

Pb Free Plating Product

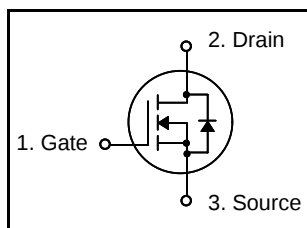
FQP50N06



50A,60V Heatsink Planar N-Channel Power MOSFET

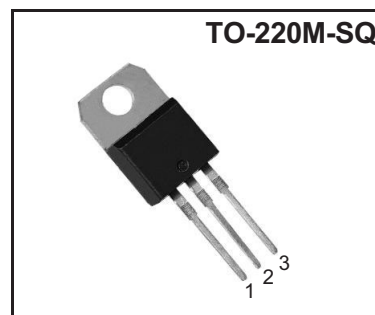
Features

- 50A, 60V, $R_{DS(on)} = 0.022\Omega$ @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 31 nC)
- Low C_{rss} (typical 65 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- 175°C maximum junction temperature rating

 $BV_{DSS} = 60\text{V}$ $R_{DS(ON)} = 0.022\text{ ohm}$ $I_D = 50\text{A}$

General Description

This N-channel enhancement mode field-effect power transistor using THINKI Semiconductor advanced planar stripe, DMOS technology intended for off-line switch mode power supply. Also, especially designed to minimize $r_{ds(on)}$ and high rugged avalanche characteristics. The TO-220M-SQ pkg is well suited for adaptor power units, amplifiers, inverters and SMPS application.

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FQP50N06	Units
V_{DSS}	Drain-Source Voltage	60	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	50	A
	- Continuous ($T_C = 100^\circ\text{C}$)	35.4	A
I_{DM}	Drain Current - Pulsed (Note 1)	200	A
V_{GSS}	Gate-Source Voltage	± 25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	490	mJ
I_{AR}	Avalanche Current (Note 1)	50	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	12	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	7.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	120	W
	- Derate above 25°C	0.8	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.24	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink	0.5	--	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C/W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	0.06	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 48\text{ V}, T_C = 150^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 25\text{ A}$	--	0.018	0.022	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 25\text{ V}, I_D = 25\text{ A}$ (Note 4)	--	22	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1180	1540	pF
C_{oss}	Output Capacitance		--	440	580	pF
C_{rss}	Reverse Transfer Capacitance		--	65	90	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}, I_D = 25\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4, 5)	--	15	40	ns
t_r	Turn-On Rise Time		--	105	220	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
t_f	Turn-Off Fall Time		--	65	140	ns
Q_g	Total Gate Charge	$V_{DS} = 48\text{ V}, I_D = 50\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4, 5)	--	31	41	nC
Q_{gs}	Gate-Source Charge		--	8	--	nC
Q_{gd}	Gate-Drain Charge		--	13	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	200	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 50 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 50 A, dI _F / dt = 100 A/μs (Note 4)	--	52	--	ns
Q _{rr}	Reverse Recovery Charge		--	75	--	nC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 230\text{ }\mu\text{H}$, $I_{AS} = 50\text{ A}$, $V_{DD} = 25\text{ V}$, $R_G = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 50\text{ A}$, $di/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

