

## FUJI POWER MOSFET Super FAP-G Series

### N-CHANNEL SILICON POWER MOSFET

#### Features

- High speed switching
- Low on-resistance
- No secondary breakdown
- Low driving power
- Avalanche-proof

#### Applications

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

#### Maximum ratings and characteristic Absolute maximum ratings

( $T_c=25^\circ\text{C}$  unless otherwise specified)

Item	Symbol	Ratings	Unit	Remarks
Drain-source voltage	$V_{DS}$	500	V	
Continuous drain current	$I_D$	$\pm 13$	A	
Pulsed drain current	$I_D(\text{puls})$	$\pm 52$	A	
Gate-source voltage	$V_{GS}$	$\pm 30$	V	
Non-Repetitive Maximum avalanche current	$I_{AS}$	13	A	$T_{ch} \leq 150^\circ\text{C}$
Non-Repetitive Maximum avalanche energy	$E_{AS}$	202	mJ	*1
Maximum Drain-Source dV/dt	$dV_{DS}/dt$	20	kV/s	$V_{DS} \leq 500\text{V}$
Peak diode recovery dV/dt	$dV/dt$	5	kV/ $\mu\text{s}$	*2
Peak diode recovery -di/dt	$-di/dt$	100	A/ $\mu\text{s}$	*3
Max. power dissipation	$P_D$	2.16	W	$T_a=25^\circ\text{C}$
		70		$T_c=25^\circ\text{C}$
Operating and storage temperature range	$T_{ch}$	+150	$^\circ\text{C}$	
	$T_{stg}$	-55 to +150	$^\circ\text{C}$	
Isolation voltage	$V_{iso}$	2	kVrms	$t=60\text{sec}$ $f=60\text{Hz}$

\*1  $L=2.20\text{mH}$ ,  $V_{CC}=50\text{V}$ , Starting  $T_{ch}=25^\circ\text{C}$ , See to Avalanche Energy Graph

\*2  $I_F = -I_D$ ,  $-di/dt=100\text{A}/\mu\text{s}$ ,  $V_{CC} \leq BV_{DSS}$ ,  $T_{ch} \leq 150^\circ\text{C}$

\*3  $I_{AV} = -I_D$ ,  $dV/dt=5\text{kV}/\mu\text{s}$ ,  $V_{CC} \leq BV_{DSS}$ ,  $T_{ch} \leq 150^\circ\text{C}$

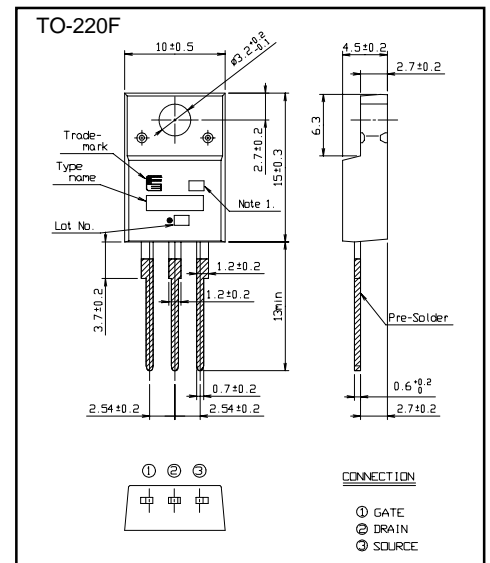
#### Electrical characteristics ( $T_c=25^\circ\text{C}$ unless otherwise specified)

