

IRFN350 (JANTX2N7227U)

PD-91551E

Power MOSFET

Surface Mount (SMD-1)

400V, 14A, N-channel, HEXFET™ MOSFET Technology

Features

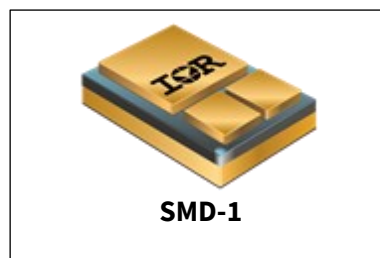
- Simple drive requirements
- Hermetically sealed
- Electrically isolated
- Surface mount
- Dynamic dv/dt rating
- Light weight

Product Summary

- **BV_{DSS}**: 400V
- **I_D**: 14A
- **R_{DS(on),max}**: 315mΩ
- **Q_{G,max}**: 110nC
- **REF**: MIL-PRF-19500/592

Potential Applications

- DC-DC converter
- Motor drives



Product Validation

Qualified to JANTXV screening flow according to MIL-PRF-19500 for high-reliability applications

Description

IR HiRel HEXFET™ technology is 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, fast switching and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, 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
IRFN350	SMD-1	COTS
JANTX2N7227U	SMD-1	JANTX
JANTXV2N7227U	SMD-1	JANTXV

IRFN350 (JANTX2N7227U)
Power MOSFET Surface Mount (SMD-1)

Table of contents

Table of contents

Features 1

Potential Applications..... 1

Product Validation..... 1

Description 1

Ordering Information..... 1

Table of contents..... 2

1 Absolute Maximum Ratings 3

2 Device Characteristics 4

2.1 Electrical Characteristics4

2.2 Source-Drain Diode Ratings and Characteristics5

2.3 Thermal Characteristics5

3 Electrical Characteristics Curves..... 6

4 Test Circuits 9

5 Package Outline10

Revision history.....11

Absolute Maximum Ratings

1 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$I_{D1} @ V_{GS} = 10V, T_C = 25^{\circ}C$	Continuous Drain Current	14	A
$I_{D2} @ V_{GS} = 10V, T_C = 100^{\circ}C$	Continuous Drain Current	9.0	A
$I_{DM} @ T_C = 25^{\circ}C$	Pulsed Drain Current ¹	56	A
$P_D @ T_C = 25^{\circ}C$	Maximum Power Dissipation	150	W
	Linear Derating Factor	1.2	W/ $^{\circ}C$
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ²	700	mJ
I_{AR}	Avalanche Current ¹	14	A
E_{AR}	Repetitive Avalanche Energy ¹	15	mJ
dv/dt	Peak Diode Reverse Recovery ³	4.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	$^{\circ}C$
	Lead Temperature	300 (0.063 in. /1.6 mm from case for 10s)	
	Weight	2.6 (Typical)	

¹ Repetitive Rating; Pulse width limited by maximum junction temperature.² $V_{DD} = 50V$, starting $T_J = 25^{\circ}C$, $L = 7.1mH$, Peak $I_L = 14A$, $V_{GS} = 10V$ ³ $I_{SD} \leq 14A$, $di/dt \leq 145A/\mu s$, $V_{DD} \leq 400V$, $T_J \leq 150^{\circ}C$

Device Characteristics

2 Device Characteristics

2.1 Electrical Characteristics

Table 3 Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	400	—	—	V	$V_{GS} = 0V, I_D = 1.0mA$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.46	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1.0mA$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	315	$m\Omega$	$V_{GS} = 10V, I_{D2} = 9.0A^1$
		—	—	415		$V_{GS} = 10V, I_{D1} = 14A^1$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
G_{fs}	Forward Transconductance	6.0	—	—	S	$V_{DS} = 15V, I_{D2} = 9.0A$
I_{DSS}	Zero Gate Voltage Drain Current	—	—	25	μA	$V_{DS} = 320V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 320V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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	—	—	110	nC	$I_{D1} = 14A$
Q_{GS}	Gate-to-Source Charge	—	—	18		$V_{DS} = 200V$
Q_{GD}	Gate-to-Drain ('Miller') Charge	—	—	65		$V_{GS} = 10V$
$t_{d(on)}$	Turn-On Delay Time	—	—	35	ns	$I_{D1} = 14A^{**}$ $V_{DD} = 200V$ $R_G = 2.35\Omega$ $V_{GS} = 10V$
t_r	Rise Time	—	—	190		
$t_{d(off)}$	Turn-Off Delay Time	—	—	170		
t_f	Fall Time	—	—	130		
$L_s + L_D$	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to center of source pad.
C_{iss}	Input Capacitance	—	2600	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz$
C_{oss}	Output Capacitance	—	680	—		
C_{rss}	Reverse Transfer Capacitance	—	250	—		

