

FMR11N90E

FUJI POWER MOSFET

Super FAP-E³ series

N-CHANNEL SILICON POWER MOSFET

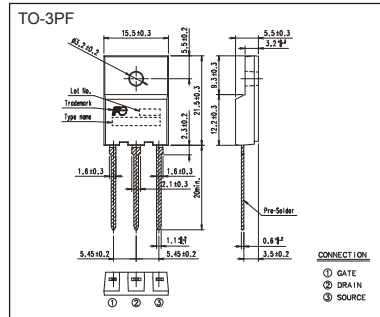
Features

- Maintains both low power loss and low noise
- Lower $R_{DS(on)}$ characteristic
- More controllable switching dv/dt by gate resistance
- Smaller V_{GS} ringing waveform during switching
- Narrow band of the gate threshold voltage ($4.0 \pm 0.5V$)
- High avalanche durability

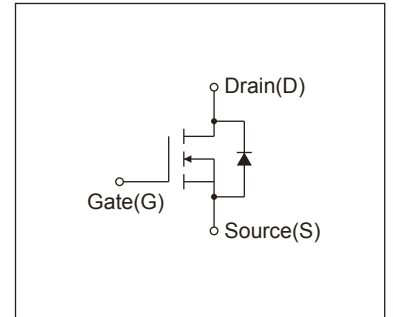
Applications

- Switching regulators
- UPS (Uninterruptible Power Supply)
- DC-DC converters

Outline Drawings [mm]



Equivalent circuit schematic



Maximum Ratings and Characteristics

Absolute Maximum Ratings at $T_c=25^\circ C$ (unless otherwise specified)

Description	Symbol	Characteristics	Unit	Remarks
Drain-Source Voltage	V_{DS}	900	V	
	V_{DSX}	900	V	$V_{GS} = -30V$
Continuous Drain Current	I_D	± 11	A	
Pulsed Drain Current	I_{DP}	± 44	A	
Gate-Source Voltage	V_{GS}	± 30	V	
Repetitive and Non-Repetitive Maximum Avalanche Current	I_{AR}	11	A	Note*1
Non-Repetitive Maximum Avalanche Energy	E_{AS}	811.9	mJ	Note*2
Repetitive Maximum Avalanche Energy	E_{AR}	13.5	mJ	Note*3
Peak Diode Recovery dV/dt	dV/dt	2.2	kV/ μs	Note*4
Peak Diode Recovery $-di/dt$	$-di/dt$	100	A/ μs	Note*5
Maximum Power Dissipation	P_D	3.13	W	$T_a=25^\circ C$
		135		$T_c=25^\circ C$
Operating and Storage Temperature range	T_{ch}	150	$^\circ C$	
	T_{stg}	-55 to + 150	$^\circ C$	

Electrical Characteristics at $T_c=25^\circ C$ (unless otherwise specified)

Description	Symbol	Conditions	min.	typ.	max.	Unit
Drain-Source Breakdown Voltage	BV_{DS}	$I_D=250\mu A, V_{GS}=0V$	900	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	3.5	4.0	4.5	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$	-	-	25	μA
		$V_{DS}=720V, V_{GS}=0V$	-	-	250	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$	-	10	100	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	$I_D=5.5A, V_{GS}=10V$	-	0.83	1.0	Ω
Forward Transconductance	g_{fs}	$I_D=5.5A, V_{DS}=25V$	6.5	13	-	S
Input Capacitance	C_{iss}	$V_{DS}=25V$	-	2300	3450	pF
Output Capacitance	C_{oss}	$V_{GS}=0V$	-	200	300	
Reverse Transfer Capacitance	C_{rss}	$f=1MHz$	-	15	22.5	
Turn-On Time	$t_{d(on)}$	$V_{cc}=600V$	-	37	56	ns
	t_r	$V_{GS}=10V$	-	32	48	
Turn-Off Time	$t_{d(off)}$	$I_D=5.5A$	-	124	186	
	t_f	$R_G=20\Omega$	-	34	51	
Total Gate Charge	Q_G	$V_{cc}=450V$	-	60	90	nC
Gate-Source Charge	Q_{GS}	$I_D=11A$	-	17	26	
Gate-Drain Charge	Q_{GD}	$V_{GS}=10V$	-	23	35	
Gate-Drain Crossover Charge	Q_{SW}		-	7	11	
Avalanche Capability	I_{AV}	$L=4.92mH, T_{ch}=25^\circ C$	11	-	-	A
Diode Forward On-Voltage	V_{SD}	$I_F=11A, V_{GS}=0V, T_{ch}=25^\circ C$	-	0.90	1.35	V
Reverse Recovery Time	t_{rr}	$I_F=11A, V_{GS}=0V$	-	2.0	-	μs
Reverse Recovery Charge	Q_{rr}	$-di/dt=100A/\mu s, T_{ch}=25^\circ C$	-	20	-	μC