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D=250\mu\text{A}$ $V_{GS}=0\text{V}$	500			V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$ $V_{DS}=V_{GS}$	3.0		5.0	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=500\text{V}$ $V_{GS}=0\text{V}$ $T_{ch}=25^\circ\text{C}$		10	25	$\mu\text{A}$
		$V_{DS}=400\text{V}$ $V_{GS}=0\text{V}$ $T_{ch}=125^\circ\text{C}$		1.0	2	$\text{mA}$
Gate-source leakage current	$I_{GSS}$	$V_{GS}=\pm 30\text{V}$ $V_{DS}=0\text{V}$		10	100	$\text{nA}$
Drain-source on-state resistance	$R_{DS(on)}$	$I_D=6.5\text{A}$ $V_{GS}=10\text{V}$		0.42	0.55	$\Omega$
Forward transconductance	$g_{fs}$	$I_D=6.5\text{A}$ $V_{DS}=25\text{V}$	5.5	11		S
Input capacitance	$C_{iss}$	$V_{DS}=25\text{V}$		1100	1650	$\text{pF}$
Output capacitance	$C_{oss}$	$V_{GS}=0\text{V}$		165	250	$\text{pF}$
Reverse transfer capacitance	$C_{rss}$	$f=1\text{MHz}$		9	13.5	$\text{pF}$
Turn-on time $t_{on}$	$t_{d(on)}$	$V_{CC}=300\text{V}$ $I_D=6.5\text{A}$		23	35	$\text{ns}$
	$t_r$	$V_{GS}=10\text{V}$		6.5	11	$\text{ns}$
Turn-off time $t_{off}$	$t_{d(off)}$	$R_{GS}=10\Omega$		47	71	$\text{ns}$
	$t_f$			7.5	12	$\text{ns}$
Total Gate Charge	$Q_G$	$V_{CC}=250\text{V}$		28	42	$\text{nC}$
Gate-Source Charge	$Q_{GS}$	$I_D=13\text{A}$		10	15	$\text{nC}$
Gate-Drain Charge	$Q_{GD}$	$V_{GS}=10\text{V}$		9	14	$\text{nC}$
Avalanche capability	$I_{AV}$	$L=2.20\text{mH}$ $T_{ch}=25^\circ\text{C}$	13			A
Diode forward on-voltage	$V_{SD}$	$I_F=13\text{A}$ $V_{GS}=0\text{V}$ $T_{ch}=25^\circ\text{C}$		1.05	1.60	V
Reverse recovery time	$t_{rr}$	$I_F=13\text{A}$ $V_{GS}=0\text{V}$		120	250	$\text{ns}$
Reverse recovery charge	$Q_{rr}$	$-di/dt=100\text{A}/\mu\text{s}$ $T_{ch}=25^\circ\text{C}$		0.5	1.2	$\mu\text{C}$

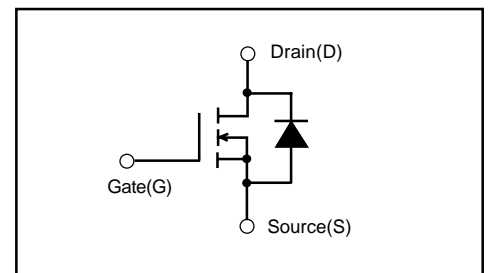
#### Thermal characteristics

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal resistance	$R_{th(ch-c)}$	channel to case			1.79	$^\circ\text{C}/\text{W}$
	$R_{th(ch-a)}$	channel to ambient			58.0	$^\circ\text{C}/\text{W}$

