

PFP70R590 / PFF70R590

N-Channel Super Junction MOSFET

FEATURES

- New technology for high voltage device
- Low $R_{DS(on)}$ low conduction losses
- Small package
- Ultra low gate charge cause lower driving requirement
- 100% avalanche tested

$BV_{DSS} = 700\text{ V}$ $R_{DS(on)} = 0.52\Omega$ $I_D = 8.0\text{ A}$	
TO-220 	TO-220F

APPLICATION

- Power Factor Correction(PFC)
- Switched mode power supply (SMPS)
- Uninterruptible Power Supply (UPS)

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	PFP70R590	PFF70R590	Units
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	700		V
I_D	Drain Current – Continuous ($T_c = 25^\circ\text{C}$)	8.0	8.0*	A
	Drain Current – Continuous ($T_c = 100^\circ\text{C}$)	5.0	5.0*	A
$I_{DM(pulse)}$	Drain Current – Pulsed * Note 1	23.5	23.5*	A
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 30		V
E_{AS}	Single Pulsed Avalanche Energy * Note 2	185		mJ
I_{AR}	Avalanche Current * Note 1	4.0		A
E_{AR}	Repetitive Avalanche Energy * Note 1	0.4		mJ
dv/dt	Drain Source Voltage Slope, $V_{DS} \leq 480V$	50		V/ns
	Reverse Diode dv/dt , $V_{DS} \leq 480V$	15		V/ns
P_D	Maximum Power Dissipation ($T_c = 25^\circ\text{C}$)	80	31.7	W
	Derate above 25°C	0.64	0.25	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$

* Limited by maximum junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	PFP70R590	PFF70R590	Units
$R_{\theta JC}$	Junction-to-Case (Maximum)	1.56	3.94	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient (Maximum)	62.5	80.0	

Electrical Characteristics $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.5	3.0	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 4.0 \text{ A}$	--	520	590	m.ohm
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	700	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 700 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	10	μA
		$V_{DS} = 700 \text{ V}, T_C=125^\circ\text{C}$	--	--	100	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
Dynamic Characteristics						
g_{FS}	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_D = 4.0 \text{ A}$	--	5.5	--	S
R_G	Intrinsic Gate Resistance	$f = 1.0 \text{ MHz}$, open drain	--	2.0	--	ohm
C_{iss}	Input Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	680	--	pF
C_{oss}	Output Capacitance		--	58	--	pF
C_{rss}	Reverse Transfer Capacitance		--	4	--	pF
Q_g	Total Gate Charge	$V_{DS} = 560 \text{ V}, I_D = 8.0 \text{ A}$, $V_{GS} = 10 \text{ V}$	--	14.5	22	nC
Q_{gs}	Gate-Source Charge		--	2.8	--	nC
Q_{gd}	Gate-Drain Charge		--	5.5	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 350 \text{ V}, I_D = 4.0 \text{ A}$, $R_G = 12 \Omega, V_{GS} = 10 \text{ V}$	--	5.5	--	ns
t_r	Turn-On Rise Time		--	3.5	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	75	ns
t_f	Turn-Off Fall Time		--	6.5	10	ns
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	8.0	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	23.5	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 8.0 \text{ A}, V_{GS} = 0 \text{ V}$	--	0.9	1.2	V
t_{rr}	Reverse Recovery Time	$I_S = 8.0 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$	--	220	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.2	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $V_{DS}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

