MOSFET – Power, N-Channel

150 V, 6.1 $m\Omega$

PCFA86210F

Features

- Typical $R_{DS(on)} = 4.8 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$
- Typical $Q_{g(tot)} = 70 \text{ nC}$ at $V_{GS} = 10 \text{ V}$
- AEC-Q101 Qualified and PPAP Capable
- RoHS Compliant

DIMENSION (µm)

Die Size	6096 × 4445
Die Size (Sawn)	$6076 \pm 15 \times 4425 \pm 15$
Source Attach Area	5435.3 × 4138
Gate Attach Area	318.6 × 520
Die Thickness	203.2 ±25.4

Gate and Source: AlSiCu

Drain: Ti-NiV-Ag (back side of die)

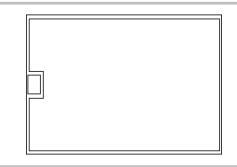
Passivation: Polyimide Wafer Diameter: 8 inch Wafer sawn on UV Tape Bad dice identified in inking Gross Die Counts: 961

The Chip is 100% Probed to Meet the Conditions and Limits Specified at T_J = 25°C.



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ORDERING INFORMATION

Device	Package
PCFA86210F	Wafer
	Sawn on Foil

RECOMMENDED STORAGE CONDITIONS

Temperature	22 to 28°C
RH	40 to 66%

Symbol	Parameter	Condition	Min	Тур	Max	Unit
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	150	-	-	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 150 V, V _{GS} = 0 V	-	-	1	μΑ
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±100	nA
V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	2.0	-	4.0	V
*R _{DS(on)}	Bare Die Drain to Source On Resistance	I _D = 5 A, V _{GS} = 10 V	-	4.8	6.1	mΩ
V _{SD}	Source to Drain Diode Voltage	I _{SD} = 5 A, V _{GS} = 0 V	-	-	1.25	V

^{*}Accurate $R_{DS(on)}$ test at die level is not feasible as limited by the test contact precision attainable in a die form. The max $R_{DS(on)}$ specification is defined from the historical performance of the die in package but is not guaranteed by test in production. The die $R_{DS(on)}$ performance depends on the Source wire/ribbon bonding layout.

MOSFET MAXIMUM RATINGS in Reference to the FDBL86210-F085 electrical data in TOLL

(T_J = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V _{DSS}	Drain to Source Voltage	150	V
V_{GS}	Gate to Source Voltage	±20	V
I _D	Continuous Drain Current $R_{\theta JC}$ (V_{GS} = 10) (Note 1) T_{C} = 25°C T_{C} = 100°C	169 119	A
E _{AS}	Single Pulse Avalanche Energy (Note 2)	502	mJ
P_{D}	Power Dissipation $R_{\theta JC}$	500	W
	Derate Above 25°C	3.3	W/°C
T _J , T _{STG}	Operating and Storage Temperature	-55 to +175	°C
$R_{ heta JC}$	Thermal Resistance, Junction to Case	0.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 3)	43	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- 1. Current is limited by silicon.
- Starting T_J = 25°C, L = 0.24 mH, I_{AS} = 64 A
 R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.

ELECTRICAL CHARACTERISTICS in Reference to the FDBL86210-F085 electrical data in TOLL

