

Applications

- High Frequency 3.3V and 5V input Point-of-Load Synchronous Buck Converters
- Power Management for Netcom, Computing and Portable Applications.

V_{DSS}	R_{DS(on)} max	Q_g
12V	8.5mΩ	27nC

Benefits

- Ultra-Low Gate Impedance
- Very Low R_{DS(on)}
- Fully Characterized Avalanche Voltage and Current



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V _{DS}	Drain-Source Voltage	12	V
V _{GS}	Gate-to-Source Voltage	± 12	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 4.5V	84 ④	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 4.5V	60 ③	
I _{DM}	Pulsed Drain Current ①	320	
P _D @ T _C = 25°C	Maximum Power Dissipation	88	W
P _D @ T _C = 100°C	Maximum Power Dissipation	44	W
	Linear Derating Factor	0.59	mW/°C
T _J , T _{STG}	Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	1.7	°C/W
R _{θJA}	Junction-to-Ambient (PCB mount)*	—	40	
R _{θJA}	Junction-to-Ambient	—	110	

Notes ① through ④ are on page 9
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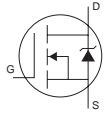
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	12	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.009	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ ③
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	6.5	8.5	$m\Omega$	$V_{GS} = 4.5V, I_D = 15A$ ③
		—	—	30		$V_{GS} = 2.8V, I_D = 12A$
$V_{GS(th)}$	Gate Threshold Voltage	0.6	—	1.9	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-3.2	—	$mV/^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	100	μA	$V_{DS} = 9.6V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 9.6V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 12V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -12V$
g_{fs}	Forward Transconductance	31	—	—	S	$V_{DS} = 6.0V, I_D = 12A$
Q_g	Total Gate Charge	—	27	41	nC	$V_{DS} = 6.0V$ $V_{GS} = 5.0V$ $I_D = 6.0A$ See Fig.16
Q_{gs1}	Pre-V _{th} Gate-Source Charge	—	3.6	—		
Q_{gs2}	Post-V _{th} Gate-Source Charge	—	2.0	—		
Q_{gd}	Gate-to-Drain Charge	—	10	—		
Q_{godr}	Gate Charge Overdrive	—	11	—		
Q_{sw}	Switch Charge ($Q_{gs2} + Q_{gd}$)	—	12	—		
Q_{oss}	Output Charge	—	28	—	nC	$V_{DS} = 10V, V_{GS} = 0V$
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{DD} = 6.0V, V_{GS} = 4.5V$ ③ $I_D = 12A$ Clamped Inductive Load
t_r	Rise Time	—	14	—		
$t_{d(off)}$	Turn-Off Delay Time	—	21	—		
t_f	Fall Time	—	17	—		
C_{iss}	Input Capacitance	—	2490	—	pF	$V_{GS} = 0V$ $V_{DS} = 6.0V$ $f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	2150	—		
C_{rss}	Reverse Transfer Capacitance	—	530	—		

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	300	mJ
I_{AR}	Avalanche Current ①	—	20	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	84 ④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	320		
V_{SD}	Diode Forward Voltage	—	0.81	1.2	V	$T_J = 25^\circ\text{C}, I_S = 12A, V_{GS} = 0V$ ③
		—	0.65	—		$T_J = 125^\circ\text{C}, I_S = 12A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	52	78	ns	$T_J = 25^\circ\text{C}, I_F = 12A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	54	81	nC	$di/dt = 100A/\mu s$ ③
t_{rr}	Reverse Recovery Time	—	50	75	ns	$T_J = 125^\circ\text{C}, I_F = 12A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	50	75	nC	$di/dt = 100A/\mu s$ ③