Thermal Characteristics

Description	Symbol	Test Conditions	min.	typ.	max.	Unit
Thermal resistance	$R_{th(ch-c)}$	Channel to case			0.9259	$^\circ C/W$
	$R_{th(ch-a)}$	Channel to ambient			40.0	$^\circ C/W$

Note *1 : $T_{ch} \leq 150^\circ C$

Note *2 : Stating $T_{ch}=25^\circ C, I_{AS}=4.4A, L=76.9mH, V_{CC}=90V, R_G=10\Omega$
 E_{AS} limited by maximum channel temperature and avalanche current.
 See to 'Avalanche current' graph.

Note *3 : Repetitive rating : Pulse width limited by maximum channel temperature.

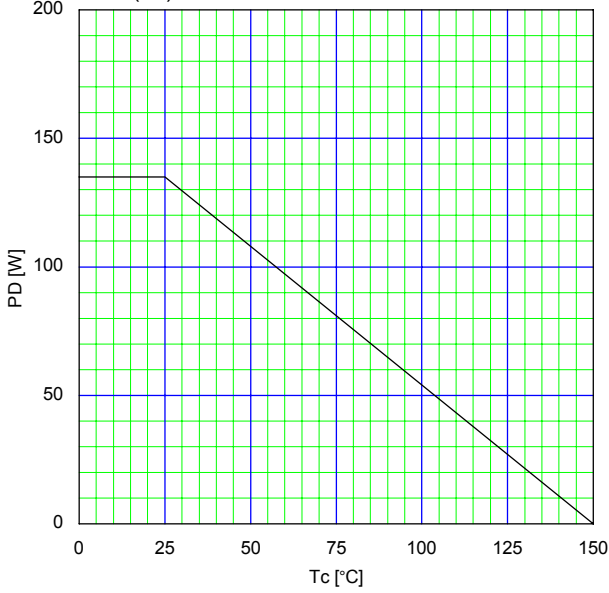
See to the 'Transient Thermal impedance' graph.

Note *4 : $I_F \leq I_D, -di/dt=100A/\mu s, V_{CC} \leq BV_{DSS}, T_{ch} \leq 150^\circ C$.

Note *5 : $I_F \leq I_D, dv/dt=2.2kV/\mu s, V_{CC} \leq BV_{DSS}, T_{ch} \leq 150^\circ C$.

