



An Infineon Technologies Company

**IRFM140**  
**JANTX2N7218**  
**JANTXV2N7218**

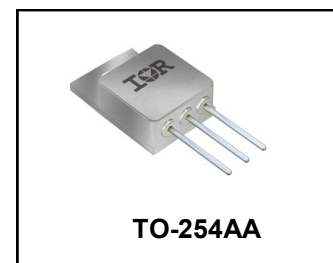
**POWER MOSFET**  
**THRU-HOLE (TO-254AA)**

**100V, N-CHANNEL**  
**REF: MIL-PRF-19500/596**

**HEXFET® MOSFET TECHNOLOGY**

**Product Summary**

Part Number	RDS(on)	I <sub>D</sub>
IRFM140	0.077Ω	28A



**Description**

HEXFET® MOSFET technology is the key to IR HiRel 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 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.

**Features**

- Simple Drive Requirements
- Hermetically Sealed
- Dynamic dv/dt Rating
- Light Weight
- ESD Rating: Class 2 per MIL-STD-750, Method 1020

**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
I <sub>D1</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 25°C	Continuous Drain Current	28	A
I <sub>D2</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 100°C	Continuous Drain Current	20	
I <sub>DM</sub> @ T <sub>C</sub> = 25°C	Pulsed Drain Current ①	112	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Maximum Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	250	mJ
I <sub>AR</sub>	Avalanche Current ①	28	A
E <sub>AR</sub>	Repetitive Avalanche Energy ①	12.5	mJ
dv/dt	Peak Diode Recovery ③	5.5	V/ns
T <sub>J</sub> T <sub>STG</sub>	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (for 5seconds)	
	Weight	9.3 (Typical)	

For footnotes refer to the page 2.

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	100	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1.0mA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.13	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.077	Ω	V <sub>GS</sub> = 10V, I <sub>D2</sub> = 20A ④
		—	—	0.125		V <sub>GS</sub> = 10V, I <sub>D1</sub> = 28A ④
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	9.1	—	—	S	V <sub>DS</sub> = 15V, I <sub>D2</sub> = 20A ④
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	25	μA	V <sub>DS</sub> = 80V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 80V, 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
	Gate-to-Source Leakage Reverse	—	—	-100		V <sub>GS</sub> = -20V
Q <sub>G</sub>	Total Gate Charge	—	—	59	nC	I <sub>D1</sub> = 28A
Q <sub>GS</sub>	Gate-to-Source Charge	—	—	16		V <sub>DS</sub> = 50V
Q <sub>GD</sub>	Gate-to-Drain ('Miller') Charge	—	—	30.7		V <sub>GS</sub> = 10V
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	21	ns	V <sub>DD</sub> = 50V
t <sub>r</sub>	Rise Time	—	—	105		I <sub>D1</sub> = 20A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	64		R <sub>G</sub> = 9.1Ω
t <sub>f</sub>	Fall Time	—	—	65		V <sub>GS</sub> = 10V
L <sub>S</sub> + L <sub>D</sub>	Total Inductance	—	6.8	—	nH	Measured from Drain lead (6mm / 0.25 in from package) to Source lead (6mm / 0.25 in from package)
C <sub>iss</sub>	Input Capacitance	—	1600	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	550	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	120	—		f = 1.0MHz

## Source-Drain Diode Ratings and Characteristics

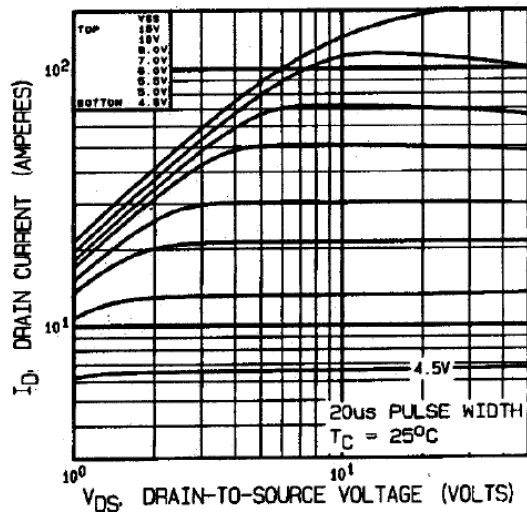
Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	28	A	
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	112		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.5	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 28A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	—	400	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 28A, V <sub>DD</sub> ≤ 30V
Q <sub>rr</sub>	Reverse Recovery Charge	—	—	2.9	μC	di/dt = 100A/μs ④
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

