

**POWER MOSFET  
THRU-HOLE (TO-254AA)**

**Product Summary**

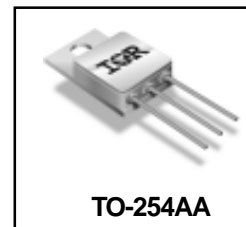
Part Number	R <sub>DS(on)</sub>	I <sub>D</sub>
IRFM450	0.415 $\Omega$	12A

HEXFET<sup>®</sup> MOSFET technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry design achieves very low on-state resistance combined with high transconductance. HEXFET transistors also feature all of the well-established advantages of MOSFETs, such as voltage control, very fast switching, ease of paralleling and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, high energy pulse circuits, and virtually any application where high reliability is required. The HEXFET transistor's totally isolated package eliminates the need for additional isolating material between the device and the heatsink. This improves thermal efficiency and reduces drain capacitance.

PD - 90493F

**IRFM450  
JANTX2N7228  
JANTXV2N7228  
REF: MIL-PRF-19500/592  
500V, N-CHANNEL**

**HEXFET<sup>®</sup> MOSFET TECHNOLOGY**



**Features:**

- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Electrically Isolated
- Dynamic dv/dt Rating
- Light-weight

**Absolute Maximum Ratings**

	Parameter		Units
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 25°C	Continuous Drain Current	12	A
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 100°C	Continuous Drain Current	8.0	
I <sub>DM</sub>	Pulsed Drain Current ①	48	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Max. Power Dissipation	150	W
	Linear Derating Factor	1.2	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	±20	V
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	750	mJ
I <sub>AR</sub>	Avalanche Current ①	12	A
E <sub>AR</sub>	Repetitive Avalanche Energy ①	15	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
T <sub>J</sub>	Operating Junction	-55 to 150	°C
T <sub>STG</sub>	Storage Temperature Range		
	Lead Temperature	300 ( 0.063 in.(1.6mm) from case for 10s)	
	Weight	9.3 (Typical)	g

For footnotes refer to the last page

**Electrical Characteristics @ T<sub>j</sub> = 25°C (Unless Otherwise Specified)**

	Parameter	Min	Typ	Max	Units	Test Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	500	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1.0mA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	—	0.68	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-State Resistance	—	—	0.415 0.515	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 8.0A ④ V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	6.5	—	—	S (r)	V <sub>DS</sub> > 15V, I <sub>DS</sub> = 8.0A ④
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	25 250	μA	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Leakage Forward	—	—	100	nA	V <sub>GS</sub> = 20V
I <sub>GSS</sub>	Gate-to-Source Leakage Reverse	—	—	-100	nA	V <sub>GS</sub> = -20V
Q <sub>g</sub>	Total Gate Charge	—	—	120	nC	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A V <sub>DS</sub> = 250V
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	19	nC	
Q <sub>gd</sub>	Gate-to-Drain ('Miller') Charge	—	—	70	nC	
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	35	ns	V <sub>DD</sub> = 250V, I <sub>D</sub> = 12A, V <sub>GS</sub> = 10V, R <sub>G</sub> = 2.35Ω
t <sub>r</sub>	Rise Time	—	—	190	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	170	ns	
t <sub>f</sub>	Fall Time	—	—	130	ns	
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	6.8	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package)
C <sub>iss</sub>	Input Capacitance	—	2700	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	600	—	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance	—	240	—	pF	

**Source-Drain Diode Ratings and Characteristics**

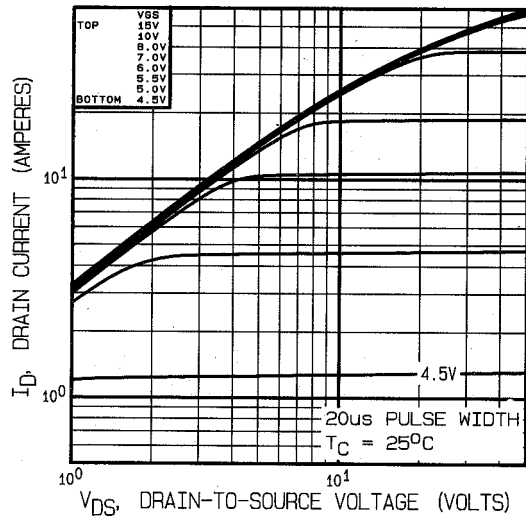
	Parameter	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	12	A	
I <sub>SM</sub>	Pulse Source Current (Body Diode) ①	—	—	48	A	
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.7	V	T <sub>j</sub> = 25°C, I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	—	1600	nS	T <sub>j</sub> = 25°C, I <sub>F</sub> = 12A, di/dt ≤ 100A/μs
Q <sub>RR</sub>	Reverse Recovery Charge	—	—	14	μC	V <sub>DD</sub> ≤ 50V ④
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L <sub>S</sub> + L <sub>D</sub> .				

