

FEATURES

- Originative New Design
- 100% EAS Test
- Rugged Gate Oxide Technology
- Extremely Low Intrinsic Capacitances
- Remarkable Switching Characteristics
- Unequalled Gate Charge : 66 nC (Typ.)
- Extended Safe Operating Area
- Lower $R_{DS(ON)}$: 0.30 Ω (Typ.) @ $V_{GS}=10V$

PFJ20N60 / PFW20N60
600V N-Channel MOSFET

$BV_{DSS} = 600\text{ V}$ $R_{DS(on)} = 0.30\ \Omega$ $I_D = 20.0\text{ A}$	
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APPLICATION

- High current, High speed switching
- Suitable for power supplies, adaptors and PFC
- SMPS (Switched Mode Power Supplies)

TO-247 1.Gate 2. Drain 3. Source	TO-3P 1.Gate 2. Drain 3. Source
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Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current – Continuous ($T_C = 25^\circ\text{C}$)	20	A
	Drain Current – Continuous ($T_C = 100^\circ\text{C}$)	13	A
I_{DM}	Drain Current – Pulsed (Note 1)	80	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	20	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	36	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	357	W
	- Derate above 25°C	2.8	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 Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.35	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 10.0 \text{ A}$	--	0.30	0.37	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.9	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	μA
		$V_{DS} = 480 \text{ V}, T_C = 125^\circ\text{C}$	--	--	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
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	3425	4450	pF
C_{oss}	Output Capacitance		--	330	430	pF
C_{rss}	Reverse Transfer Capacitance		--	105	135	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 300 \text{ V}, I_D = 20 \text{ A}$ $R_G = 25 \Omega, R_L = 15 \Omega$ (Note 4,5)	--	32	64	ns
t_r	Turn-On Rise Time		--	20	40	ns
$t_{d(off)}$	Turn-Off Delay Time		--	135	270	ns
t_f	Turn-Off Fall Time		--	38	76	ns
Q_g	Total Gate Charge	$V_{DS} = 480 \text{ V}, I_D = 20 \text{ A}$ $V_{GS} = 10 \text{ V}$ (Note 4,5)	--	66	99	nC
Q_{gs}	Gate-Source Charge		--	20	--	nC
Q_{gd}	Gate-Drain Charge		--	16.5	--	nC
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	20	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	80	
V_{SD}	Source-Drain Diode Forward Voltage	$I_S = 20 \text{ A}, V_{GS} = 0 \text{ V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S = 20 \text{ A}, V_{GS} = 0 \text{ V}$ $di_f/dt = 100 \text{ A}/\mu\text{s}$ (Note 4)	--	500	--	ns
Q_{rr}	Reverse Recovery Charge		--	6.6	--	μC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}=20\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD}\leq 20\text{A}, di/dt\leq 300\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS}$, 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

