

**HEXFET® POWER MOSFET  
 SURFACE MOUNT (SMD-1)**

**IRL7N1404  
 40V, N-CHANNEL**

**Product Summary**

Part Number	BV <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
IRL7N1404	40V	0.006Ω	55A*



**SMD-1**

Seventh Generation HEXFET® power MOSFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon unit area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient device for use in a wide variety of applications.

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

**Features:**

- Low R<sub>DS(on)</sub>
- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Light Weight
- Surface Mount
- LogicGate Drive

**Absolute Maximum Ratings**

	Parameter		Units
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 25°C	Continuous Drain Current	55*	A
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 100°C	Continuous Drain Current	55*	
I <sub>DM</sub>	Pulsed Drain Current ①	220	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Max. Power Dissipation	100	W
	Linear Derating Factor	0.8	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	±20	V
EAS	Single Pulse Avalanche Energy ②	300	mJ
I <sub>AR</sub>	Avalanche Current ①	55	A
EAR	Repetitive Avalanche Energy ①	10	mJ
dv/dt	Peak Diode Recovery dv/dt ③	2.0	V/ns
T <sub>J</sub>	Operating Junction	-55 to 150	°C
T <sub>STG</sub>	Storage Temperature Range		
	Package Mounting Surface Temp.	300 (for 5s)	
	Weight	2.6 (Typical)	g

\* Current is limited by package

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	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	—	0.041	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-State Resistance	—	—	0.006 0.008	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 55A ④ V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 55A
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	93	—	—	S (r)	V <sub>DS</sub> = 10V, I <sub>DS</sub> = 55A ④
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	20 250	μA	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Leakage Forward	—	—	200	nA	V <sub>GS</sub> = 20V
I <sub>GSS</sub>	Gate-to-Source Leakage Reverse	—	—	-200	nA	V <sub>GS</sub> = -20V
Q <sub>g</sub>	Total Gate Charge	—	—	115	nC	V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 55A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	37	nC	V <sub>DS</sub> = 32V
Q <sub>gd</sub>	Gate-to-Drain ('Miller') Charge	—	—	45	nC	
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	40	ns	V <sub>DD</sub> = 20V, I <sub>D</sub> = 55A, V <sub>GS</sub> = 5.0V, R <sub>G</sub> = 2.5Ω
t <sub>r</sub>	Rise Time	—	—	356		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	63		
t <sub>f</sub>	Fall Time	—	—	96		
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to the center of source pad
C <sub>iss</sub>	Input Capacitance	—	6470	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1600	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	165	—		

**Source-Drain Diode Ratings and Characteristics**

	Parameter	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	55*	A	T <sub>J</sub> = 25°C, I <sub>S</sub> = 55A, V <sub>GS</sub> = 0V ④
I <sub>SM</sub>	Pulse Source Current (Body Diode) ①	—	—	220		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>F</sub> = 55A, di/dt ≤ 100A/μs
t <sub>rr</sub>	Reverse Recovery Time	—	—	125	ns	V <sub>DD</sub> ≤ 25V ④
Q <sub>RR</sub>	Reverse Recovery Charge	—	—	230	nC	
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> .				

\* Current is limited by package

**Thermal Resistance**

	Parameter	Min	Typ	Max	Units	Test Conditions
R <sub>thJC</sub>	Junction-to-Case	—	—	1.25	°C/W	