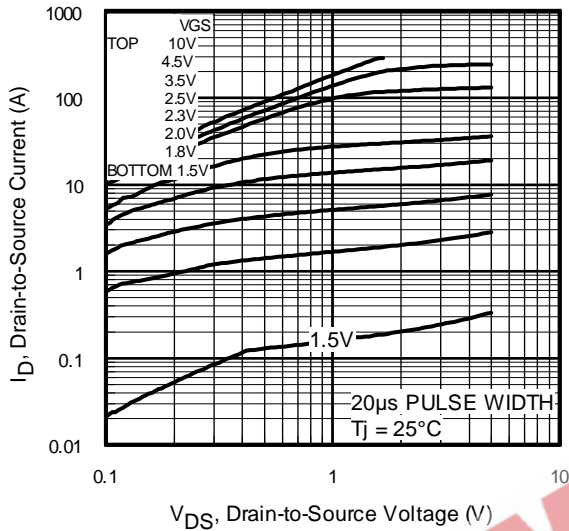


Fig 1. Typical Output Characteristics

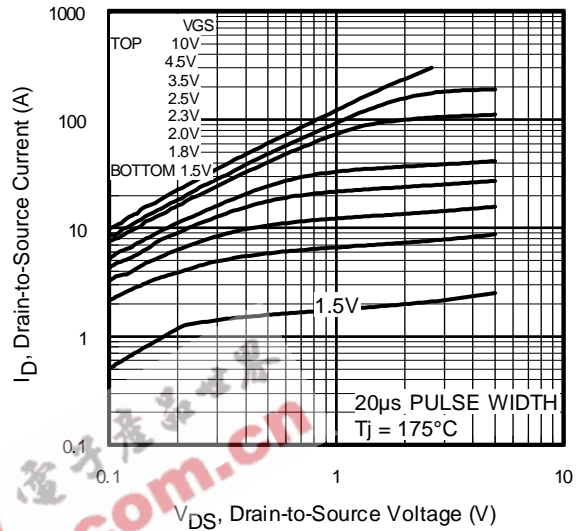


Fig 2. Typical Output Characteristics

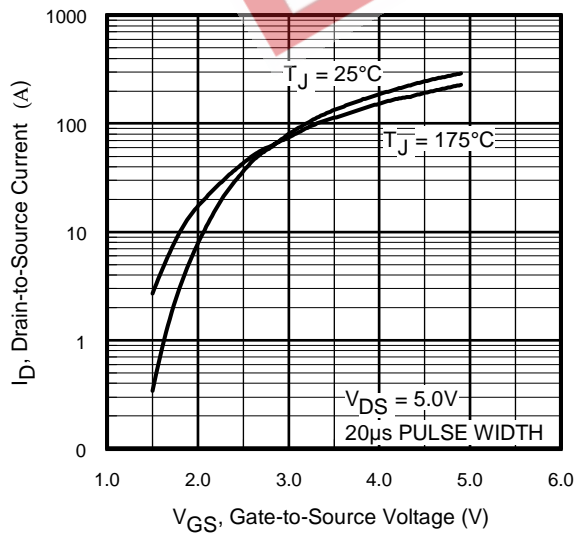


Fig 3. Typical Transfer Characteristics

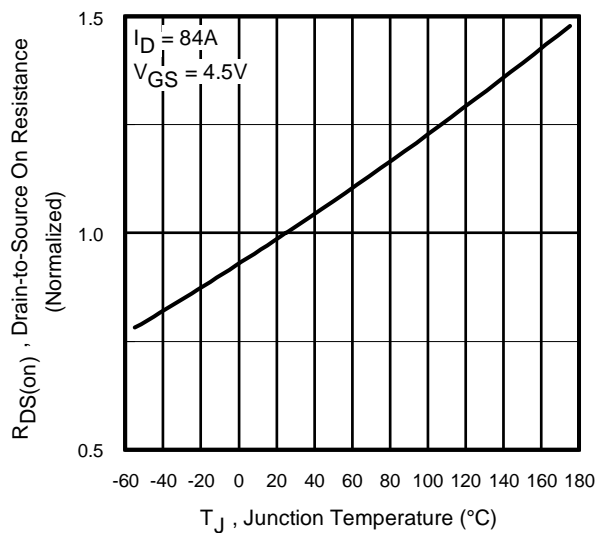