## Thermal Resistance

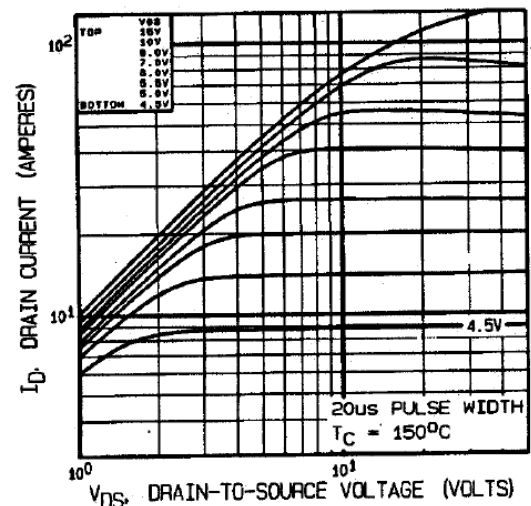
Symbol	Parameter	Min.	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	—	1.0	°C/W
R <sub>θCS</sub>	Case -to-Sink	—	0.21	—	
R <sub>θJA</sub>	Junction-to-Ambient (Typical socket mount)	—	—	48	

### Footnotes:

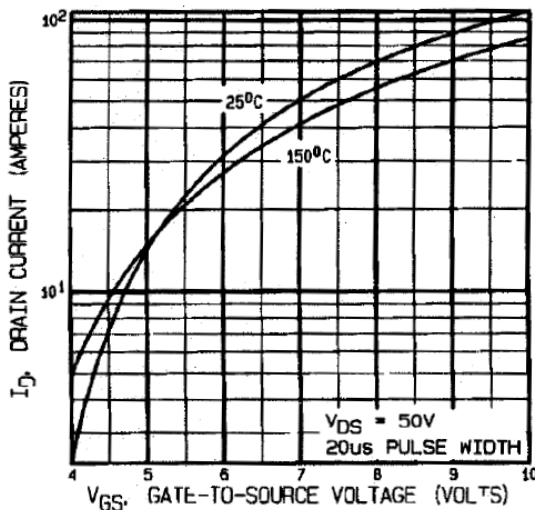
- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② V<sub>DD</sub> = 25V, starting T<sub>J</sub> = 25°C, L = 0.64mH, Peak I<sub>L</sub> = 28A, V<sub>GS</sub> = 10V.
- ③ I<sub>SD</sub> ≤ 28A, di/dt ≤ 170A/μs, V<sub>DD</sub> ≤ 100V, T<sub>J</sub> ≤ 150°C.
- ④ Pulse width ≤ 300 μs; Duty Cycle ≤ 2%



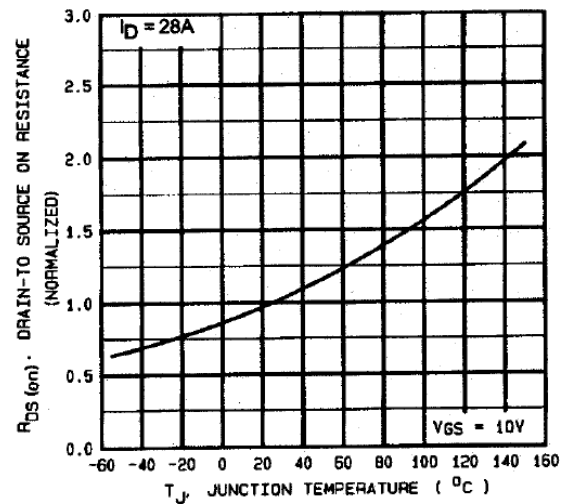
**Fig 1. Typical Output Characteristics**



