IRFY9240, IRFY9240M

PD-94199A

Power MOSFET
Thru-Hole (TO-257AA)
-200V, P-channel, HEXFET™ MOSFET Technology

Features

- Simple drive requirements
- Hermetically sealed
- Electrically Isolated
- Glass eyelets
- For Space Level Applications Refer to Ceramic Version Part Numbers IRFY9240C, IRFY9240CM

Product Summary

- **BV_{DSS}:** -200V
- **I_D :** -9.4A
- **$R_{DS(on),max}$:** 0.51Ω
- **$Q_{G,\ max}$:** 60nC

TO-257AA

Potential Applications

- DC-DC converter
- Motor drives

Product Validation

Adhered to JANTX screening flow according to MIL-PRF-19500 for high-reliability applications

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 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.

Ordering Information

Table 1 Ordering options

Part number	Package	Screening Level
IRFY9240	TO-257AA	COTS
IRFY9240M	TO-257AA	COTS
IRFY9240SCX	TO-257AA	JANTX

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1 Absolute Maximum Ratings

Table 2 Absolute Maximum Rating

Symbol	Parameter	Value	Unit
I_{D1} @ V_{GS} = -10V, T_C = 25°C	Continuous Drain Current	-9.4	A
I_{D2} @ V_{GS} = -10V, T_C = 100°C	Continuous Drain Current	-6.0	A
I_{DM} @ T_C = 25°C	Pulsed Drain Current [1]	-36	A
P_D @ T_C = 25°C	Maximum Power Dissipation	100	W
	Linear Derating Factor	0.8	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy [2]	700	mJ
I_{AR}	Avalanche Current [1]	-9.4	A
E_{AR}	Repetitive Avalanche Energy [1]	10	mJ
dv/dt	Peak Diode Reverse Recovery [3]	-5.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Lead Temperature	300 (0.063in./1.6mm from case for 10s)	
	Weight	4.3 (Typical)	g

[1] Repetitive Rating: Pulse width limited by maximum junction temperature.
[2] V_{DD} = -50V, starting T_J = 25°C, L = 15mH, Peak I_L = -9.4A, V_{GS} = -10V
[3] $I_{SD} \leq$ -9.4A, di/dt $\leq$ -150A/µs, $V_{DD} \leq$ -200V, $T_J \leq$ 150°C

2 Device Characteristics

2.1 Electrical Characteristics

Table 3 Static and Dynamic Electrical Characteristics @ T_j = 25°C (Unless Otherwise Specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	-200	—	—	V	V_{GS} = 0V, I_D = -1.0mA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.2	—	V/°C	Reference to 25°C, I_D = -1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	0.51	Ω	V_{GS} = -10V, I_{D2} = -6.0A [1]
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	V_{DS} = V_{GS}, I_D = -250µA
Gfs	Forward Transconductance	4.0	—	—	S	V_{DS} = -15V, I_{D2} = -6.0A [1]
I_{DSS}	Zero Gate Voltage Drain Current	—	—	-25	µA	V_{DS} = -160V, V_{GS} = 0V
		—	—	-250		V_{DS} = -160V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Leakage Forward	—	—	-100	nA	V_{GS} = -20V
	Gate-to-Source Leakage Reverse	—	—	100		V_{GS} = 20V
Q_G	Total Gate Charge	—	—	60	nC	I_{D1} = -9.4A V_{DS} = -100V V_{GS} = -10V
Q_{GS}	Gate-to-Source Charge	—	—	15		
Q_{GD}	Gate-to-Drain ('Miller') Charge	—	—	38		
$t_{d(on)}$	Turn-On Delay Time	—	—	35	ns	I_{D1} = -9.4A ** V_{DD} = -100V R_G = 9.1Ω V_{GS} = -10V
t_r	Rise Time	—	—	85		
$t_{d(off)}$	Turn-Off Delay Time	—	—	85		
t_f	Fall Time	—	—	65		
$L_s + L_D$	Total Inductance	—	6.8	—	nH	Measured from Drain lead (6mm /0.25in. from package) to Source lead (6mm /0.25in. From package) with Source wires internally bonded from Source Pin to Drain Pad
C_{iss}	Input Capacitance	—	1200	—	pF	V_{GS} = 0V V_{DS} = -25V ƒ = 1.0MHz
C_{oss}	Output Capacitance	—	570	—		
C_{rss}	Reverse Transfer Capacitance	—	81	—		