Fig 4. Normalized On-Resistance Vs. Temperature

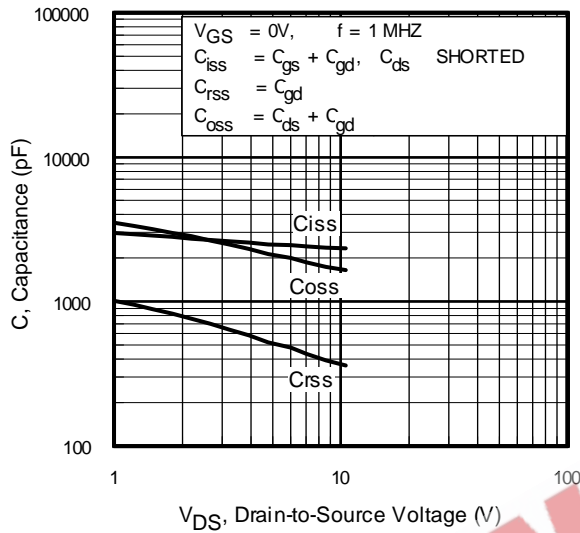


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

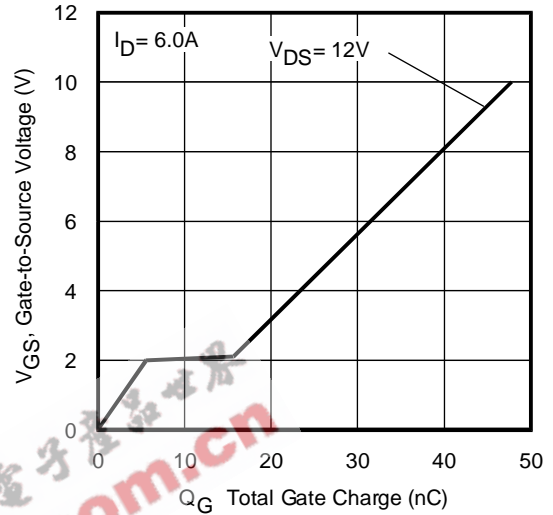


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

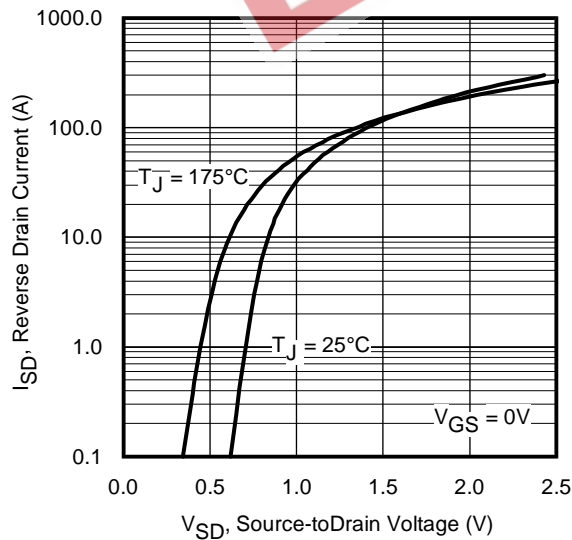


Fig 7. Typical Source-Drain Diode Forward Voltage