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

For footnotes refer to the last page

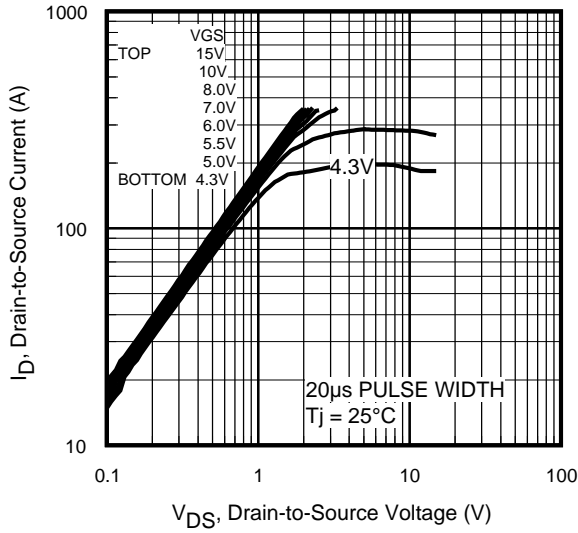


Fig 1. Typical Output Characteristics

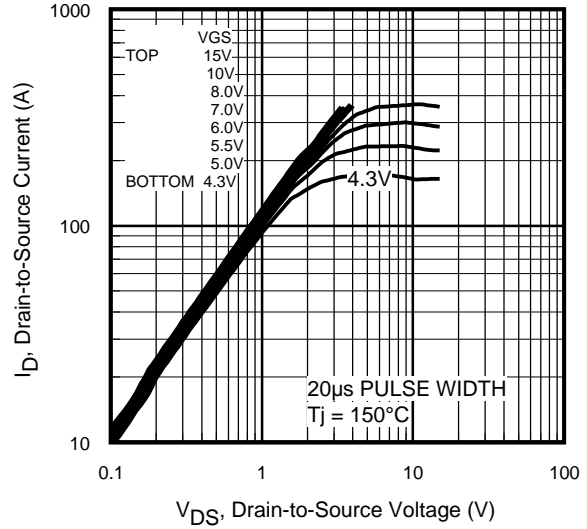


Fig 2. Typical Output Characteristics

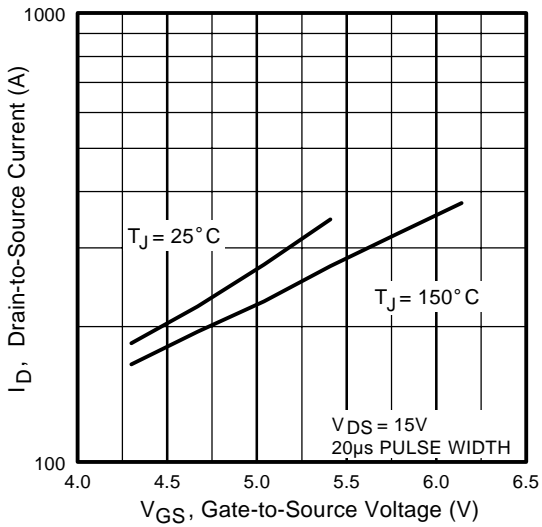


Fig 3. Typical Transfer Characteristics

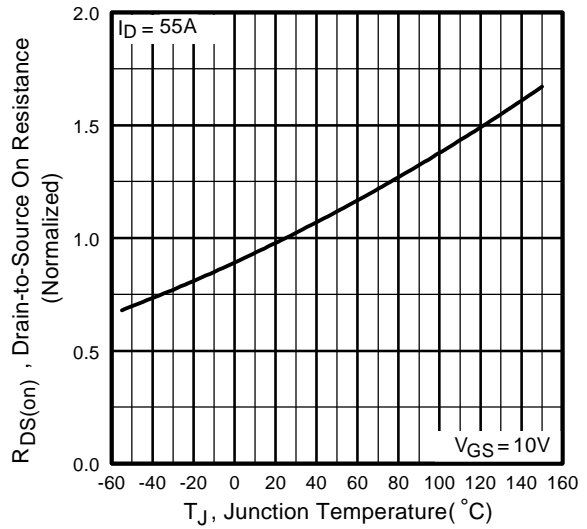
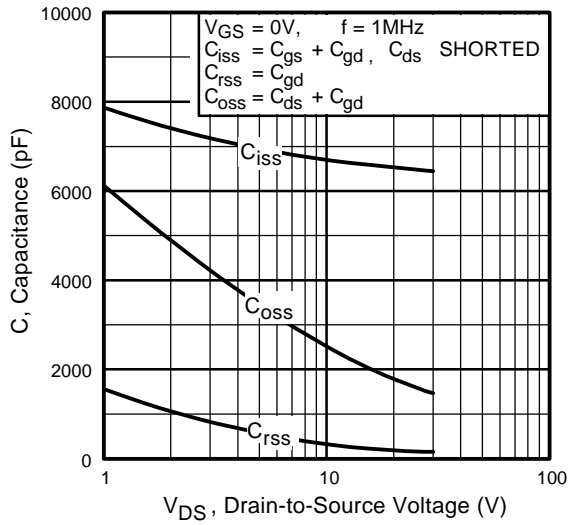
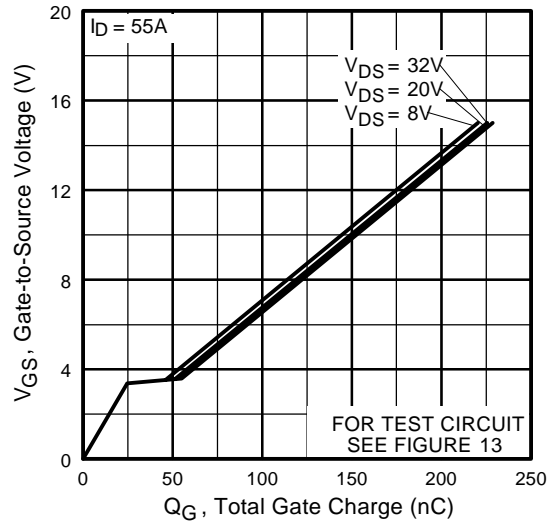