Typical Characteristics

Fig 1. Safe Operation Area for TO-220

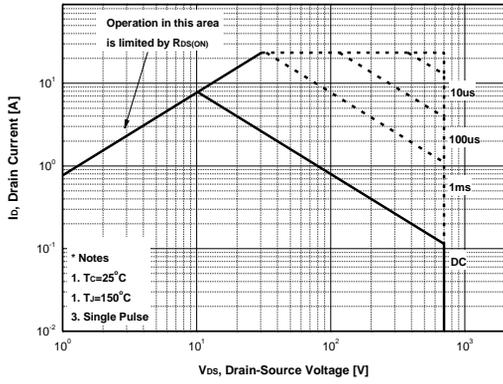


Fig 2. Safe Operation Area for TO-220F

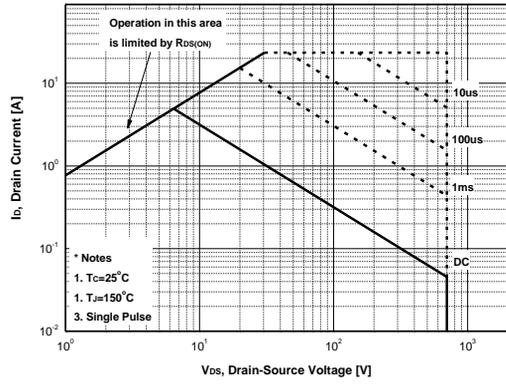


Fig 3. Source-Drain Diode Forward Voltage

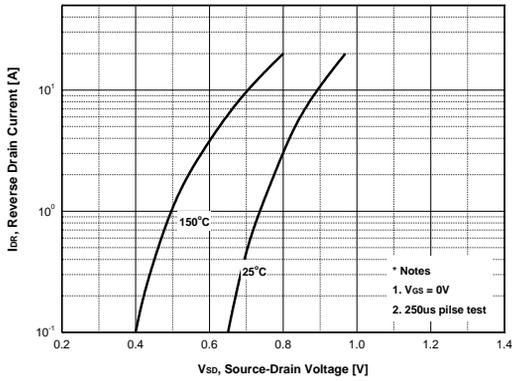


Fig 4. Output Characteristics

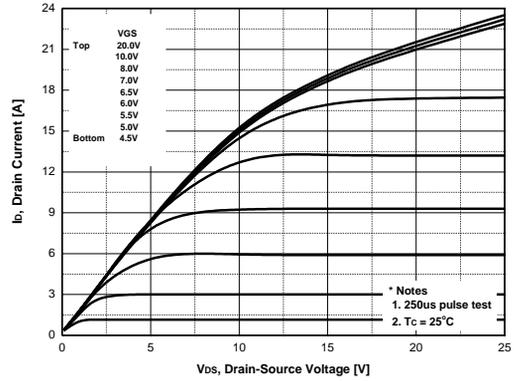


Fig 5. Transfer Characteristics

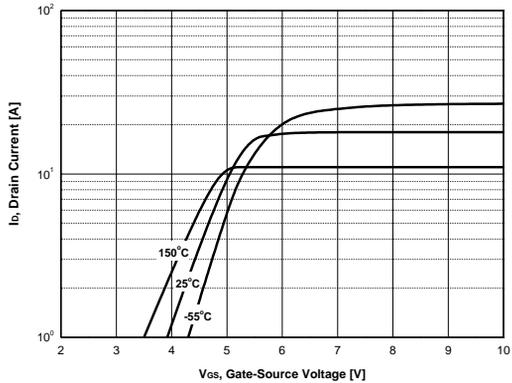
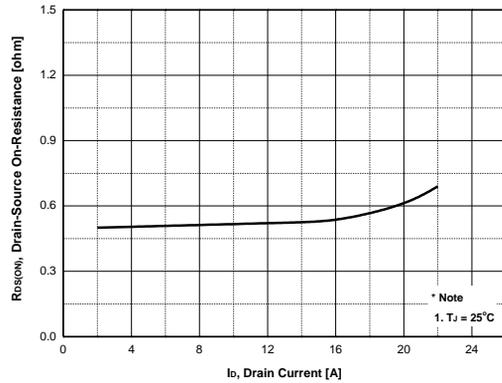


Fig 6. Static Drain-Source On Resistance



Typical Characteristics (continued)

