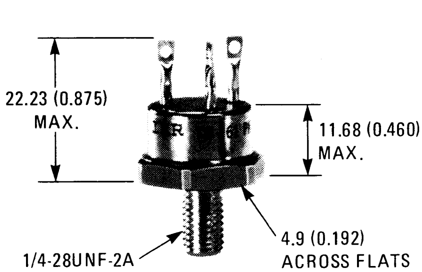
Features:

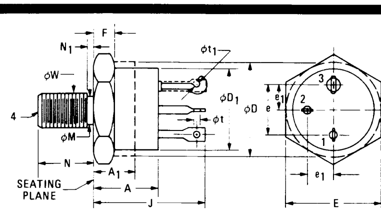
- Fast Switching
- Low Drive Current
- Ease of Paralleling
- No Second Breakdown
- Excellent Temperature Stability

Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFH450	500V	0.4Ω	13A

CASE STYLE AND DIMENSIONS





Symbol	Inches Min.	Inches Max.	Millimeters Min.	Millimeters Max.	Notes
A	0.325	0.460	8.26	11.68	
A_1		0.270		6.86	2
ϕD	0.610	0.687	15.49	17.45	2
ϕD_1	0.570	0.610	14.48	15.49	
E	0.667	0.687	16.94	17.45	
e	0.340	0.415	8.64	10.54	5
e_1	0.170	0.213	4.32	5.41	5
F	0.090	0.150	2.29	3.81	1
J	0.640	0.875	16.26	22.23	
ϕM	0.220	0.249	5.59	6.32	
N	0.422	0.455	10.72	11.56	
N_1		0.090		2.29	
ϕt	0.055	0.072	1.19	1.83	
ϕt_1	0.046	0.077	1.17	1.96	4
ϕW	0.2225	0.2268	5.561	5.761	3

NOTES:

1. DIMENSION DOES NOT INCLUDE SEALING FLANGES.
2. PACKAGE CONTOUR OPTIONAL WITHIN DIMENSIONS SPECIFIED.
3. PITCH DIAMETER – THREAD 1 4-28 UNF-2A (COATED).
   REFERENCE (SCREW THREAD STANDARDS FOR FEDERAL SERVICES – HANDBOOK H-28).
4. THIS TERMINAL CAN BE FLATTENED AND PIERCED OR HOOK TYPE.
5. POSITION OF LEADS IN RELATION TO THE HEXAGON IS NOT CONTROLLED.

Conforms to JEDEC Outline TO-210AC (TO-61)
Dimensions in Millimeters and (Inches)

IRFH450 Device

Absolute Maximum Ratings

Parameter		IRFH450	Units
V_{DS}	Drain - Source Voltage ①	500	V
V_{DGR}	Drain - Gate Voltage (R_{GS} = 20 KΩ) ①	500	V
I_D @ T_C = 25°C	Continuous Drain Current	13	A
I_D @ T_C = 100°C	Continuous Drain Current	8.3	A
I_{DM}	Pulsed Drain Current ③	52	A
V_{GS}	Gate - Source Voltage	± 20	V
P_D @ T_C = 25°C	Max. Power Dissipation	150 (See Fig. 13)	W
	Linear Derating Factor	1.2 (See Fig. 13)	W/K
I_{LM}	Inductive Current, Clamped	(See Fig. 14 and 15) L = 100μH 52	A
T_J T_{stg}	Operating Junction and Storage Temperature Range	-55 to 150	°C
	Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)	°C

