

MT86N10N5

N-Channel Enhancement Mode Field Effect Transistor

Product Summary

- $V_{DS} = 60V$
- $I_D = 50A$ ($V_{GS} = 10V$)
- $R_{DS(ON)} = 10 m\Omega$ @ $V_{GS} = 10V$
- $R_{DS(ON)} = 14 m\Omega$ @ $V_{GS} = 4.5V$

Features

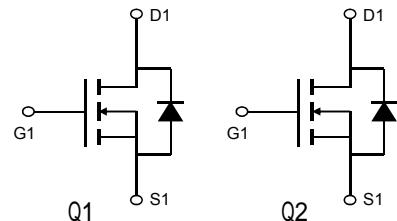
- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.
- PDFN5x6-8L Package



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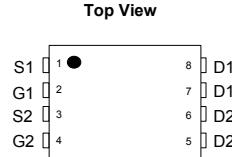
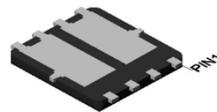
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Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT

DFN5X6-8L



Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	(Note 4)	V
I_D	Drain Current -Continuous (Package limited) $T_C = 25^\circ C$	20	A
	-Continuous (Silicon limited) $T_C = 25^\circ C$	50	
	-Continuous $T_A = 25^\circ C$ (Note 1a)	22	
	-Pulsed	90	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
P_D	Power Dissipation $T_C = 25^\circ C$	26	W
	Power Dissipation $T_A = 25^\circ C$ (Note 1a)	2.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} =$	60			V
ΔBV_{DSS} ΔT_J	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		14		$\text{mV/}^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current, Forward	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$			100	nA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0		2.0	V
$\Delta V_{GS(\text{th})}$ ΔT_J	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		-6		$\text{mV/}^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}$		10	19	$\text{m}\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$		14	23	
		$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}, T_J = 125^\circ\text{C}$		16	28	
g_{FS}	Forward Transconductance	$V_{DS} = 5 \text{ V}, I_D = 12 \text{ A}$		45		s

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 45 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		1011	1220	pF
C_{oss}	Output Capacitance			330	401	pF
C_{rss}	Reverse Transfer Capacitance			40	48	pF
R_g	Gate Resistance		0.2	1.0	2.0	Ω

Switching Characteristics

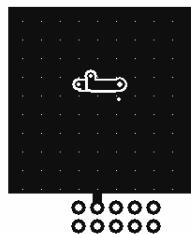
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 45 \text{ V}, I_D = 12 \text{ A}, V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		9	18	ns
t_r	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			15	31	ns
t_f	Fall Time			2	10	ns
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 10 \text{ V}$		16	26	nC
	Total Gate Charge		$V_{GS} = 0 \text{ V} \text{ to } 5 \text{ V}$	8	11	nC
Q_{gs}	Gate to Source Charge	$V_{DD} = 15 \text{ V}, I_D = 12 \text{ A}$		3.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.9		nC

Drain-Source Diode Characteristics

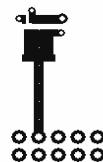
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 1.9 \text{ A}$ (Note 2)		0.75	1.2	V
		$V_{GS} = 0 \text{ V}, I_S = 12 \text{ A}$ (Note 2)		0.80	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 12 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		26	41	ns
				9	18	

Notes:

1. $R_{\text{th}JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\text{th}JC}$ is guaranteed by design while $R_{\text{th}CA}$ is determined by the user's board design.



a. 53 °C/W when mounted on a 1 in² pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. E_{AS} of 21 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 0.3 \text{ mH}$, $I_{AS} = 12 \text{ A}$, $V_{DD} = 27 \text{ V}$, $V_{GS} = 10 \text{ V}$.

4. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

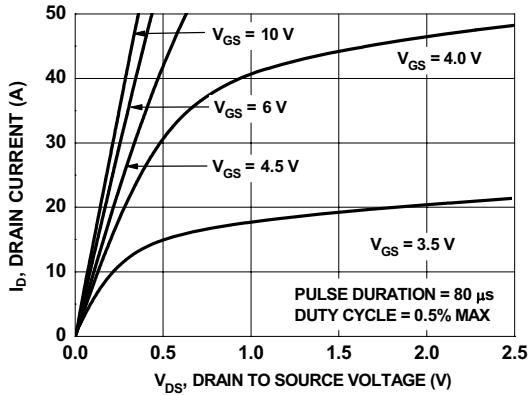


Figure 1. On Region Characteristics

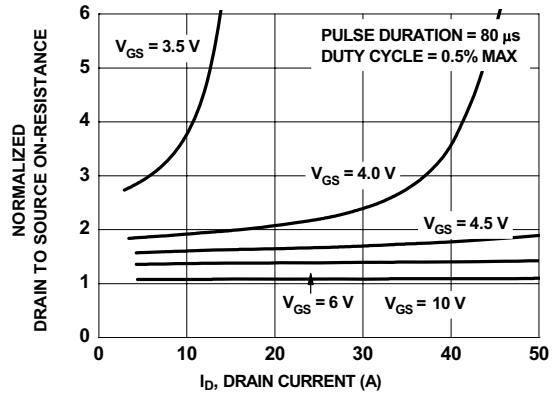


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

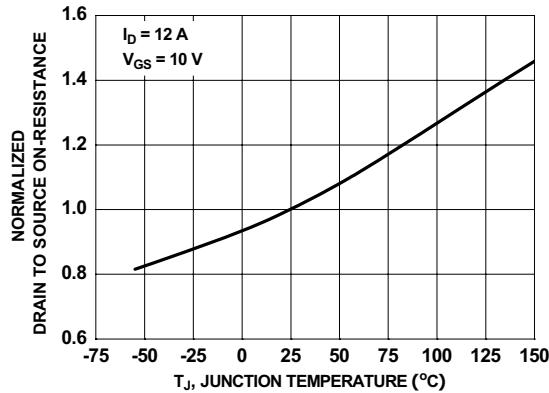


Figure 3. Normalized On Resistance vs Junction Temperature

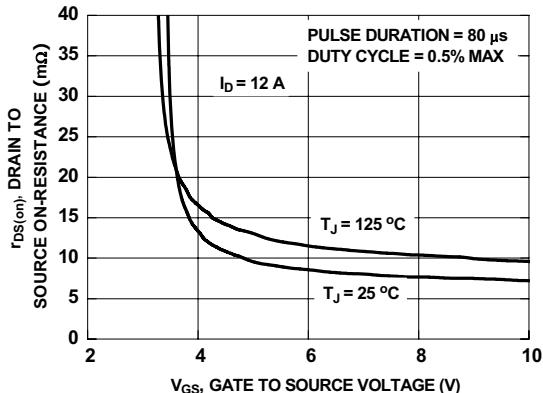


Figure 4. On-Resistance vs Gate to Source Voltage

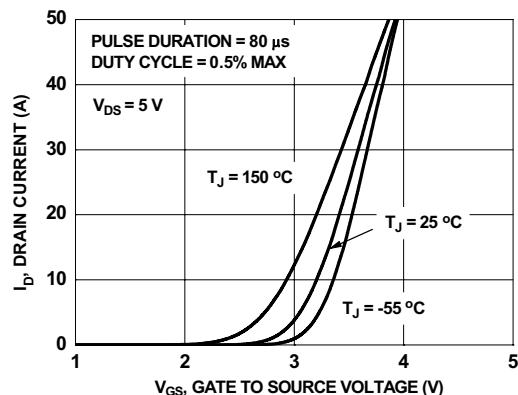


