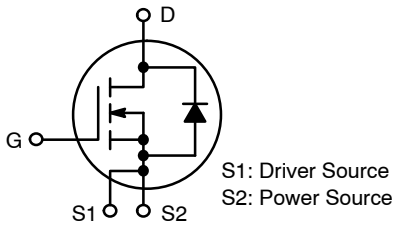
MOSFET - Power, Single N-Channel, SUPERFET®, FAST, TO247-4L
600 V, 41 mΩ, 57 A
NTH4LN041N60S5H

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
600 V	41 mΩ @ 10 V	57 A

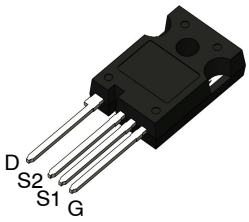
Description
The SUPERFET V MOSFET FAST series helps maximize system efficiency by the extremely low switching losses in hard switching application.

Features
- 650 V @ T_J = 150°C / Typ. $R_{DS(on)}$ = 32.8 mΩ
- 100% Avalanche Tested
- Pb−Free, Halogen Free / BFR Free and RoHS Compliant

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



N−CHANNEL MOSFET



TO247−4L
CASE 340CW

MARKING DIAGRAM

T041N60S5H = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Traceability

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

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	600	V
Gate−to−Source Voltage	DC	V_{GS}	±30	V
	AC (f > 1 Hz)		±30	
Continuous Drain Current	T_C = 25°C	I_D	57	A
	T_C = 100°C		36	
Power Dissipation	T_C = 25°C	P_D	329	W
Pulsed Drain Current (Note 1)	T_C = 25°C	I_{DM}	200	A
Pulsed Source Current (Body Diode) (Note 1)		I_{SM}	200	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
Source Current (Body Diode)		I_S	57	A
Single Pulse Avalanche Energy	I_L = 8 A, R_G = 25 Ω	E_{AS}	560	mJ
Avalanche Current		I_{AS}	8	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	3.29	mJ
MOSFET dv/dt		dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)			20	
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} ≤ 28.5 A, di/dt ≤ 200 A/μs, V_{DD} ≤ 400 V, starting T_J = 25°C.

ORDERING INFORMATION

Device	Package	Shipping
NTH4LN041N60S5H	TO247−4L	30 Units / Tube

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	0.38	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	40	

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

Parameter	Symbol	Test Conditions	Min	Typ	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	–	–	V
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	–	–	2	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 28.5 A, T_J = 25°C	–	32.8	41	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 6.7 mA, T_J = 25°C	2.7	–	4.3	V
Forward Transconductance	g_{FS}	V_{DS} = 20 V, I_D = 28.5 A	–	60.3	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{DS} = 400 V, V_{GS} = 0 V, f = 250 kHz	–	6213	–	pF
Output Capacitance	C_{OSS}		–	87.3	–	
Time Related Output Capacitance	$C_{OSS(tr)}$	I_D = Constant, V_{DS} = 0 to 400 V, V_{GS} = 0 V	–	1369	–	
Energy Related Output Capacitance	$C_{OSS(er)}$	V_{DS} = 0 to 400 V, V_{GS} = 0 V	–	146	–	
Total Gate Charge	$Q_{G(TOT)}$	V_{DD} = 400 V, I_D = 28.5 A, V_{GS} = 10 V	–	110	–	nC
Gate−to−Source Charge	Q_{GS}		–	29.9	–	
Gate−to−Drain Charge	Q_{GD}		–	29.4	–	
Gate Resistance	R_G	f = 1 MHz	–	0.73	–	Ω
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 0/10 V, V_{DD} = 400 V, I_D = 28.5 A, R_G = 2.2 Ω	–	38.1	–	ns
Rise Time	t_r		–	10.5	–	
Turn−Off Delay Time	$t_{d(OFF)}$		–	93.7	–	
Fall Time	t_f		–	2.76	–	
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	I_{SD} = 28.5 A, V_{GS} = 0 V, T_J = 25°C	–	–	1.2	V
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_{SD} = 28.5 A, dI/dt =100 A/μs, V_{DD} = 400 V	–	462	–	ns
Reverse Recovery Charge	Q_{RR}		–	9428	–	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