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

¹ Pulse width $\leq 300 \mu s$; Duty Cycle $\leq 2\%$

Device Characteristics

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)	—	—	14	A	
I _{SM}	Pulsed Source Current (Body Diode) ¹	—	—	56	A	
V _{SD}	Diode Forward Voltage	—	—	1.7	V	T _J = 25°C, I _S = 14A, V _{GS} = 0V ²
t _{rr}	Reverse Recovery Time	—	—	1200	ns	T _J = 25°C, I _F = 14A, V _{DD} ≤ 30V di/dt = 100A/μs
Q _{rr}	Reverse Recovery Charge	—	7.3	—	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	—	—	0.83	$^\circ\text{C}/\text{W}$
$R_{\theta J-PCB}$	Junction-to-PC board (Soldered to a copper-clad PC board)	—	3.0	—	

¹ Repetitive Rating; Pulse width limited by maximum junction temperature.² Pulse width $\leq 300\ \mu\text{s}$; Duty Cycle $\leq 2\%$

IRFN350 (JANTX2N7227U)

Power MOSFET Surface Mount (SMD-1)

Electrical Characteristics Curves

3 Electrical Characteristics Curves

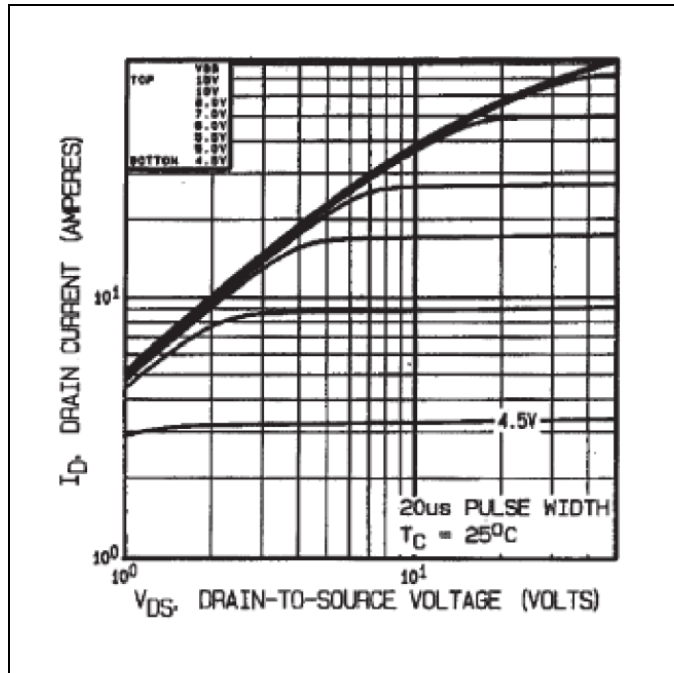


Figure 1 Typical Output Characteristics

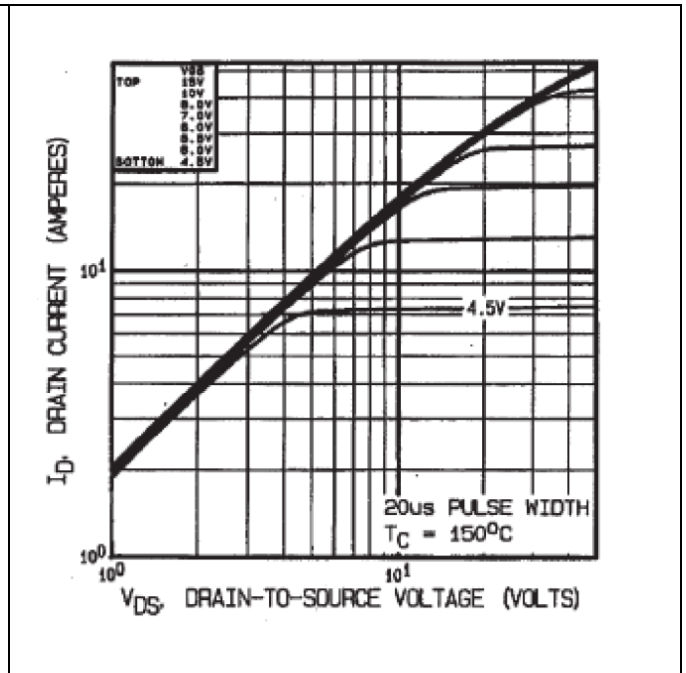


Figure 2 Typical Output Characteristics

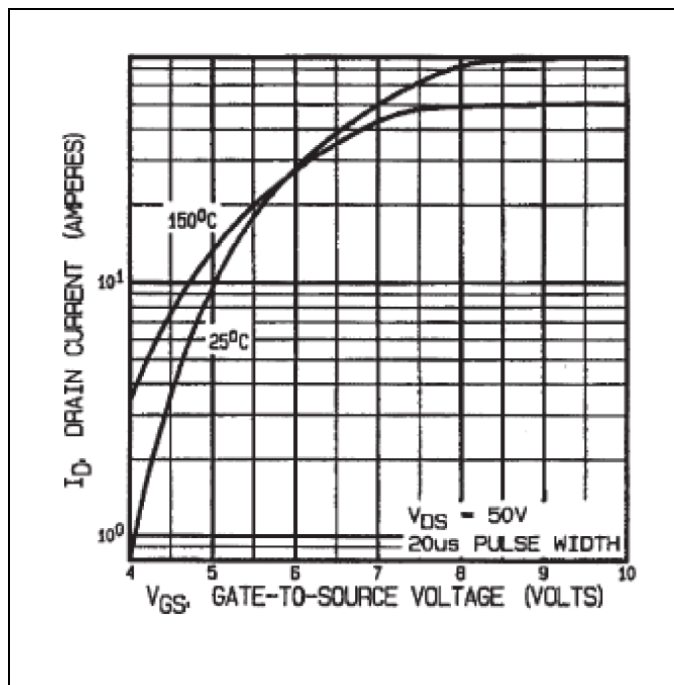


Figure 3 Typical Transfer Characteristics

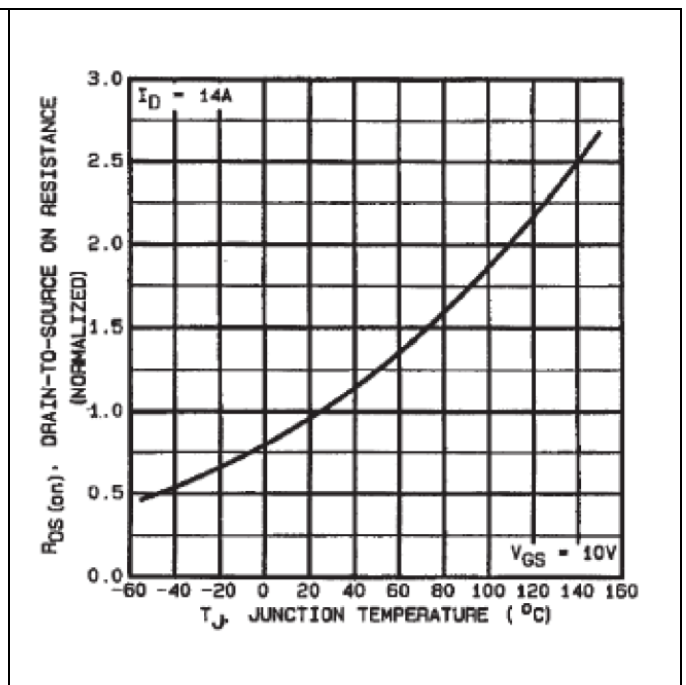


Figure 4 Normalized On-Resistance Vs. Temperature

IRFN350 (JANTX2N7227U)

Power MOSFET Surface Mount (SMD-1)