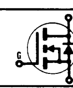
Electrical Characteristics @T_C = 25°C (Unless Otherwise Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain - Source Breakdown Voltage	IRFH450	500	–	–	V	V_{GS} = 0V, I_D = 250μA
$V_{GS(th)}$	Gate Threshold Voltage	IRFH450	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
I_{GSS}	Gate - Source Leakage Forward	IRFH450	–	–	100	nA	V_{GS} = 20V
I_{GSS}	Gate - Source Leakage Reverse	IRFH450	–	–	-100	nA	V_{GS} = -20V
I_{DSS}	Zero Gate Voltage Drain Current	IRFH450	–	–	250	μA	V_{DS} = Max. Rating, V_{GS} = 0V
			–	–	1000	μA	V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_C = 125°C
$V_{DS(on)}$	On-State Voltage ②	IRFH450	–	–	5.6	V	V_{GS} = 10V, I_D = 13A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ②	IRFH450	–	0.3	0.4	Ω	V_{GS} = 10V, I_D = 8.3A
g_{fs}	Forward Transconductance ②	IRFH450	8.0	12	–	S (℧)	V_{DS} > $I_{D(on)}$ x $R_{DS(on)}$ max., I_D = 8.3A
C_{iss}	Input Capacitance	IRFH450	–	2000	3000	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	IRFH450	–	400	600	pF	
C_{rss}	Reverse Transfer Capacitance	IRFH450	–	100	200	pF	
C_{dc}	Drain-to-Case Capacitance	IRFH450	–	9.0	12	pF	V_{DC} = 25V, f = 1 MHz
$t_{d(on)}$	Turn-On Delay Time	IRFH450	–	–	35	ns	V_{DD} ≈ 210V, I_D = 8.3A, Z_o = 4.7Ω See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
t_r	Rise Time	IRFH450	–	–	50	ns	
$t_{d(off)}$	Turn-Off Delay Time	IRFH450	–	–	150	ns	
t_f	Fall Time	IRFH450	–	–	70	ns	

Thermal Resistance

R_{thJC}	Junction-to-Case	IRFH450	–	–	0.83	K/W	
R_{thCS}	Case-to-Sink	IRFH450	–	0.4	–	K/W	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	IRFH450	–	–	40	K/W	Free Air Operation

Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFH450	–	–	13	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
I_{SM}	Pulse Source Current (Body Diode) ③	IRFH450	–	–	52	A	
V_{SD}	Diode Forward Voltage ②	IRFH450	–	–	1.6	V	T_C = 25°C, I_S = 13A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	IRFH450	–	1300	–	ns	T_J = 150°C, I_F = 13A, dI_F/dt = 100A/μs
Q_{RR}	Reverse Recovered Charge	IRFH450	–	7.4	–	μC	T_J = 150°C, I_F = 13A, dI_F/dt = 100A/μs
t_{on}	Forward Turn-on Time	IRFH450	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

① T_J = 25°C to 150°C. ② Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%. ③ Repetitive Rating: Pulse width limited by max. junction temperature. See Transient Thermal Impedance Curve (Fig. 5).

