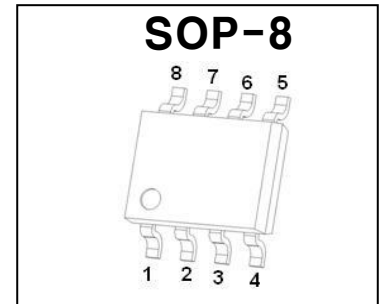


# P Channel MOS FET

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D$
-20V	8.5mΩ@-4.5V	-14A
	12mΩ@-2.5V	
	15mΩ@-1.8V	



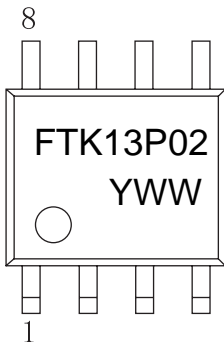
## FEATURE

- High Density Cell Design for Ultra Low Rdson
- Fully Characterized Avalanche Voltage and Current
- Good Stability and Uniformity With High  $E_{AS}$
- Excellent Package for Good Heat Dissipation

## APPLICATION

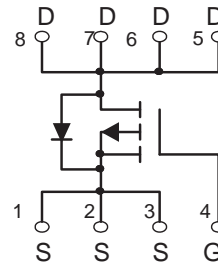
- Load Switch
- Battery Protection

## MARKING



FTK13P02 = Device code  
Solid dot = Pin1 indicator  
YWW = Date Code

## Equivalent Circuit



## ABSOLUTE MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	- 20	V
Gate-Source Voltage	$V_{GS}$	±12	V
Continuous Drain Current	$I_D$	-14	A
Pulsed Drain Current (note 1)	$I_{DM}$	-56	A
Power Dissipation	$P_D$	1.4	W
Thermal Resistance, Junction-to-ambient (note 2)	$R_{\theta JA}$	89.29	°C/W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	°C



## MOSFET ELECTRICAL CHARACTERISTICS

$T_a=25^\circ\text{C}$  unless otherwise specified

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=-250\mu\text{A}$	-20	---	---	V
BVDSS temperature coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Reference to $25^\circ\text{C}$ , $I_D=-1\text{mA}$	---	-0.01	---	$\text{V}/^\circ\text{C}$
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.3	-0.6	-1.0	V
Drain-source leakage current	$I_{DSS}$	$V_{DS}=-20\text{ V}, V_{GS}=0\text{V}, T_J = 25^\circ\text{C}$	---	---	-1	$\mu\text{A}$
		$V_{DS}=-16\text{ V}, V_{GS}=0\text{V}, T_J = 125^\circ\text{C}$	---	---	-10	$\mu\text{A}$
Gate leakage current, Forward	$I_{GSSF}$	$V_{GS}=12\text{ V}, V_{DS}=0\text{ V}$	---	---	100	nA
Gate leakage current, Reverse	$I_{GSSR}$	$V_{GS}=-12\text{ V}, V_{DS}=0\text{ V}$	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5\text{V}, I_D=-10\text{A}$	---	6.5	8.5	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}, I_D=-8\text{A}$	---	9	12	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}, I_D=-5\text{A}$	---	12	15	$\text{m}\Omega$
Forward transconductance	$g_{fs}$	$V_{DS} = -10\text{V}, I_D=-5\text{A}$	---	20	---	S
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = -15\text{V}, V_{GS} = 0\text{ V},$ $F = 1\text{MHz}$	---	4060	8000	pF
Output capacitance	$C_{oss}$		---	520	1000	
Reverse transfer capacitance	$C_{rss}$		---	400	800	
Turn-on delay time <sup>(note 2,3)</sup>	$t_{d(on)}$	$V_{DD} = -10\text{V}, V_{GS}=-4.5\text{V}, I_D = -1\text{A}$ $R_G = 25\Omega$	---	13.2	26	ns
Rise time <sup>(note 2,3)</sup>	$t_r$		---	68	120	
Turn-off delay time <sup>(note 2,3)</sup>	$t_{d(off)}$		---	160	320	
Fall time <sup>(note 2,3)</sup>	$t_f$		---	154	300	
<b>Gate charge characteristics</b>						
Gate to source charge <sup>(note 2,3)</sup>	$Q_{gs}$	$V_{DS}=-10\text{ V}, I_D=-5\text{A},$ $V_{GS}= -4.5\text{ V}$	---	7.2	14	nC
Gate to drain charge <sup>(note 2,3)</sup>	$Q_{gd}$		---	10.2	20	
Gate charge total <sup>(note 2,3)</sup>	$Q_g$		---	44.4	80	
<b>Drain-Source diode characteristics and Maximum Ratings</b>						
Continuous Source Current	$I_S$	$V_G=V_D=0\text{ V},$ Force Current	---	---	-14	A
Pulsed Source Current	$I_{SM}$		---	---	-28	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0\text{V}, I_S=-1\text{A}, T_J=25^\circ\text{C}$	---	---	-1	V