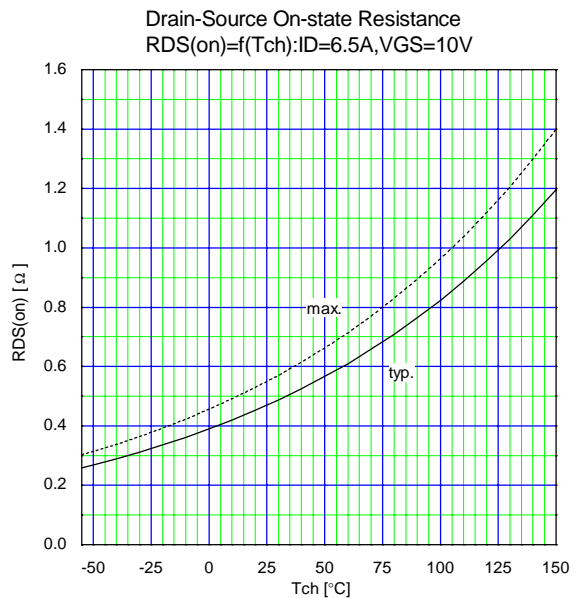
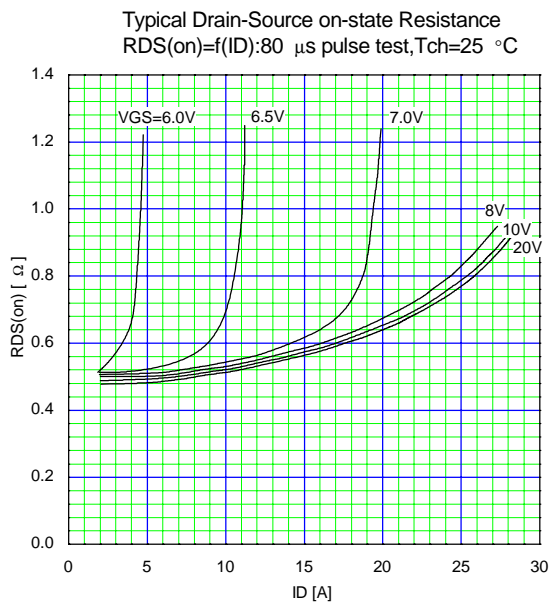
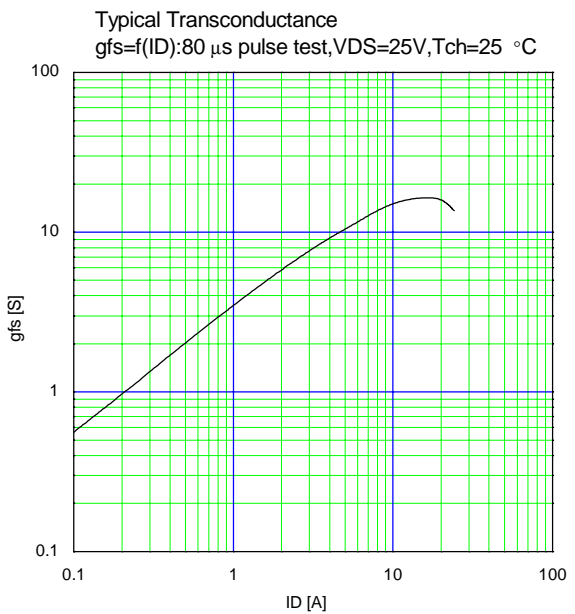
