

MOSFET - Power, Single N-Channel, SUPERFET® V, Easy Drive, TO247-3L 600 V, 120 mΩ, 28 A NTHL120N60S5Z

Description

SUPERFET V MOSFET Easy Drive series combines excellent switching performance without sacrificing ease of use and EMI issues for both hard and soft switching topologies.

Features

- 650 V @ T_J = 150°C
- Typ. $R_{DS(on)} = 96 \text{ m}\Omega$
- 100% Avalanche Tested
- Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Telecom / Server Power Supplies
- EV Charger / UPS / Solar / Industrial Power Supplies

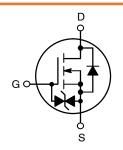
ABSOLUTE MAXIMUM RATINGS (T. = 25°C, Unless otherwise noted)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V _{DSS}	600	V	
Gate-to-Source Voltage	DC	V _{GSS}	±20	V
	AC (f > 1 Hz)		±20	
Continuous Drain Current	T _C = 25°C	I _D	28*	Α
	T _C = 100°C		17*	
Power Dissipation	T _C = 25°C	P_{D}	160	W
Pulsed Drain Current (Note 1)	T _C = 25°C	I _{DM}	81*	Α
Pulsed Source Current (Body Diode) (Note 1)	T _C = 25°C	I _{SM}	81*	А
Operating Junction and Storage Range	T _J , T _{STG}	-55 to +150	°C	
Source Current (Body Diode)		IS	28*	Α
Single Pulse Avalanche Energy	$I_L = 4.6 \text{ A},$ $R_G = 25 \Omega$	E _{AS}	191	mJ
Avalanche Current		I _{AS}	4.6	Α
Repetitive Avalanche Energy (N	E _{AR}	1.6	mJ	
MOSFET dv/dt		dv/dt	120	V/ns
Peak Diode Recovery dv/dt (No		50		
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)		T _L	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.

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. $I_{SD} \le 11.5 \text{ A}$, di/dt $\le 200 \text{ A/}\mu\text{s}$, $V_{DD} \le 400 \text{ V}$, starting $T_J = 25^{\circ}\text{C}$.

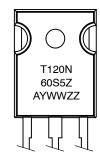
V _{DSS}	R _{DS(ON)} MAX	I _D MAX	
600 V	120 m Ω @ 10 V	28 A	





TO-247 Long Leads CASE 340CX

MARKING DIAGRAM



T120N60S5Z = Specific Device Code
A = Assembly Location
YWW = Data Code (Year & Week)
ZZ = Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
NTHL120N60S5Z	TO-247	30 Units / Tube

^{*}Drain current limited by maximum junction temperature.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case, Max.	$R_{ heta JC}$	0.78	°C/W
Thermal Resistance, Junction-to-Ambient, Max.	R_{\thetaJA}	40	

Parameter	Symbol	Test Conditions	Min	Тур	Max	Unit
OFF CHARACTERISTICS						•
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	600	-	-	٧
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/ \Delta T_J$	I _D = 10 mA, Referenced to 25°C	-	630	-	mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 600 V, T _J = 25°C	_	-	1	μΑ
Gate-to-Source Leakage Current	I _{GSS}	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	_	±5	μΑ
ON CHARACTERISTICS						-
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 11.5 A, T _J = 25°C	-	96	120	mΩ
Gate Threshold Voltage	V _{GS(th)}	$V_{GS} = V_{DS}, I_D = 2.2 \text{ mA}, T_J = 25^{\circ}\text{C}$	2.4	-	4.0	٧
Forward Trans-conductance	9FS	V _{DS} = 20 V, I _D = 11.5 A	-	17.1	-	S
CHARGES, CAPACITANCES & GATE I	RESISTANCE					
Input Capacitance	C _{ISS}	V _{DS} = 400 V, V _{GS} = 0 V, f = 250 kHz	-	2088	-	pF
Output Capacitance	C _{OSS}		-	35	-	1
Time Related Output Capacitance	C _{OSS(tr.)}	I_D = Constant, V_{DS} = 0 V to 400 V, V_{GS} = 0 V	-	547	-	
Energy Related Output Capacitance	C _{OSS(er.)}	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	_	59	-	1
Total Gate Charge	Q _{G(tot)}	V _{DD} = 400 V, I _D = 11.5 A, V _{GS} = 10 V	_	40	-	nC
Gate-to-Source Charge	Q_{GS}		-	9	-	
Gate-to-Drain Charge	Q_{GD}		-	11	-	
Gate Resistance	R_{G}	f = 1 MHz	ı	3.5	-	Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(on)}	$V_{GS} = 0/10 \text{ V}, V_{DD} = 400 \text{ V},$	-	23	-	ns
Rise Time	t _r	$I_D = 11.5 \text{ A}, R_G = 7.5 \Omega$	_	13	-	1
Turn-Off Delay Time	t _{d(off)}		_	78	-	1
Fall Time	t _f		-	3	-	1
SOURCE-TO-DRAIN DIODE CHARAC	TERISTICS					
Forward Diode Voltage	V_{SD}	$V_{GS} = 0 \text{ V}, I_{SD} = 11.5 \text{ A}, T_{J} = 25^{\circ}\text{C}$	-	_	1.2	٧
Reverse Recovery Time	t _{RR}	$V_{GS} = 0 \text{ V}, I_{SD} = 11.5 \text{ A},$	-	277	-	ns
Reverse Recovery Charge	Q _{RR}	dl/dt = 100 A/μs, V _{DD} = 400 V	_	3664	-	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.