Figure 5. Transfer Characteristics

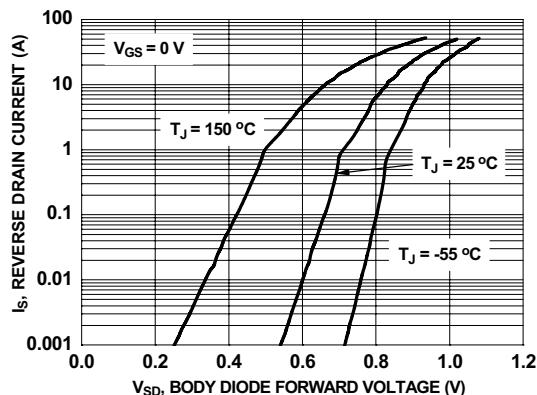


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

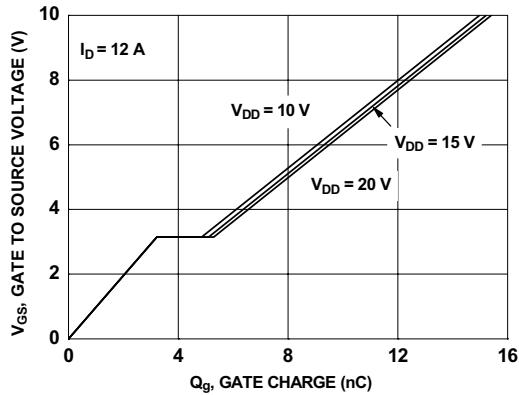


Figure 7. Gate Charge Characteristics

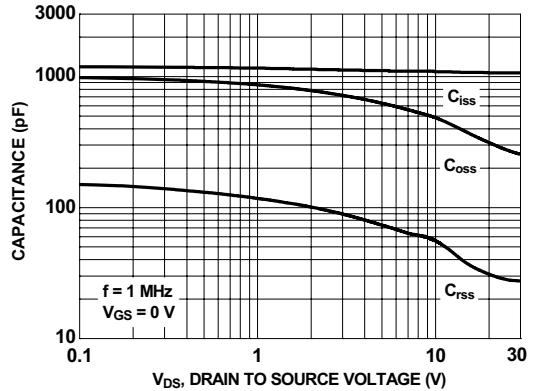


Figure 8. Capacitance vs Drain to Source Voltage

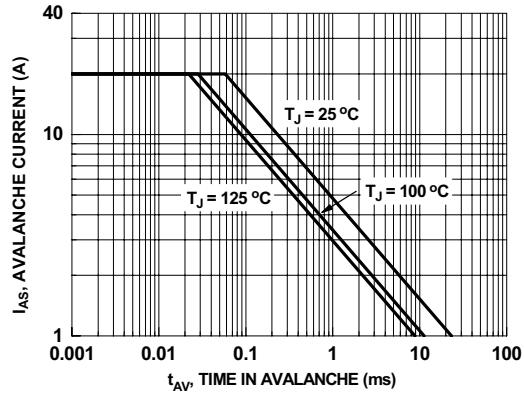


Figure 9. Unclamped Inductive Switching Capability

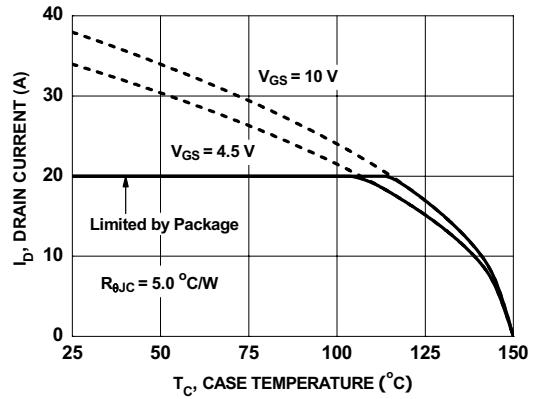