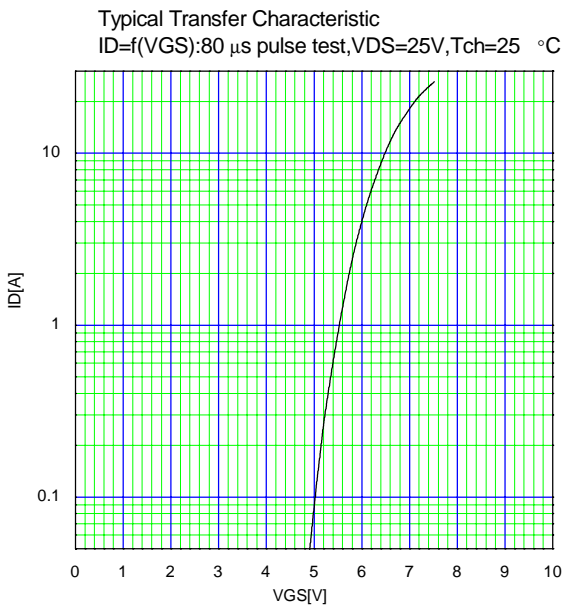
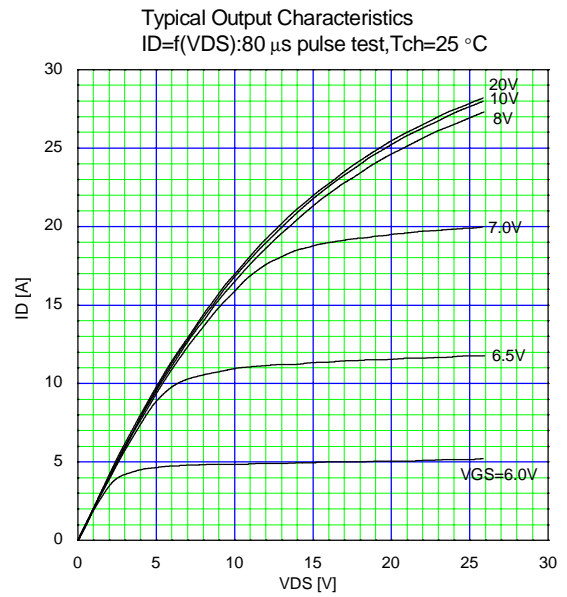
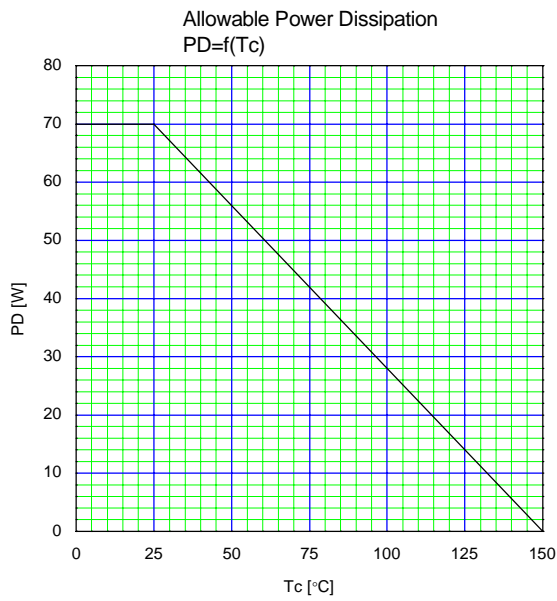
#### Outline Drawings [mm]