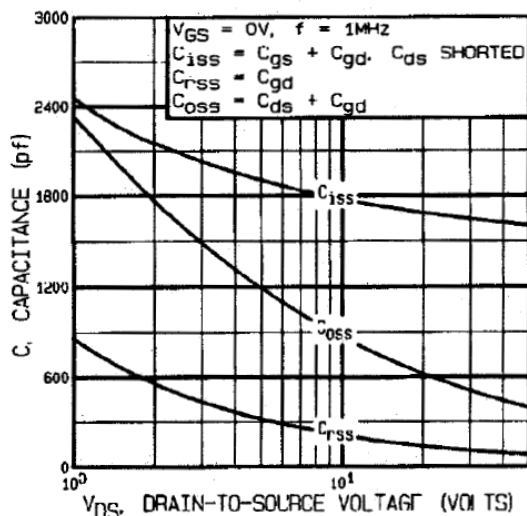
**Fig 2. Typical Output Characteristics**



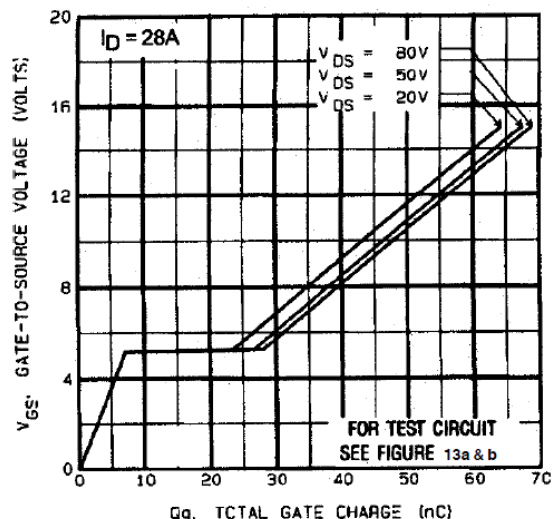
**Fig 3. Typical Transfer Characteristics**