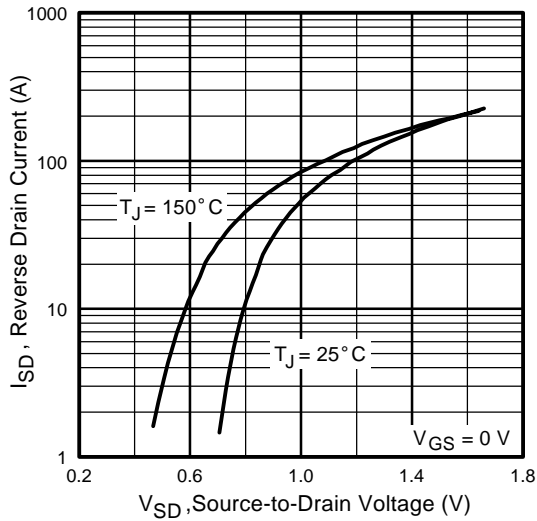
Fig 4. Normalized On-Resistance Vs. Temperature



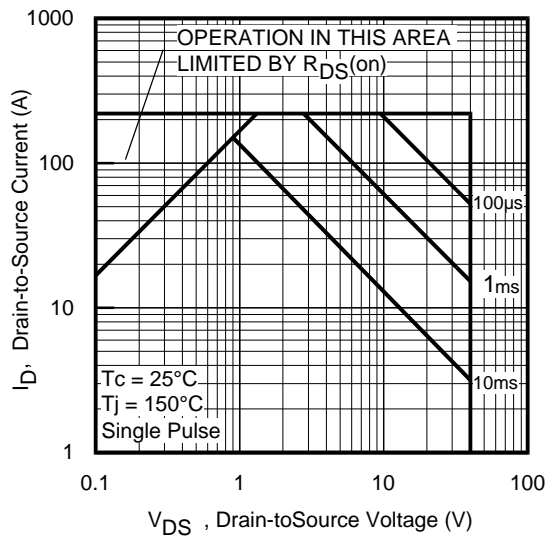
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



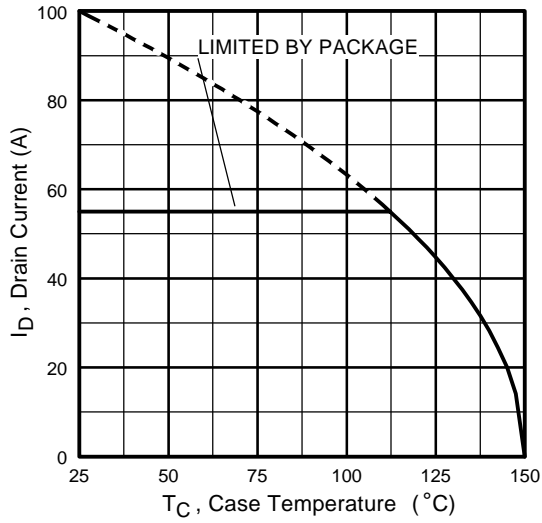
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



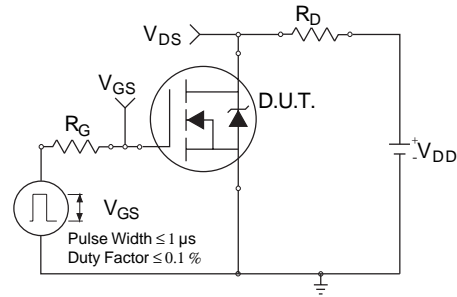
**Fig 7.** Typical Source-Drain Diode Forward Voltage