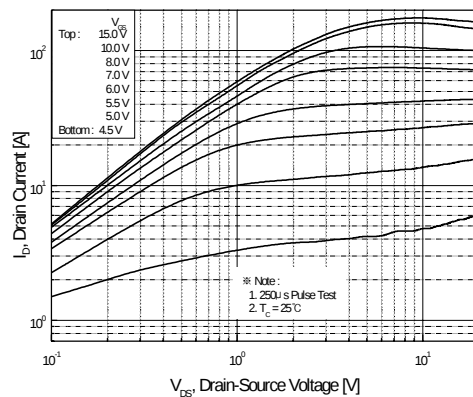


Figure 1. On-Region Characteristics

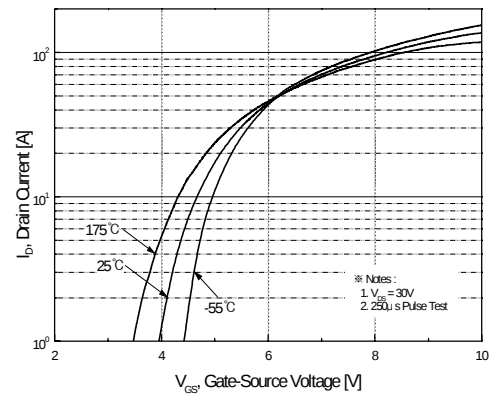


Figure 2. Transfer Characteristics

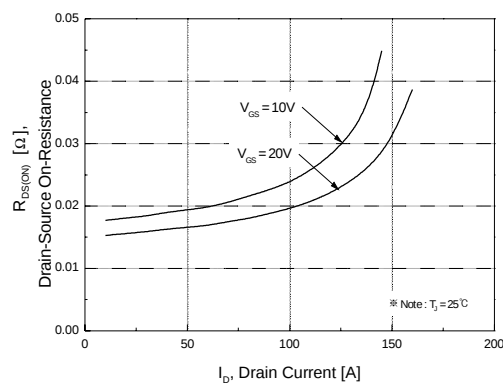


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

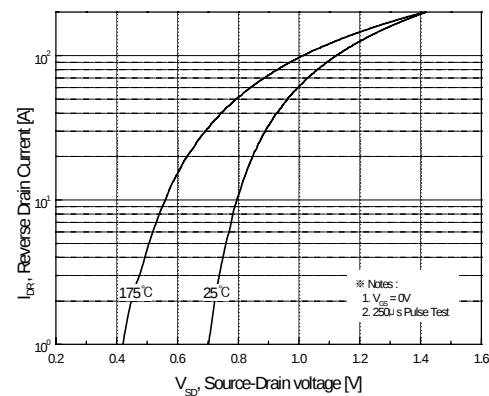


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

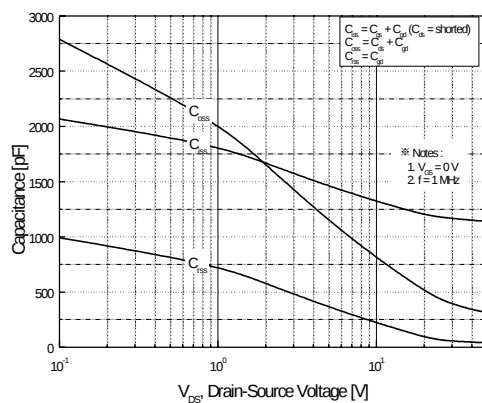


Figure 5. Capacitance Characteristics

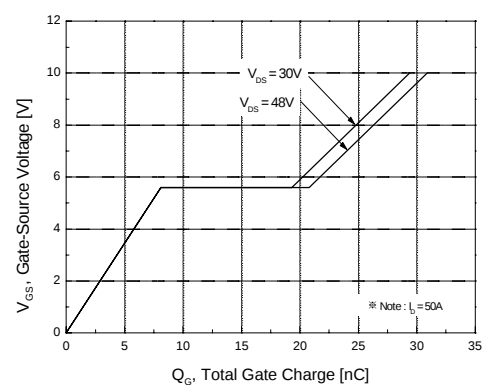


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

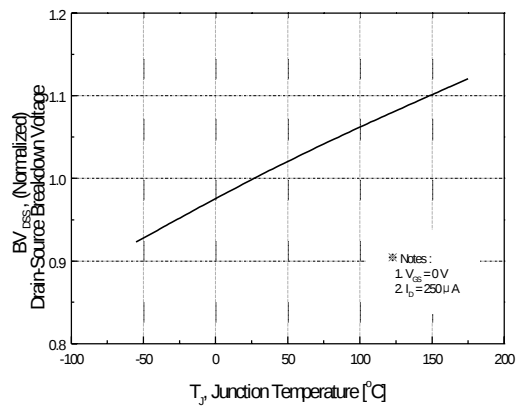