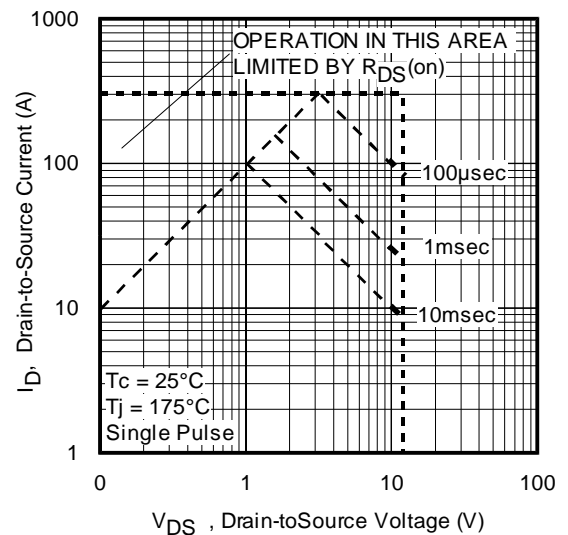


Fig 8. Maximum Safe Operating Area

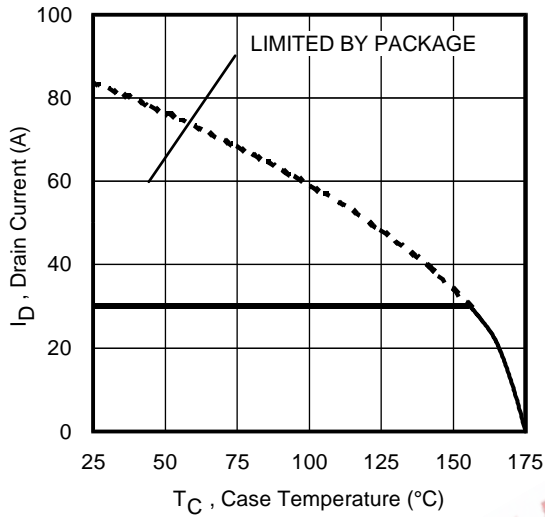


Fig 9. Maximum Drain Current Vs. Case Temperature

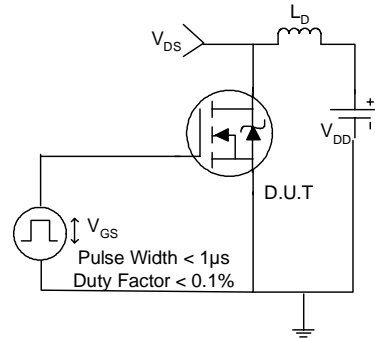


Fig 10a. Switching Time Test Circuit

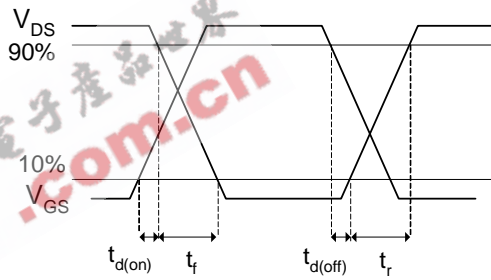