**Notes:**

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

2: Pulse Test : Pulse Width  $\leq 300\mu\text{ s}$ , Duty Cycle  $\leq 2\%$ .

3: Essentially independent of operating temperature.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 1. Continuous Drain Current vs.  $T_c$

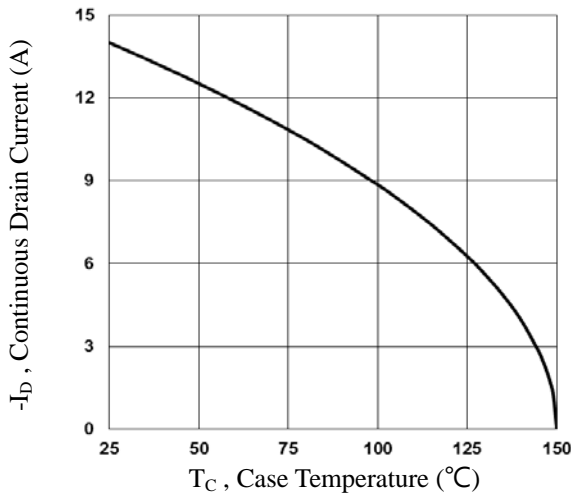


Figure 2. Normalized  $R_{DS(on)}$  vs.  $T_J$