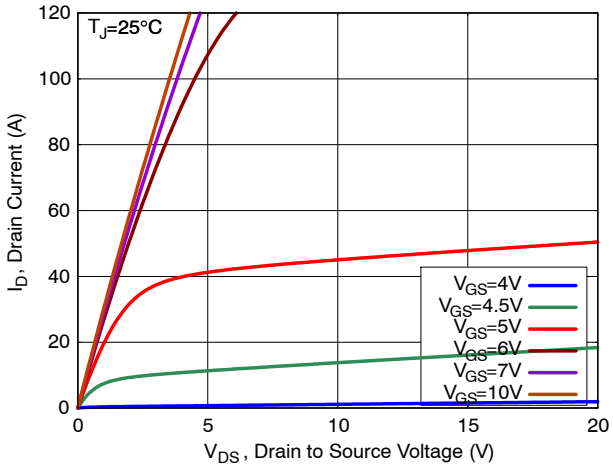


Figure 1. On−Region Characteristics

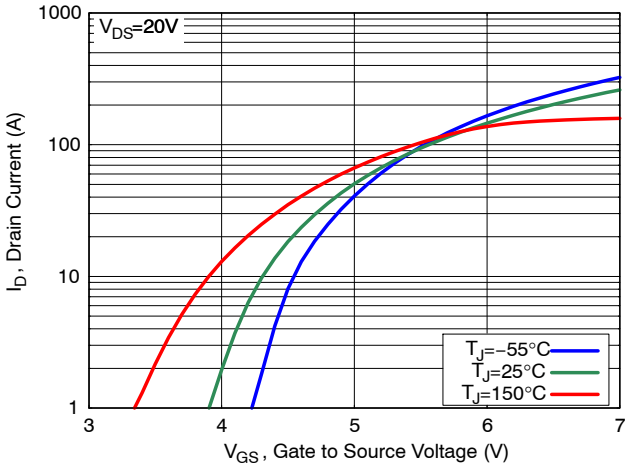


Figure 2. Transfer Characteristics

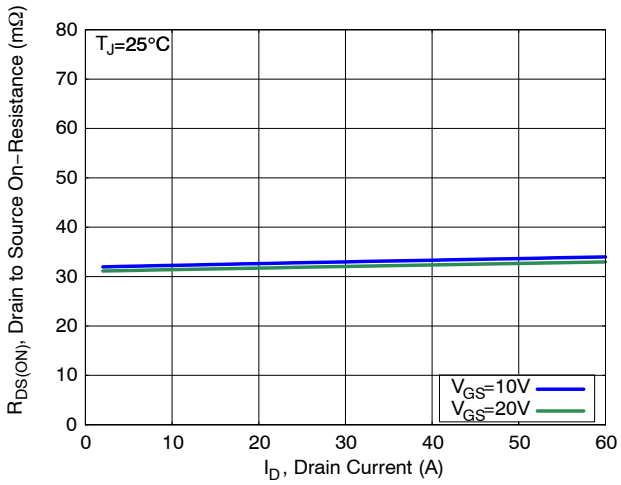


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

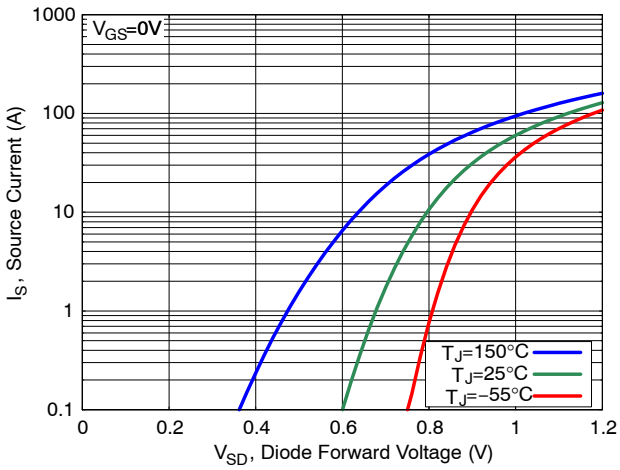


Figure 4. Diode Forward Voltage vs. Source Current

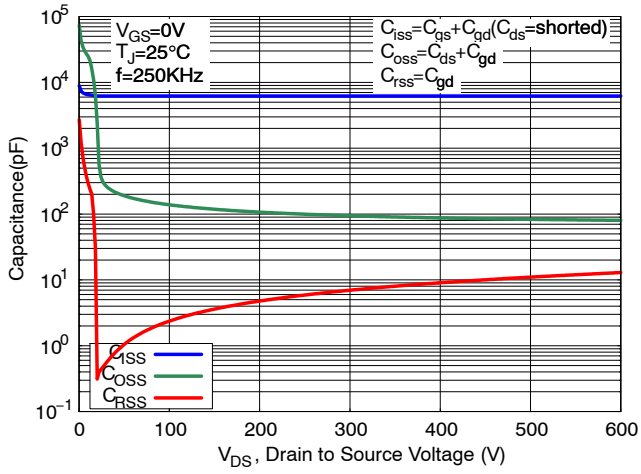


Figure 5. Capacitance Characteristics

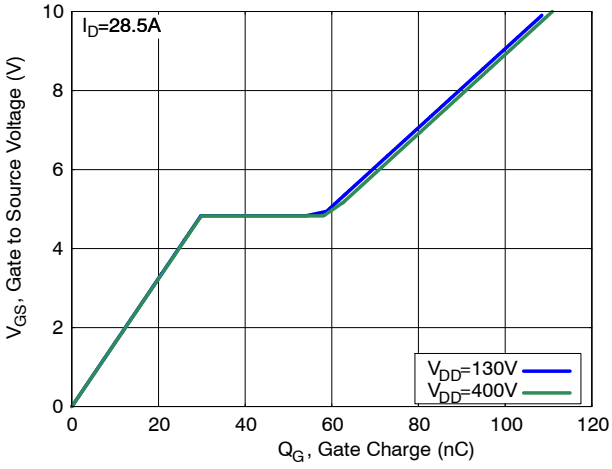