** Switching speed maximum limits are based on manufacturing test equipment and capability.

[1] Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

2.2 Source-Drain Diode Ratings and Characteristics

Table 4 Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-9.4	A	
I_{SM}	Pulsed Source Current (Body Diode) [1]	—	—	-36	A	
V_{SD}	Diode Forward Voltage	—	—	-4.6	V	T_J = 25°C, I_S = -9.4A, V_{GS} = 0V [2]
t_{rr}	Reverse Recovery Time	—	—	440	ns	T_J = 25°C, I_F = -9.4A, V_{DD} ≤ -50V di/dt = -100A/µs [2]
Q_{rr}	Reverse Recovery Charge	—	4.8	—	µC	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

2.3 Thermal Characteristics

Table 5 Thermal Resistance

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction-to-Case	—	—	1.25	°C/W
$R_{\theta JCS}$	Case-to-Sink	—	0.21	—	
$R_{\theta JA}$	Junction-to-Ambient (Typical socket mount)	—	—	80	

[1] Repetitive Rating; Pulse width limited by maximum junction temperature.
[2] Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

3 Electrical Characteristics Curves

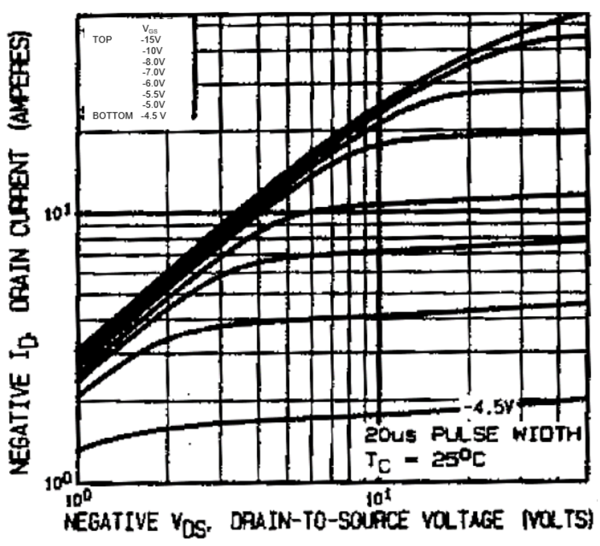


Figure 1 Typical Output Characteristics