Fig.1 On Region Characteristics

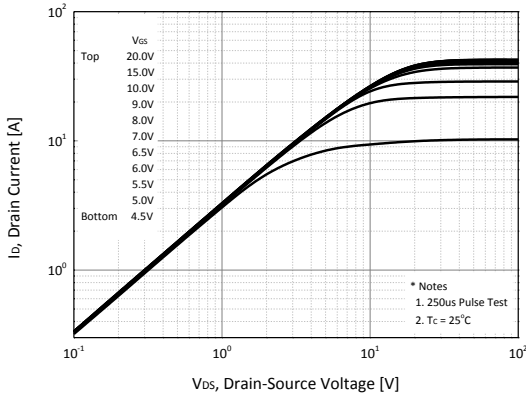


Fig.2 Transfer Characteristics

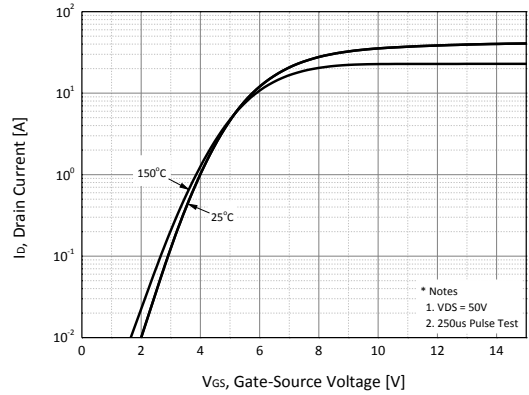


Fig.3 Static Drain-Source On Resistance

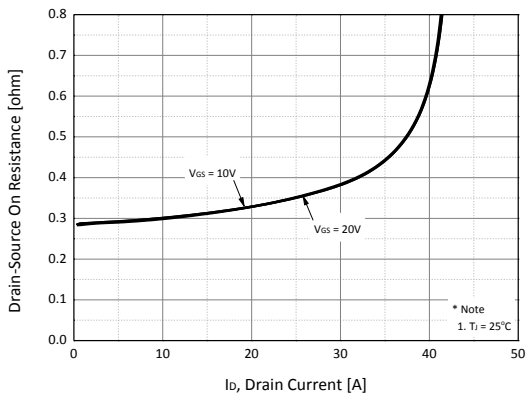


Fig.4 Body Diode Forward Voltage

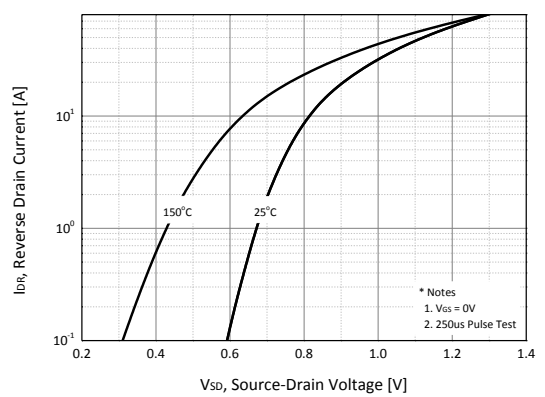


Fig.5 Capacitance Characteristics

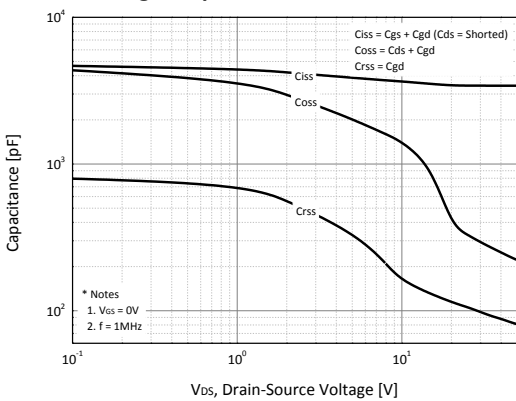
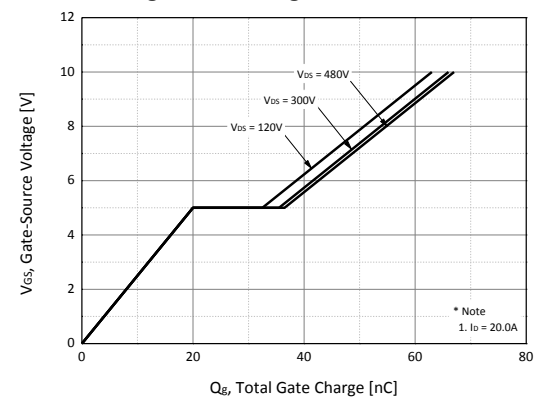