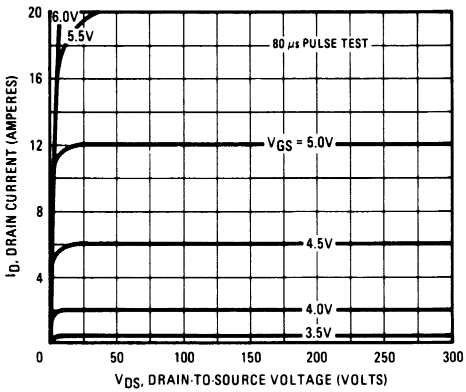


Fig. 1 — Typical Output Characteristics

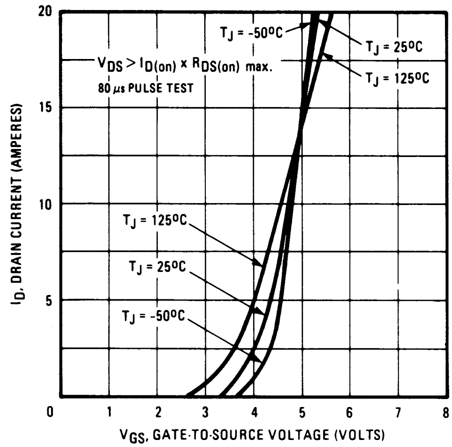


Fig. 2 — Typical Transfer Characteristics

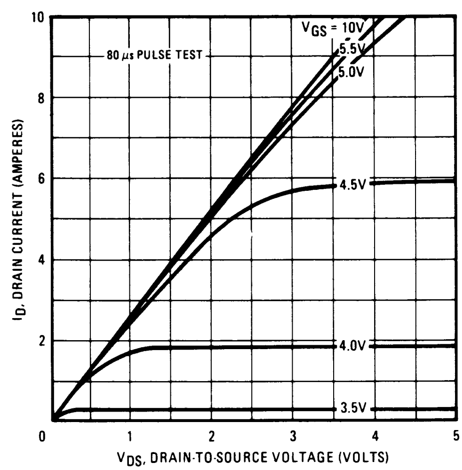


Fig. 3 — Typical Saturation Characteristics

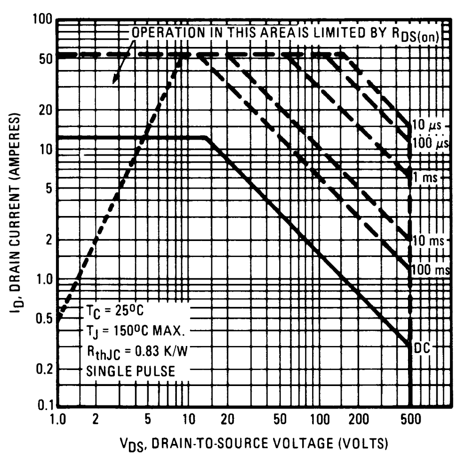


Fig. 4 — Maximum Safe Operating Area

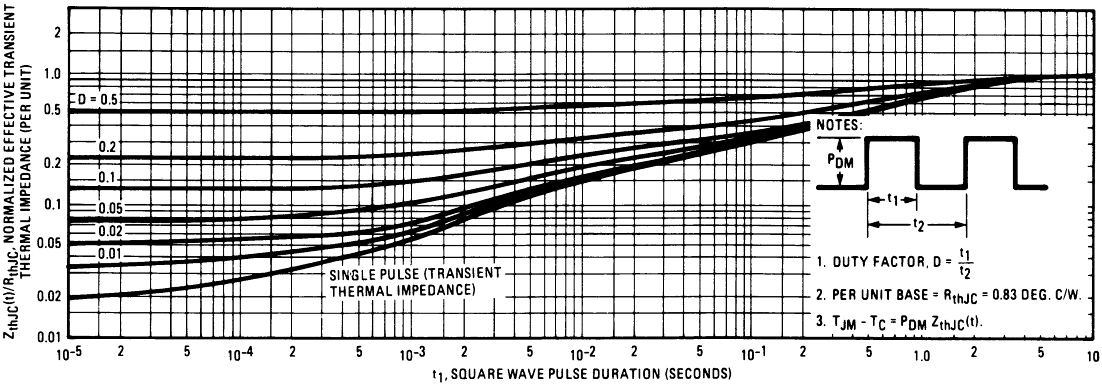


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

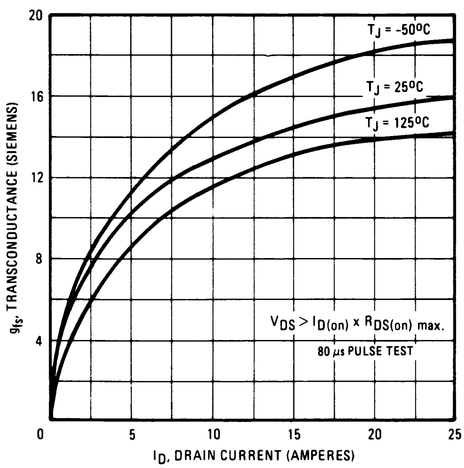


Fig. 6 — Typical Transconductance Vs. Drain Current

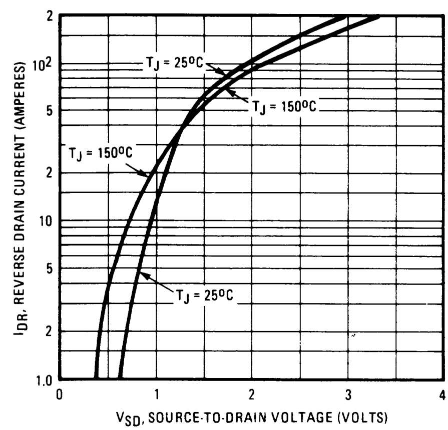


