

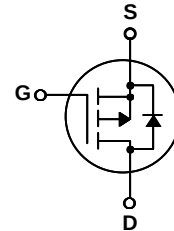
200V P-Channel MOSFET

General Description

These P-Channel enhancement mode power field effect transistors are produced using Toohong's proprietary ,planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters.

Features

- -3.7A, -200V, $R_{DS(on)} = 1.4\Omega$ @ $V_{GS} = -10V$
- Low gate charge (typical 10 nC)
- Low C_{rss} (typical 12 pF)
- Fast switching
- 100% avalanche tested
- RoHS Compliant



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

Symbol	Parameter	FQD5P20 / FQU5P20	Units
V_{DSS}	Drain-Source Voltage	-200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	-3.7	A
	- Continuous ($T_C = 100^\circ\text{C}$)	-2.34	A
I_{DM}	Drain Current - Pulsed (Note 1)	-14.8	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	330	mJ
I_{AR}	Avalanche Current (Note 1)	-3.7	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	-5.5	V/ns
P_D	Power Dissipation ($T_A = 25^\circ\text{C}$) *	2.5	W
	Power Dissipation ($T_C = 25^\circ\text{C}$)	45	W
	- Derate above 25°C	0.36	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
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	--	2.78	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	--	50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	110	$^\circ\text{C/W}$

* When mounted on the minimum pad size recommended (PCB Mount)

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-200	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C	--	-0.17	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -200\text{ V}, V_{GS} = 0\text{ V}$	--	--	-1	μA
		$V_{DS} = -160\text{ V}, T_C = 125^\circ\text{C}$	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-3.0	--	-5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -1.85\text{ A}$	--	1.1	1.4	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -40\text{ V}, I_D = -1.85\text{ A}$ (Note 4)	--	2.2	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	330	430	pF
C_{oss}	Output Capacitance		--	75	98	pF
C_{rss}	Reverse Transfer Capacitance		--	12	15	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -100\text{ V}, I_D = -4.8\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4, 5)	--	9	28	ns
t_r	Turn-On Rise Time		--	70	150	ns
$t_{d(off)}$	Turn-Off Delay Time		--	12	35	ns
t_f	Turn-Off Fall Time		--	25	60	ns
Q_g	Total Gate Charge	$V_{DS} = -160\text{ V}, I_D = -4.8\text{ A},$ $V_{GS} = -10\text{ V}$ (Note 4, 5)	--	10	13	nC
Q_{gs}	Gate-Source Charge		--	2.8	--	nC
Q_{gd}	Gate-Drain Charge		--	5.2	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-3.7	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-14.8	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -3.7 A	--	--	-5.0	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = -4.8 A, dI _F / dt = 100 A/μs (Note 4)	--	175	--	ns
Q _{rr}	Reverse Recovery Charge		--	1.07	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 36.2\text{ mH}$, $I_{AS} = -3.7\text{ A}$, $V_{DD} = -50\text{ V}$, $R_G = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq -4.8\text{ A}$, $dI/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

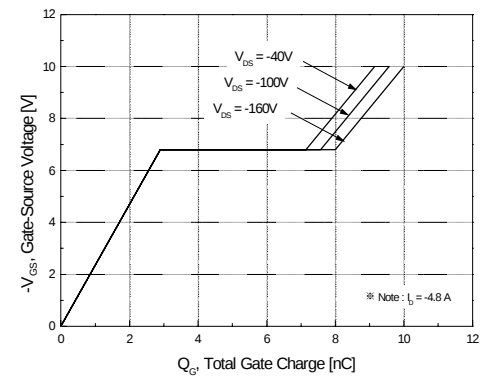
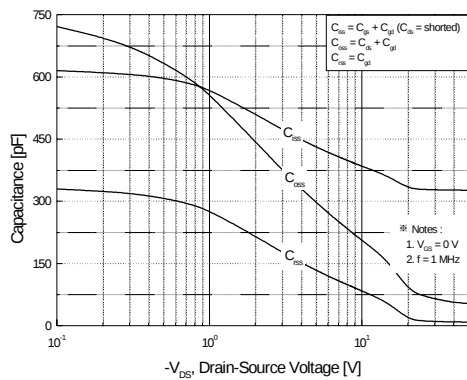
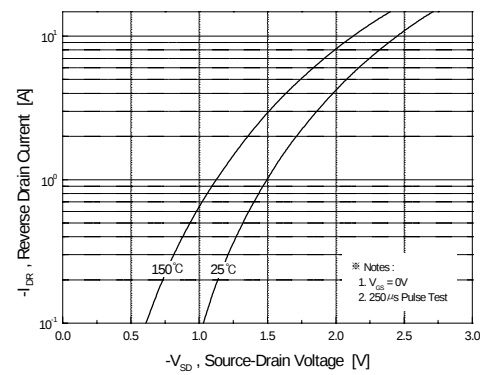
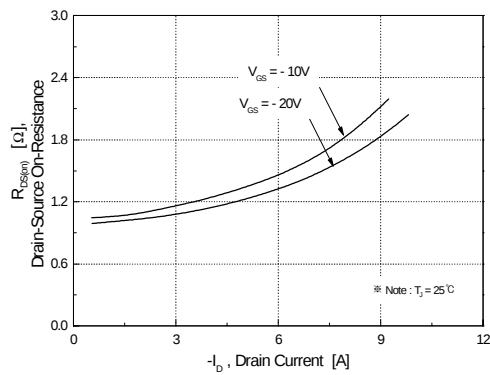
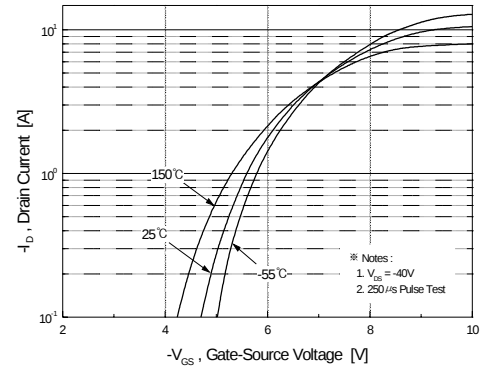
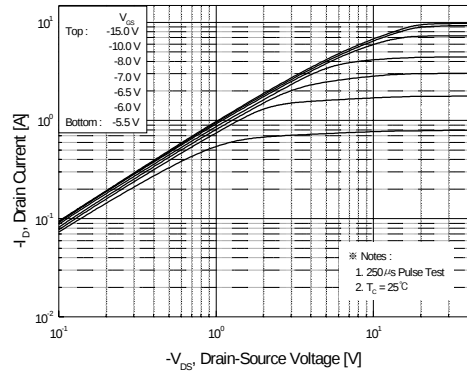


Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics

Typical Characteristics (Continued)

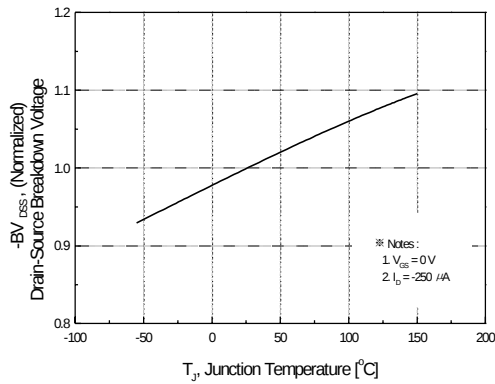


Figure 7. Breakdown Voltage Variation vs. Temperature

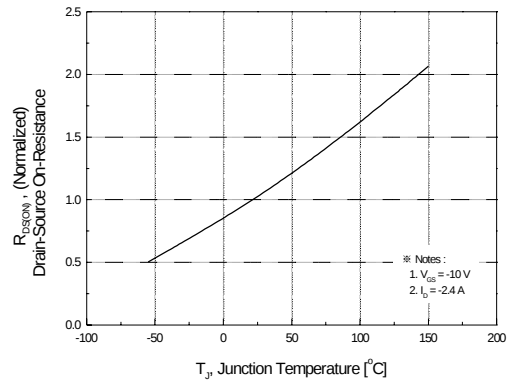


Figure 8. On-Resistance Variation vs. Temperature

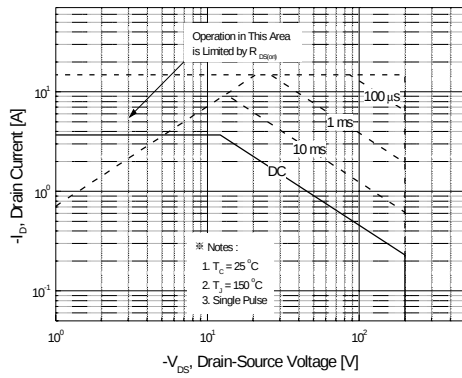


Figure 9. Maximum Safe Operating Area

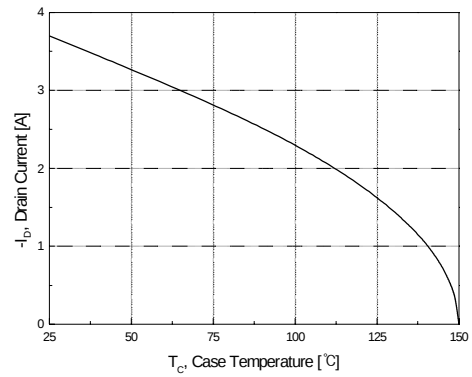


Figure 10. Maximum Drain Current vs. Case Temperature

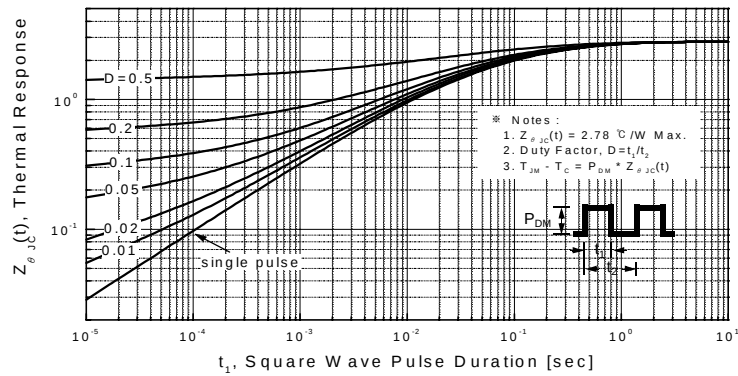


Figure 11. Transient Thermal Response Curve