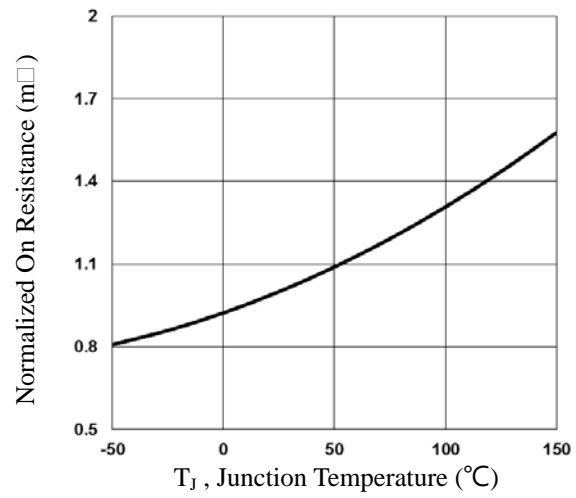


Figure 3. Normalized  $V_{th}$  vs.  $T_J$

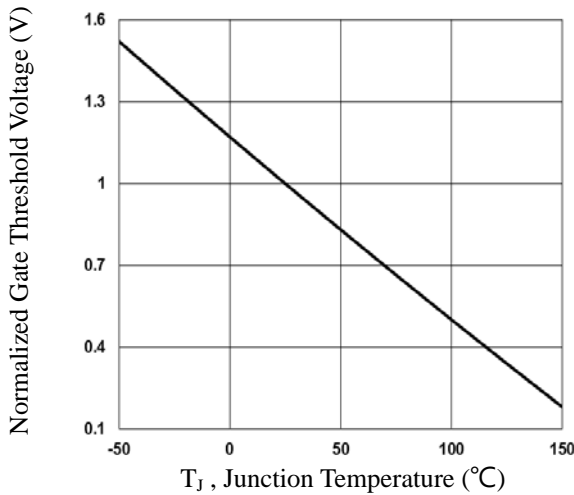


Figure 4. Gate Charge Waveform

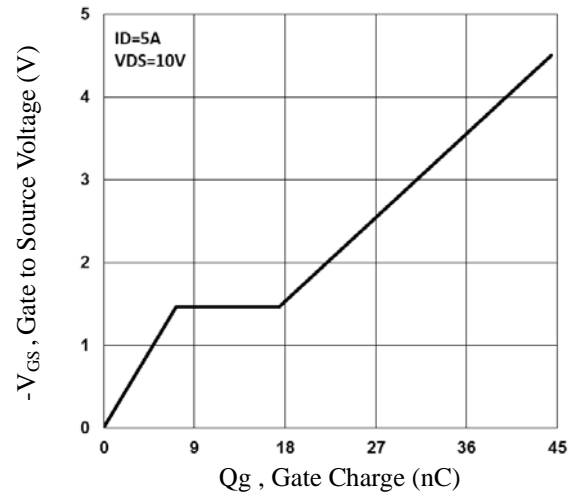


Figure 5. Normalized Transient Impedance

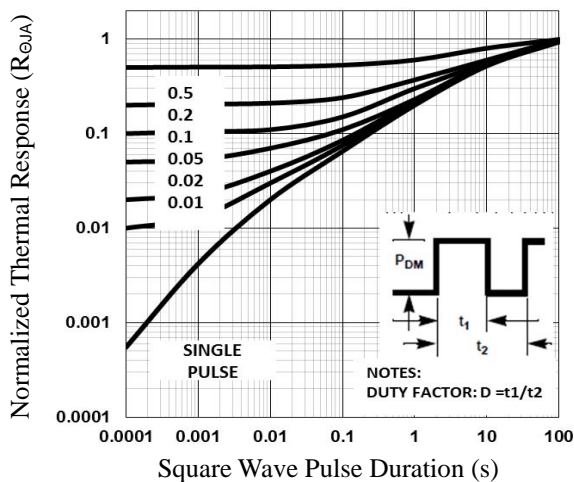
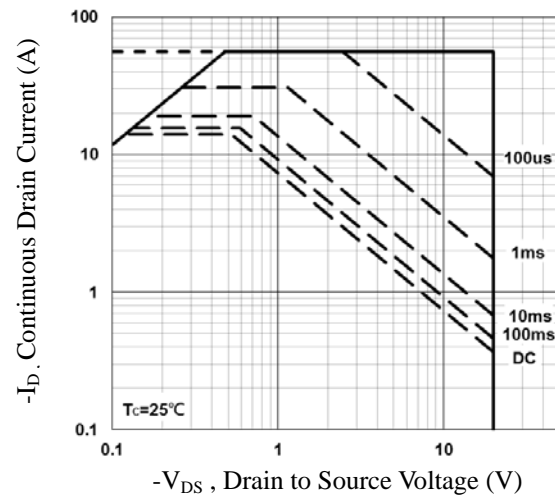
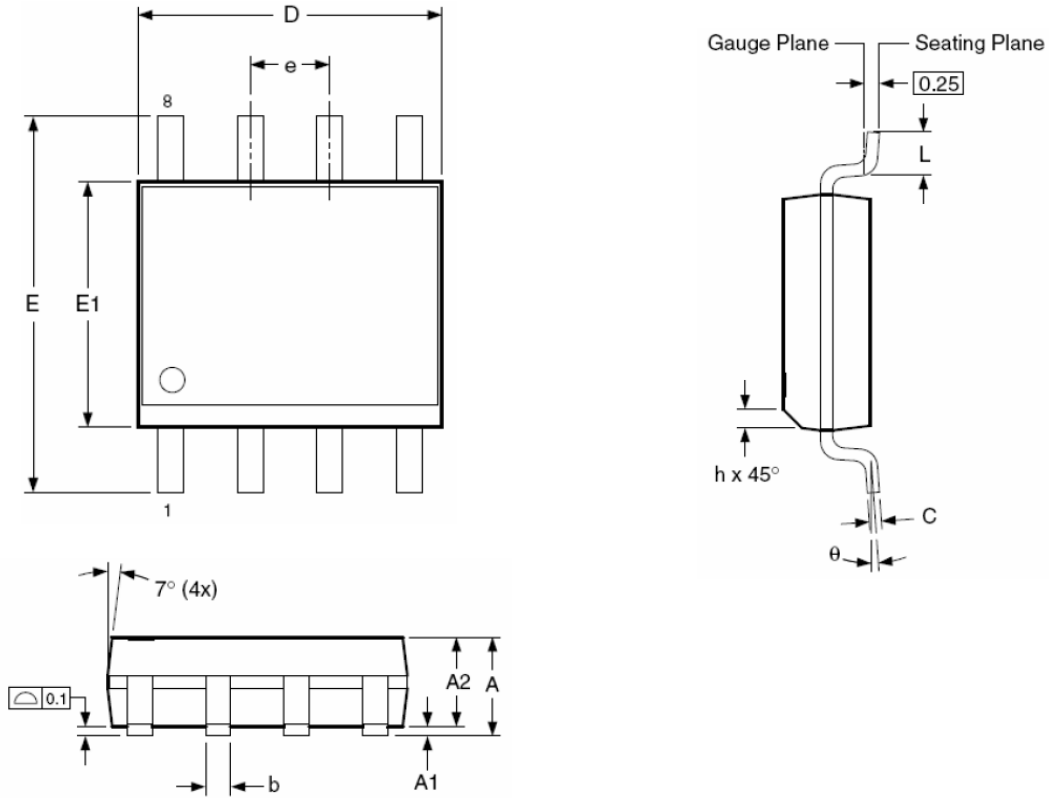