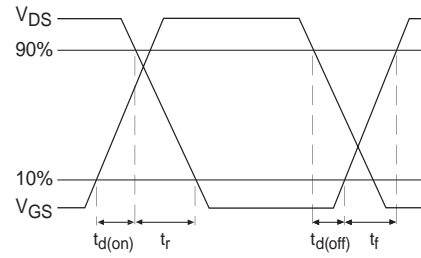
**Fig 8.** Maximum Safe Operating Area



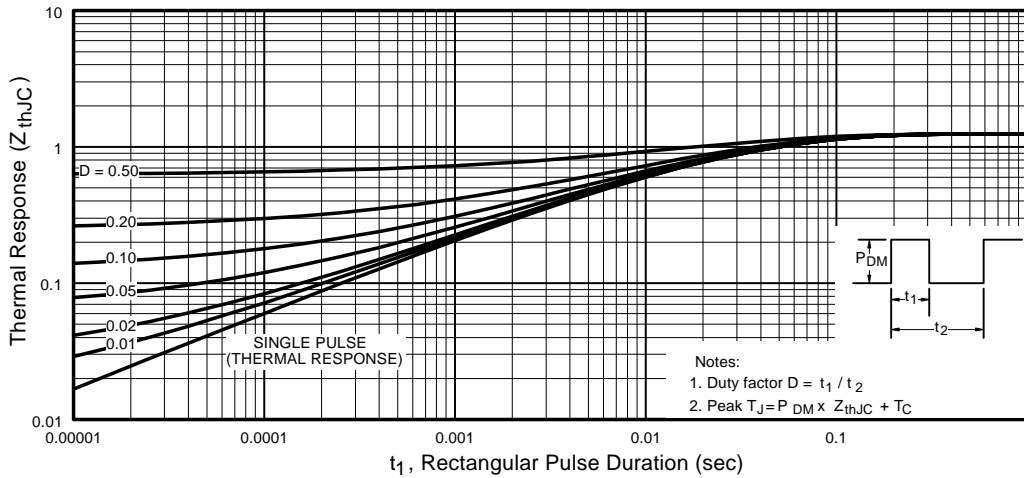
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