Fig. 7 — Typical Source-Drain Diode Forward Voltage

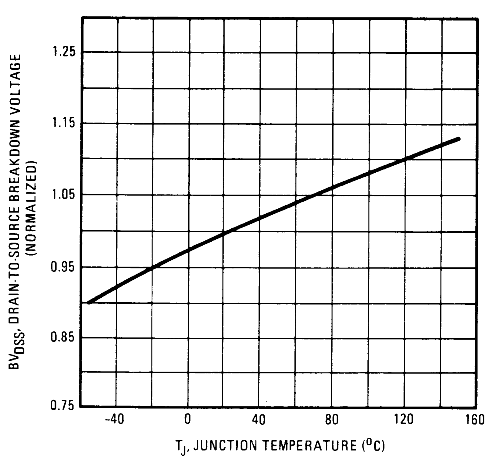


Fig. 8 — Breakdown Voltage Vs. Temperature

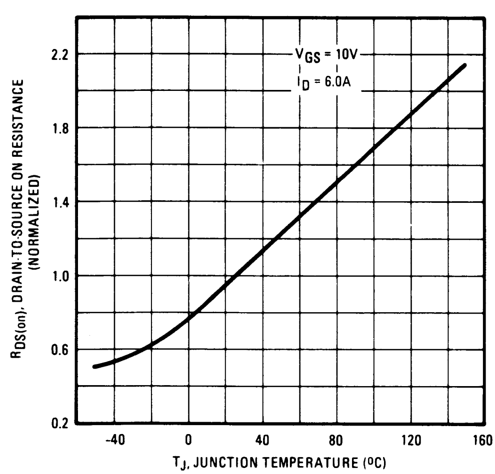


Fig. 9 — Normalized On-Resistance Vs. Temperature

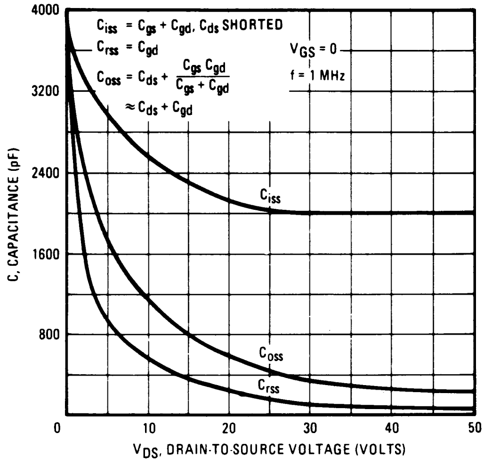


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

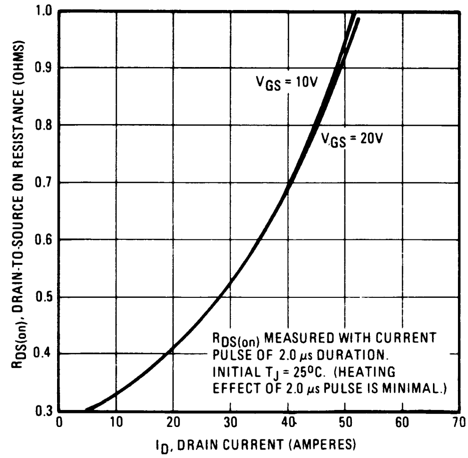


Fig. 11 — Typical On-Resistance Vs. Drain Current

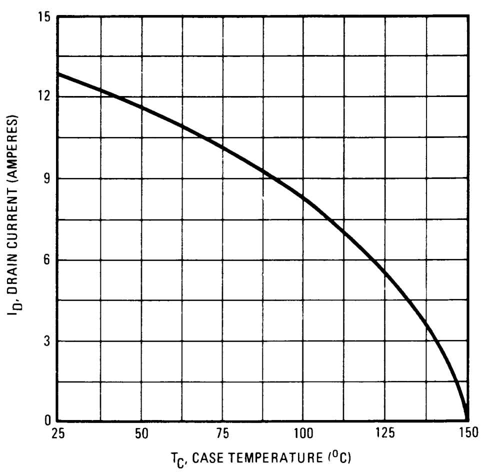


Fig. 12 — Maximum Drain Current Vs. Case Temperature

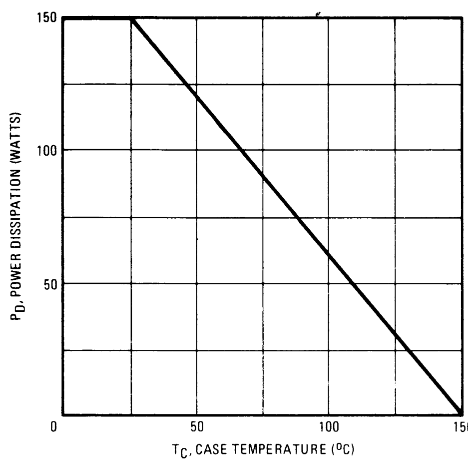


Fig. 13 — Power Vs. Temperature Derating Curve