Electrical Characteristics Curves

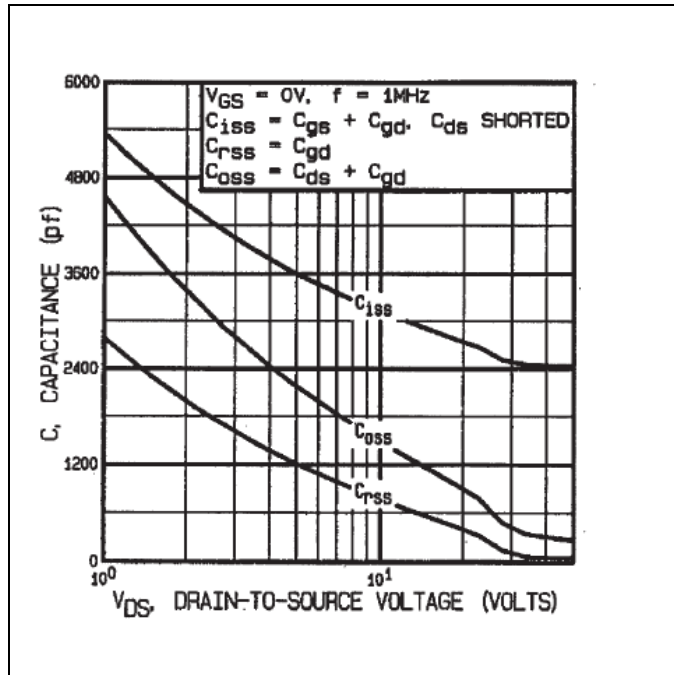


Figure 5 Typical Capacitance Vs. Drain-to-Source Voltage

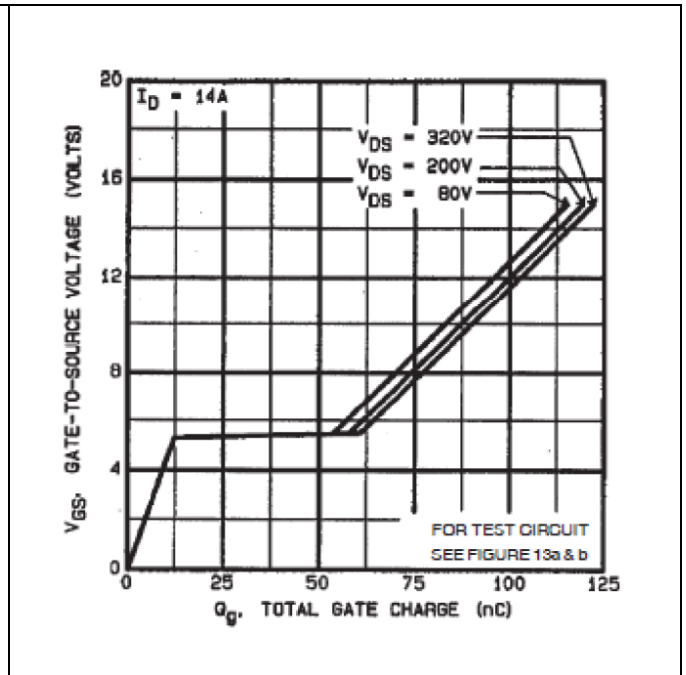


Figure 6 Typical Gate Charge Vs. Gate-to-Source Voltage

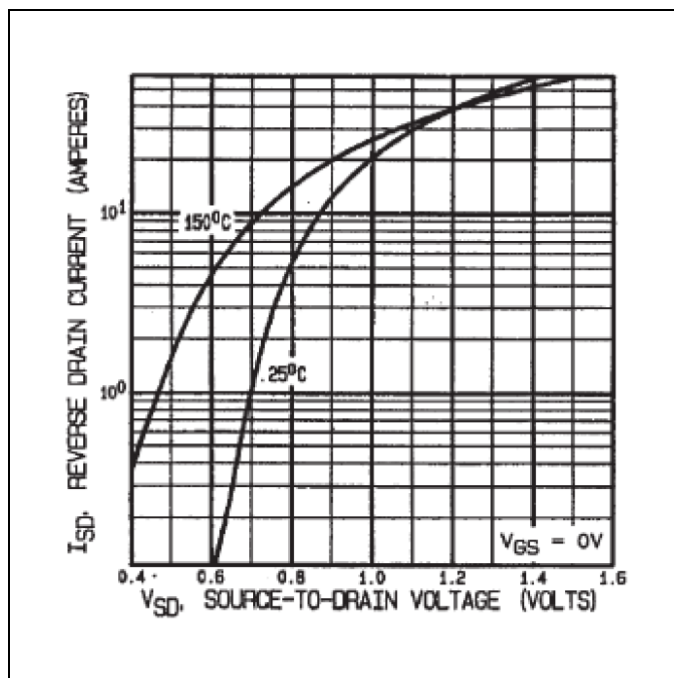


Figure 7 Typical Source-Drain Current Vs. Diode Forward Voltage

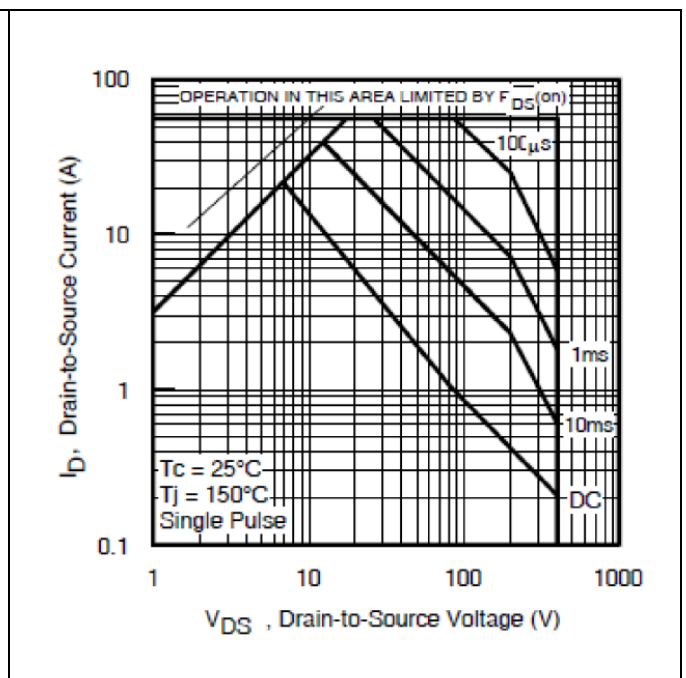


Figure 8 Maximum Safe Operating Area

IRFN350 (JANTX2N7227U)