TYPICAL CHARACTERISTICS

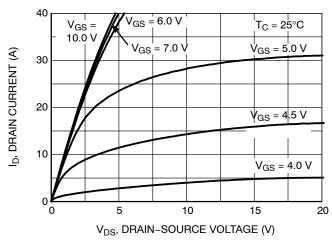


Figure 1. On-Region Characteristics

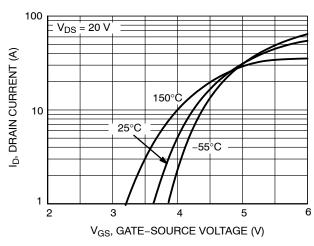


Figure 2. Transfer Characteristics

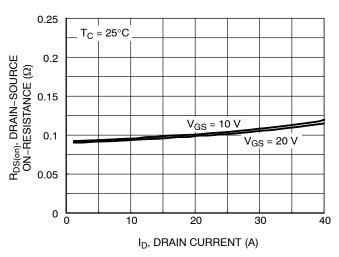


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

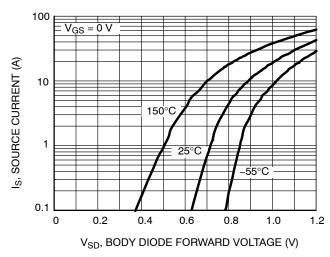


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

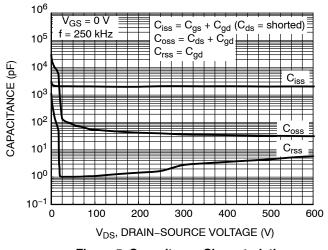


Figure 5. Capacitance Characteristics

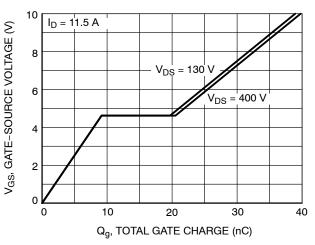


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

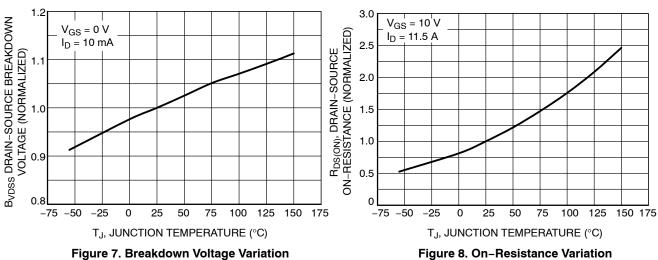


Figure 7. Breakdown Voltage Variation vs. Temperature

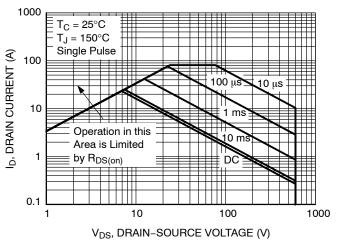
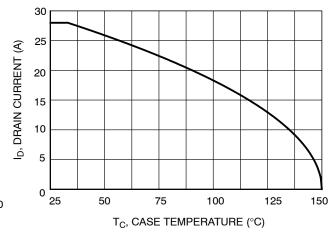