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

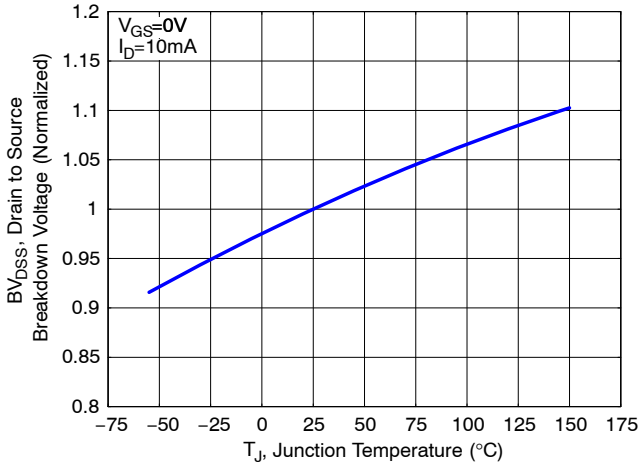


Figure 7. Breakdown Voltage Variation vs. Temperature

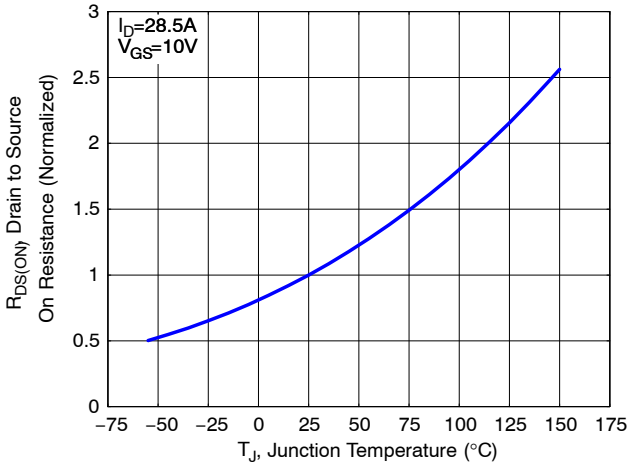


Figure 8. On−Resistance Variation vs. Temperature

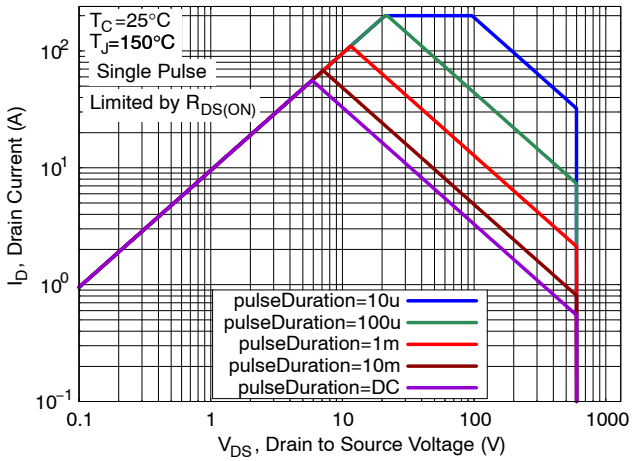


Figure 9. Maximum Safe Operating Area

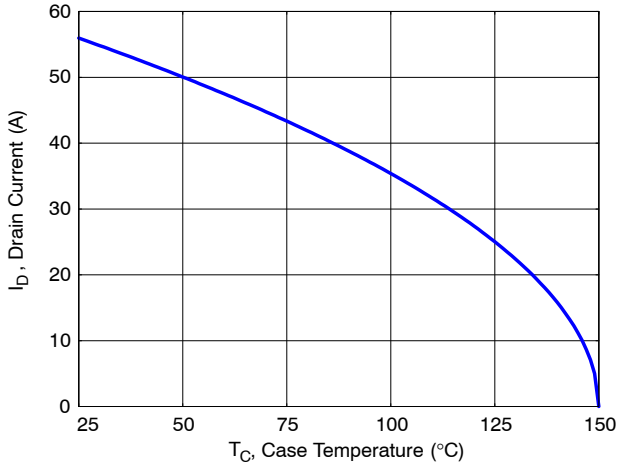


Figure 10. Maximum Drain Current vs. Case Temperature

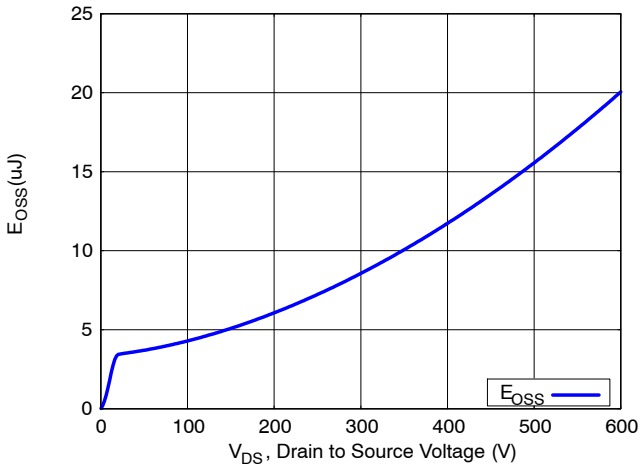


