MOSFET – Power, Single, N-Channel 60 V, 1.3 mΩ, 250 A

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}	60	V
Gate-to-Source Voltage			V _{GS}	±20	V
Continuous Drain		T _C = 25°C	I _D	250	Α
Current R _{θJC} (Notes 1, 3)	Steady	T _C = 100°C	1	160	
Power Dissipation	State	T _C = 25°C	P_{D}	160	W
R _{θJC} (Note 1)		T _C = 100°C	1	63	
Continuous Drain		T _A = 25°C	I _D	35	Α
Current R _{θJA} (Notes 1, 2, 3)	Steady	T _A = 100°C	1	22	
Power Dissipation	State	T _A = 25°C	P_{D}	3.3	W
R _{θJA} (Notes 1, 2)		T _A = 100°C	1	1.3	
Pulsed Drain Current	$T_A = 25$	°C, t _p = 10 μs	I _{DM}	900	Α
Operating Junction and Storage Temperature			T _J , T _{stg}	–55 to + 150	°C
Source Current (Body Diode)			Is	170	Α
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 26 A)			E _{AS}	338	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	$R_{\theta JC}$	0.80	°C/W
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	38	

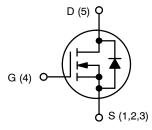
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
- Maximum current for pulses as long as 1 second is higher but is dependent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



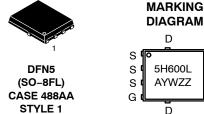
ON Semiconductor®

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V _{(BR)DSS}	R _{DS(ON)} MAX	I _D MAX
60 V	1.3 m Ω @ 10 V	050 4
00 V	1.7 mΩ @ 4.5 V	250 A



N-CHANNEL MOSFET



5H600L = Specific Device Code A = Assembly Location D

Y = Year W = Work Week ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section 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}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		60			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /				34.3		mV/°C	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V,	T _J = 25 °C			10		
		V _{DS} = 60 V	T _J = 125°C			250	0 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				-5.0		mV/°C	
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 50 A		1.1	1.3	_	
		V _{GS} = 4.5 V	I _D = 50 A		1.4	1.7	mΩ	
Forward Transconductance	9 _{FS}	V _{DS} =15 V, I _D = 50 A			280		S	
CHARGES, CAPACITANCES & GATE RE	SISTANCE						•	
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 30 V			6680		pF	
Output Capacitance	C _{OSS}				1230			
Reverse Transfer Capacitance	C _{RSS}				30			
Output Charge	Q _{OSS}	V _{GS} = 0 V, V _{DD} = 30 V			100			
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 30 V; I _D = 50 A			40		1	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 30 V; I _D = 50 A			89			
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 4.5 V, V _{DS} = 30 V; I _D = 50 A			11		nC	
Gate-to-Source Charge	Q _{GS}				20			
Gate-to-Drain Charge	Q_GD				6.5			
Plateau Voltage	V_{GP}				3.0		V	
SWITCHING CHARACTERISTICS (Note &	5)				•			
Turn-On Delay Time	t _{d(ON)}				29.8			
Rise Time	t _r	$V_{GS} = 4.5 \text{ V}, V_{DS} = 30 \text{ V},$ $I_{D} = 50 \text{ A}, R_{G} = 2.5 \Omega$			20.7		- ns	
Turn-Off Delay Time	t _{d(OFF)}				41.6			
Fall Time	t _f				14.1			
DRAIN-SOURCE DIODE CHARACTERIS	TICS				1			
Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 50 A	T _J = 25°C		0.77	1.2		
			T _J = 125°C		0.63		V	
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V, } dI_{S}/dt = 100 \text{ A}/\mu\text{s,}$ $I_{S} = 50 \text{ A}$			72			
Charge Time	t _a				36		ns	
Discharge Time	t _b				36			
Reverse Recovery Charge	Q _{RR}				60		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

