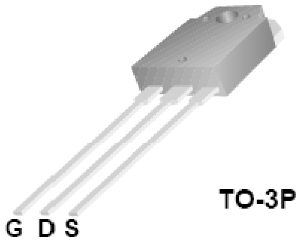
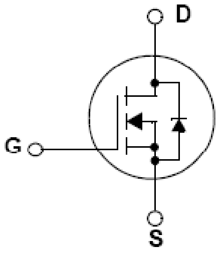
500V N-Channel MOSFET

General Description

This Power MOSFET is produced using advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.





Features

25A, 500V, R_{DS}(on)typ. = 0.21Ω@VGS = 10 V
Advanced planar process
Low gate charge minimize switching loss
Fast switching
100% avalanche tested
Improved dv/dt capability

Absolute Maximum Ratings T_C = 25 ℃ unless otherwise noted

Symbol	Parameter		JFAM25N50E	Units
V_{DSS}	Drain – Source Voltage		500	V
I_D	Drain Current	Continuous (T_C = 25 ℃)	25*	A
		Continuous (T_C = 100 ℃)	16*	A
I_{DM}	Drain Current - Pulsed (Note 1)		98	A
V_{GSS}	Gate – Source Voltage		±30	V
EAS	Single Pulsed Avalanche Energy (Note 2)		1910	mJ
I_{AR}	Avalanche Current (Note 1)		20	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		25	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		5.0	V/ns
P_D	Power Dissipation (T_C = 25 ℃)		300	W
	-Derate above 25 ℃		2.4	W/℃
T_J,T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes 1/8" frome case for 5 seconds		300	℃

*Drain current limited by maximum junction temperature.

Thermal characteristics

Symbol	Parameter	JFAM25N50E	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.42	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	℃/W

Electrical Characteristics T_C = 25 ℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain – Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA	500	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 uA, Referenced to 25℃	--	0.5	--	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} = 400 V, Tc = 125 ℃	--	--	125	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{GS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{GS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source on-Resistance	V_{GS} = 10 V, I_D = 12.5A	--	0.21	0.28	Ω
g_{FS}	Forward Transconductance	V_{DS} = 25 V, I_D = 13 A (Note 4)	--	32	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	4550	--	pF
C_{oss}	Output Capacitance		--	1050	--	pF
C_{rss}	Reverse Transfer Capacitance		--	170	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 250 V, I_D = 25.0 A , R_G = 25Ω , V_{GS} = 10 V (Note 4,5)	--	45	--	ns
t_r	Turn-On Rise Time		--	85	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	120	--	ns
t_f	Turn-Off Fall Time		--	75	--	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 25.0 A V_{GS} = 10 V (Note 4,5)	--	66	--	nC
Q_{gs}	Gate-Source Charge		--	20	--	nC
Q_{gd}	Gate-Drain Charge		--	17	--	nC
Drain – Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	25	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	98	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 25.0 A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 25.0 A	--	565	--	ns
Q_{rr}	Reverse Recovery Charge	dI_F/dt = 100 A/us (Note 4)	--	4.2	--	uC

Notes:

1. Repetitive Rating : Pulsed width limited by maximum junction temperature
2. L = 5.5mH , I_{AS} = 25A, V_{DD} = 50V,R_G = 25Ω, Starting T_J = 25℃
3. I_{SD} ≤ 25.0A, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulsed Test : Pulsed width ≤300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