Power MOSFET Surface Mount (SMD-1)

Electrical Characteristics Curves

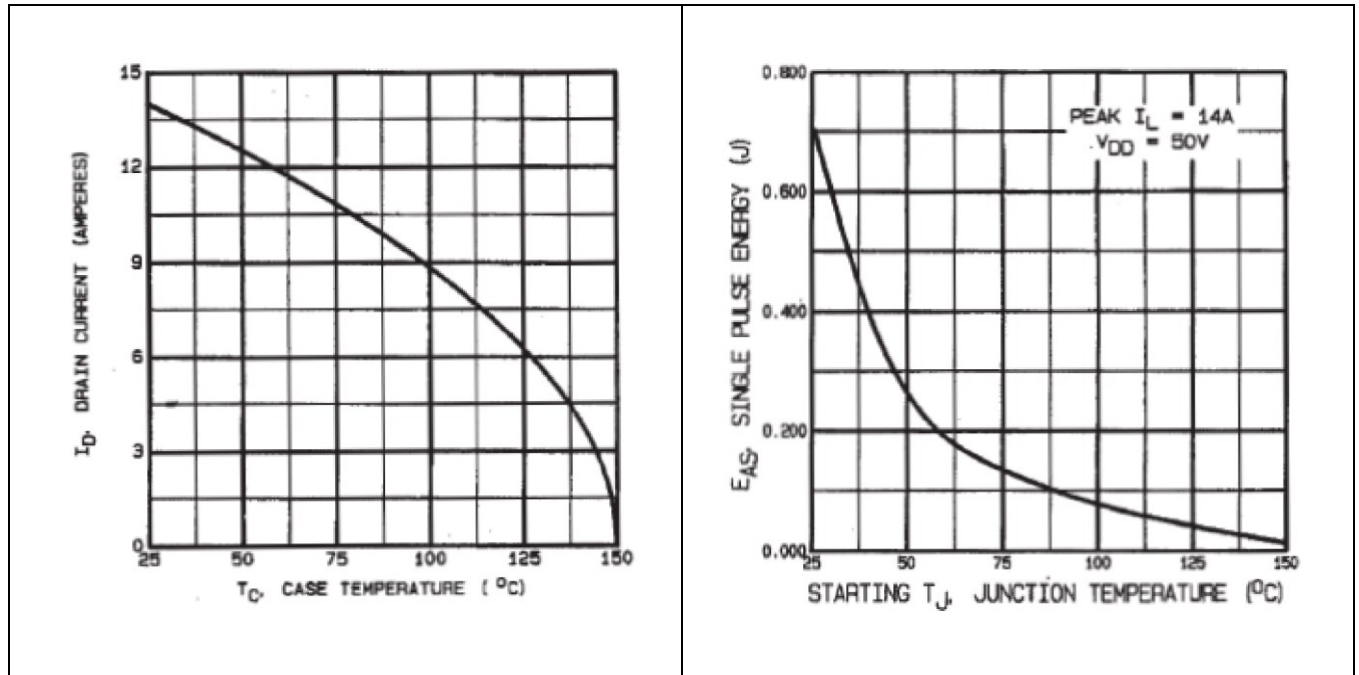


Figure 9 Maximum Drain Current Vs. Case Temperature

Figure 10 Maximum Avalanche Energy Vs. Junction Temperature

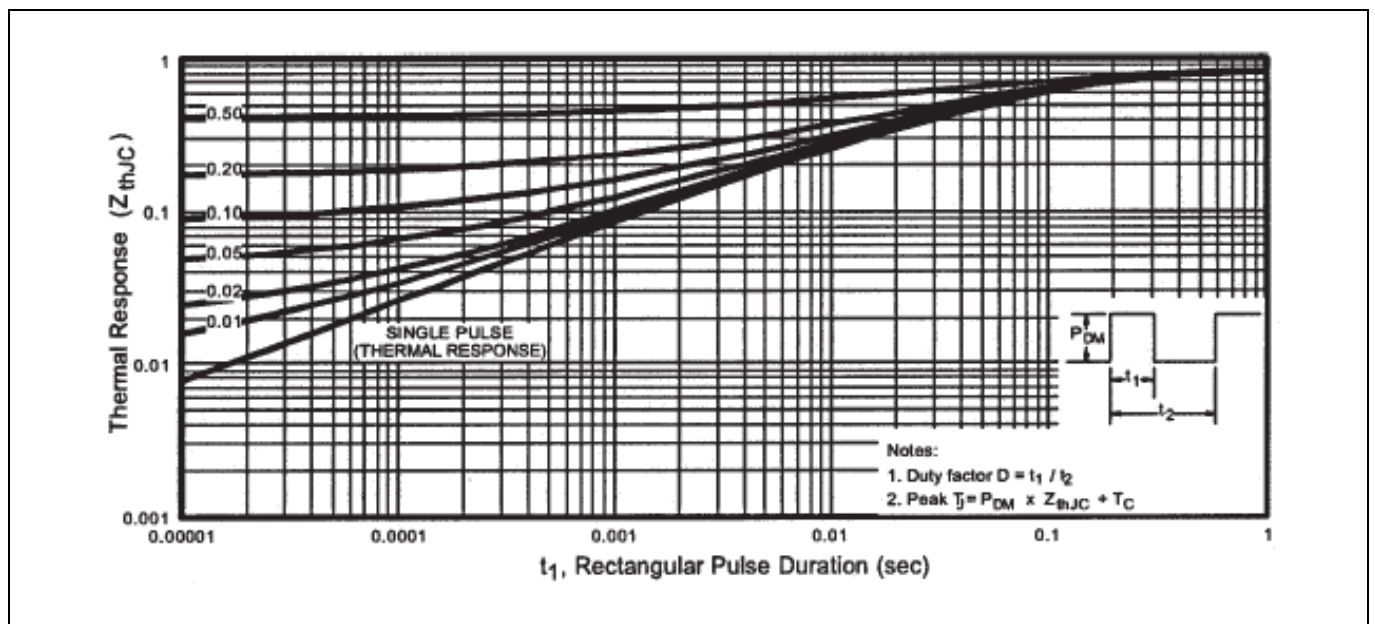


Figure 11 Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFN350 (JANTX2N7227U)

Power MOSFET Surface Mount (SMD-1)