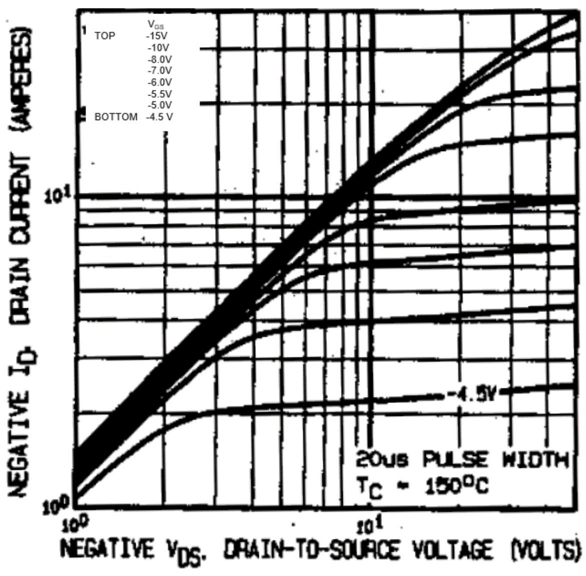


Figure 2 Typical Output Characteristics

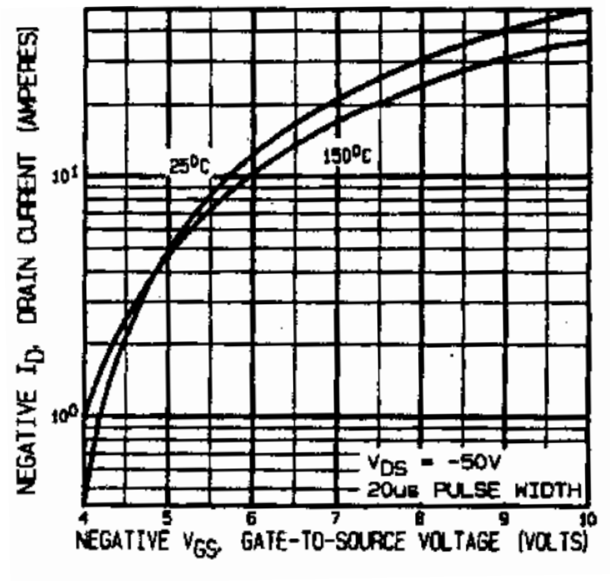


Figure 3 Typical Transfer Characteristics

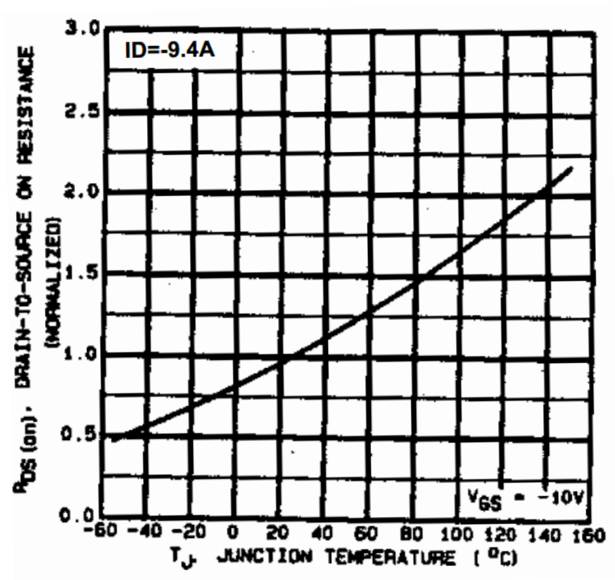


Figure 4 Normalized On-Resistance Vs. Temperature

Electrical Characteristics Curves

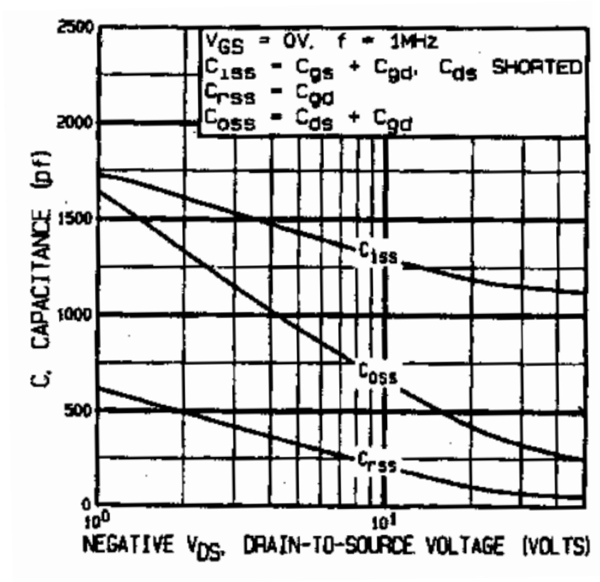


Figure 5 Typical Capacitance Vs. Drain-to-Source Voltage

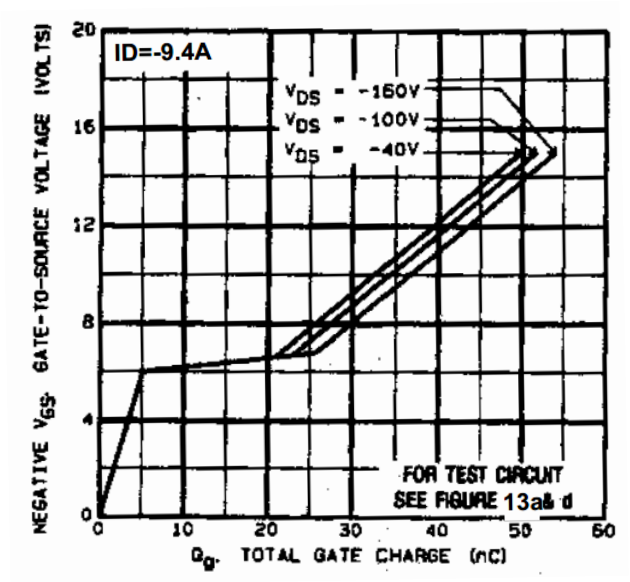


Figure 6 Typical Gate Charge Vs. Gate-to-Source Voltage

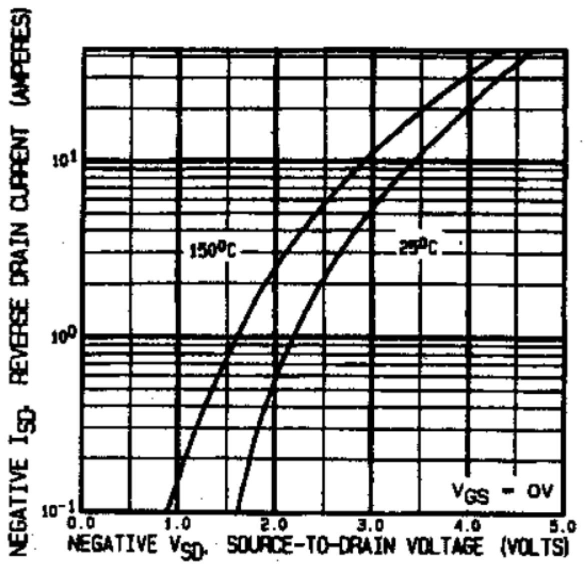