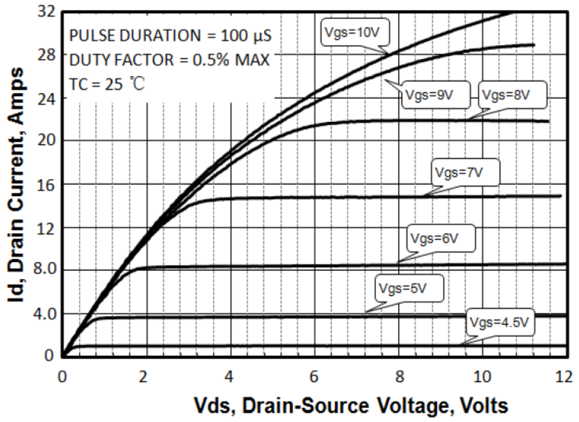


Figure 1. On-Region Characteristics

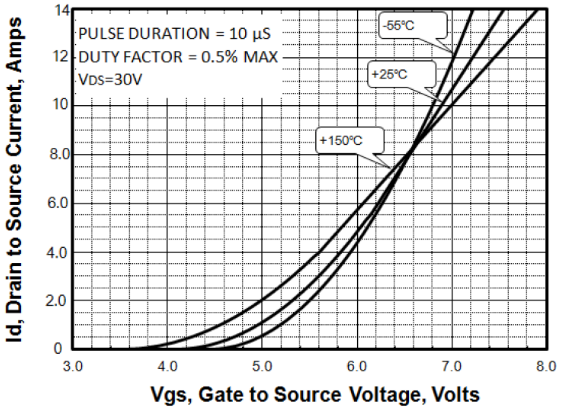


Figure 2. Transfer Characteristics

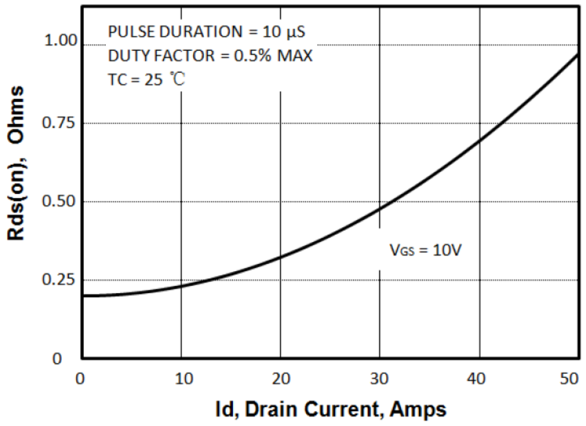


Figure 3. On-Resistance Variation vs
Drain Current and Gate Voltage

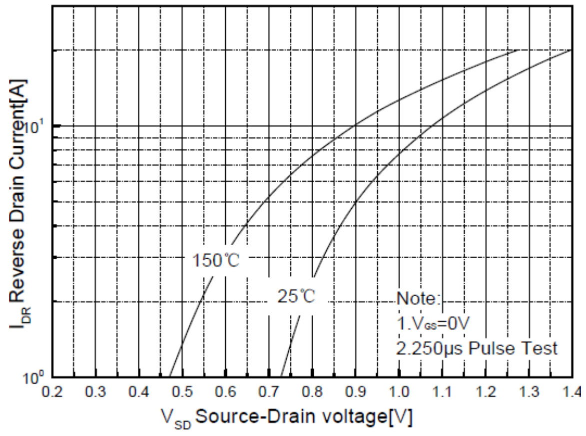


Figure 4. Body Diode Forward Voltage
Variation with Source Current
and Temperature