Figure 11. Eoss vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

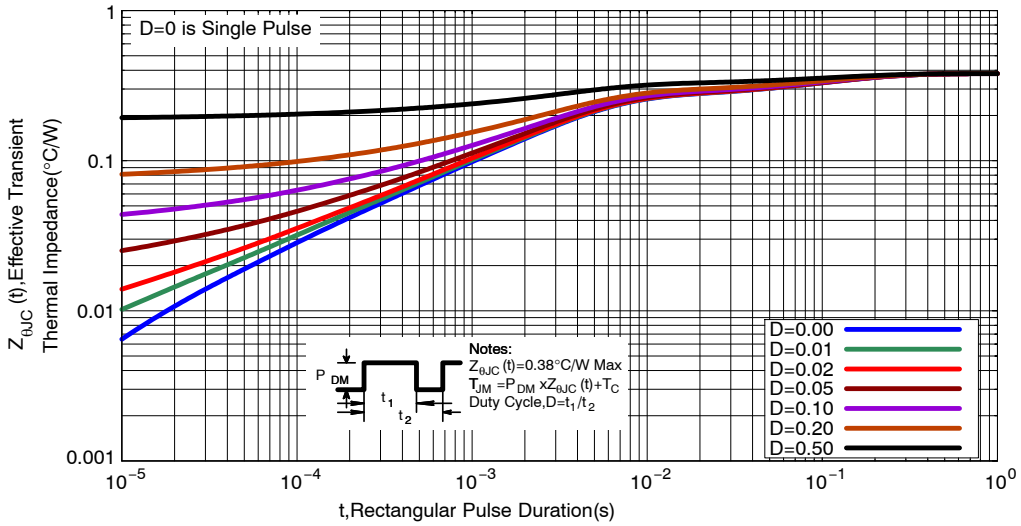
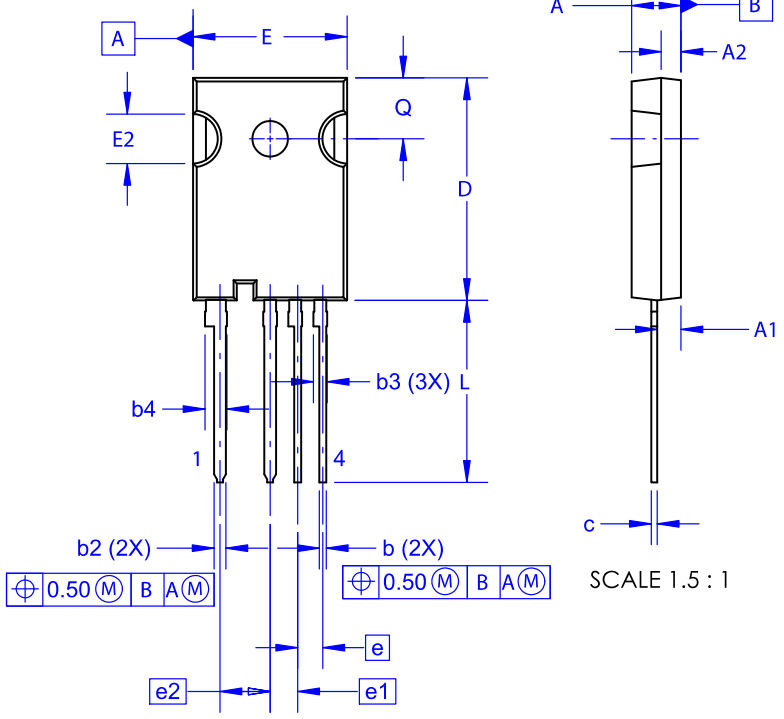


Figure 12. Transient Thermal Impedance

PACKAGE DIMENSIONS

TO−247 4−LEAD, THIN LEADS
CASE 340CW
ISSUE A



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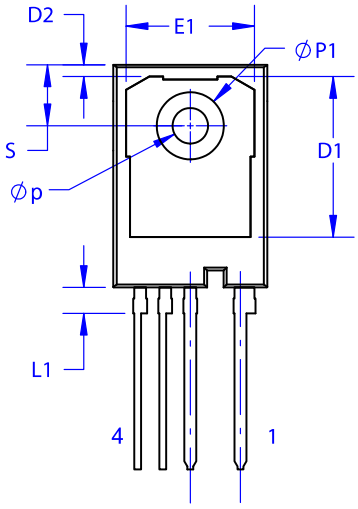

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NOTES:

A. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS,MOLD FLASH AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.10	2.40	2.70
A2	1.80	2.00	2.20
b	0.57	0.70	0.83
b2	1.07	1.20	1.33
b3	1.20	1.40	1.60
b4	2.02	2.22	2.42
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.30	16.50
D2	0.97	1.17	1.37
e		2.54	
e1		2.79	
e2		5.08	
E	15.40	15.60	15.80
E1	12.80	13.00	13.20
E2	4.80	5.00	5.20
L	18.12	18.42	18.72
L1	2.42	2.62	2.82
Øp	3.40	3.60	3.80
ØP1	6.60	6.80	7.00
Q	5.97	6.17	6.37
S	5.97	6.17	6.37

ADDITIONAL INFORMATION

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