Power MOSFET

40 V, 2.1 m Ω , 155 A, Single N-Channel

Features

- Small Footprint (5x6 mm) for Compact Design
- Low R_{DS(on)} to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	40	V
Gate-to-Source Voltage	9		V _{GS}	±20	V
Continuous Drain	Steady State	T _C = 25°C	I _D	155	Α
Current R _{θJC} (Notes 1, 3)		T _C = 100°C		98	
Power Dissipation		T _C = 25°C	P_{D}	89	W
R _{θJC} (Note 1)		T _C = 100°C		36	
Continuous Drain	Steady State	T _A = 25°C	I _D	29	Α
Current R _{θJA} (Notes 1, 2, 3)		T _A = 100°C		18	
Power Dissipation		T _A = 25°C	P_{D}	3.1	W
R _{θJA} (Notes 1, 2)		T _A = 100°C		1.3	
Pulsed Drain Current	T _A = 25	°C, t _p = 10 μs	I _{DM}	900	Α
Operating Junction and Storage Temperature Range			T _J , T _{stg}	–55 to + 150	°C
Source Current (Body Diode)			I _S	74	Α
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 14 A)			E _{AS}	375	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			TL	260	°C

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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State	$R_{\theta JC}$	1.4	°C/W
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	40	

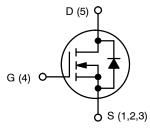
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
- 3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.



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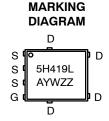
V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
40 V	2.1 mΩ @ 10 V	4FF A
40 V	3.1 mΩ @ 4.5 V	155 A



N-CHANNEL MOSFET



STYLE 1



5H419L = Specific Device Code A = Assembly Location

Y = Year W = Work Week ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit	
OFF CHARACTERISTICS					•	•	•	
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		40			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				15.6		mV/°C	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V,	T _J = 25 °C			10		
		$V_{DS} = 40 \text{ V}$	T _J = 125°C			250	μΑ	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V				100	nA	
ON CHARACTERISTICS (Note 4)						•		
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}, I_D = 250 \mu A$		1.2		2.0	V	
Threshold Temperature Coefficient	V _{GS(TH)} /T _J				-4.6		mV/°C	
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 20 A		1.7	2.1	mΩ	
		V _{GS} = 4.5 V	I _D = 20 A		2.5	3.1		
Forward Transconductance	9 _{FS}	V _{DS} =15 V, I _D = 20 A			80		S	
CHARGES AND CAPACITANCES							•	
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 20 V			2900		pF	
Output Capacitance	C _{OSS}				675			
Reverse Transfer Capacitance	C _{RSS}				37			
Output Charge	Q _{OSS}	V _{GS} = 0 V, V _{DD} = 20 V			29		nC	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 20 V; I _D = 20 A			45			
Total Gate Charge	Q _{G(TOT)}	$V_{GS} = 4.5 \text{ V}, V_{DS} = 20 \text{ V}; I_D = 20 \text{ A}$			21		nC	
Threshold Gate Charge	Q _{G(TH)}				4.8			
Gate-to-Source Charge	Q _{GS}				8.6			
Gate-to-Drain Charge	Q_{GD}				5.4			
Plateau Voltage	V_{GP}				3		V	
SWITCHING CHARACTERISTICS (Note &	5)				•	•	•	
Turn-On Delay Time	t _{d(ON)}	V_{GS} = 4.5 V, V_{DS} = 20 V, I_{D} = 20 A, R_{G} = 2.5 Ω			24			
Rise Time	t _r				56		- ns	
Turn-Off Delay Time	t _{d(OFF)}				62			
Fall Time	t _f				15			
DRAIN-SOURCE DIODE CHARACTERIS	TICS						•	
Forward Diode Voltage	V_{SD}	Voc = 0 V	T _J = 25°C		0.8	1.2		
	oltage V_{SD} $V_{GS} = 0 \text{ V},$ $I_{J} = 25^{\circ}\text{C}$ $T_{J} = 125^{\circ}\text{C}$		0.6		· V			
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V, } dI_{S}/dt = 100 \text{ A}/\mu\text{s,}$ $I_{S} = 20 \text{ A}$			40			
Charge Time	ta				23		ns	
Discharge Time	t _b				17			
Reverse Recovery Charge	Q _{RR}				38		nC	

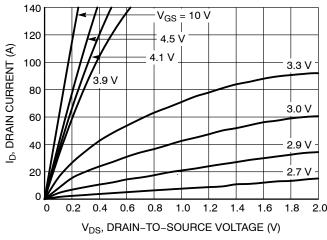
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width $\leq 300~\mu s$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

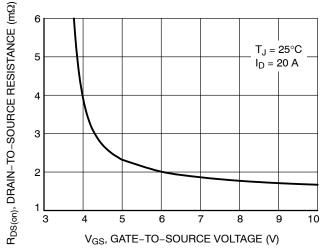
140



120 ID, DRAIN CURRENT (A) 100 80 60 $T_J = 25^{\circ}C$ 40 20 $T_J = -55^{\circ}C$ 0 3.5 1.0 3.0 4.0 1.5 2.0 2.5 V_{GS}, GATE-TO-SOURCE VOLTAGE (V)