Fig 7. $R_{DS(ON)}$ vs. Junction Temperature

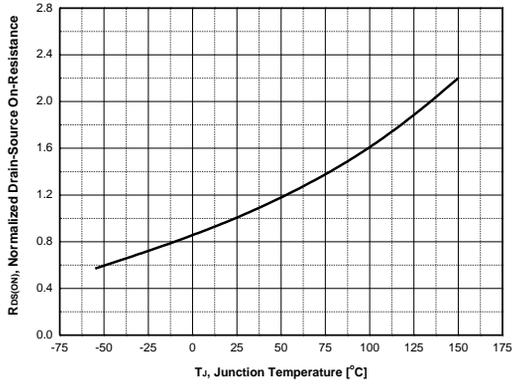


Fig 8. BV_{DSS} vs. Junction Temperature

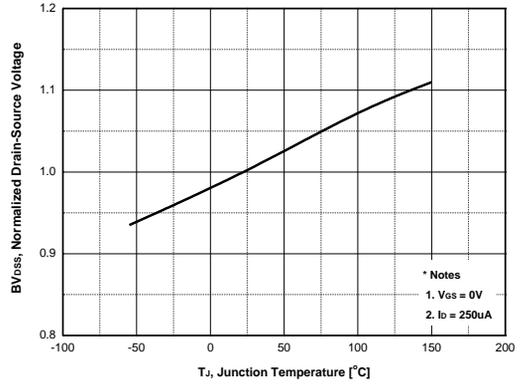


Fig 9. Maximum I_D vs. Case Temperature

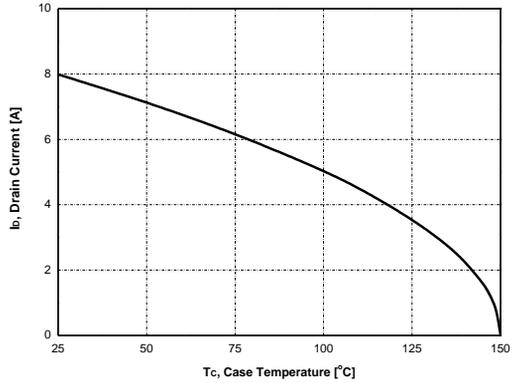


Fig 10. Gate Charge Characteristics

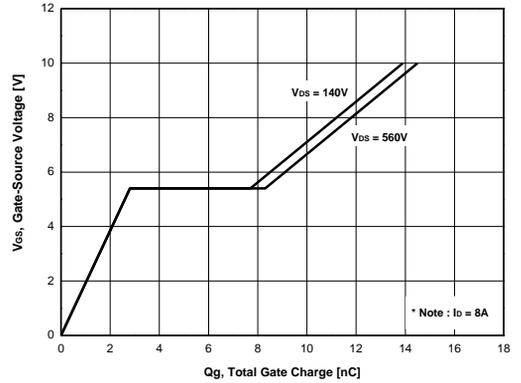
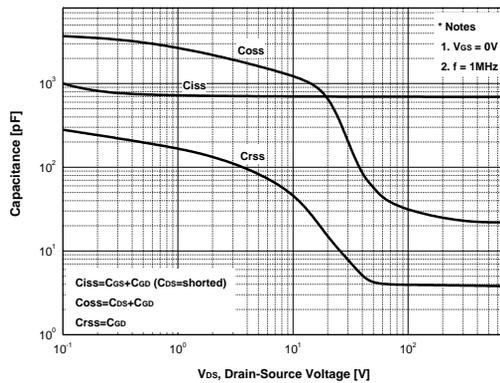


Fig 11. Capacitance Characteristics



Typical Characteristics (continued)