Fig 10b. Switching Time Waveforms

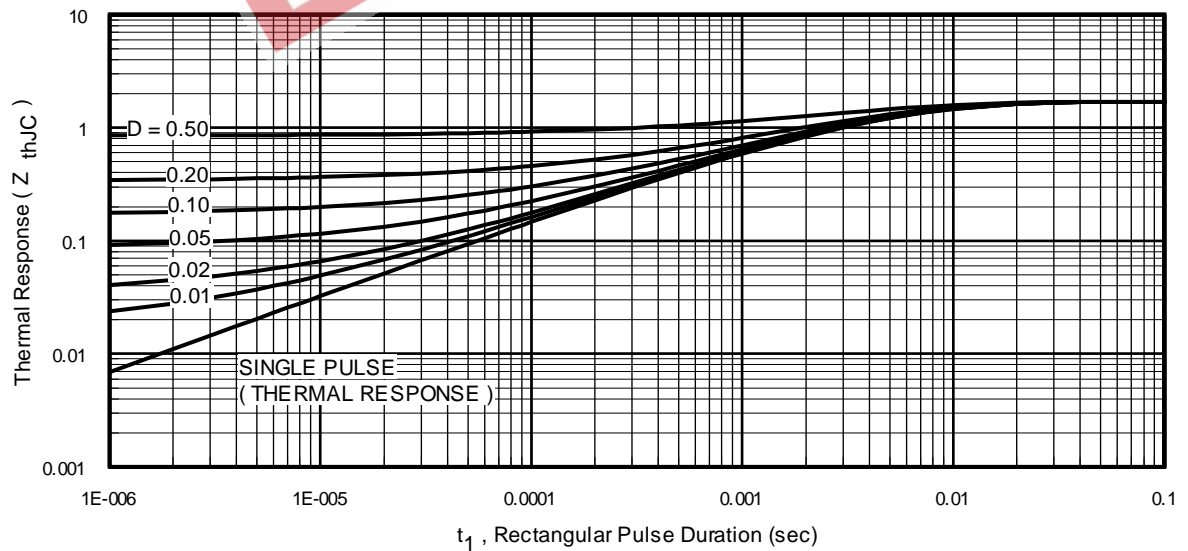


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

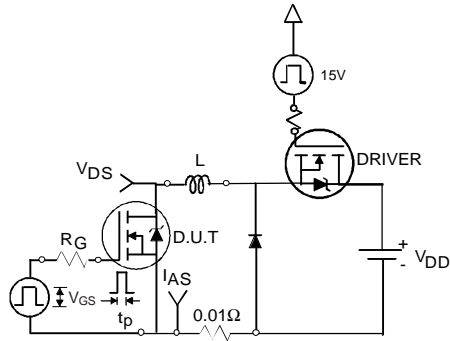


Fig 12a. Unclamped Inductive Test Circuit

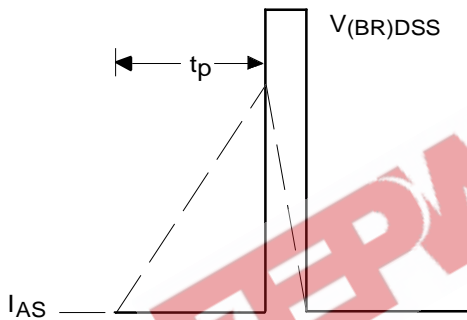


Fig 12b. Unclamped Inductive Waveforms