Test Circuits

4 Test Circuits

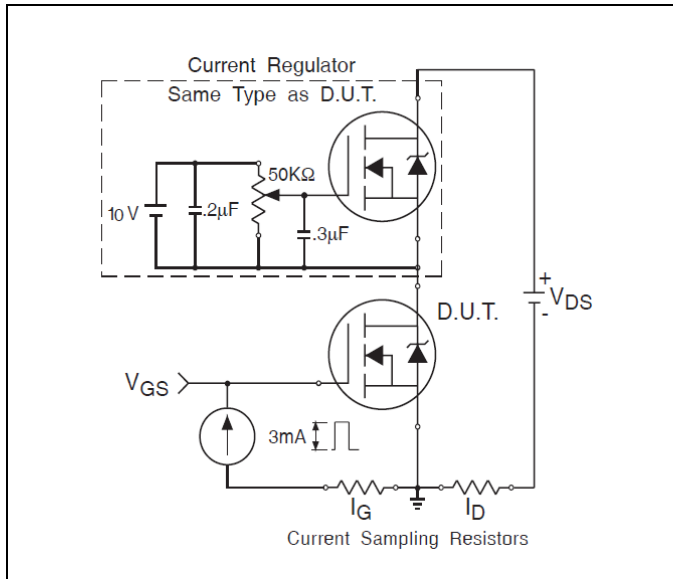


Figure 12 Gate Charge Test Circuit

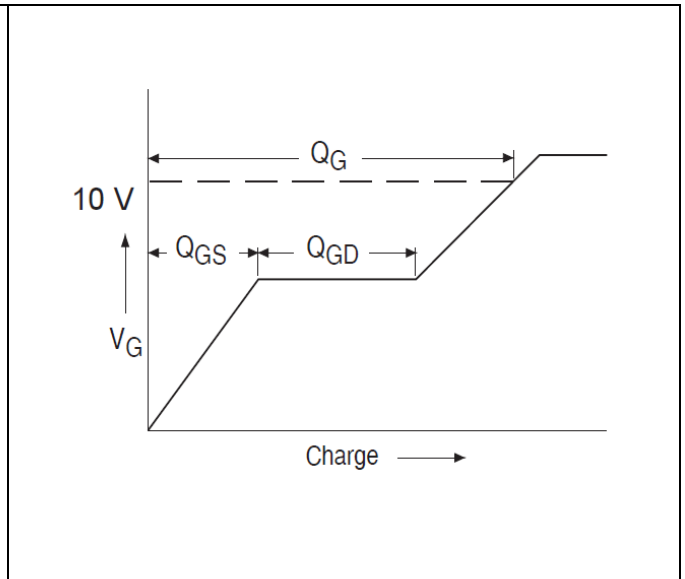


Figure 13 Gate Charge Waveform

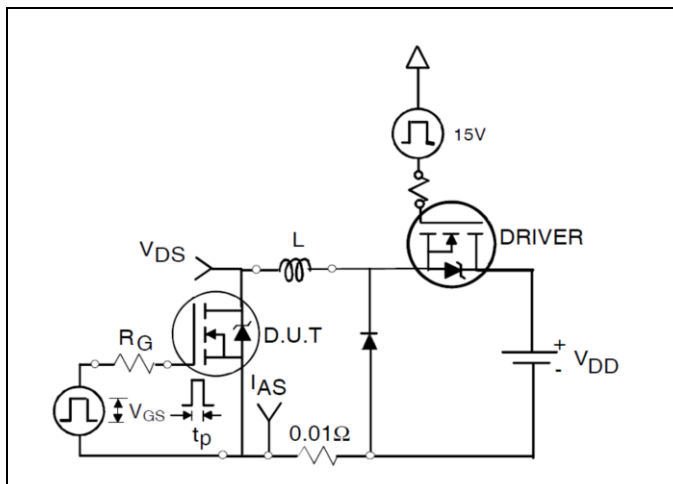


Figure 14 Unclamped Inductive Test Circuit

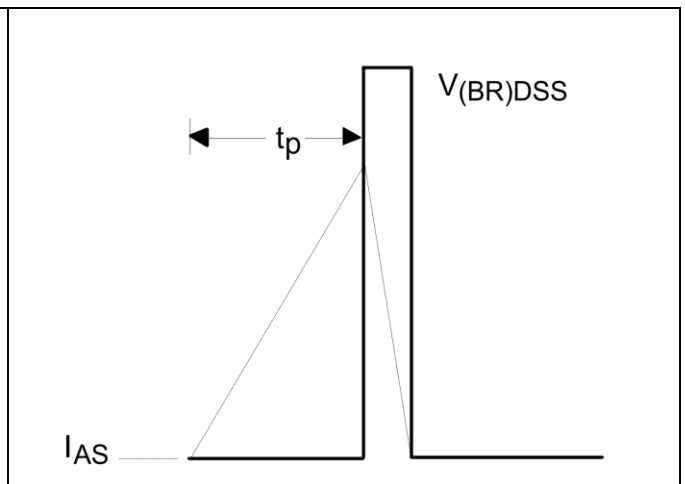


Figure 15 Unclamped Inductive Waveform

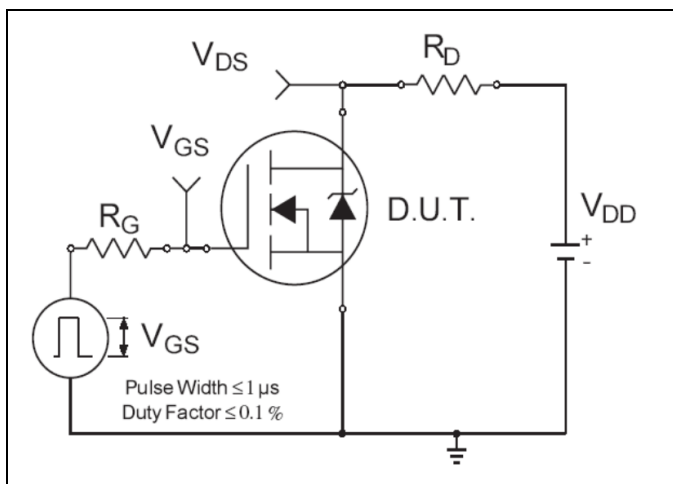


Figure 16 Switching Time Test Circuit

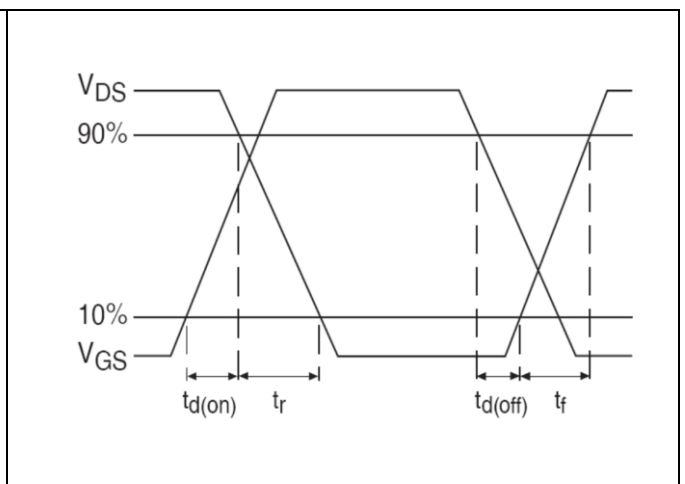


Figure 17 Switching Time Waveforms

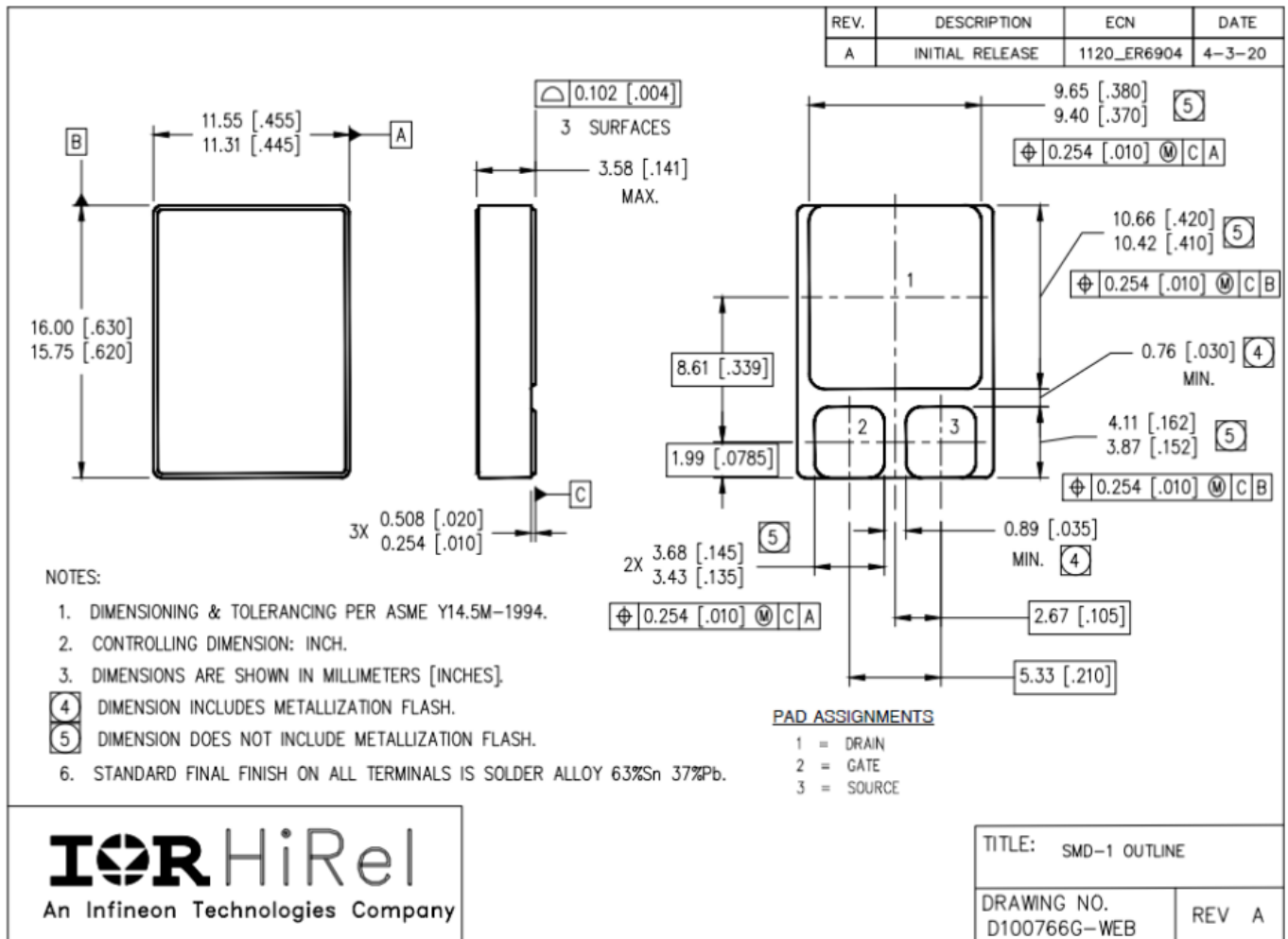
IRFN350 (JANTX2N7227U)

Power MOSFET Surface Mount (SMD-1)

Package Outline

5 Package Outline

Note: For the most updated package outline, please see the website: [SMD-1](#)



IRFN350 (JANTX2N7227U)**Power MOSFET Surface Mount (SMD-1)****Revision history****Revision history**

Document version	Date of release	Description of changes
Rev B	12/06/1999	Datasheet (PD-91551)
Rev C	01/28/2002	Updated switch time test condition VGS=10V
Rev D	12/12/2007	Added JAN part number
Rev E	08/06/2024	Updated based on ECN-1120_10008

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2024-08-06

Published by

**International Rectifier HiRel Products,
Inc.**

**An Infineon Technologies company
El Segundo, California 90245 USA**

**© 2024 Infineon Technologies AG.
All Rights Reserved.**

**Do you have a question about this
document?**

Email: erratum@infineon.com

Document reference

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest International Rectifier HiRel Products, Inc., an Infineon Technologies company, office.

International Rectifier HiRel Components may only be used in life-support devices or systems with the expressed written approval of International Rectifier HiRel Products, Inc., an Infineon Technologies company, if failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety and effectiveness of that device or system.

Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.