 $(T_J = 25^{\circ}C \text{ unless otherwise noted})$

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
OFF CHARAC	CTERISTICS						
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$		150	-	_	V
I _{DSS}		V _{DS} = 150 V,	T _J = 25°C	-	-	1	μΑ
		$V_{GS} = 0 V$	T _J = 175°C (Note 4)	-	-	1	mA
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$		-	-	±100	nA
ON CHARAC	TERISTICS						
V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D =$: 250 μA	2.0	3.0	4.0	V
R _{DS(on)}	Drain to Source On-Resistance	I _D = 80 A,	, ,		5	6.3	mΩ
		V _{GS} = 10 V	T _J = 175°C (Note 4)	_	14	17.5	mΩ
DYNAMIC CH	ARACTERISTICS						
C _{iss}	Input Capacitance	V _{DS} = 75 V, V _{GS} = 0 V, f = 1 MHz		-	5805	_	pF
C _{oss}	Output Capacitance			-	536	_	pF
C _{rss}	Reverse Transfer Capacitance			-	16	-	pF
R_g	Gate Resistance			-	2.2	_	Ω
Q _{g(ToT)}	Total Gate Charge	V _{GS} = 0 to 10 V, V _{DD} = 75 V, I _D = 80 A		-	70	_	nC
$Q_{g(th)}$	Threshold Gate Charge	V _{GS} = 0 to 2 V, V _{DD} = 75 V, I _D = 80 A		-	11	_	nC
Q _{gs}	Gate to Source Gate Charge	V _{DD} = 75 V, I _D = 80 A		-	32	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	10	_	nC
SWITCHING (CHARACTERISTICS						
t _{d(on)}	Turn-On Delay	V_{DD} = 75 V, I_{D} = 80 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		_	39	_	ns
t _r	Rise Time			-	30	-	ns
t _{d(off)}	Turn-Off Delay			-	70	-	ns
t _f	Fall Time			-	23	-	ns

ELECTRICAL CHARACTERISTICS in Reference to the FDBL86210–F085 electrical data in TOLL

 $(T_J = 25^{\circ}C \text{ unless otherwise noted})$

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
DRAIN-SOURCE DIODE CHARACTERISTIC						
V_{SD}	Source to Drain Diode Voltage	I _{SD} = 80 A, V _{GS} = 0 V	-	-	1.25	V
		I _{SD} = 40 A, V _{GS} = 0 V	-	-	1.2	V
t _{rr}	Reverse Recovery Time	$I_F = 80 \text{ A}, dI_{SD}/dt = 100 \text{ A/}\mu\text{s},$	-	108	-	ns
Q _{rr}	Reverse Recovery Charge	V _{DD} = 120 V	-	323	_	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

