X3P4R55P

30V P-Channel MOSFETs

General Description

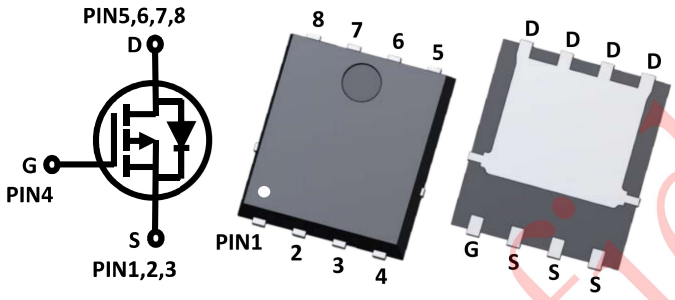
These P-Channel enhancement mode power field effect transistors are using trench - technology. This advanced technology is designed to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche period. These devices are well suited for high efficiency fast switching applications.

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
-30V	4.5mΩ	-90A

Features

- Advanced Trench Process
- Low-$R_{DS(ON)}$
- Low Gate Charge
- High Current Capability

Power PAK 5060 Pin Configuration



Applications

- Load Switch
- Switching Power Supplies
- Battery Power Management

Absolute Maximum Ratings (T_J=25°C, unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DS}	Drain-Source Voltage		-30	V
V_{GS}	Gate-Source Voltage		±20	
I_D	Drain Current-Continuous [A]	T_A = 25°C	-23	A
		T_A = 70°C	-18	
		T_C = 25°C	-90	
		T_C = 100°C	-56	
I_{DM}	Drain Current-Pulsed [A, B]	T_A = 25°C	-210	
I_{AS}	Non-repetitive Avalanche Current [E]		-66	
E_{AS}	Single Pulse Drain-to-Source Avalanche Energy [E]		217.8	mJ
P_D	Maximum Power Dissipation	T_A = 25°C	3.5	W
		T_C = 25°C	104	
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	Conditions	Value	Unit
$R_{\theta JA}$	Junction-to-Ambient [C]	Steady State	35	°C/W
$R_{\theta JC}$	Junction-to-Case	Steady State	1.2	°C/W

Electrical Characteristics (T_J=25°C, unless otherwise noted)

Static State Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = -250μA	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -30V, V_{GS} = 0V	-	-	-1	μA
		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C	-	-	-10	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	-1.2	-1.6	-2.2	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS} = -10V, I_D = -30A	-	3.5	4.5	mΩ
		V_{GS} = -4.5V, I_D = -20A	-	5	7	mΩ
g_{fs}	Forward Transconductance	V_{DS} = -10V, I_D = -5A	-	25	-	S

Dynamic Characteristics Note D

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance		V_{DS} = -15V, V_{GS} = 0V, f = 1MHz	-	6100	-	pF
C_{oss}	Output Capacitance			-	850	-	pF
C_{rss}	Reverse Transfer Capacitance			-	400	-	pF
R_g	Gate Resistance		V_{DS} = 0V, f = 1MHz	-	3	-	Ω
Q_g	Total Gate charge	V_{GS} = 10V	V_{DD} = -15V, I_{DS} = -30A	-	100	-	nC
		V_{GS} = 4.5V		-	49	-	nC
Q_{gs}	Gate to Source Charge			-	20	-	nC
Q_{gd}	Gate to Drain Charge			-	20	-	nC
$T_{d(on)}$	Turn-On Delay Time		V_{DD} = -15V, V_{GS} = -10V, I_{DS} = -30A, $R_{G,ext}$ = 6Ω	-	16	-	ns
t_r	Rise Time			-	100	-	ns
$T_{d(off)}$	Turn-Off Delay Time			-	125	-	ns
t_f	Fall Time			-	120	-	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Diode continuous forward current	-	-	-	-90	A
I_{SM}	Diode pulse current B	-	-	-	-210	A
V_{SD}	Diode Forward Voltage B	V_{GS} = 0V, I_S = -1A	-	-	-1	V
t_{rr}	Diode Reverse Recovery Time	I_S = -30A, di/dt = 100A/μs		25		ns
Q_{rr}	Diode Reverse Recovery Charge			16		nC

Note A, The maximum current rating is package limited.
Note B, The test condition is pulse width ≤ 300us, duty cycle ≤ 2%.
Note C, The $R_{\theta JA}$ is measured with the device mounted on 1 in^2 FR-4 board with 2oz. copper, determined by the PCB design, in a still air environment with T_A=25°C.
Note D, The switching characteristics are independent of operating junction temperatures. Not subject to product testing.
Note E, Maximum UIS current limited by test equipment. The test condition is L=0.1mH, Starting T_J=25°C.