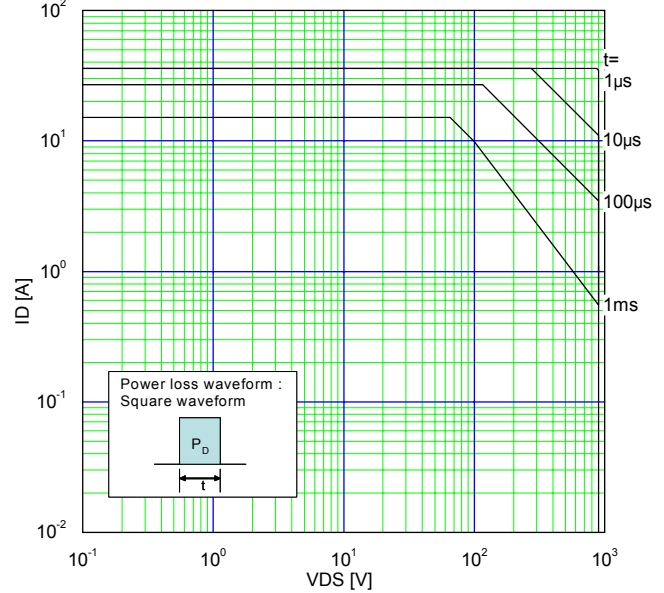
Allowable Power Dissipation

$PD=f(T_c)$



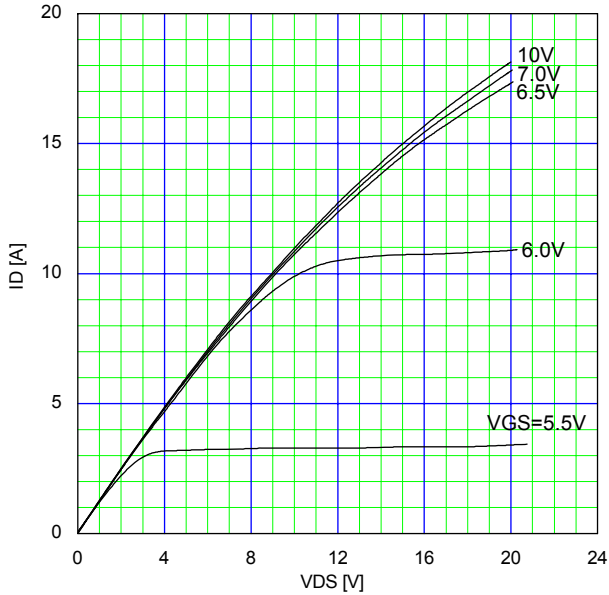
Safe Operating Area

$I_D=f(V_{DS}):Duty=0(\text{Single pulse}),T_c=25^\circ\text{C}$



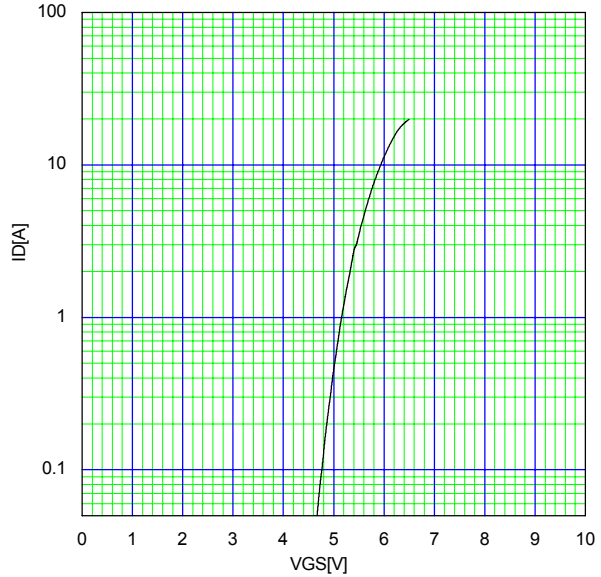
Typical Output Characteristics

$I_D=f(V_{DS}):80\ \mu\text{s pulse test},T_{ch}=25^\circ\text{C}$



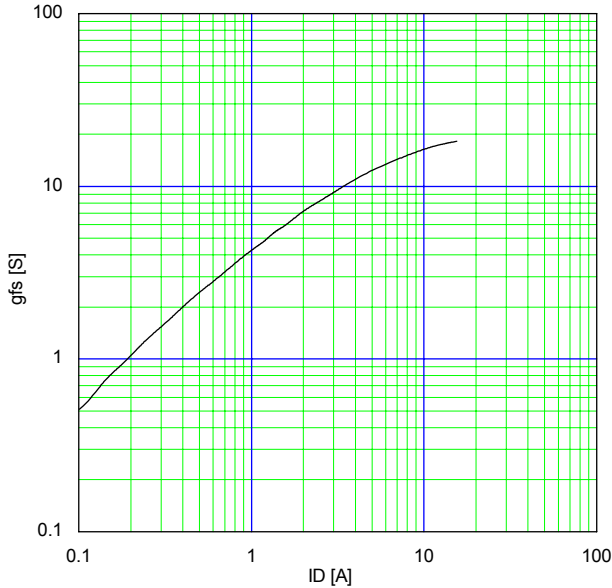
Typical Transfer Characteristic

$I_D=f(V_{GS}):80\ \mu\text{s pulse test},V_{DS}=25\text{V},T_{ch}=25^\circ\text{C}$