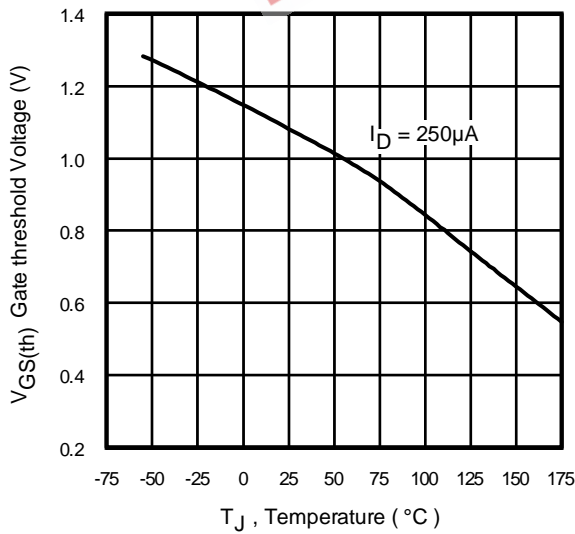


Fig 13. Threshold Voltage Vs. Temperature

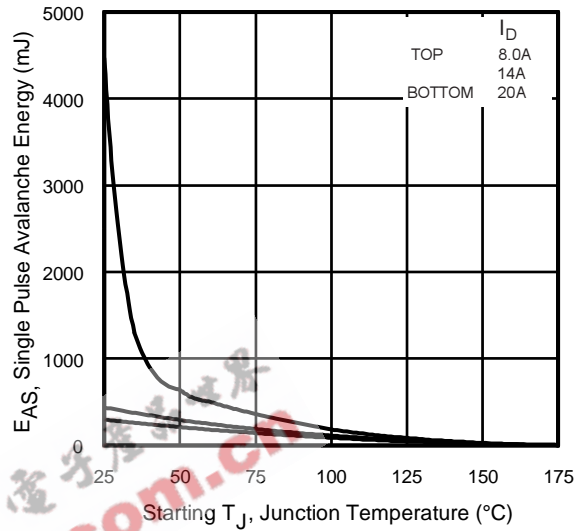


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

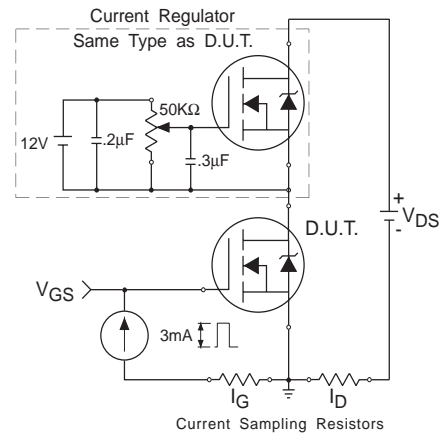


Fig 14. Gate Charge Test Circuit

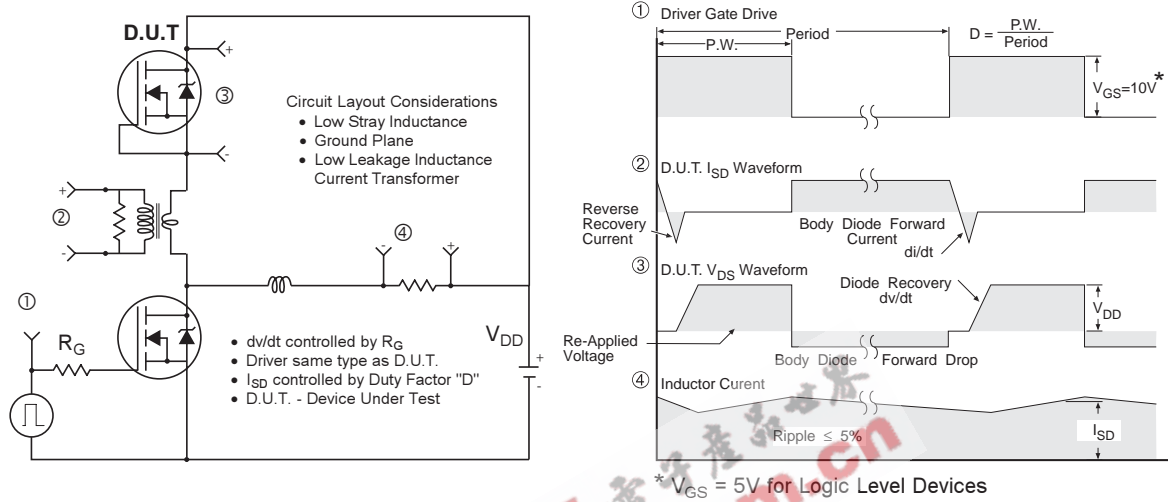


