Power MOSFET

30 V, 93 A, Single N-Channel, SO-8 FL

Features

- Low R_{DS(on)} to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

• CPU Power Delivery, DC-DC Converters

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain-to-Source Vol	Drain-to-Source Voltage			30	V
Gate-to-Source Volt	Gate-to-Source Voltage			±20	V
Continuous Drain		T _A = 25°C	I _D	21.8	Α
Current R _{θJA} (Note 1)		T _A = 100°C		13.8	
Power Dissipation $R_{\theta JA}$ (Note 1)		T _A = 25°C	P _D	2.63	W
Continuous Drain		T _A = 25°C	I _D	40	Α
Current R _{θJA} ≤ 10 s (Note 1)		T _A = 100°C		25	
Power Dissipation $R_{\theta JA} \le 10 \text{ s}$ (Note 1)	Steady State	T _A = 25°C	P _D	8.7	W
Continuous Drain	State	T _A = 25°C	Ι _D	13	Α
Current R _{θJA} (Note 2)		T _A = 100°C		8.2	
Power Dissipation R _{θJA} (Note 2)		T _A = 25°C	P _D	0.93	W
Continuous Drain		T _C = 25°C	I _D	93	Α
Current R _{θJC} (Note 1)		T _C = 85°C		59	
Power Dissipation $R_{\theta JC}$ (Note 1)		T _C = 25°C	P _D	48	W
Pulsed Drain Current	T _A = 25°	°C, t _p = 10 μs	I _{DM}	275	Α
Current Limited by Pa	ackage	T _A = 25°C	I _{Dmax}	100	Α
Operating Junction and Storage Temperature			T _J , T _{STG}	–55 to +150	°C
Source Current (Body Diode)			IS	44	Α
Drain to Source DV/DT			dV/d _t	6	V/ns
Single Pulse Drain-to-Source Avalanche Energy T_J = 25°C, V_{DD} = 24 V, V_{GS} = 10 V, I_L = 47 A_{pk} , L = 0.1 mH, R_G = 25 Ω			E _{AS}	110	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			TL	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

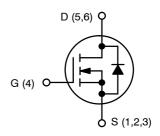
- 1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
- 2. Surface-mounted on FR4 board using the minimum recommended pad size.



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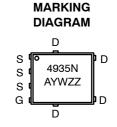
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V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX	
30 V	3.2 m Ω @ 10 V	00.4	
	4.2 m Ω @ 4.5 V	93 A	



N-CHANNEL MOSFET





A = Assembly Location

Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMFS4935NT1G	SO-8 FL	1500 /
NTMFS4935NCT1G	(Pb-Free)	Tape & Reel
NTMFS4935NT3G	SO-8 FL	5000 /
NTMFS4935NCT3G	(Pb-Free)	Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{ heta JC}$	2.6	
Junction-to-Ambient - Steady State (Note 3)	$R_{\theta JA}$	47.5	°C/W
Junction-to-Ambient - Steady State (Note 4)	$R_{\theta JA}$	134.8	C/VV
Junction-to-Ambient - (t ≤ 10 s) (Note 3)	$R_{\theta JA}$	14.4	

- Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
 Surface-mounted on FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS (T_{.1} = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		30			V
Drain-to-Source Breakdown Voltage (transient)	V _{(BR)DSSt}	V _{GS} = 0 V, I _{D(aval)} = 19.5 A, T _{case} = 25°C, t _{transient} = 100 ns		34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} / T _J				15		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 24 V	T _J = 25°C			1.0	μΑ
			T _J = 125°C			10	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS}	_S = ±20 V			±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_{D}$	= 250 μΑ	1.2	1.63	2.2	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J				4.0		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 30 A		2.7	3.2	mΩ
			I _D = 15 A		2.7		
		V _{GS} = 4.5 V	I _D = 30 A		3.7	4.2	
			I _D = 15 A		3.7		
Forward Transconductance	9FS	V _{DS} = 1.5 V, I _D = 15 A			32		S
CHARGES, CAPACITANCES & GATE RESIS	TANCE				•	•	•
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V			3579	4850	pF
Output Capacitance	C _{OSS}				1264	1710	
Reverse Transfer Capacitance	C _{RSS}				39	59	
Capacitance Ratio	C _{RSS} / C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V			0.011	0.022	
Total Gate Charge	Q _{G(TOT)}				22		
Threshold Gate Charge	Q _{G(TH)}	$V_{GS} = 4.5 \text{ V}, V_{DS} = 15 \text{ V}; I_D = 30 \text{ A}$ $V_{GS} = 10 \text{ V}, V_{DS} = 15 \text{ V}; I_D = 30 \text{ A}$			5.6		nC
Gate-to-Source Charge	Q _{GS}				10.2		
Gate-to-Drain Charge	Q_{GD}				3.0		
Total Gate Charge	Q _{G(TOT)}				49.4		nC
SWITCHING CHARACTERISTICS (Note 6)	•				•	•	•
Turn-On Delay Time	t _{d(ON)}	V_{GS} = 4.5 V, V_{DS} = 15 V, I_{D} = 15 A, R_{G} = 3.0 Ω			16.3		
Rise Time	t _r				20		
Turn-Off Delay Time	t _{d(OFF)}				27.5		ns
Fall Time	t _f				6.6	1	1