Figure 10. Maximum Continuous Drain Current vs Case Temperature

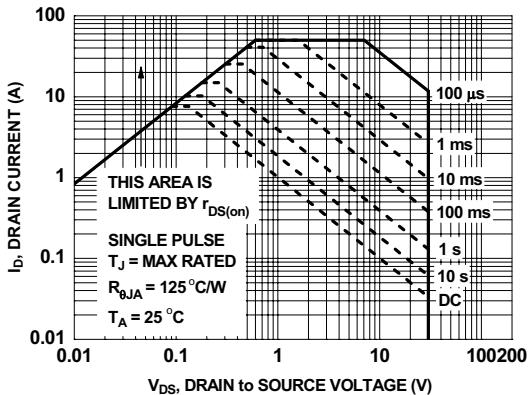


Figure 11. Forward Bias Safe Operating Area

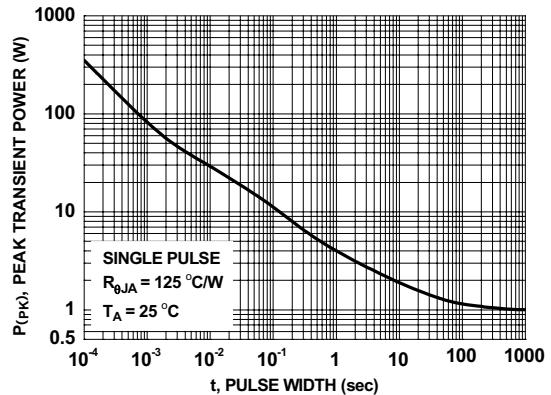


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

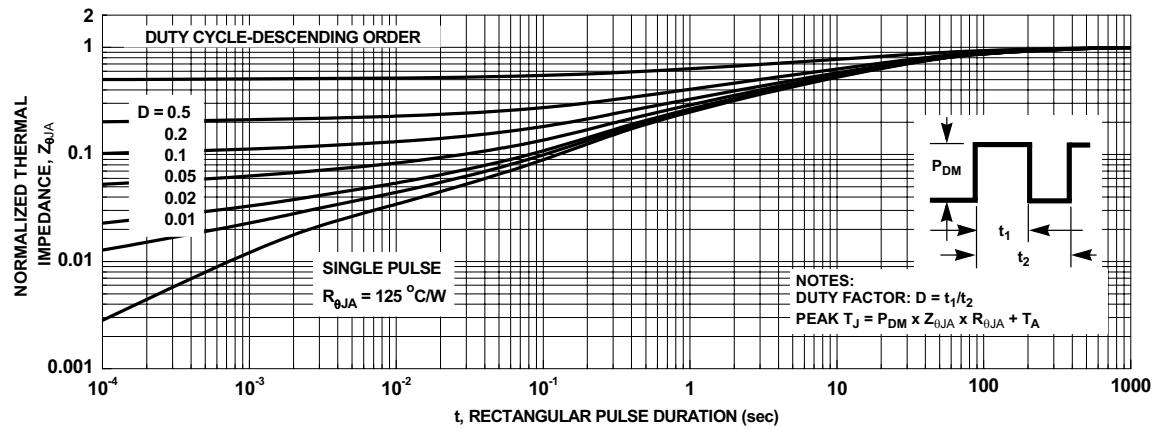
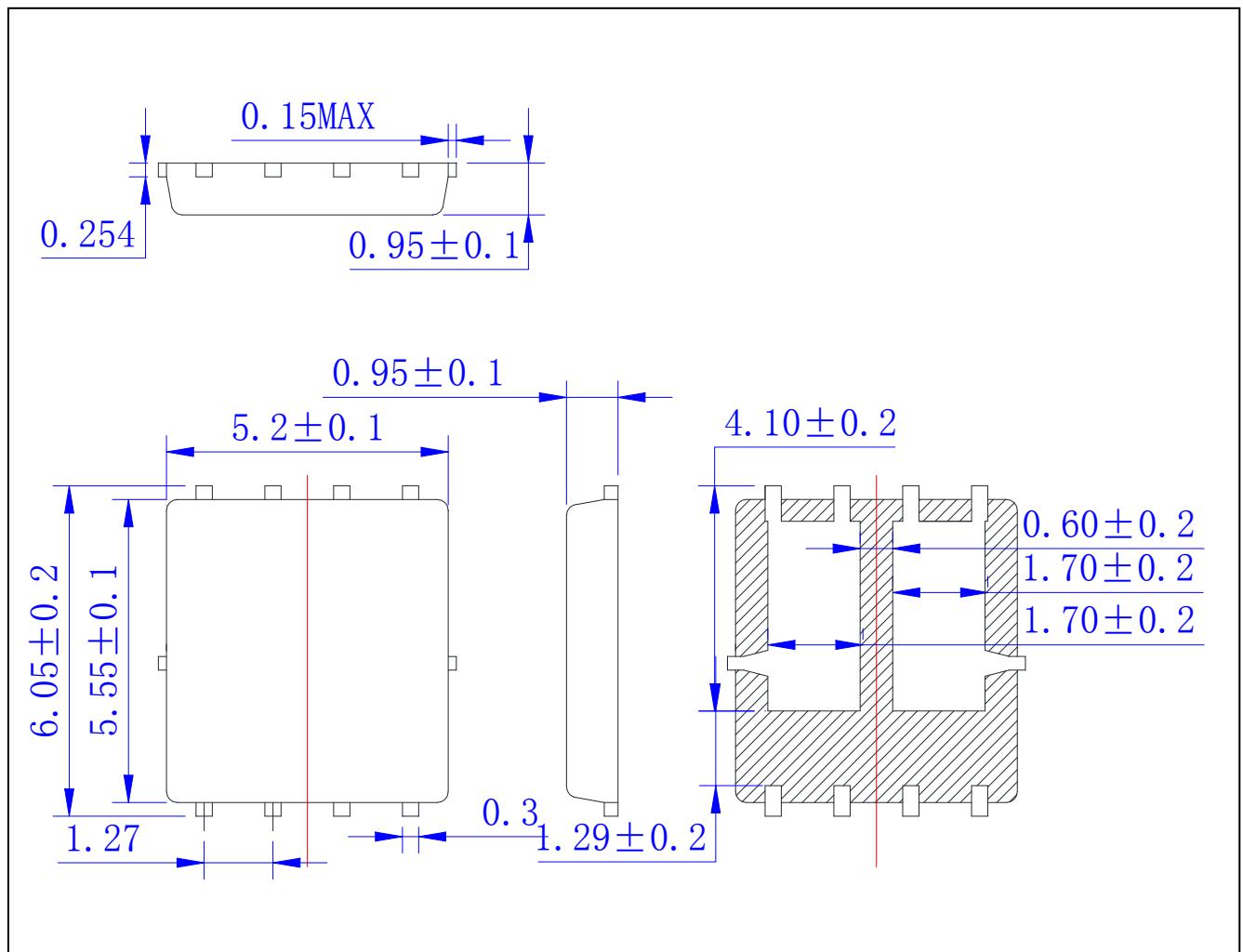


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

DFN5×6 OUTLINE



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