**Thermal Resistance**

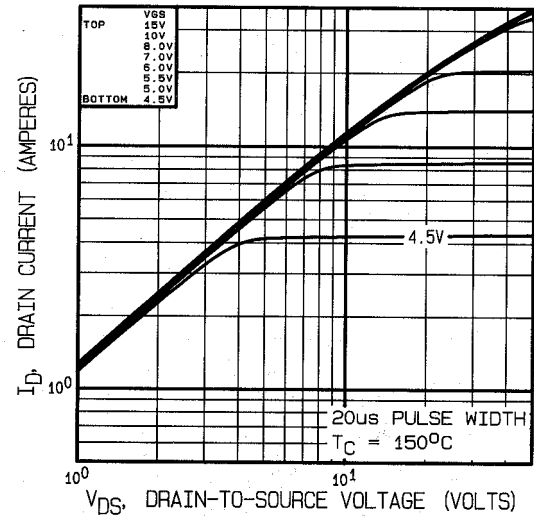
	Parameter	Min	Typ	Max	Units	Test Conditions
R <sub>thJC</sub>	Junction-to-Case	—	—	0.83	°C/W	
R <sub>thJCS</sub>	Case-to-Sink	—	0.21	—	°C/W	
R <sub>thJA</sub>	Junction-to-Ambient	—	—	48	°C/W	Typical socket mount

**Note:** Corresponding Spice and Saber models are available on the G&S Website.

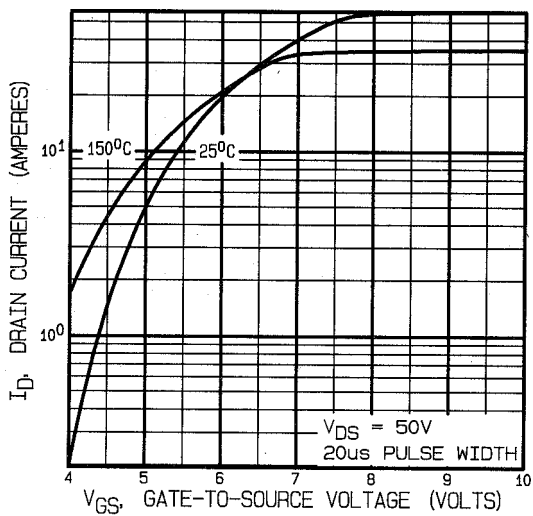
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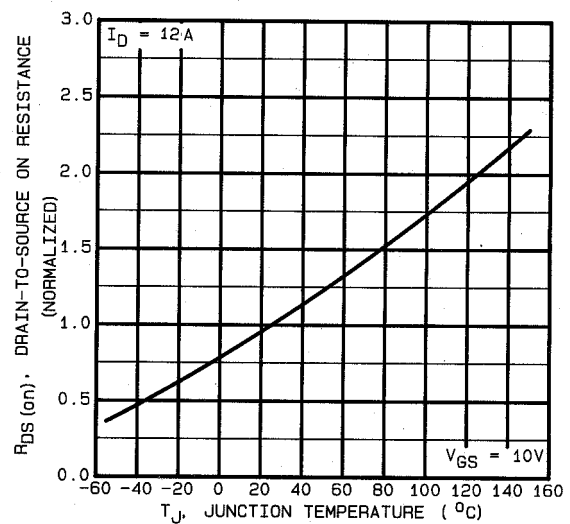
**Fig 1.** Typical Output Characteristics