**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**

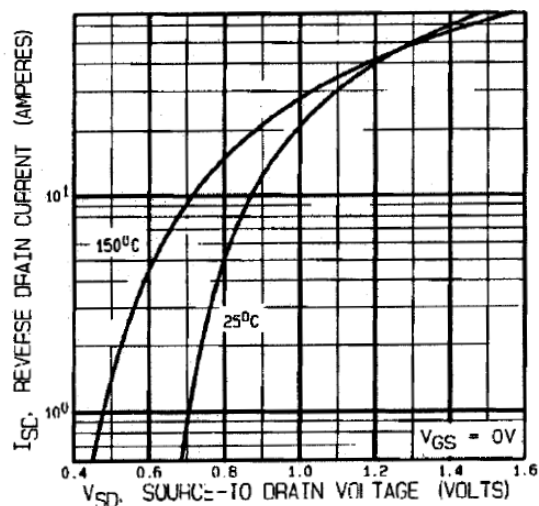


Fig 7. Typical Source-Drain Diode Forward Voltage

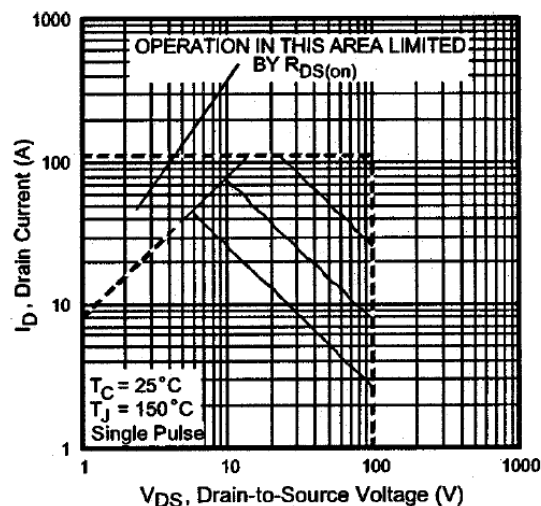


Fig 8. Maximum Safe Operating Area

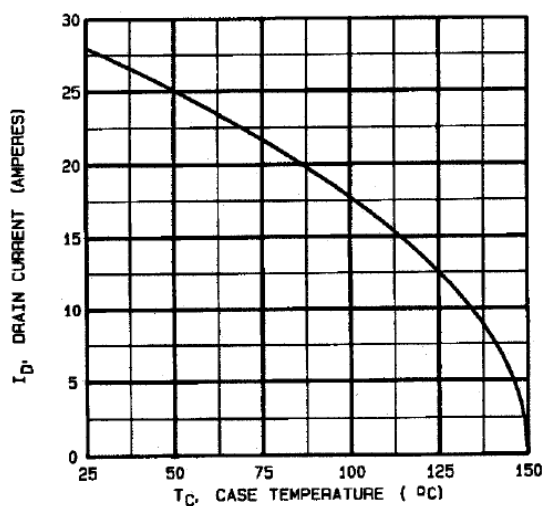


Fig 9. Maximum Drain Current Vs. Case Temperature

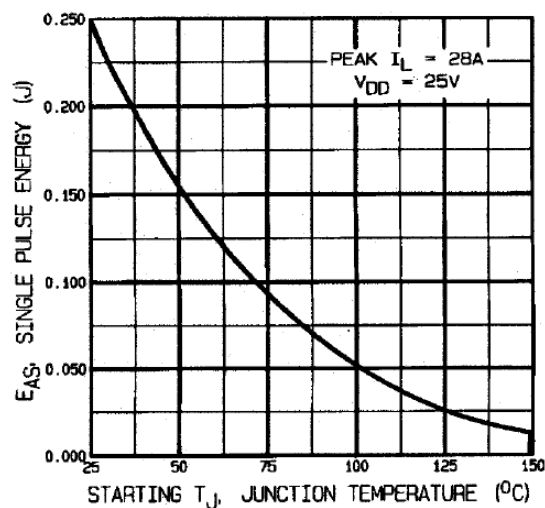


Fig 10. Maximum Avalanche Energy Vs. Drain Current

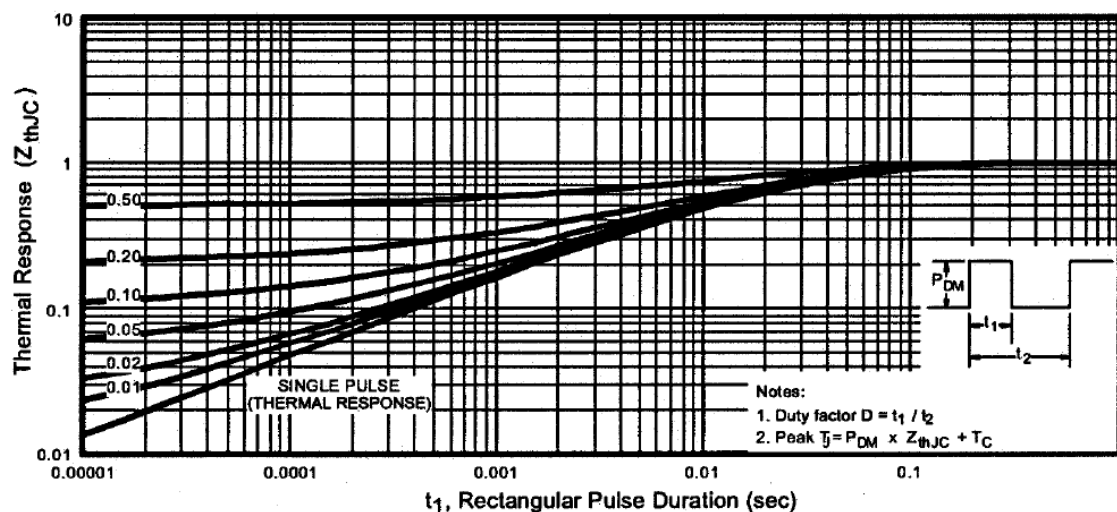
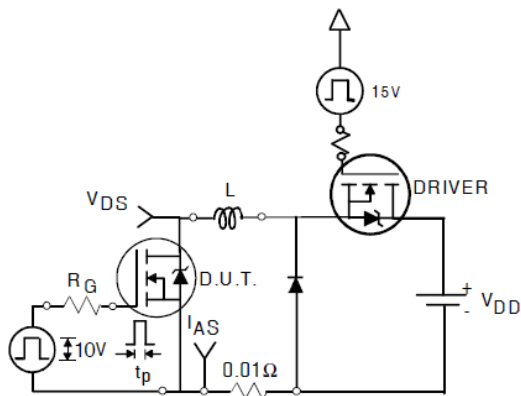
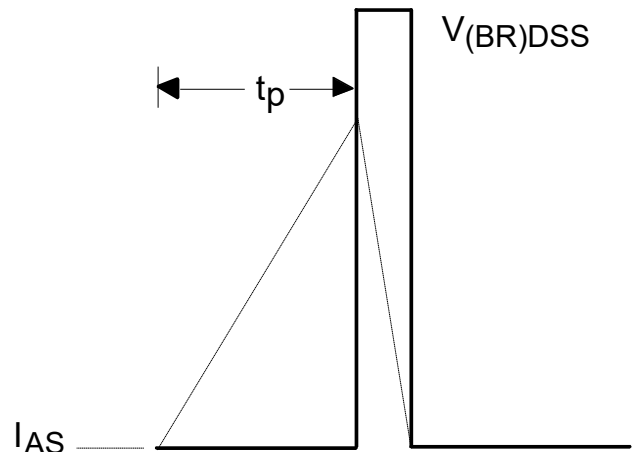