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics



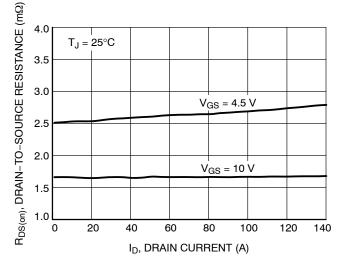
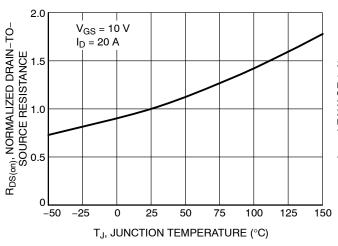


Figure 3. On-Resistance vs. Gate-to-Source Voltage

Figure 4. On-Resistance vs. Drain Current and Gate Voltage



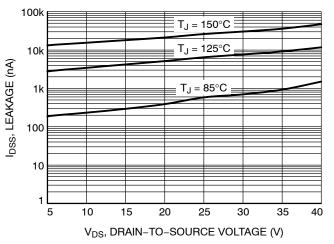


Figure 5. On–Resistance Variation with Temperature

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

TYPICAL CHARACTERISTICS

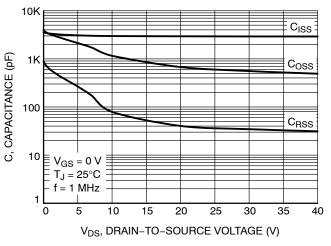


Figure 7. Capacitance Variation

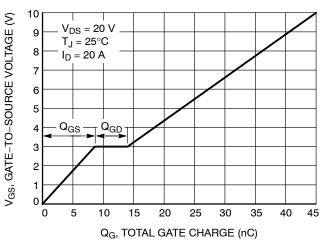


Figure 8. Gate-to-Source vs. Total Charge

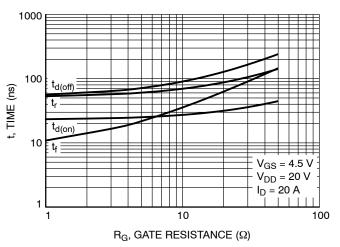


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

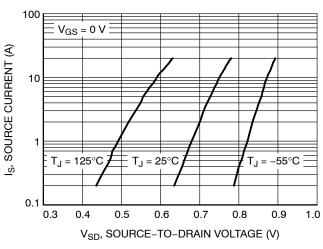


Figure 10. Diode Forward Voltage vs. Current

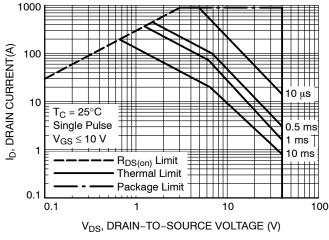


Figure 11. Maximum Rated Forward Biased Safe Operating Area

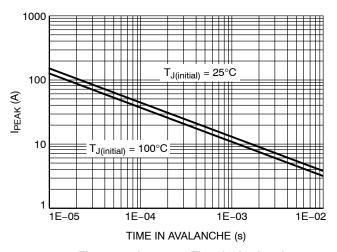


Figure 12. I_{PEAK} vs. Time in Avalanche

TYPICAL CHARACTERISTICS

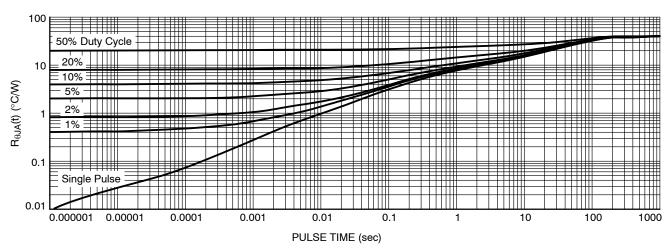


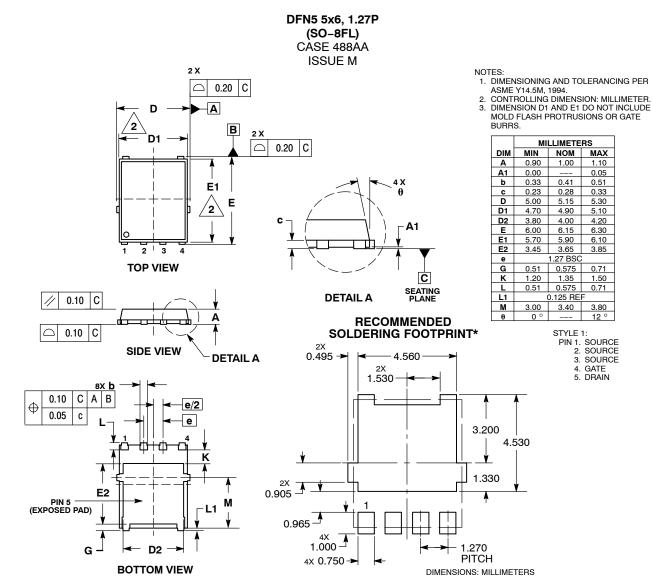
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NTMFS5H419NLT1G	5H419L	DFN5 (Pb-Free)	1500 / 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.

PACKAGE DIMENSIONS



*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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