Figure 6. Maximum Safe Operation Area

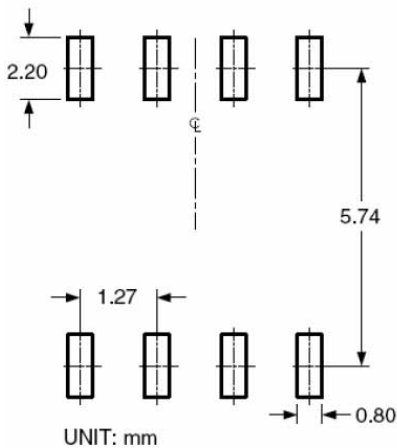


## SOP-8 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



### RECOMMENDED LAND PATTERN



### Dimensions in millimeters

Symbols	Min.	Nom.	Max.
A	1.35	1.65	1.75
A1	0.10	—	0.25
A2	1.25	1.50	1.65
b	0.31	—	0.51
c	0.17	—	0.25
D	4.80	4.90	5.00
E1	3.80	3.90	4.00
e	1.27 BSC		
E	5.80	6.00	6.20
h	0.25	—	0.50
L	0.40	—	1.27
$\theta$	0°	—	8°

### Dimensions in inches

Symbols	Min.	Nom.	Max.
A	0.053	0.065	0.069
A1	0.004	—	0.010
A2	0.049	0.059	0.065
b	0.012	—	0.020
c	0.007	—	0.010
D	0.189	0.193	0.197
E1	0.150	0.154	0.157
e	0.050 BSC		
E	0.228	0.236	0.244
h	0.010	—	0.020
L	0.016	—	0.050
$\theta$	0°	—	8°

### NOTES:

1. All dimensions are in millimeters.
2. Dimensions are inclusive of plating
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 6 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.