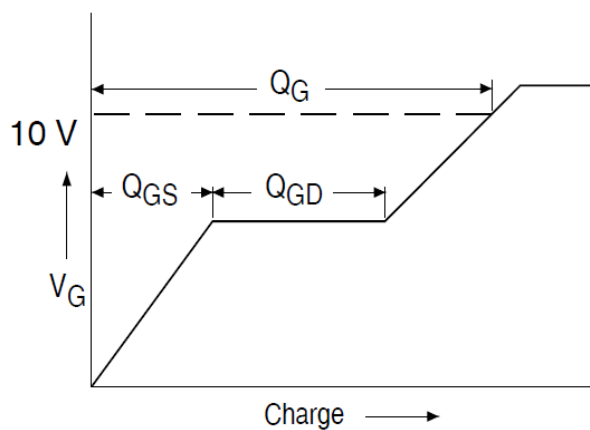
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



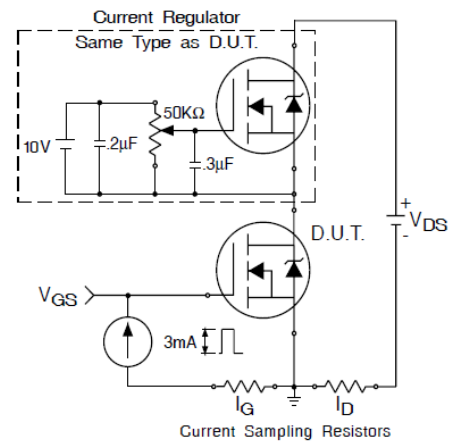
**Fig 12a.** Unclamped Inductive Test Circuit



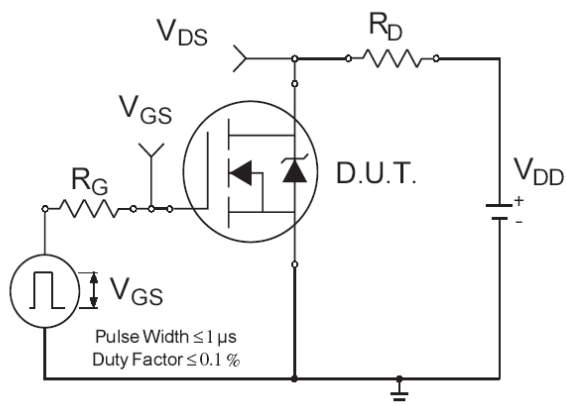
**Fig 12b.** Unclamped Inductive Waveforms