Figure 7. Breakdown Voltage Variation vs. Temperature

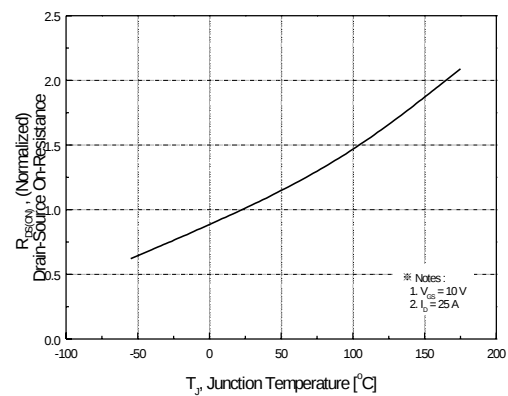


Figure 8. On-Resistance Variation vs. Temperature

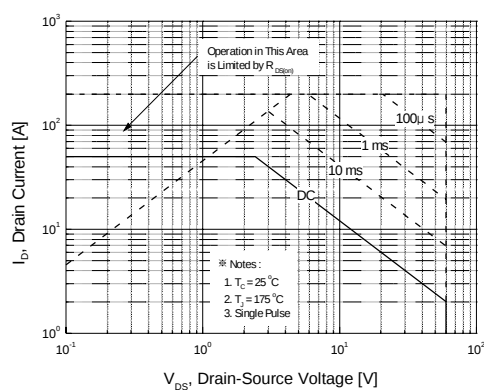


Figure 9. Maximum Safe Operating Area

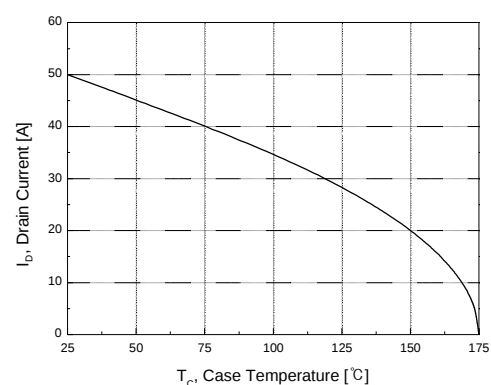


Figure 10. Maximum Drain Current vs. Case Temperature

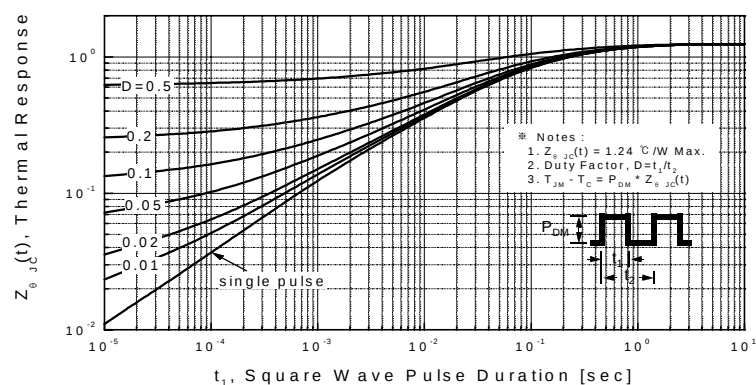
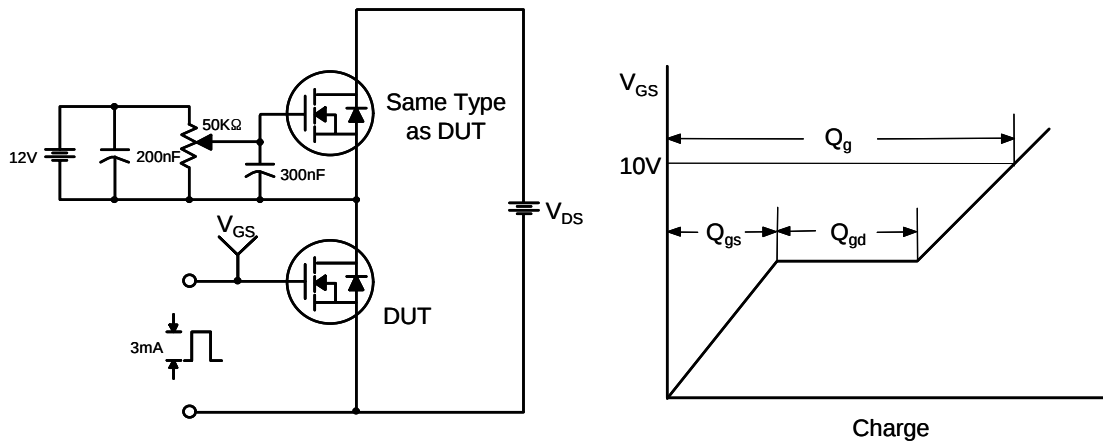
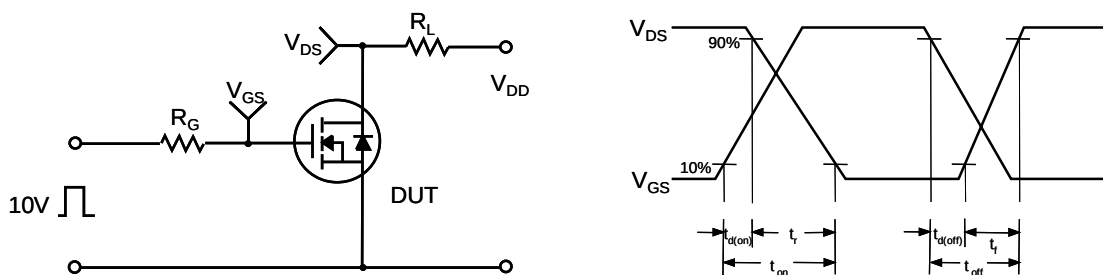


Figure 11. Transient Thermal Response Curve

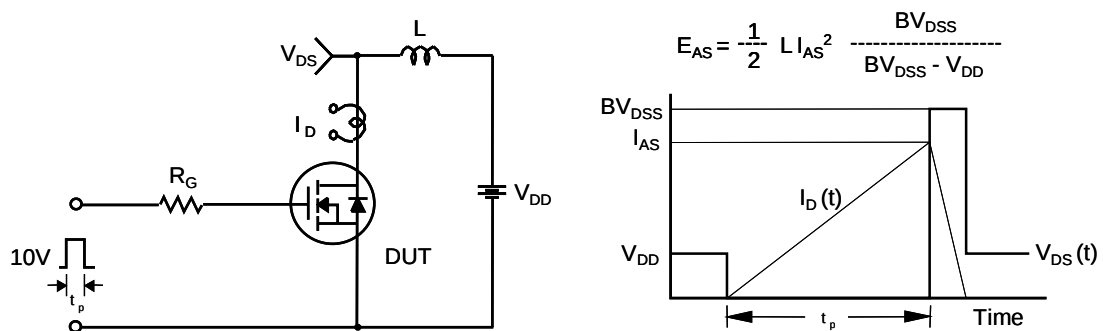
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