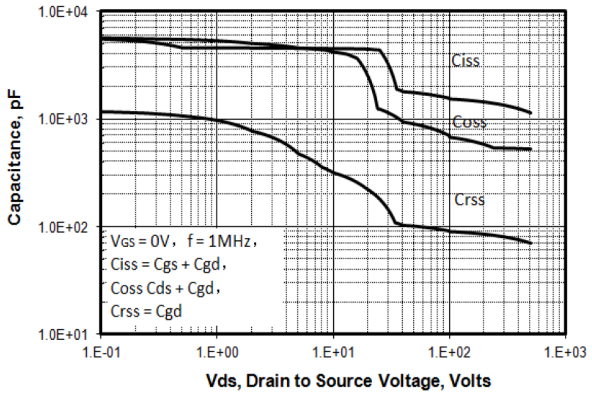


Figure 5. Capacitance Characteristics

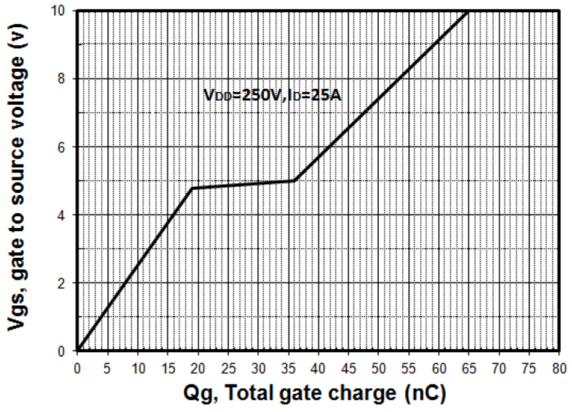


Figure 6. Gate Charge Characteristics

Typical Characteristics

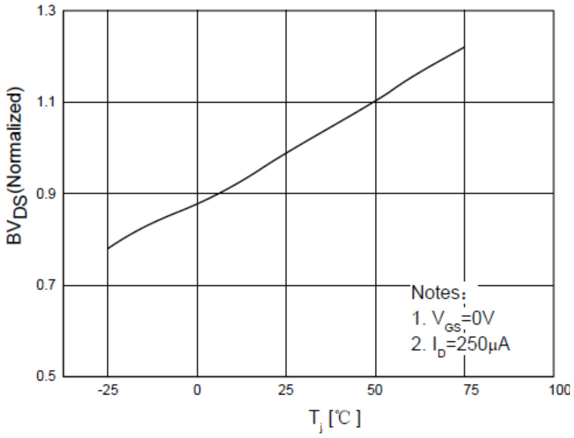


Figure 7. Breakdown Voltage Variation
vs Temperature

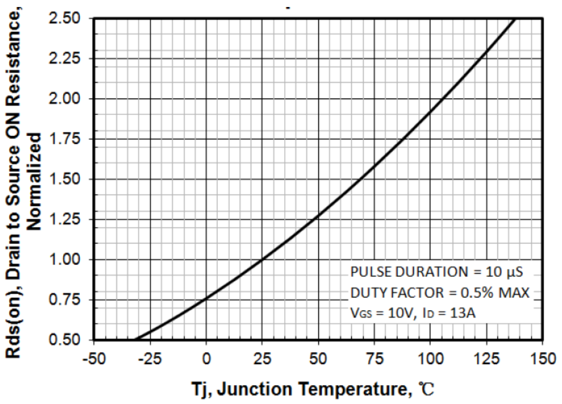


Figure 8. On-Resistance Variation
vs Temperature

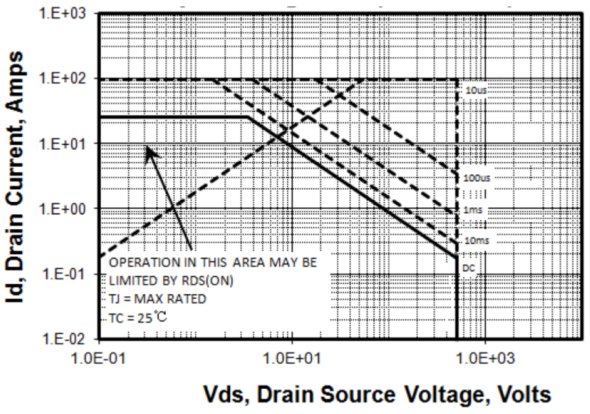


Figure 9-2. Maximum Safe Operating Area
for JFAM25N50E