**Fig 10b.** Switching Time Waveforms



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

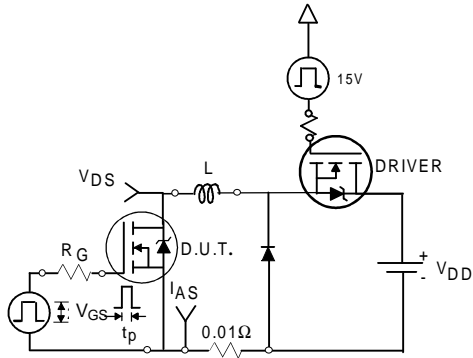


Fig 12a. Unclamped Inductive Test Circuit

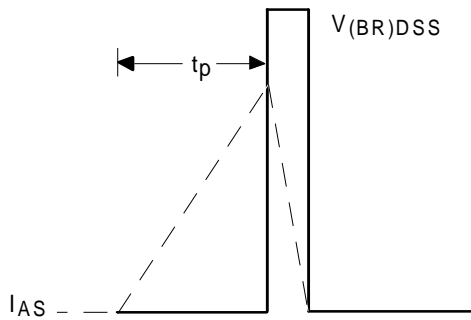


Fig 12b. Unclamped Inductive Waveforms

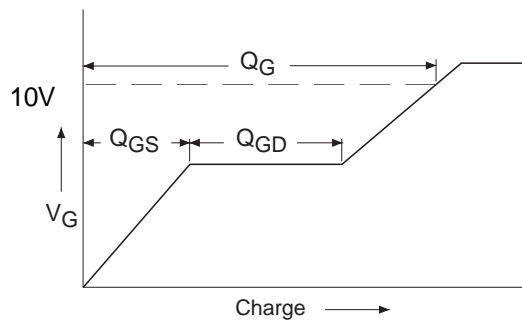


Fig 13a. Basic Gate Charge Waveform

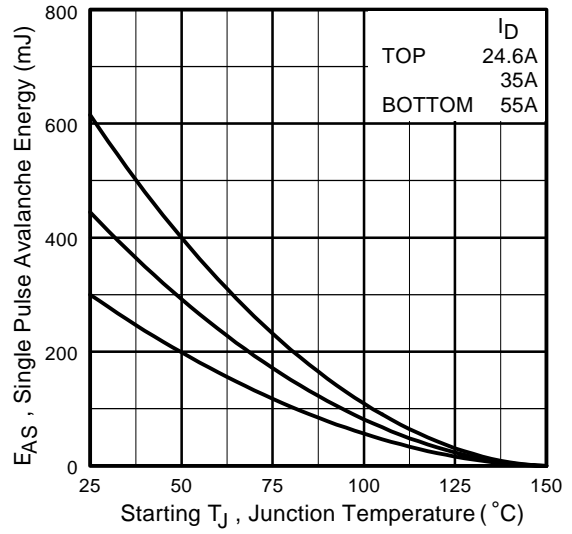


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

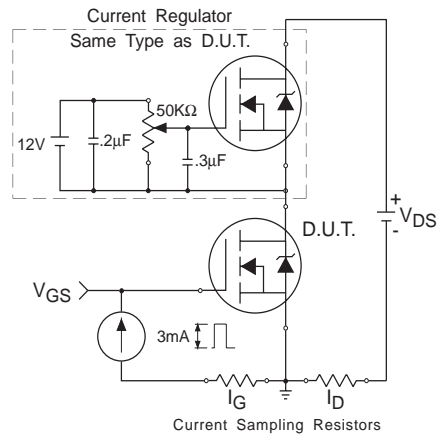


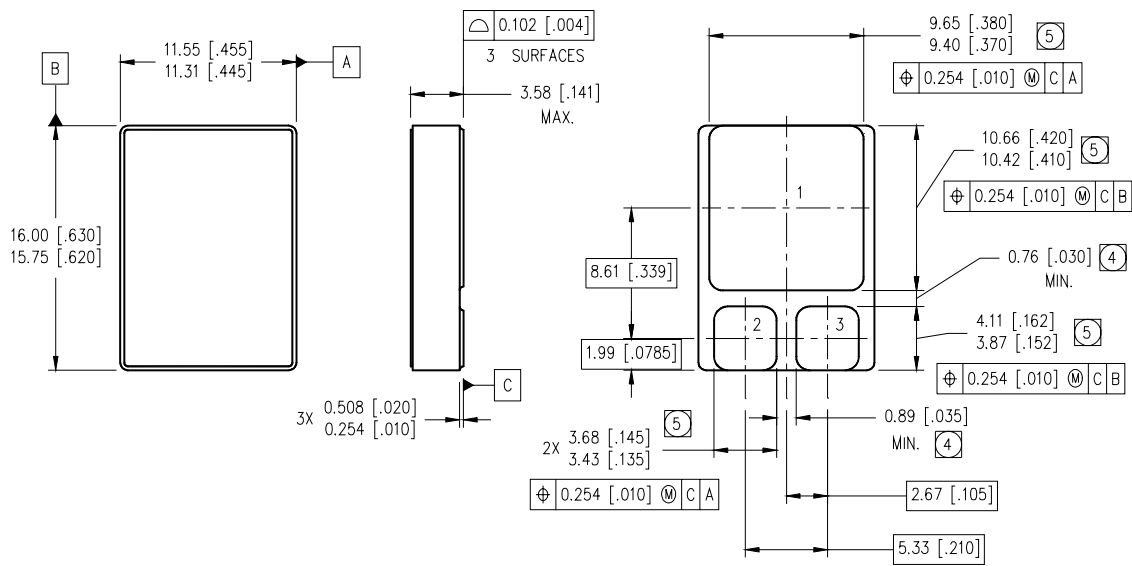
Fig 13b. Gate Charge Test Circuit

**Footnotes:**

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 25\text{ V}$ , Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.2\text{mH}$   
 Peak  $I_{AS} = 55\text{A}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$

- ③  $I_{SD} \leq 55\text{A}$ ,  $di/dt \leq 166\text{A}/\mu\text{s}$ ,  
 $V_{DD} \leq 55\text{V}$ ,  $T_J \leq 150^\circ\text{C}$
- ④ Pulse width  $\leq 300\ \mu\text{s}$ ; Duty Cycle  $\leq 2\%$

**Case Outline and Dimensions — SMD-1**



**NOTES:**

- 1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- 2. CONTROLLING DIMENSION: INCH.
- 3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- ④ DIMENSION INCLUDES METALLIZATION FLASH.
- ⑤ DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

**PAD ASSIGNMENTS**

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