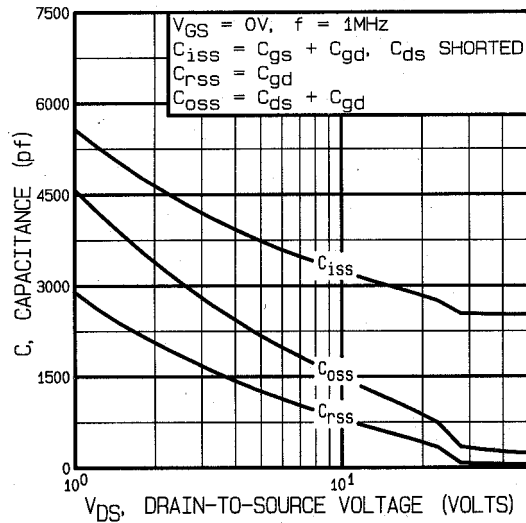
**Fig 2.** Typical Output Characteristics



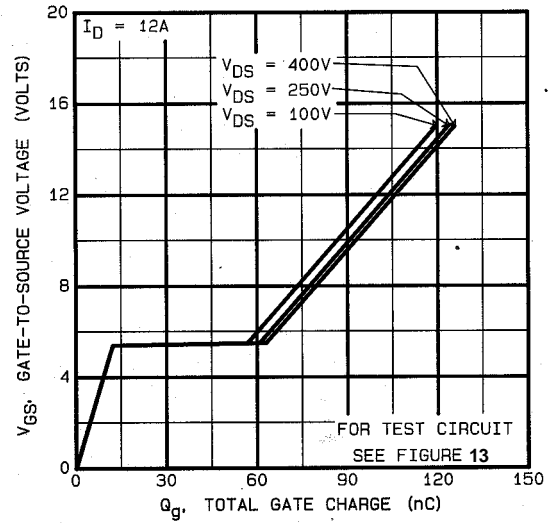
**Fig 3.** Typical Transfer Characteristics



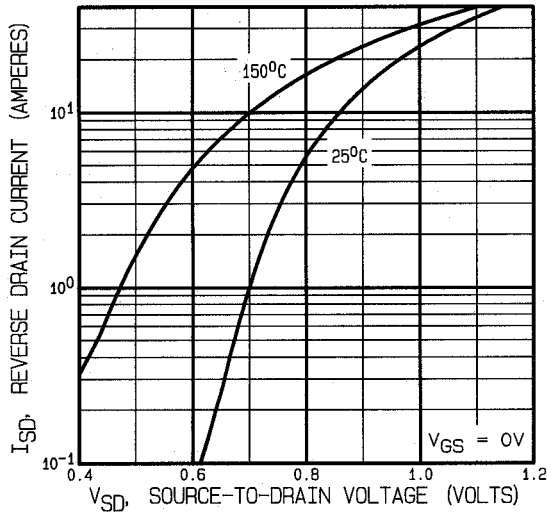
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



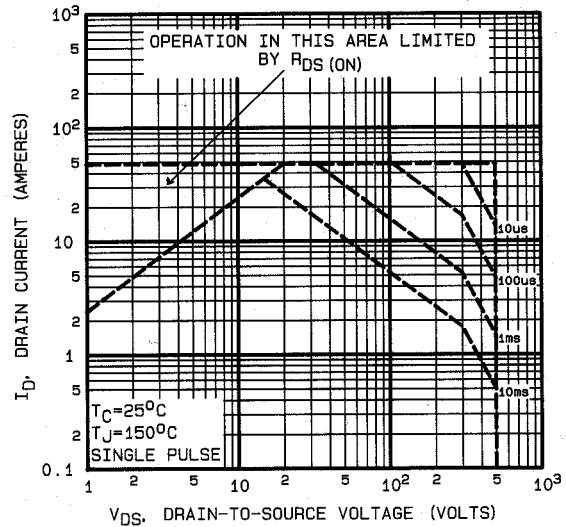
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



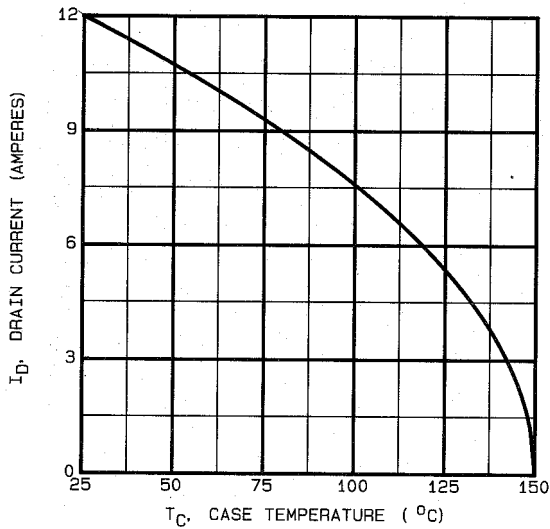
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