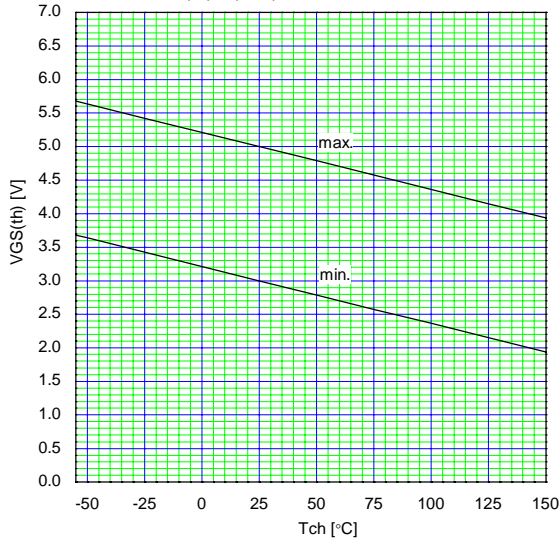
#### Equivalent circuit schematic



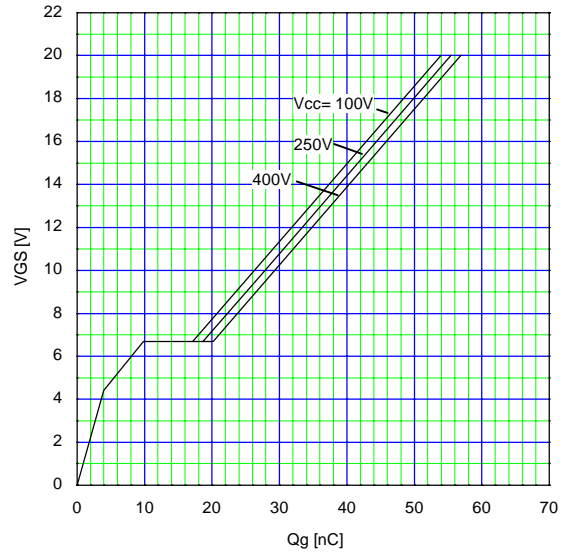
Characteristics



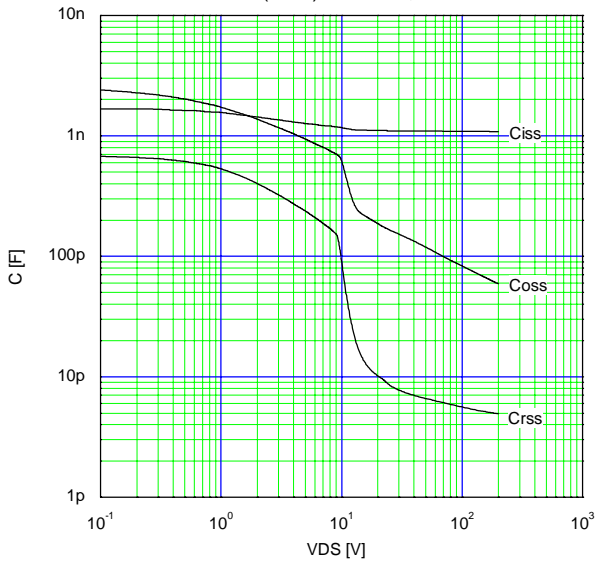
Gate Threshold Voltage vs. T<sub>ch</sub>  
 $V_{GS(th)} = f(T_{ch}) : V_{DS} = V_{GS}, I_D = 250\mu A$



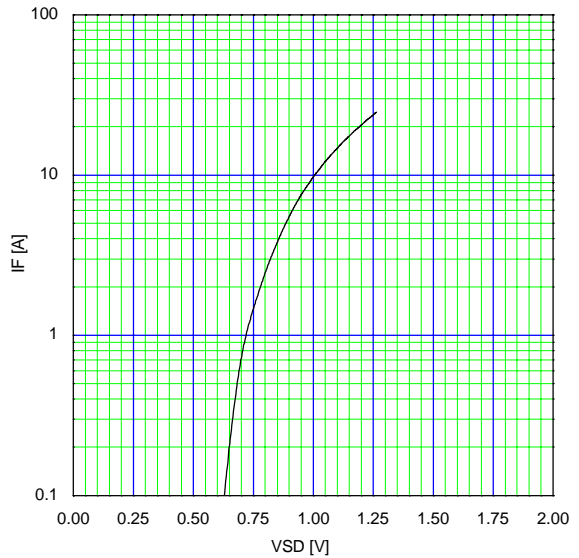
Typical Gate Charge Characteristics  
 $V_{GS} = f(Q_g) : I_D = 13A, T_{ch} = 25\text{ }^\circ C$



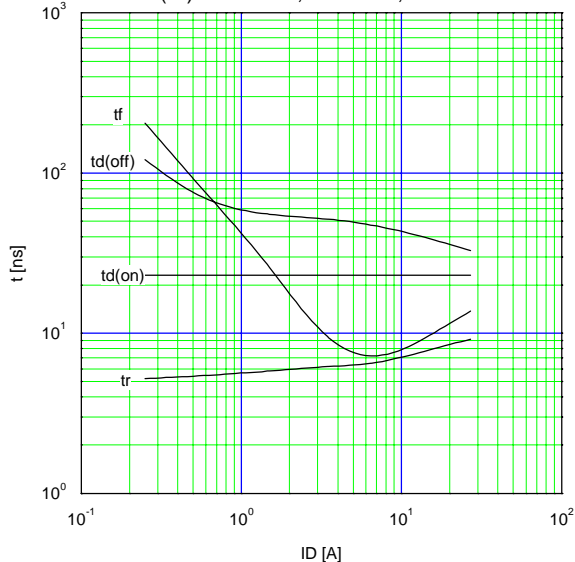
Typical Capacitance  
 $C = f(V_{DS}) : V_{GS} = 0V, f = 1MHz$



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



Typical Switching Characteristics vs. I<sub>D</sub>  
 $t = f(I_D) : V_{cc} = 300V, V_{GS} = 10V, R_G = 10\text{ }\Omega$



Maximum Avalanche Energy vs. starting T<sub>ch</sub>  
 $E_{AS} = f(\text{starting } T_{ch}) : V_{cc} = 50V$