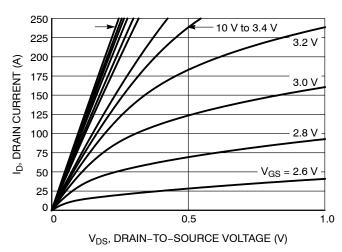


Figure 1. On-Region Characteristics

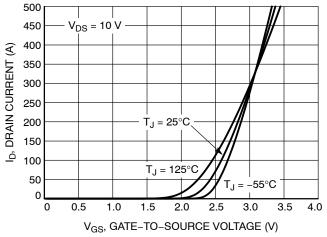


Figure 2. Transfer Characteristics

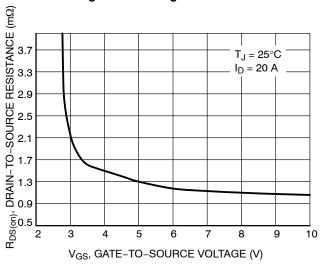


Figure 3. On-Resistance vs. Gate-to-Source Voltage

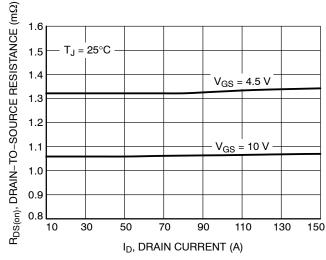


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

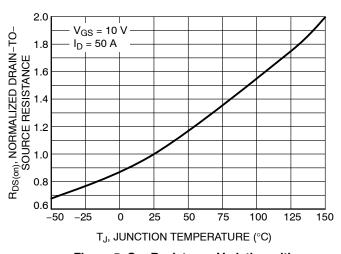


Figure 5. On–Resistance Variation with Temperature

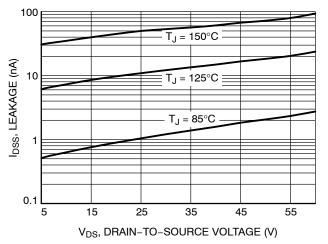


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

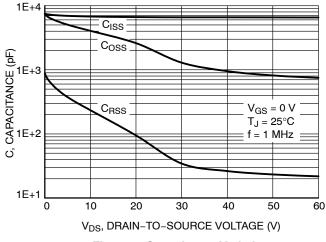


Figure 7. Capacitance Variation

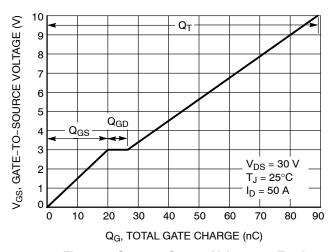


Figure 8. Gate-to-Source Voltage vs. Total Charge

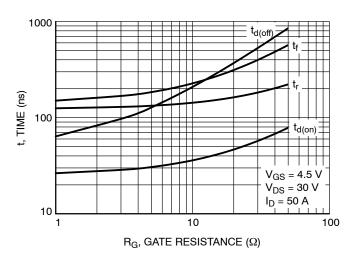


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

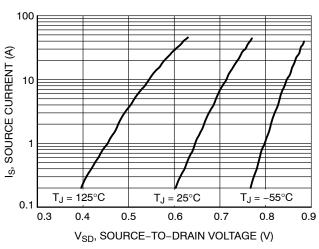


Figure 10. Diode Forward Voltage vs. Current

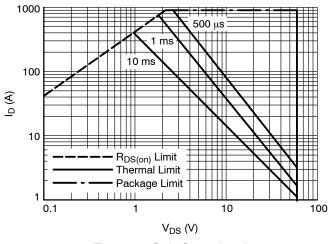


Figure 11. Safe Operating Area

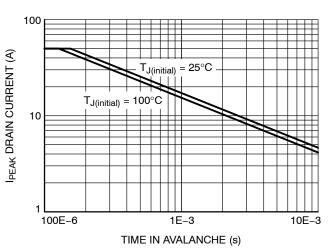


Figure 12. I_{PEAK} vs. Time in Avalanche

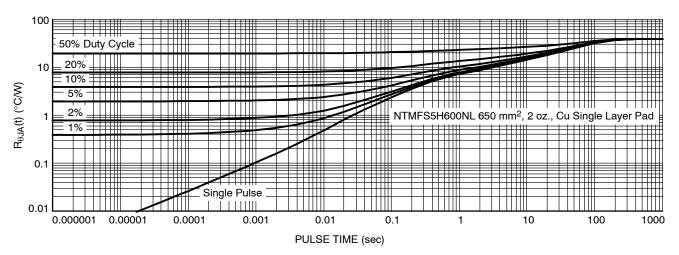


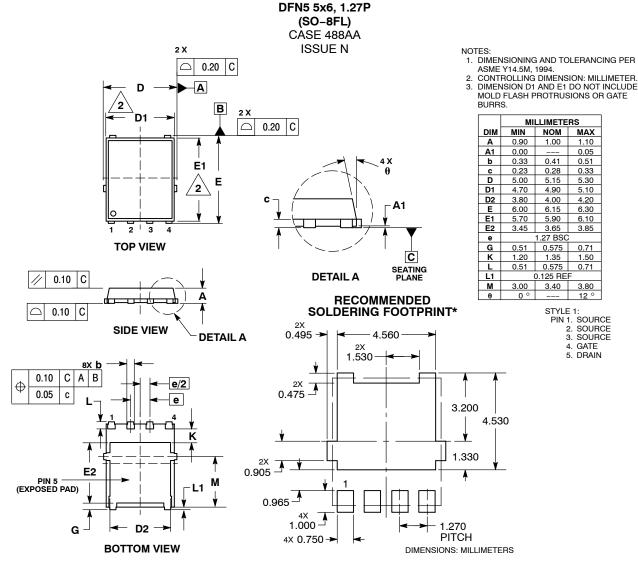
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NTMFS5H600NLT1G	5H600L	DFN5 (Pb-Free)	1500 / Tape & Reel
NTMFS5H600NLT3G	5H600L	DFN5 (Pb-Free)	5000 / 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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