Figure 9. Maximum Safe Operating Area



vs. Temperature

Figure 10. Maximum Drain Current vs. Case **Temperature**

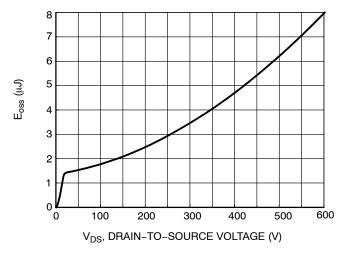


Figure 11. E_{OSS} vs. Drain to Source Voltage

TYPICAL CHARACTERISTICS

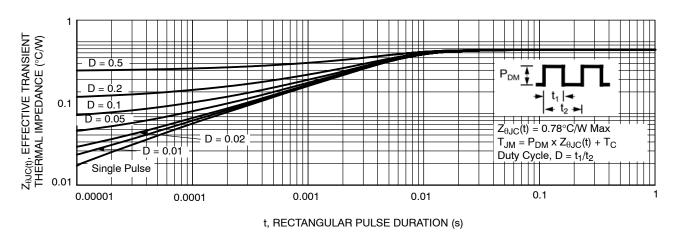


Figure 12. Transient Thermal Impedance

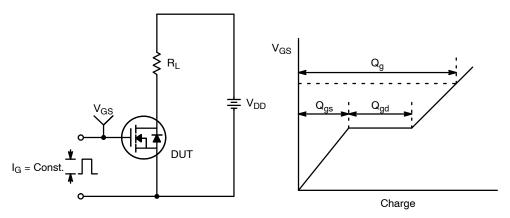


Figure 13. Gate Charge Test Circuit & Waveform

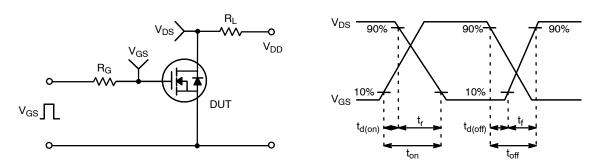


Figure 14. Resistive Switching Test Circuit & Waveforms

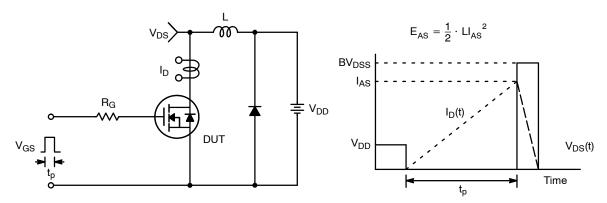


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

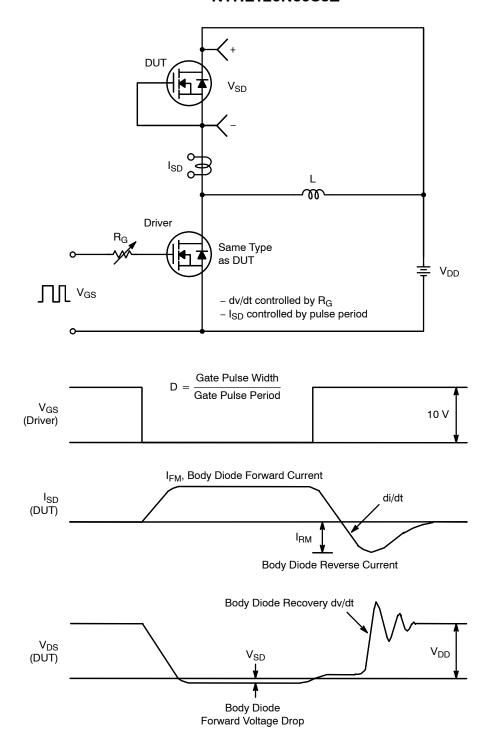
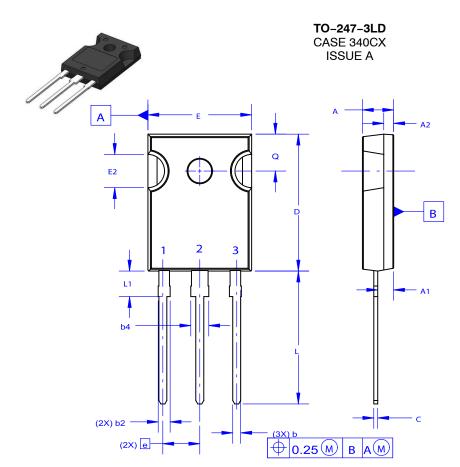
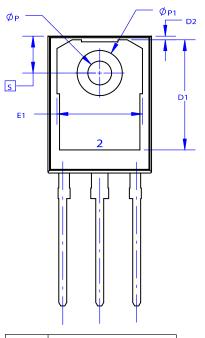


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms



DATE 06 JUL 2020

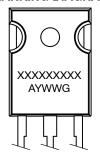


NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

 B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code = Assembly Location

= Year WW = Work Week G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot " =", may or may not be present. Some products may not follow the Generic Marking.

DIM	MILLIMETERS				
DIM	MIN	NOM	MAX		
Α	4.58	4.70	4.82		
A 1	2.20	2.40	2.60		
A2	1.40	1.50	1.60		
D	20.32	20.57	20.82		
Е	15.37	15.62	15.87		
E2	4.96	5.08	5.20		
е	~	5.56	~		
L	19.75	20.00	20.25		
L1	3.69	3.81	3.93		
ØΡ	3.51	3.58	3.65		
Q	5.34	5.46	5.58		
S	5.34	5.46	5.58		
b	1.17	1.26	1.35		
b2	1.53	1.65	1.77		
b4	2.42	2.54	2.66		
С	0.51	0.61	0.71		
D1	13.08	~	?		
D2	0.51	0.93	1.35		
E1	12.81	~	1		
ØP1	6.60	6.80	7.00		

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