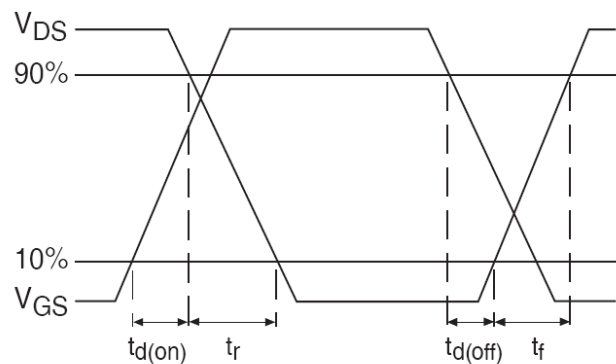
**Fig 13a.** Gate Charge Waveform



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



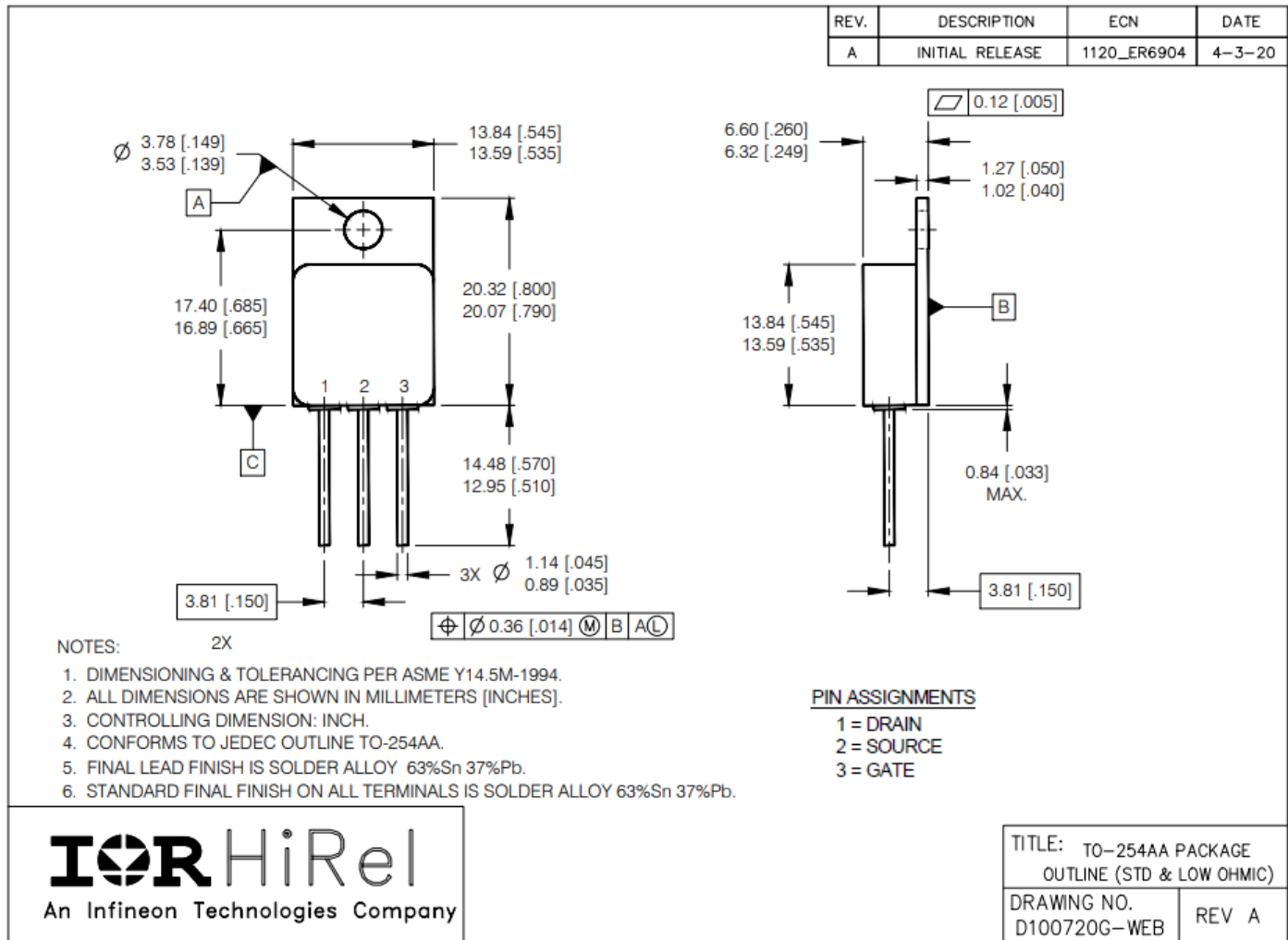
**Fig 14a.** Switching Time Test Circuit



**Fig 14b.** Switching Time Waveforms

Note: For the most updated package outline, please see the website: [TO-254AA](http://TO-254AA)

## Case Outline and Dimensions - Low-Ohmic TO-254AA



### BERYLLIA WARNING PER MIL-PRF-19500

Package 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.

### **IMPORTANT NOTICE**

The information given in this document shall be in no event regarded as guarantee of conditions or characteristic. The data contained herein is a characterization of the component based on internal standards and is intended to demonstrate and provide guidance for typical part performance. It will require further evaluation, qualification and analysis to determine suitability in the application environment to confirm compliance to your system requirements.

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