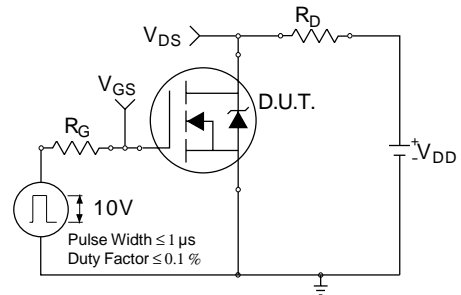
**Fig 7.** Typical Source-Drain Diode Forward Voltage



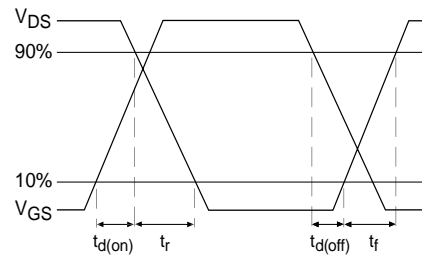
**Fig 8.** Maximum Safe Operating Area



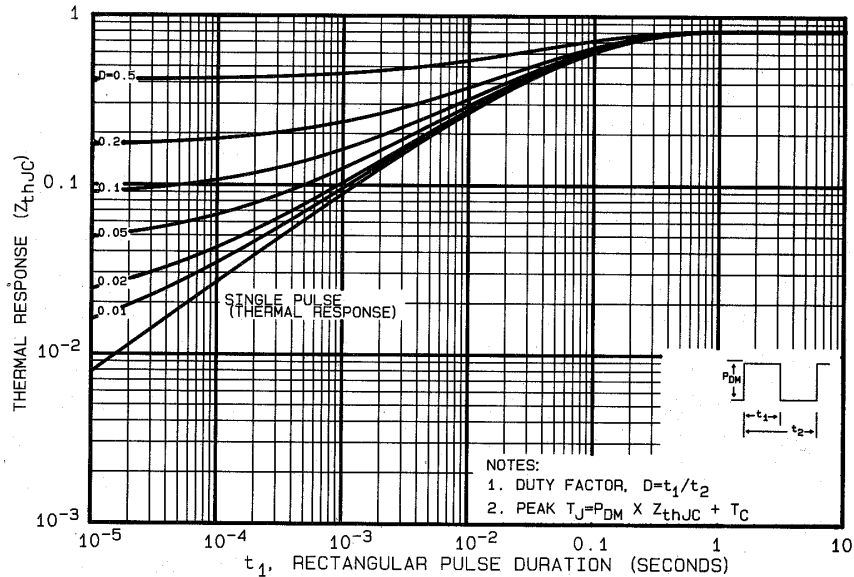
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