Figure 7 Typical Source-Drain Vs. Diode Forward Voltage

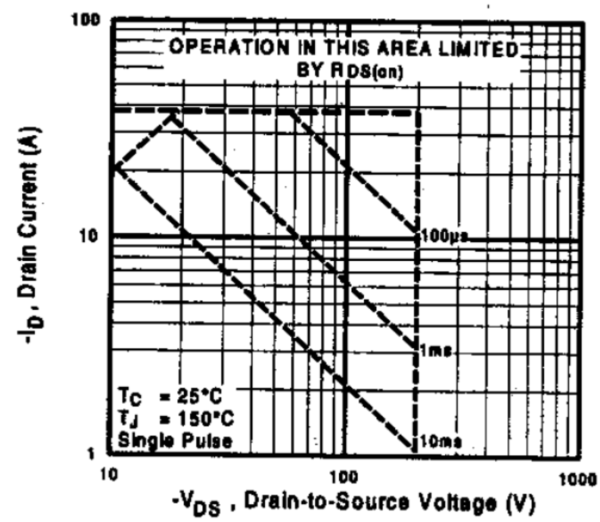


Figure 8 Maximum Safe Operating Area

Electrical Characteristics Curves

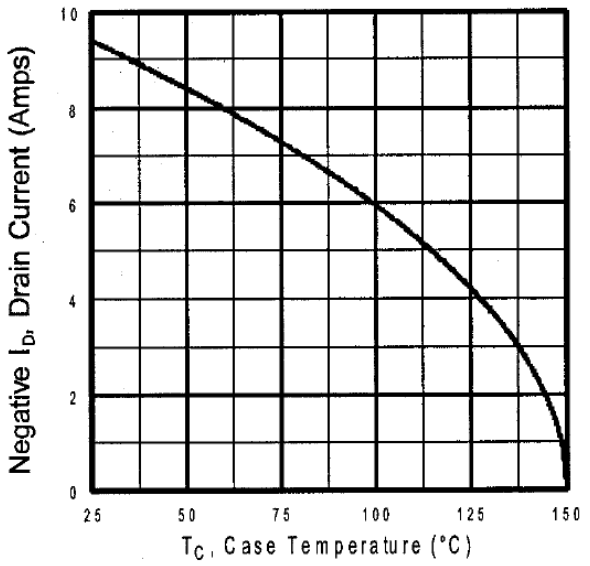


Figure 9 **Maximum Drain Current Vs. Case Temperature**

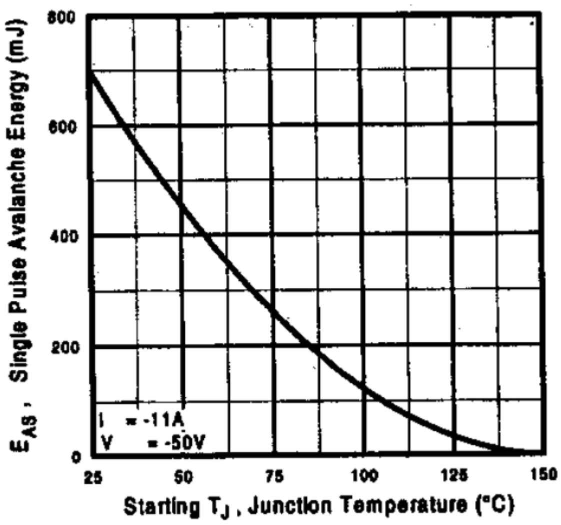


Figure 10 **Maximum Avalanche Energy Vs. Drain Current**

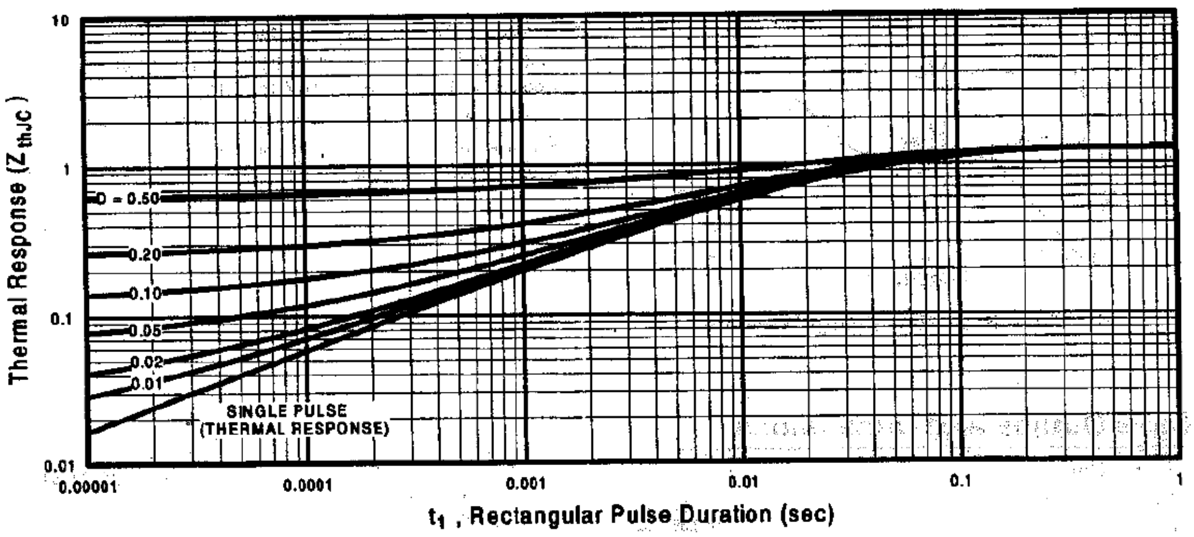


Figure 11 **Maximum Effective Transient Thermal Impedance, Junction-to-Case**

4 Test Circuits (Pre-irradiation)