Fig 12. Transient Thermal Response Curve

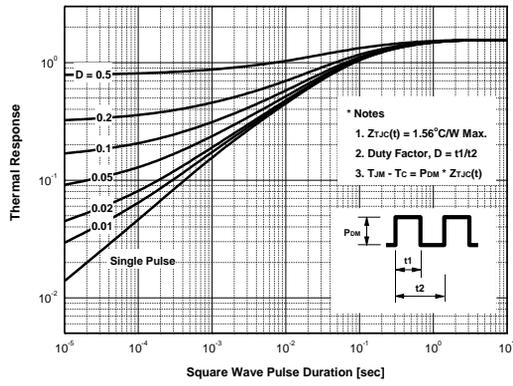
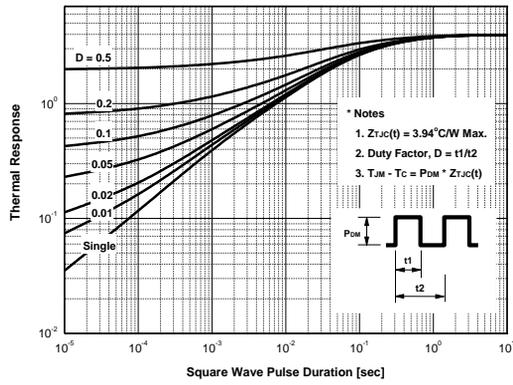
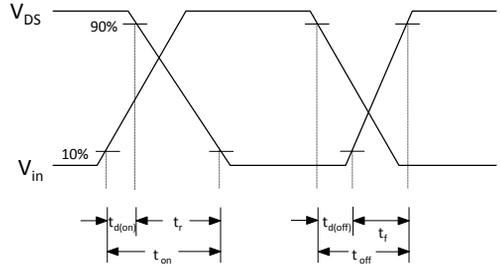
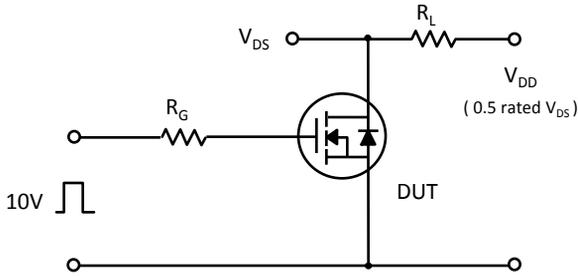


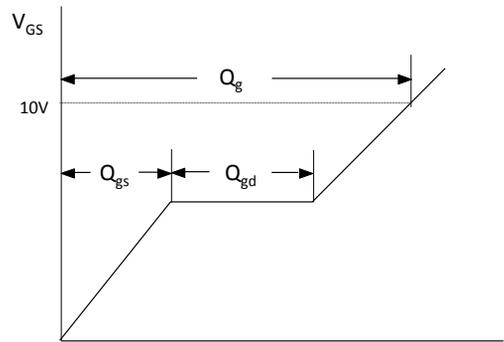
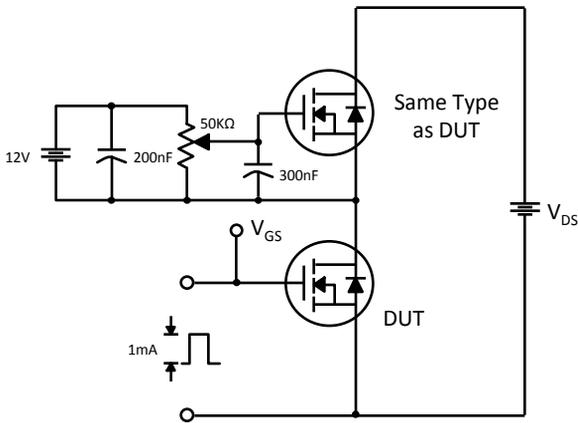
Fig 13. Transient Thermal Response Curve