Fig 15. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET[®] Power MOSFETs

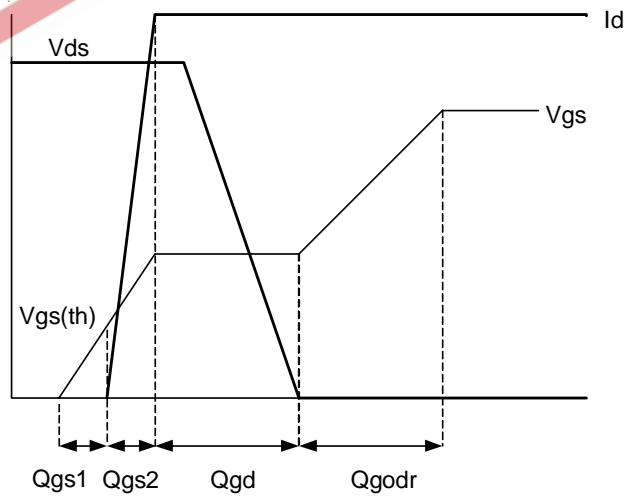
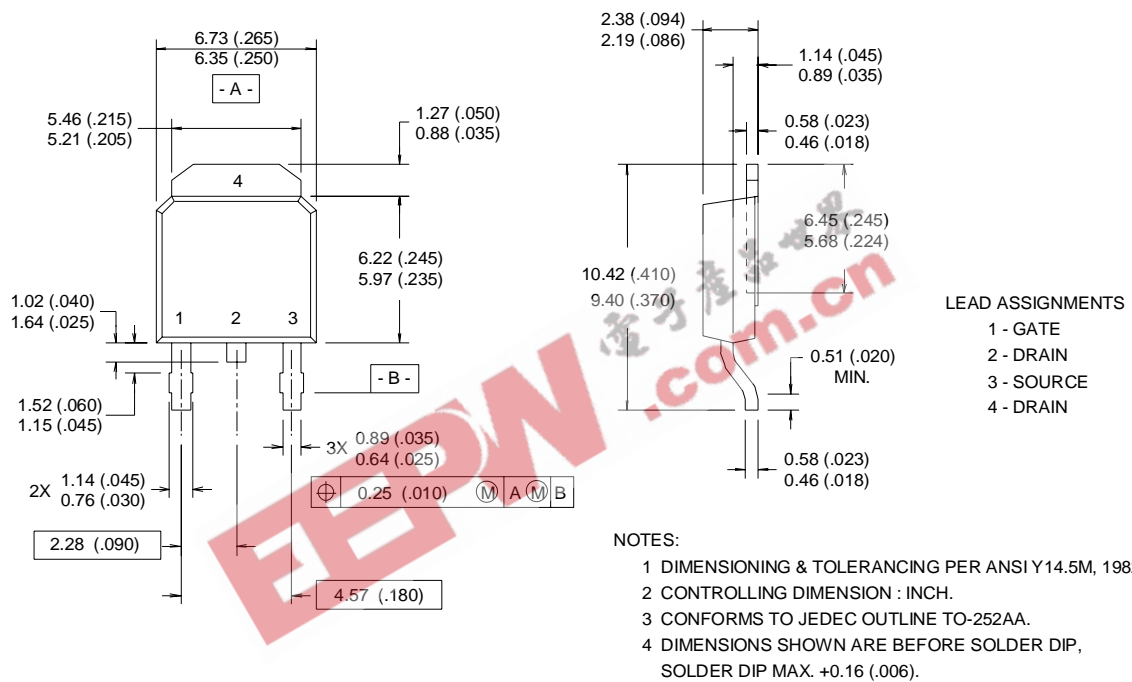


Fig 16. Gate Charge Waveform

IRLR/U3802

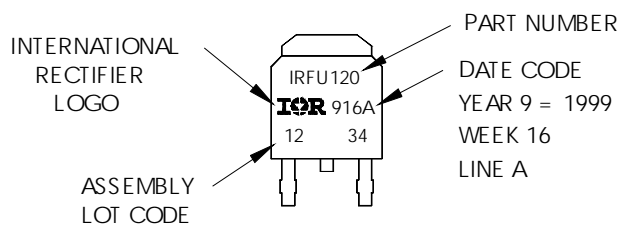
D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