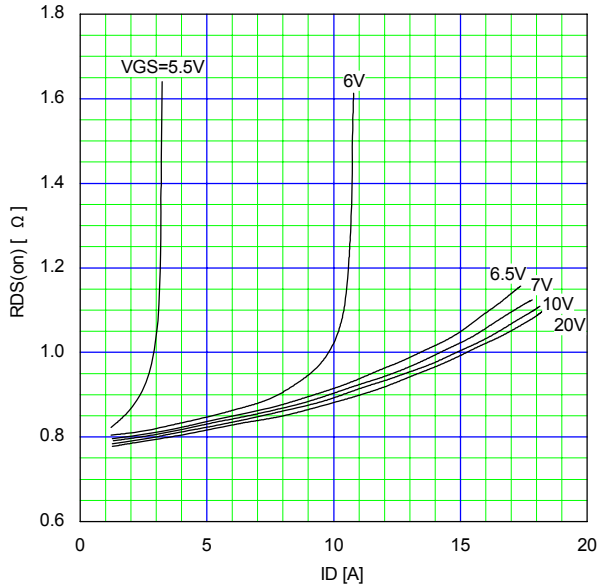
Typical Transconductance

$g_{fs}=f(I_D):80\ \mu\text{s pulse test},V_{DS}=25\text{V},T_{ch}=25^\circ\text{C}$

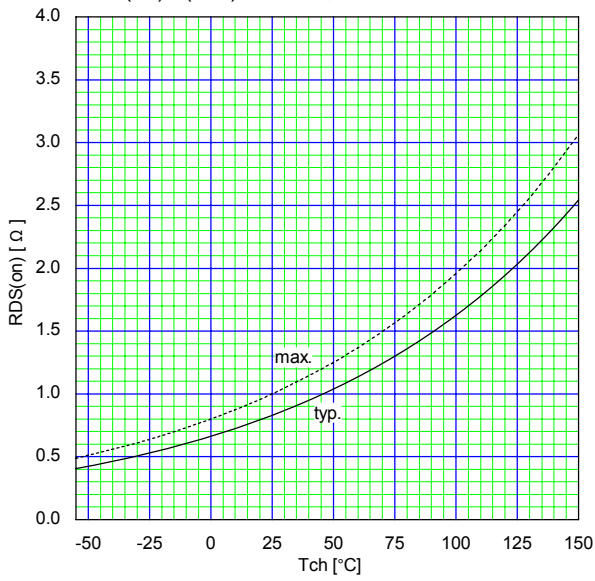


Typical Drain-Source on-state Resistance

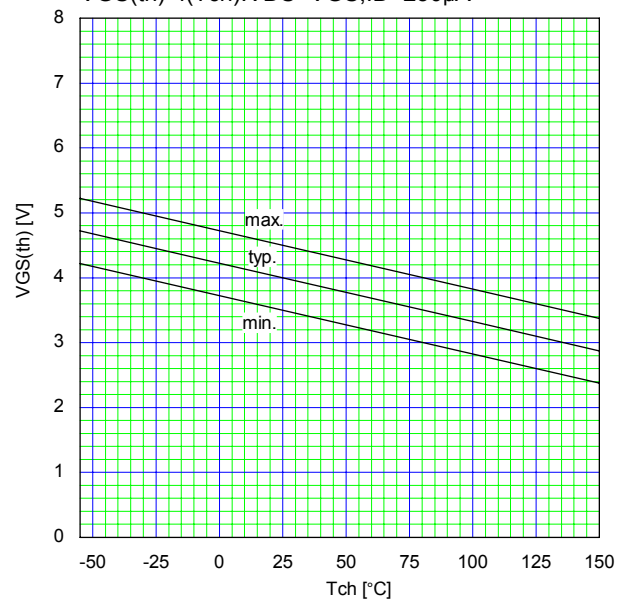
$R_{DS(on)}=f(I_D):80\ \mu\text{s pulse test},T_{ch}=25^\circ\text{C}$