Fig.6 Gate Charge Characteristics



Typical Characteristics

Fig.7 BV_{DSS} Variation vs. Temperature

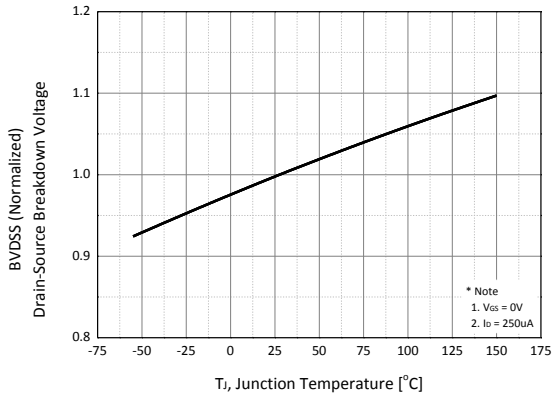


Fig.8 On-Resistance Variation vs. Temperature

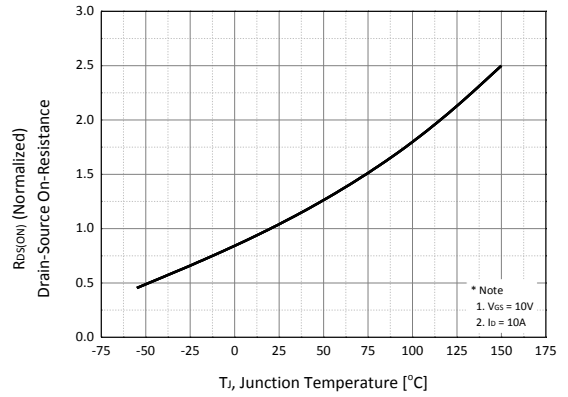


Fig.9 Safe Operation Area

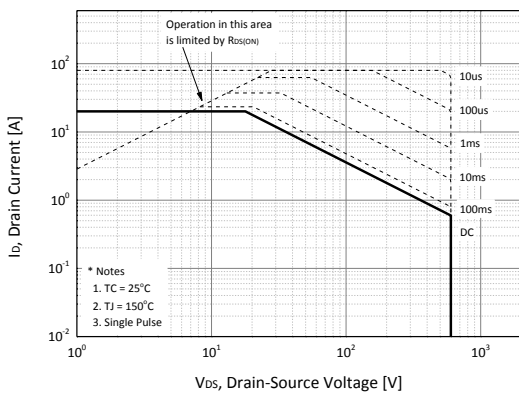


Fig.10 Maximum I_D vs. Case Temperature

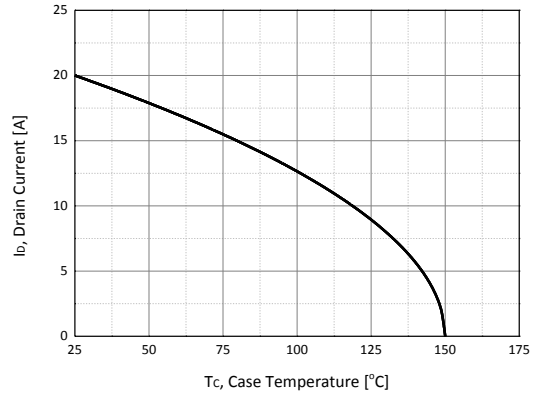
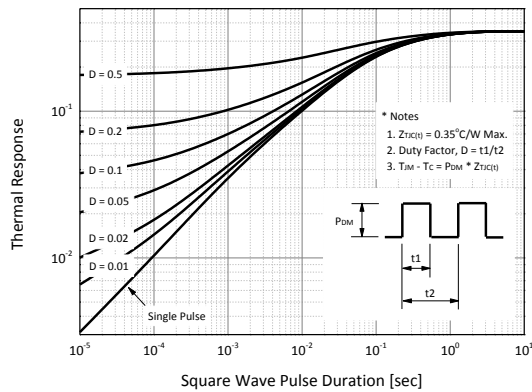
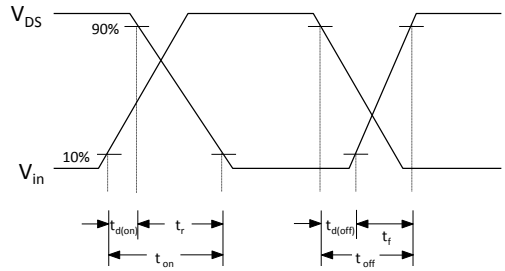
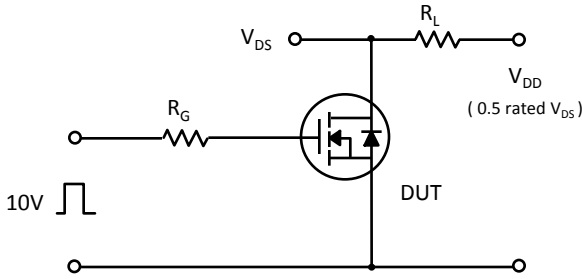


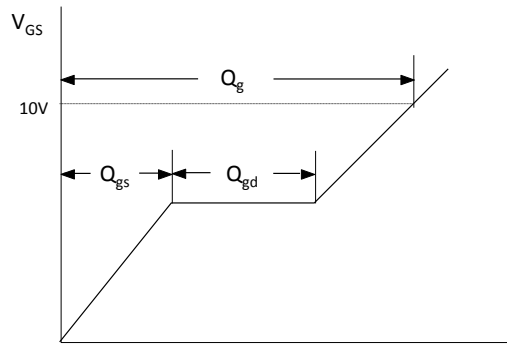
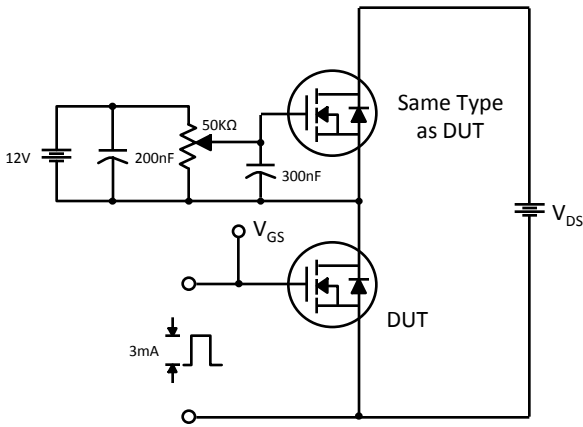
Fig.11 Transient Thermal Response Curve