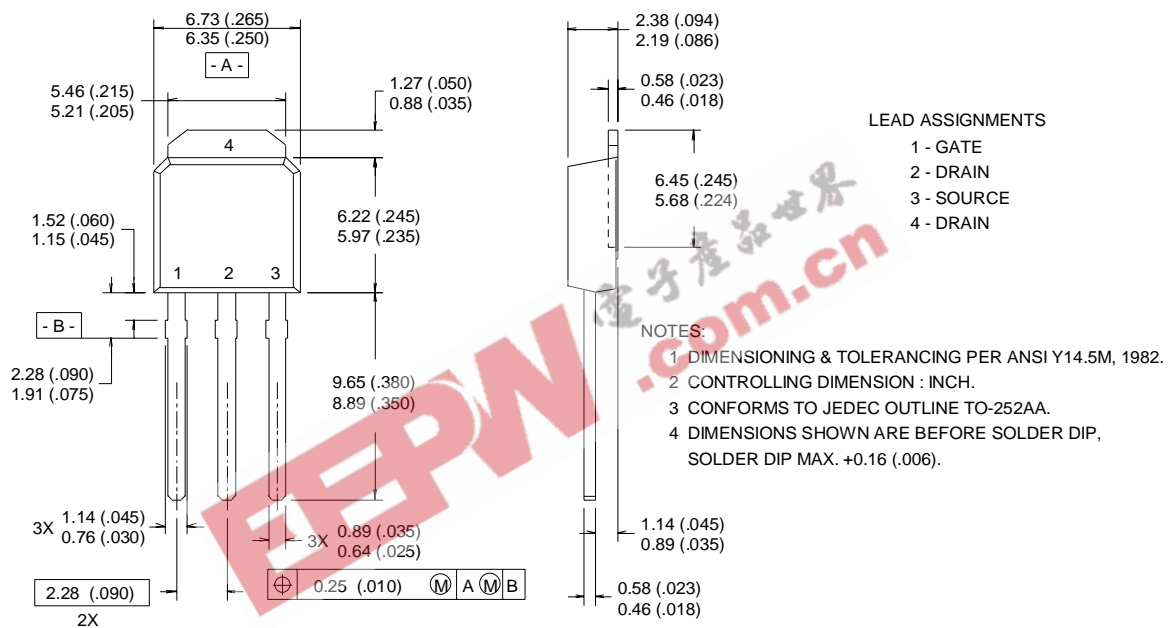
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 1999
IN THE ASSEMBLY LINE "A"



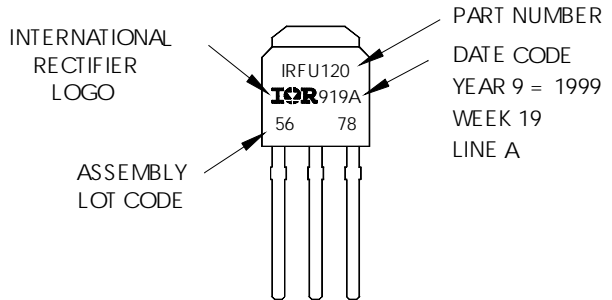
I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
 WITH ASSEMBLY
 LOT CODE 5678
 ASSEMBLED ON WW 19, 1999
 IN THE ASSEMBLY LINE "A"

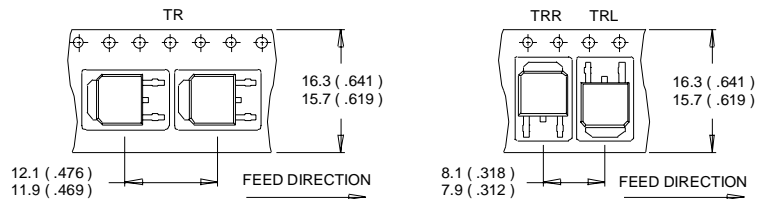


IRLR/U3802

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IR Rectifier

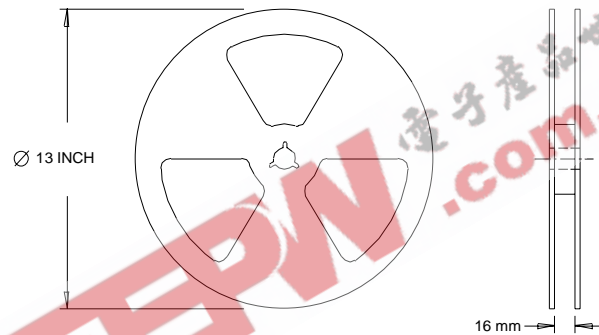
D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :

1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :

1. OUTLINE CONFORMS TO EIA-481.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
 - ② Starting $T_J = 25^\circ\text{C}$, $L = 1.4\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 20\text{A}$.
 - ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
 - ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.
- * When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrialmarket.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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