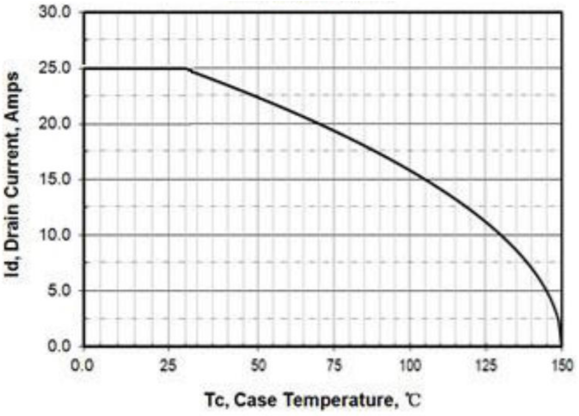


Figure 10. Maximum Drain Current
vs Case Temperature

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Typical Characteristics

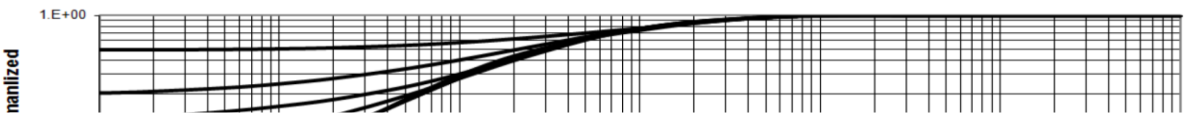

Figure 11-2. Transient Thermal Response Curve for JFAM25N50E

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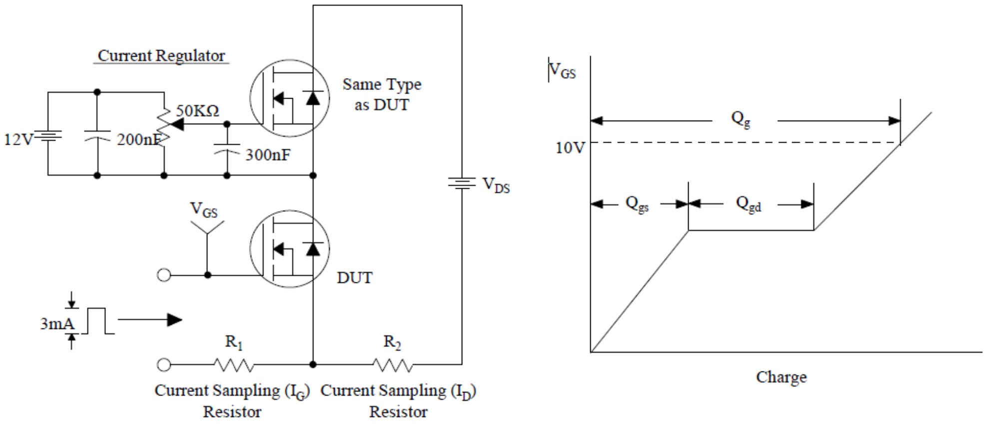
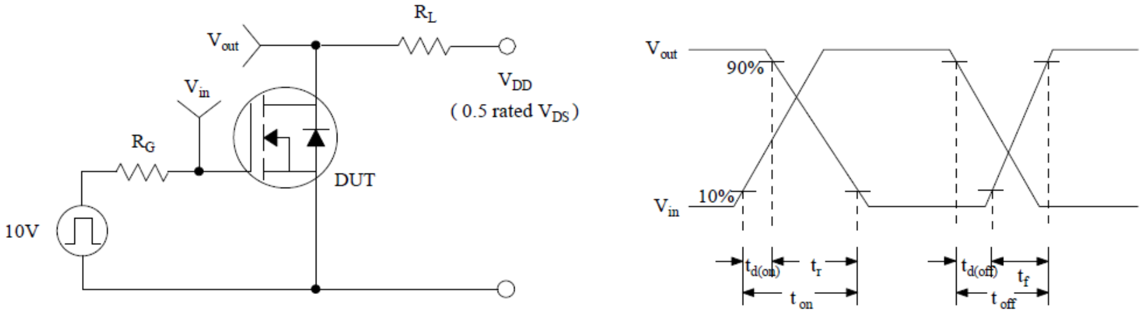
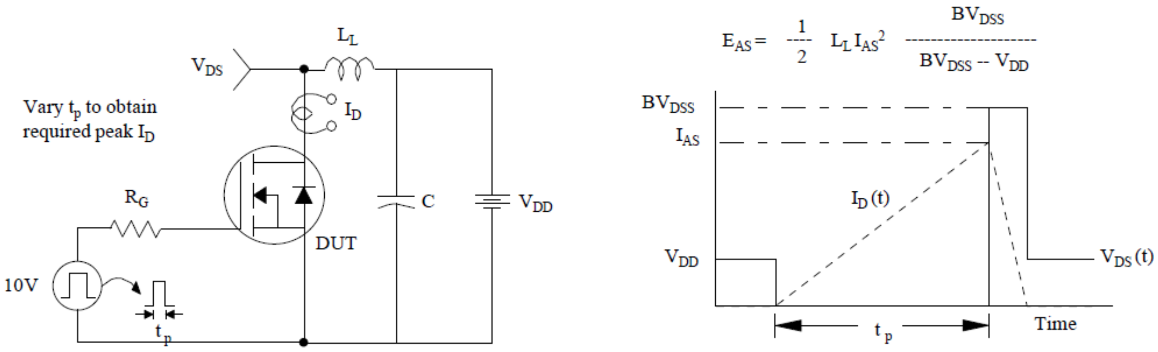
Test Circuit & Waveform