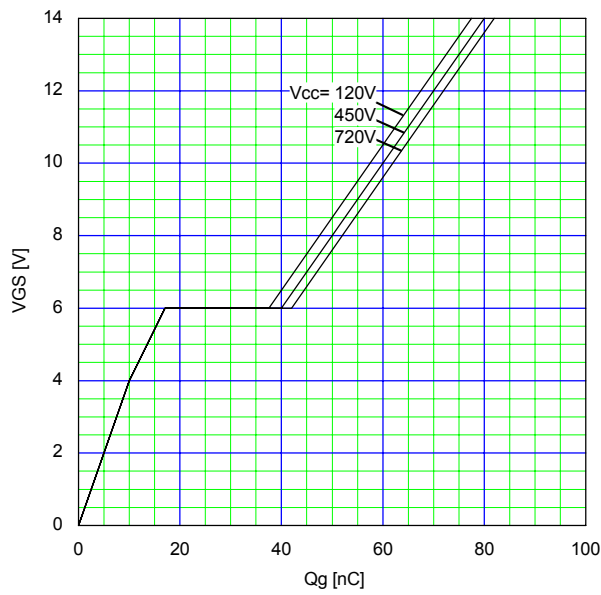
Drain-Source On-state Resistance
 $R_{DS(on)} = f(T_{ch}): I_D = 5.5A, V_{GS} = 10V$



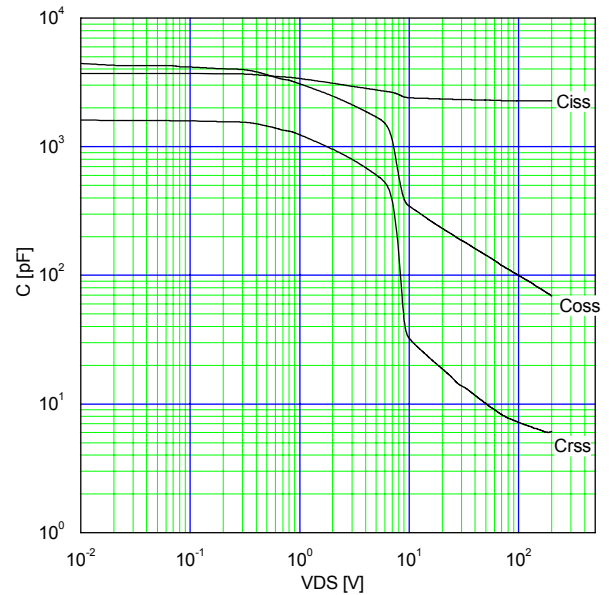
Gate Threshold Voltage vs. T_{ch}
 $V_{GS(th)} = f(T_{ch}): V_{DS} = V_{GS}, I_D = 250\mu A$



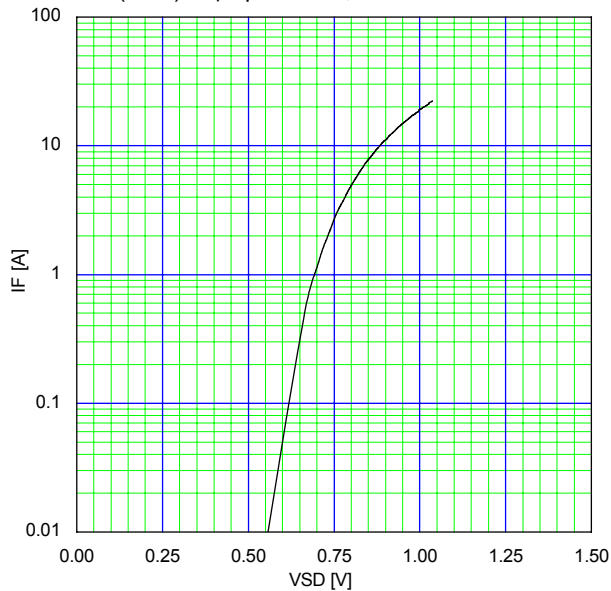
Typical Gate Charge Characteristics
 $V_{GS} = f(Q_g): I_D = 11A, T_{ch} = 25^\circ C$