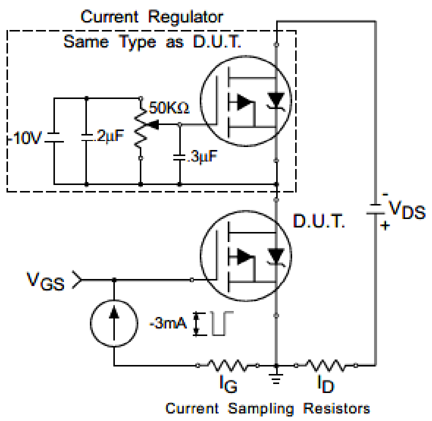


Figure 12 Gate Charge Test Circuit

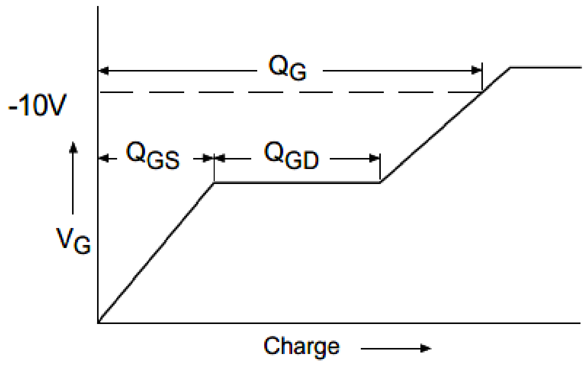


Figure 13 Gate Charge Waveform

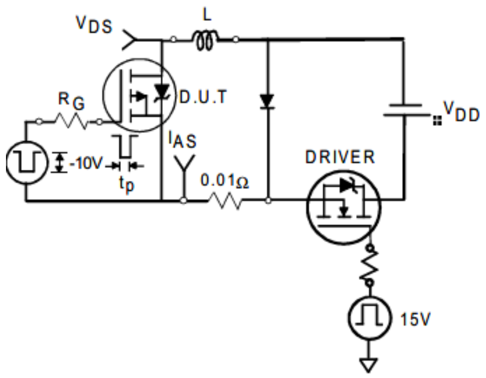


Figure 14 Unclamped Inductive Test Circuit

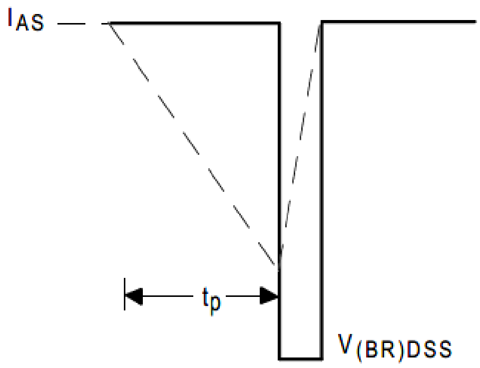


Figure 15 Unclamped Inductive Waveform

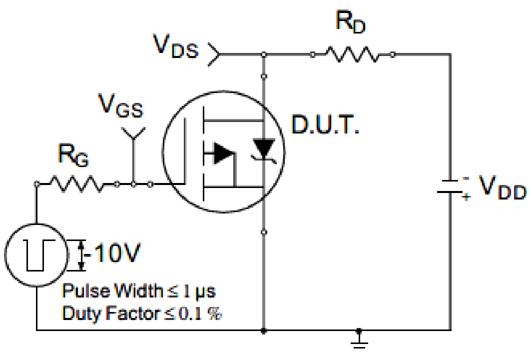


Figure 16 Switching Time Test Circuit

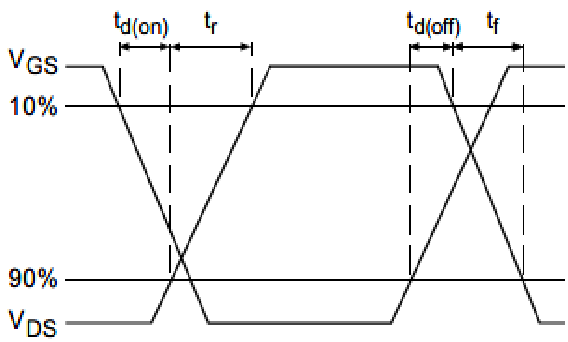
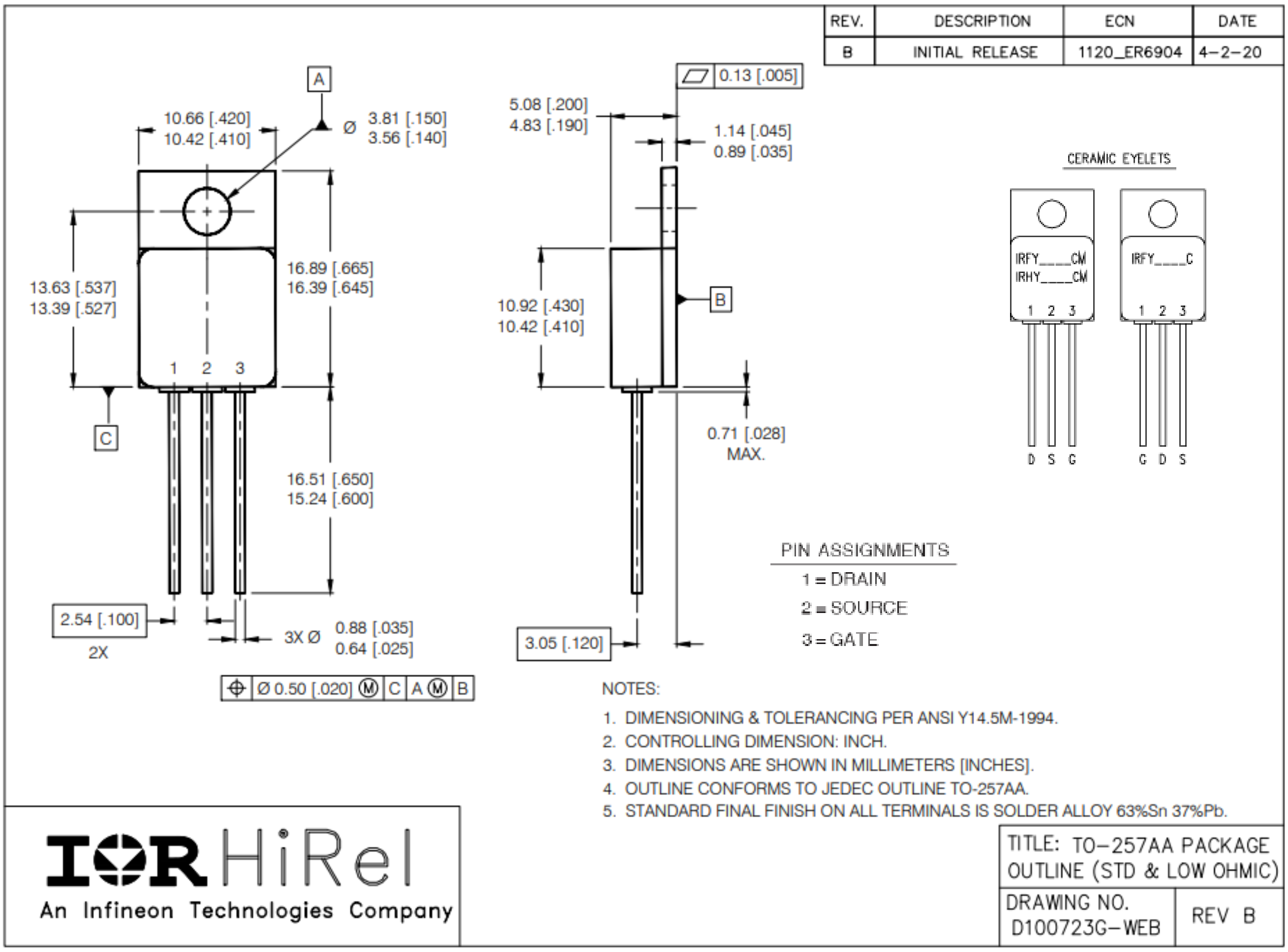


Figure 17 Switching Time Waveforms

5 Package Outline

Note: For the most updated package outline, please see the website: [TO-257AA]



Revision history

Document version	Date of release	Description of changes
	04/18/2001	Final datasheet (PD-94199)
Rev A	12/06/2024	Updated per ECN-1120-10102

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Edition 2024-12-06

Published by

International Rectifier HiRel Products, Inc.

An Infineon Technologies company

El Segundo, California 90245 USA

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Document reference

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