Gate Charge Test Circuit & Waveform

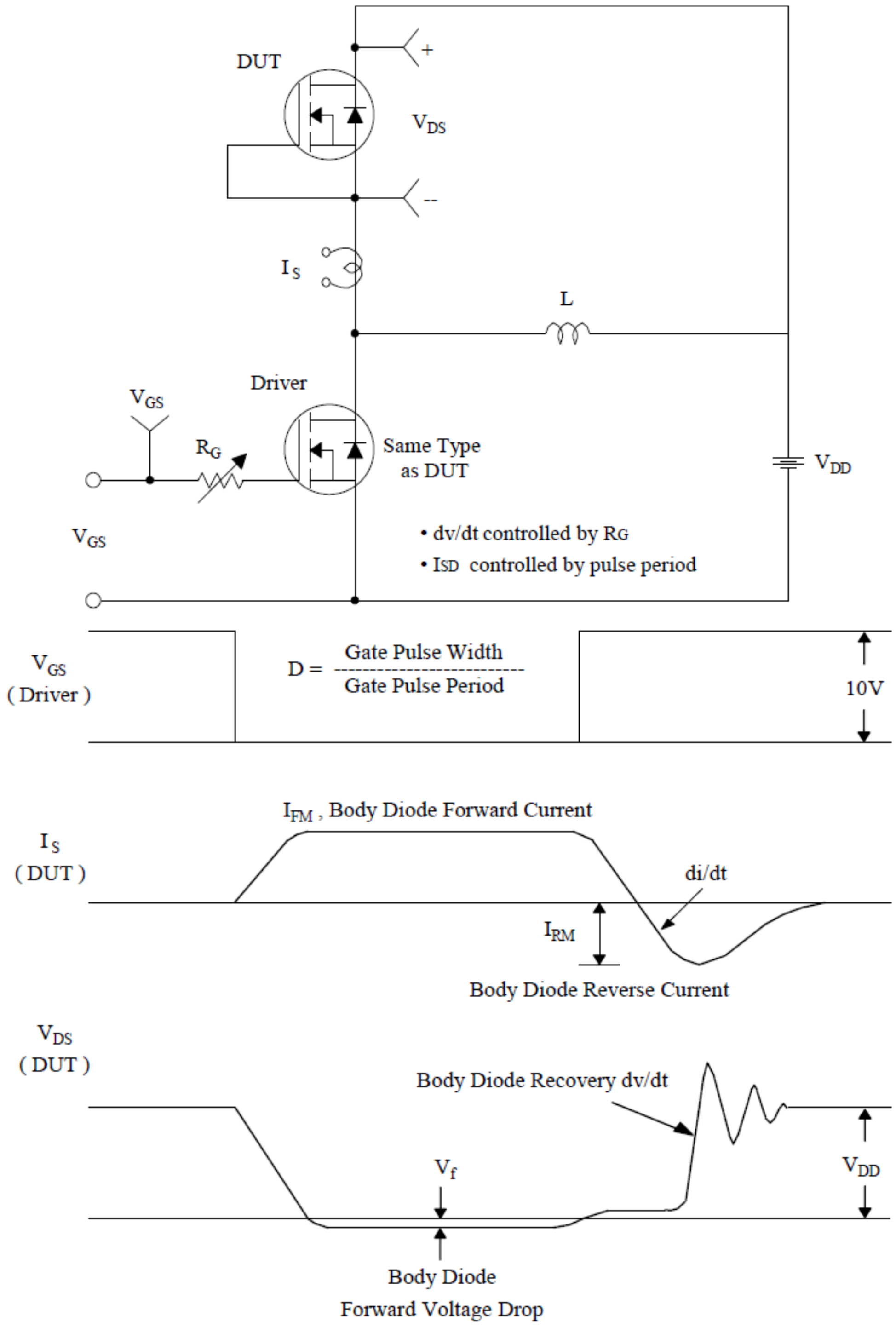


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Test Circuit & Waveform



Peak Diode Recovery dv/dt Test Circuit & Waveforms

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