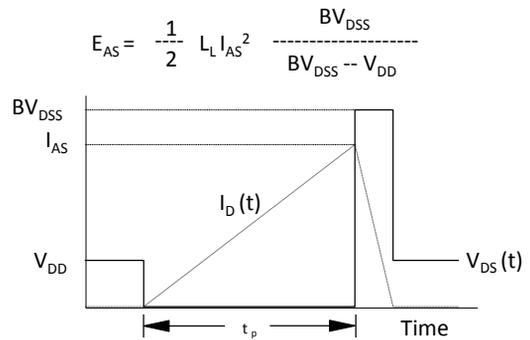
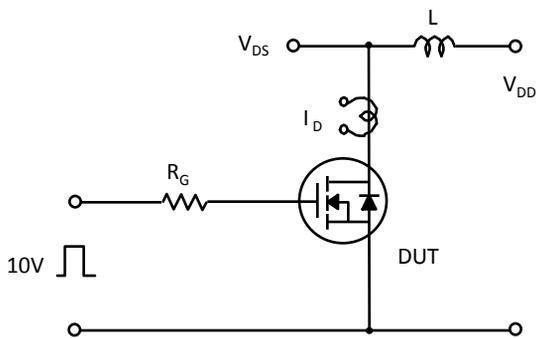
Characteristics Test Circuit & Waveform



Switching Time Test Circuit & Waveforms

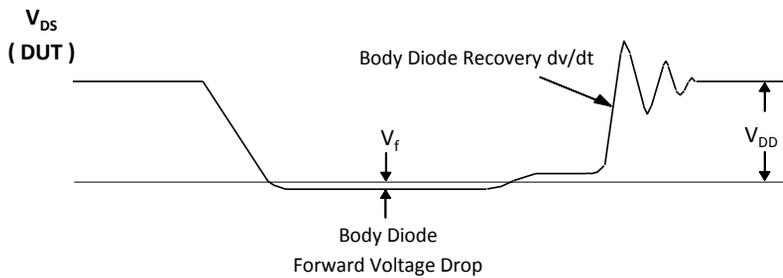
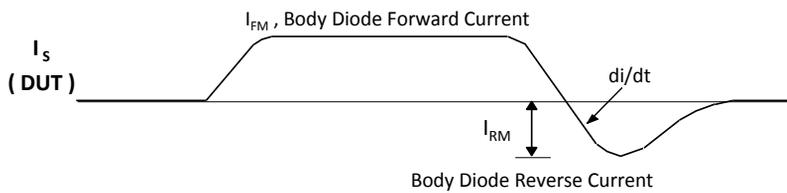
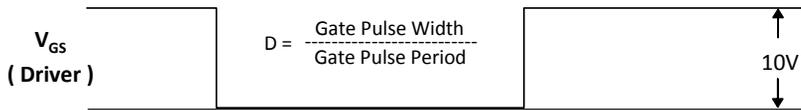
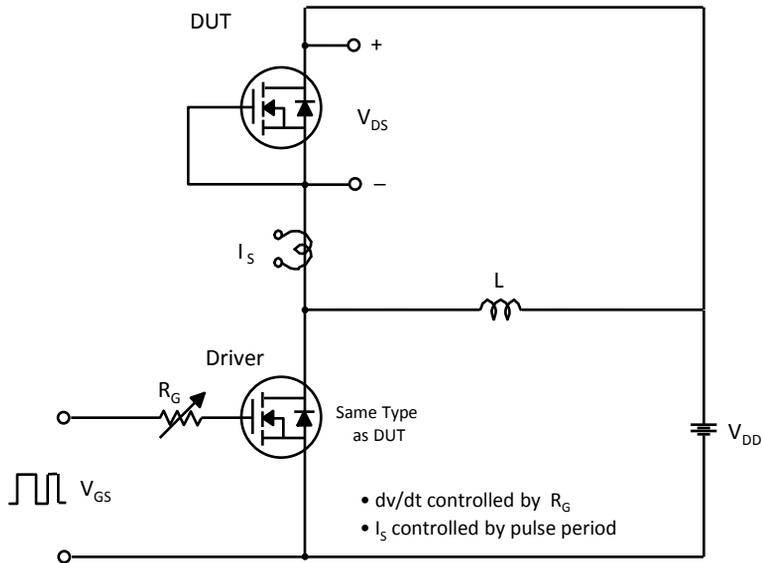


Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)



Peak Diode Recovery dv/dt Test Circuit & Waveforms