IRFH450 Device

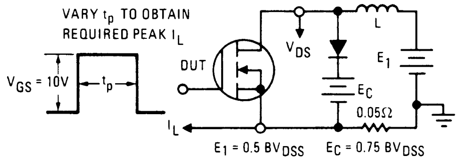


Fig. 14 – Clamped Inductive Test Circuit

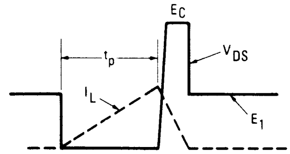


Fig. 15. – Clamped Inductive Waveforms

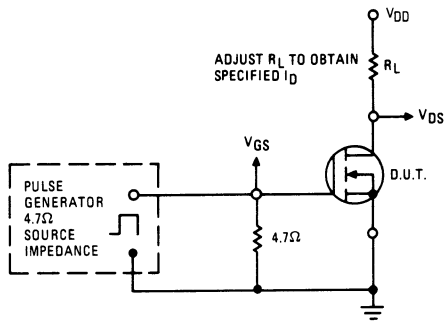


Fig. 16 – Switching Time Test Circuit

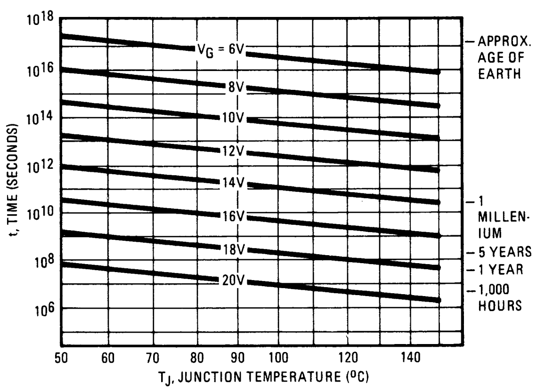


***Fig. 17 – Typical Time to Accumulated 1% Failure**

*The data shown is correct as of April 15, 1984. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.

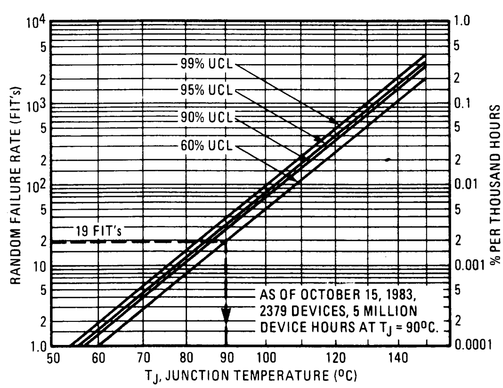


Fig. 18 – Typical High Temperature Reverse Bias (HTRB) Failure Rate