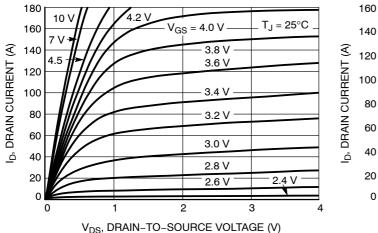
- 5. Pulse Test: pulse width \leq 300 μ s, duty cycle \leq 2%.
 6. Switching characteristics are independent of operating junction temperatures.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
SWITCHING CHARACTERISTICS (N	ote 6)				•		
Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 15 V,			11.2		
Rise Time	t _r				18.7		
Turn-Off Delay Time	t _{d(OFF)}	$I_D = 15 A, R_G$	= 3.0 Ω		28.3		ns
Fall Time	t _f	1			12.1		1
DRAIN-SOURCE DIODE CHARACT	ERISTICS						
Forward Diode Voltage	V_{SD}	VGS = 0 V,	T _J = 25°C		0.85	1.1	V
			T _J = 125°C		0.72		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dIS/dt = 100 A/μs, I _S = 30 A			44.4		
Charge Time	t _a				21.6		ns
Discharge Time	t _b				22.8		
Reverse Recovery Charge	Q _{RR}				45		nC
PACKAGE PARASITIC VALUES					-		
Source Inductance	L _S	T _A = 25°C			0.65		nΗ
Drain Inductance	L _D				0.005		nΗ
Gate Inductance	L _G				1.84		nΗ
Gate Resistance	R_{G}				1.1	1.4	Ω

^{5.} Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

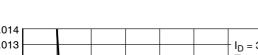
TYPICAL CHARACTERISTICS

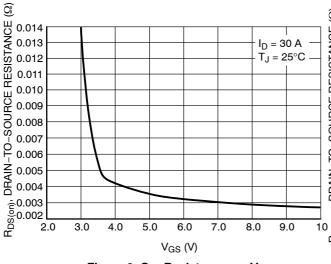


140 $V_{DS} = 10 V$ 120 100 80 $T_J = 25^{\circ}C$ 60 40 $T_{J} = 125^{\circ}$ 20 $T_J = -55^{\circ}C$ 0 1.0 1.5 2.5 3.0 2.0 3.5 4.0 V_{GS}, GATE-TO-SOURCE VOLTAGE (V)

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics





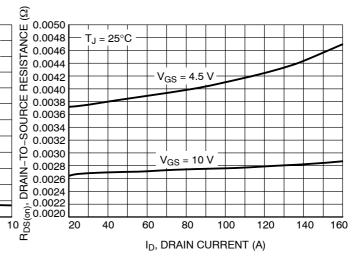
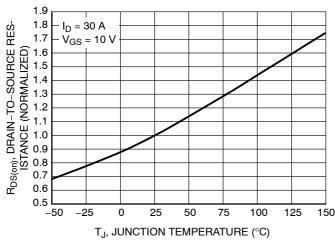