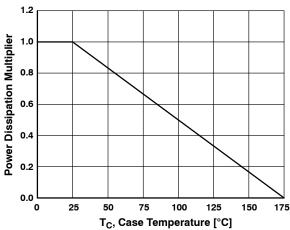


Figure 1. Normalized Power Dissipation vs. Case Temperature

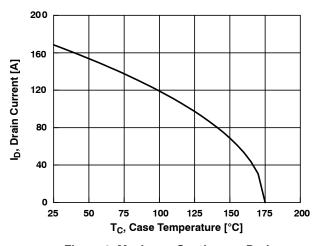


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

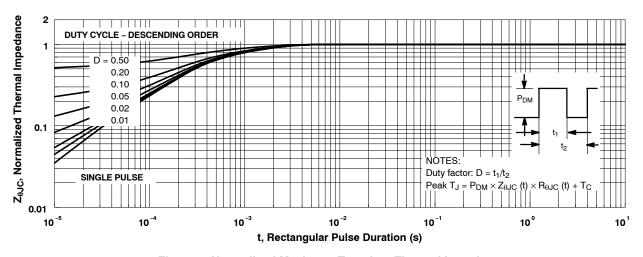


Figure 3. Normalized Maximum Transient Thermal Impedance

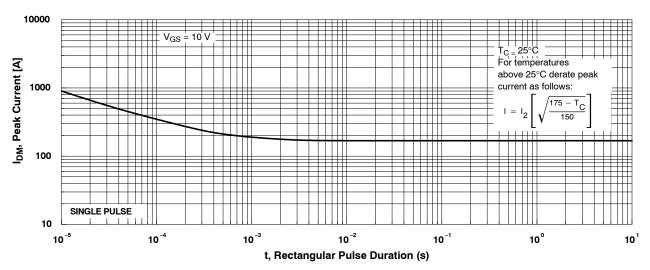


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

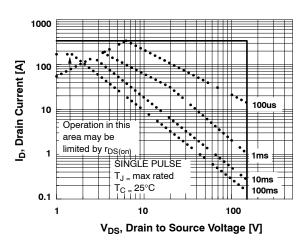


Figure 5. Forward Bias Safe Operating Area

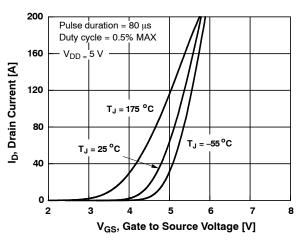


Figure 7. Transfer Characteristics

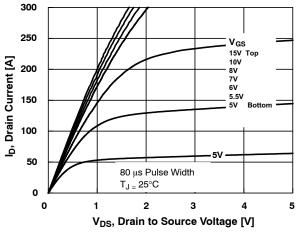
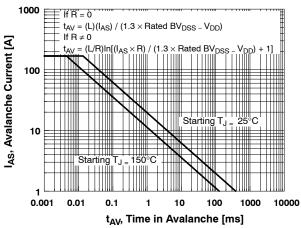


Figure 9. Saturation Characteristics



Refer to ON Semiconductor Application Notes AN7514 and AN7515.

Figure 6. Unclamped Inductive Switching Capability

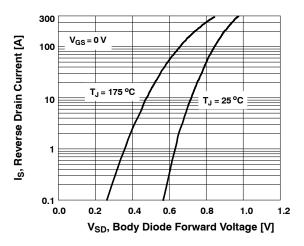


Figure 8. Forward Diode Characteristics

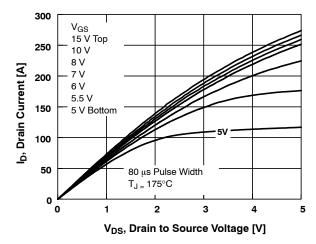


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

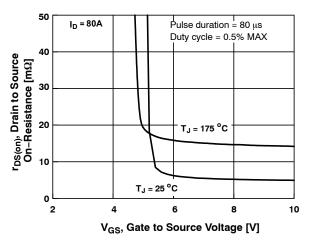


Figure 11. R_{DSON} vs. Gate Voltage

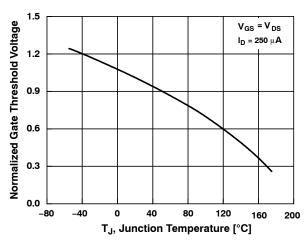


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

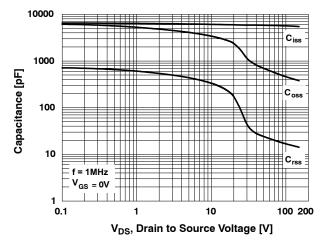


Figure 15. Capacitance vs. Drain to Source Voltage

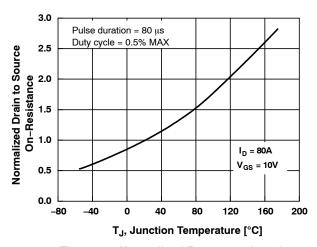


Figure 12. Normalized R_{DSON} vs. Junction Temperature

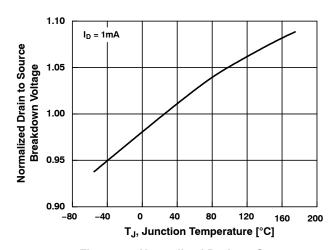


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

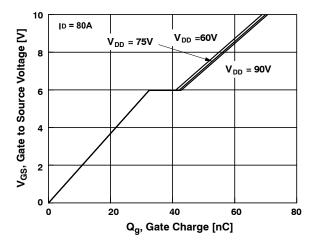


Figure 16. Gate Charge vs. Gate to Source Voltage

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