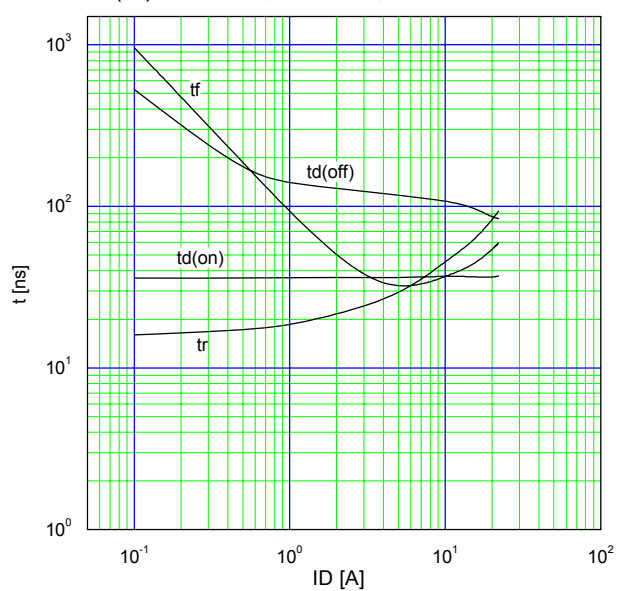
Typical Capacitance
 $C = f(V_{DS}): V_{GS} = 0V, f = 1MHz$



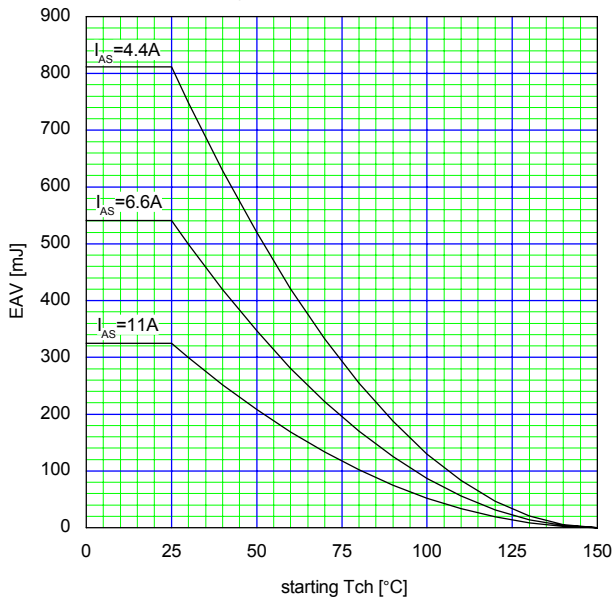
Typical Forward Characteristics of Reverse Diode
 $I_F = f(V_{SD}): 80\mu s \text{ pulse test}, T_{ch} = 25^\circ C$



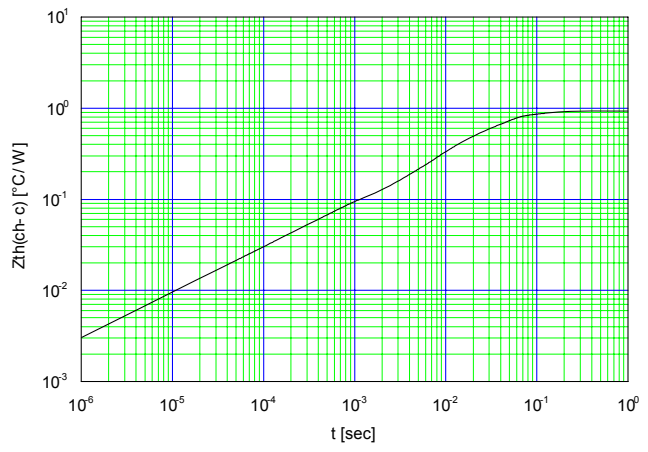
Typical Switching Characteristics vs. I_D
 $t = f(I_D): V_{cc} = 600V, V_{GS} = 10V, R_G = 20\Omega$



Maximum Avalanche Energy vs. starting Tch
 $E(AV)=f(\text{starting Tch}):V_{CC}=90V, I(AV)\leq 11A$



Transient Thermal Impedance
 $Zth(ch-c)=f(t):D=0$



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