Figure 3. On-Resistance vs. V_{GS}





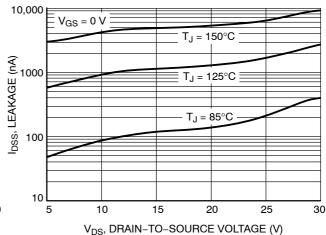


Figure 5. On-Resistance Variation with **Temperature**

Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

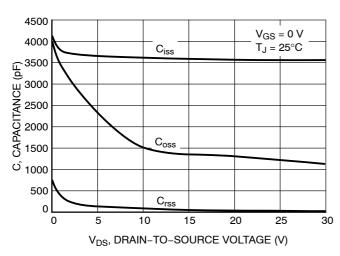


Figure 7. Capacitance Variation

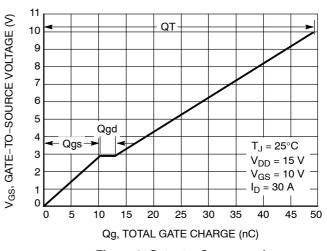


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

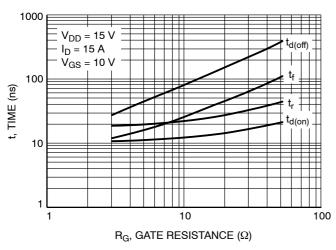


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

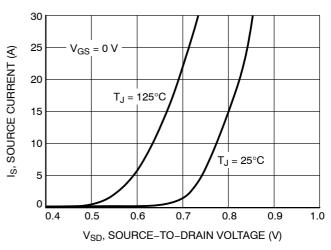


Figure 10. Diode Forward Voltage vs. Current

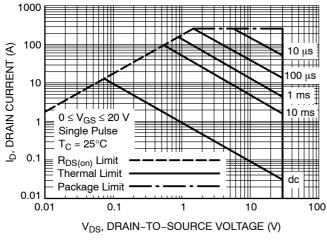


Figure 11. Maximum Rated Forward Biased Safe Operating Area

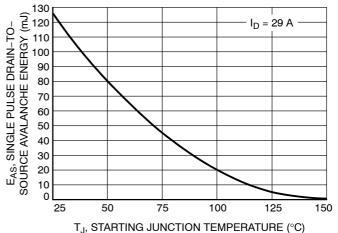


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

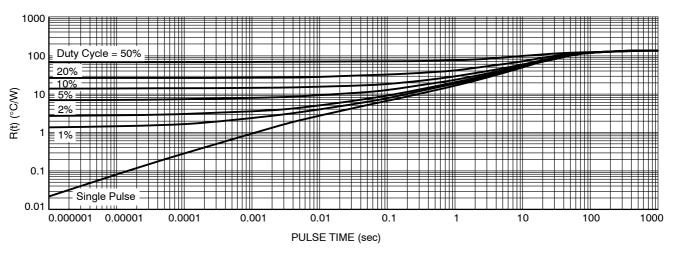


Figure 13. Thermal Response

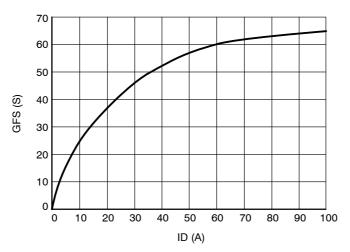
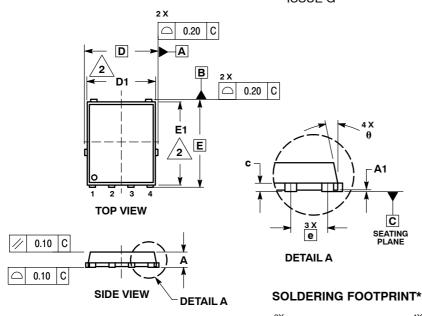


Figure 14. GFS vs. ID

PACKAGE DIMENSIONS



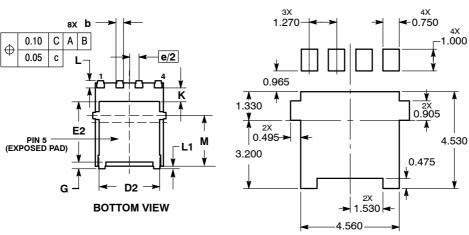


NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS					
DIM	MIN	NOM	MAX			
Α	0.90	1.00	1.10			
A1	0.00		0.05			
b	0.33	0.41	0.51			
С	0.23	0.28	0.33			
D		5.15 BSC	;			
D1	4.50	4.90	5.10			
D2	3.50		4.22			
E	6.15 BSC					
E1	5.50	5.80	6.10			
E2	3.45		4.30			
е		1.27 BSC				
G	0.51	0.61	0.71			
K	1.20	1.35	1.50			
L	0.51	0.61	0.71			
L1	0.05	0.17	0.20			
M	3.00	3.40	3.80			
θ	0 °		12 °			

- STYLE 1: PIN 1. SOURCE
 - 2. SOURCE
 - 3. SOURCE
 - GATE



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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