

S **Ca** **(S C)**
MOSFET - E S C,
23 , 650 V, M3S,
TO-247-3L

NTHL023N065M3S

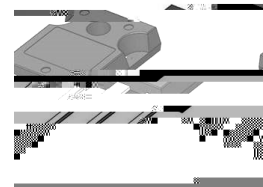
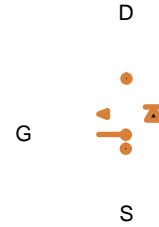
Features

- Ω
-
-
-
-

Applications

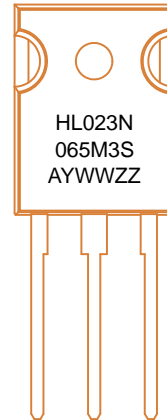
-

V _{(BR)DSS}	R _{DS(ON)} TYP	I _D MAX
650 V	23 m Ω @ V _{GS} = 18 V	70 A



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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	650	V
Gate-to-Source Voltage	V _{GS}	-8/+22	V
Continuous Drain Current	I _D	70	A
Power Dissipation			
Continuous Drain Current	I _D	49	A
Power Dissipation			
Pulsed Drain Current (Note 1)	I _{DM}	218	A
Continuous Source-Drain Current (Body Diode)	I _S	40	A
		23	
Pulsed Source-Drain Current (Body Diode) (Note 1)	I _{SM}	181	A
Single Pulse Avalanche Energy (Note 2)	E	2. E	



E_{AS} of 192 mJ is based on starting T_J = 25°C, L = 1 mH, I_{AS} = 19.6 A, V_{DD} = 100 V, V_{GS} = 18 V

NTHL023N065M3S

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 3)	$R_{\theta JC}$	0.57	°C/W
Thermal Resistance, Junction-to-Ambient (Note 3)	$R_{\theta JA}$	40	

3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value	Unit
Operation Values of Gate-to-Source Voltage	V_{GSop}	-5...-3 +18	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
-----------	--------	-----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	650	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$, Referenced to 25°C	-	89	-	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650\text{ V}, T_J = 25^\circ\text{C}$	-	-	10	μA
		$V_{DS} = 650\text{ V}, T_J = 175^\circ\text{C}$ (Note 5)	-	-	500	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = -8/+22\text{ V}, V_{DS} = 0\text{ V}$	-	-	± 1.0	μA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 25^\circ\text{C}$	-	23	33	m Ω
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 175^\circ\text{C}$ (Note 5)	-	35	-	
		$V_{GS} = 15\text{ V}, I_D = 20\text{ A}, T_J = 25^\circ\text{C}$	-	29	-	
		$V_{GS} = 15\text{ V}, I_D = 20\text{ A}, T_J = 175^\circ\text{C}$ (Note 5)	-	37	-	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 10\text{ mA}, T_J = 25^\circ\text{C}$	2	2.8	4	V
Forward Transconductance	g_{FS}	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$ (Note 5)	-	14	-	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ (Note 5)	-	1952	-	pF
Output Capacitance	C_{OSS}		-	153	-	
Reverse Transfer Capacitance	C_{RSS}		-	13	-	
Total Gate Charge	$Q_{G(TOT)}$	$V_{DD} = 400\text{ V}, I_D = 20\text{ A}, V_{GS} = -3/18\text{ V}$ (Note 5)	-	69	-	nC
Gate-to-Source Charge	Q_{GS}		-	19	-	
Gate-to-Drain Charge	Q_{GD}		-	18	-	
Gate Resistance	R_G	$f = 1\text{ MHz}$	-	4.0	-	Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -3/18\text{ V}$
--------------------	-------------	---------------------------

NTHL023N065M3S

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
-----------	--------	-----------------	-----	-----	-----	------

SWITCHING CHARACTERISTICS

Turn-On Delay Time	t _{d(ON)}	V _{GS} = -3/18 V, V _{DD} = 400 V, I _D = 20 A, R _G = 4.7 Ω, T _J = 175°C (Notes 4 and 5)	-	11	-	ns
Turn-Off Delay Time	t _{d(OFF)}		-	45	-	
Rise Time	t _r		-	29	-	
Fall Time	t _f		-	14	-	
Turn-On Switching Loss	E _{ON}		-	173	-	μJ
Turn-Off Switching Loss	E _{OFF}		-	64	-	
Total Switching Loss	E _{TOT}		-	237	-	