**Fig 10b.** Switching Time Waveforms



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

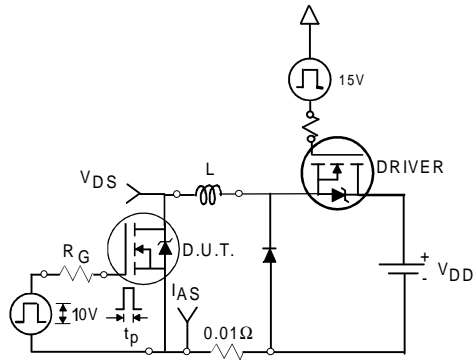


Fig 12a. Unclamped Inductive Test Circuit

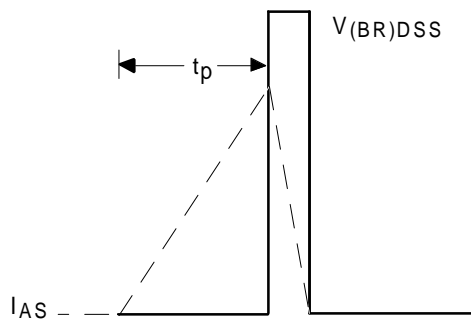


Fig 12b. Unclamped Inductive Waveforms

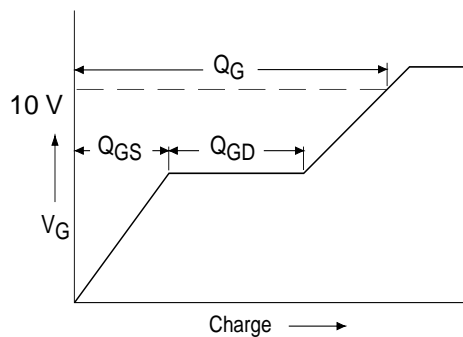


Fig 13a. Basic Gate Charge Waveform

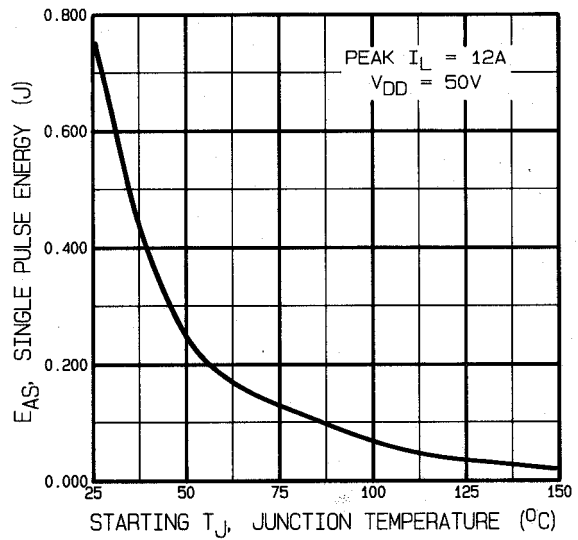
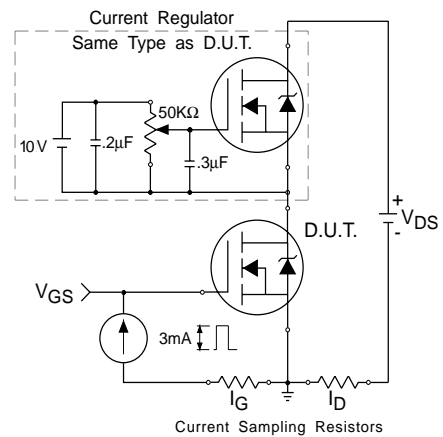
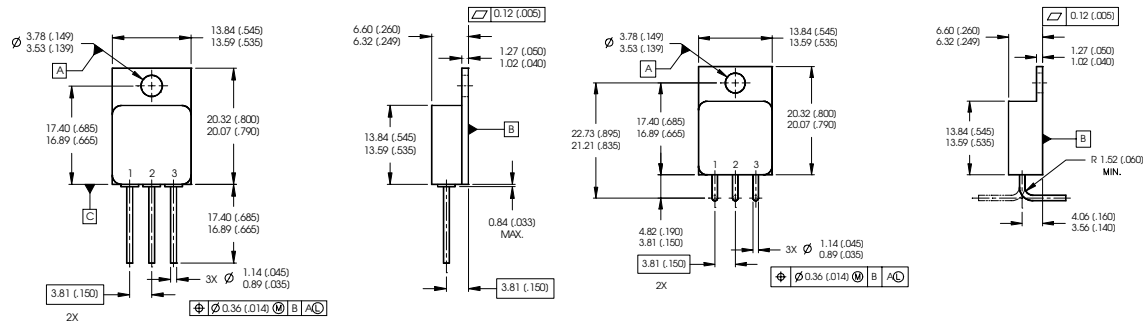
Fig 12c. Maximum Avalanche Energy  
Vs. Drain Current

Fig 13b. Gate Charge Test Circuit

## Footnotes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 50V$ , starting  $T_J = 25^\circ C$ ,  $L = 10.4mH$   
Peak  $I_L = 12A$ ,  $V_{GS} = 10V$
- ③  $I_{SD} \leq 12A$ ,  $di/dt \leq 130A/\mu s$ ,  
 $V_{DD} \leq 500V$ ,  $T_J \leq 150^\circ C$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$

## Case Outline and Dimensions — TO-254AA



### NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE TO-254AA.

### PIN ASSIGNMENTS

- 1 = DRAIN
- 2 = SOURCE
- 3 = GATE

## CAUTION

### BERYLLIA WARNING PER MIL-PRF-19500

Packages containing beryllia shall not be ground, sandblasted, machined or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

International  
**IR** Rectifier

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