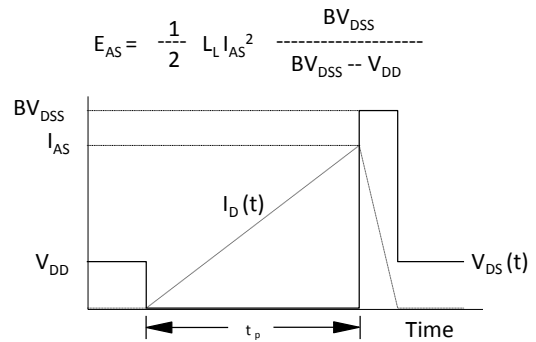
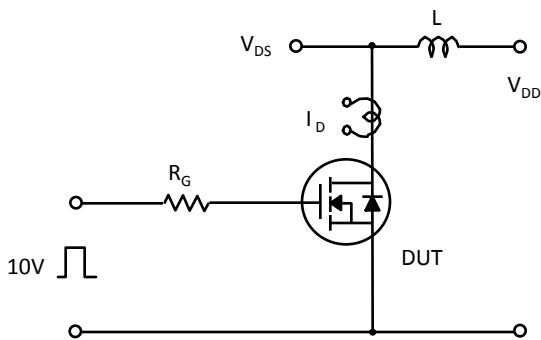
Characteristics Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

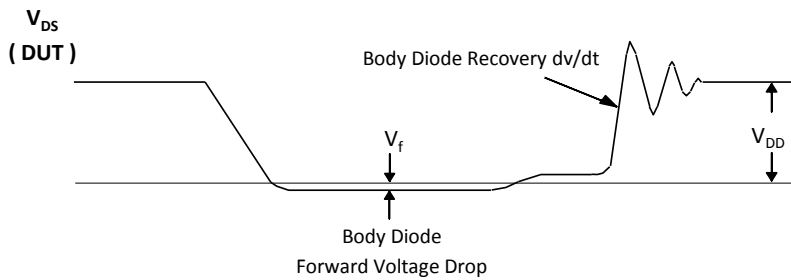
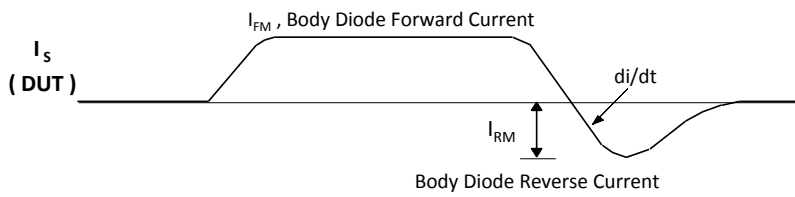
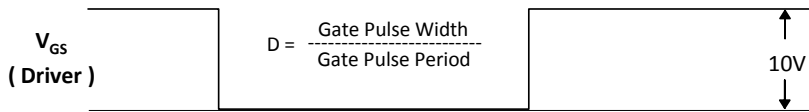
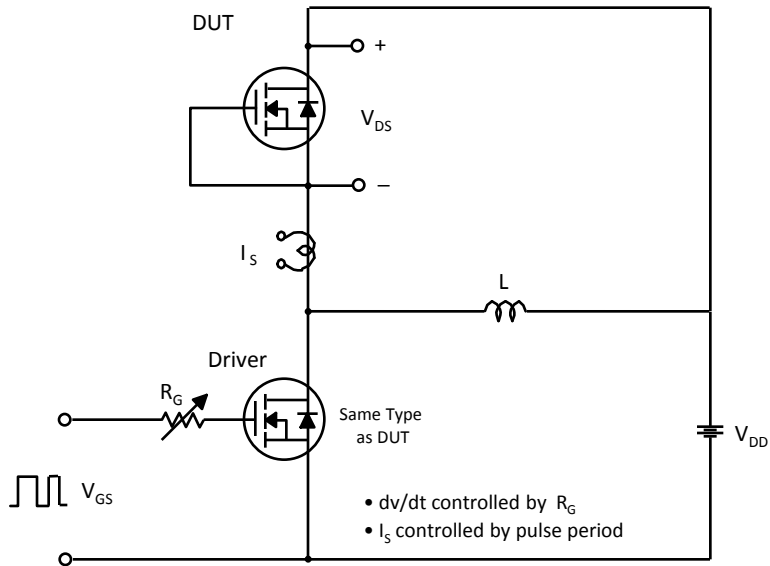


Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms

Characteristics Test Circuit & Waveform (continued)



Peak Diode Recovery dv/dt Test Circuit & Waveforms