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

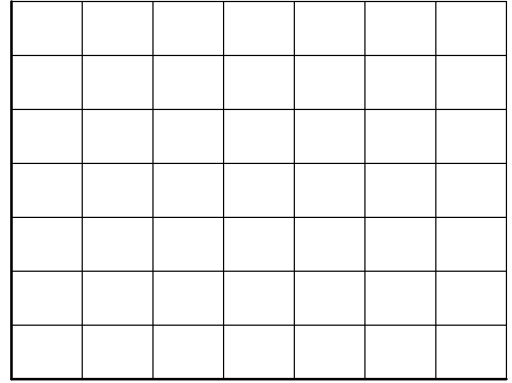
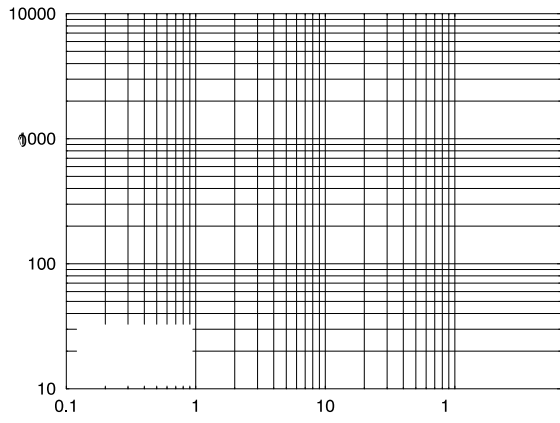
Forward Diode Voltage	V _{SD}	I _{SD} = 20 A, V _{GS} = -3 V, T _J = 25°C	-	4.5	6.0	V
		I _{SD} = 20 A, V _{GS} = -3 V, T _J = 175°C (Note 5)	-	4.2	-	
Reverse Recovery Time	t _{RR}	V _{GS} = -3 V, I _S = 20 A, di/dt = 1000 A/μs, V _{D,2079} 530.64584 539.547aA, -8((I)Tj6.6403 4 and 5))TTD-0.5685 Tm0 Tc(J)Tf61 T 53(GS8T1 1 T34 Tm-0027 Tc159 74ET(Tj1 Tf2.2394 0 TD				

NTHL023N065M3S

TYPICAL CHARACTERISTICS

NTHL023N065M3S

TYPICAL CHARACTERISTICS



NTHL023N065M3S

TYPICAL CHARACTERISTICS

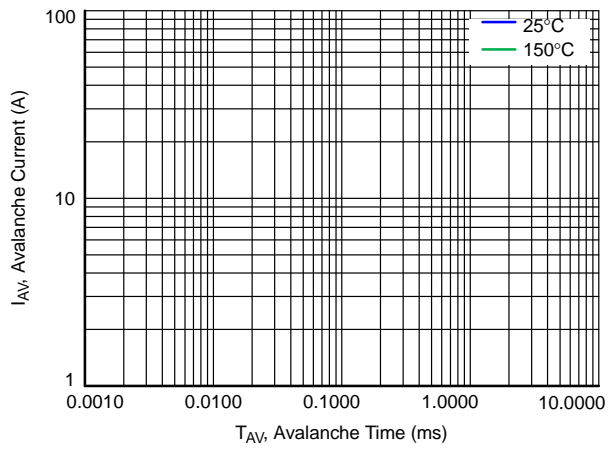


Figure 13. Avalanche Current vs Pulse Time (UIS)

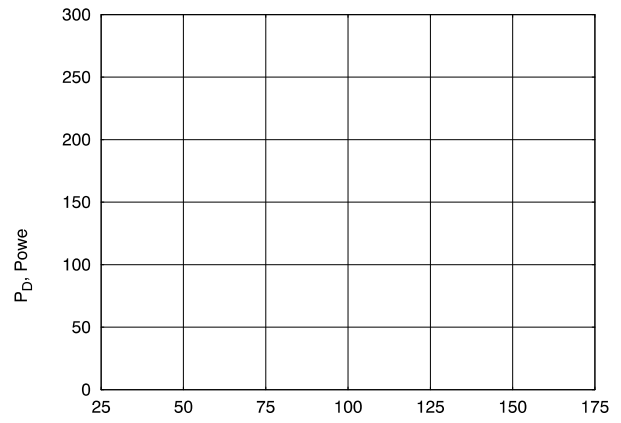


Figure 14. Maximum Power Dissipation vs Case Temperature

onsemi, **onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi**
