

NTHL040N65S3F-VB Datasheet

N-Channel 600V (D-S) Super Junction Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	600	
$R_{DS(on)}$ at 25 °C (Ω)	$V_{GS} = 10$ V	0.034

FEATURES

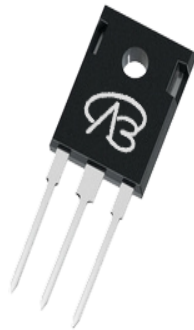
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



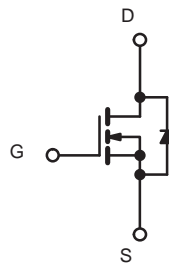
APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting

TO-247



Top View



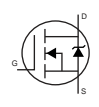
N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V_{DS}	600	V	
Gate-Source Voltage		V_{GS}	± 30		
Continuous Drain Current ($T_J = 150$ °C)	V_{GS} at 10 V	I_D	$T_C = 25$ °C	67	A
			$T_C = 100$ °C	54	
Pulsed Drain Current ^a		I_{DM}	201		
Linear Derating Factor			1.67	W/°C	
Single Pulse Avalanche Energy ^b		E_{AS}	845	mJ	
Maximum Power Dissipation		P_D	500	W	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	°C	
Drain-Source Voltage Slope	$T_J = 125$ °C	dV/dt	50	V/ns	
Reverse Diode dV/dt ^d			15		
Soldering Recommendations (Peak Temperature) ^c	for 10 s		260	°C	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 100$ V, starting $T_J = 25$ °C, $L = 30$ mH, $R_g = 25$ Ω , $I_{AS} = 24$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

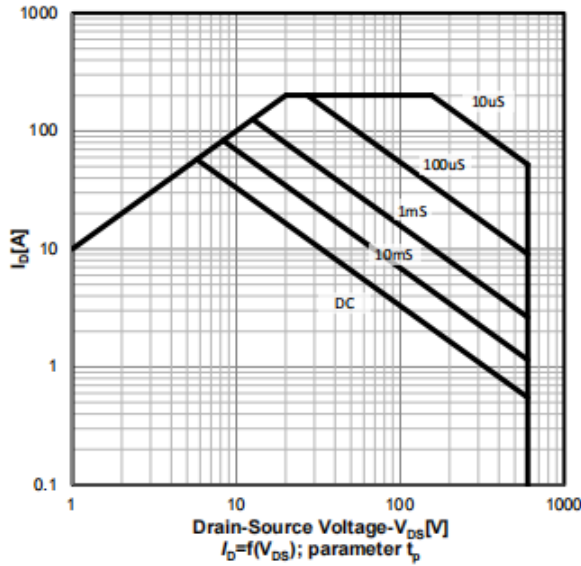
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.38	

SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$		600	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.5	-	4.5	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30\text{ V}$		-	-	± 1	μA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 16\text{ A}$	-	0.034	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 30\text{ V}, I_D = 16\text{ A}$		-	5.6	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$		-	4600	-	pF
Output Capacitance	C_{oss}			-	330	-	
Reverse Transfer Capacitance	C_{rss}			-	4	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$		-	63	-	
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$			-	213	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, V_{DS} = 520\text{ V}$	-	370	-	nC
Gate-Source Charge	Q_{gs}			-	3.8	-	
Gate-Drain Charge	Q_{gd}			-	4.7	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 480\text{ V}, I_D = 20\text{ A}, V_{GS} = 10\text{ V}, R_g = 9.1\text{ }\Omega$		-	18	24	ns
Rise Time	t_r			-	24	55	
Turn-Off Delay Time	$t_{d(off)}$			-	8.0	-	
Fall Time	t_f			-	1.2	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz}, \text{open drain}$		-	0.8	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	67	A
Pulsed Diode Forward Current	I_{SM}			-	-	201	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 8\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.5	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	230	-	ns
Reverse Recovery Charge	Q_{rr}			-	5.8	-	μC
Reverse Recovery Current	I_{RRM}			-	4.5	-	A

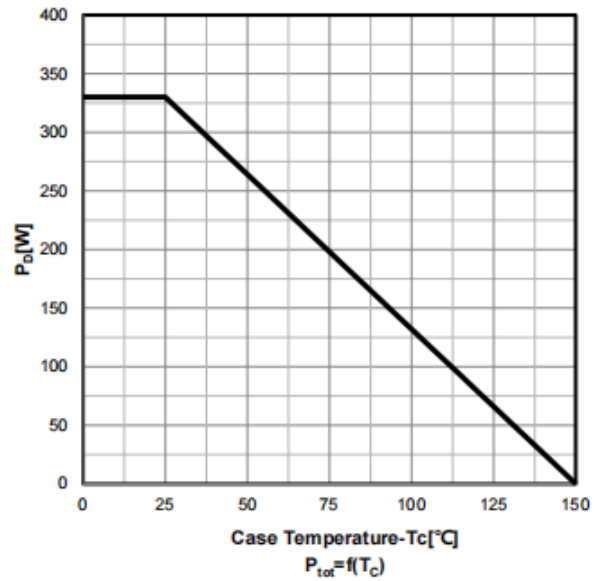
Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
- b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

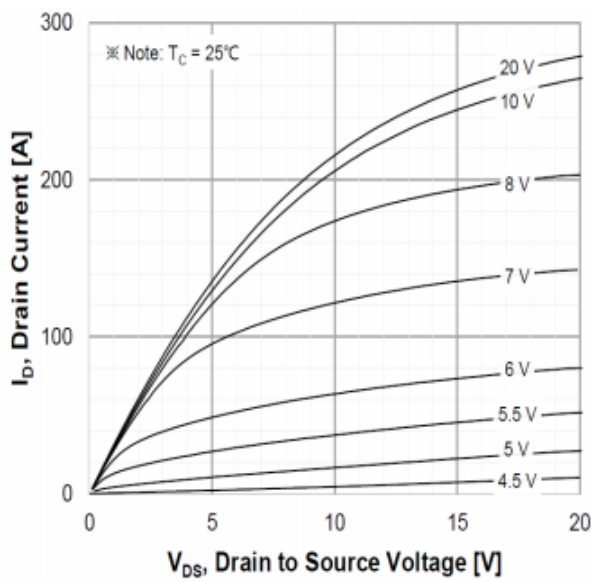
Safe operating area TC=25 °C
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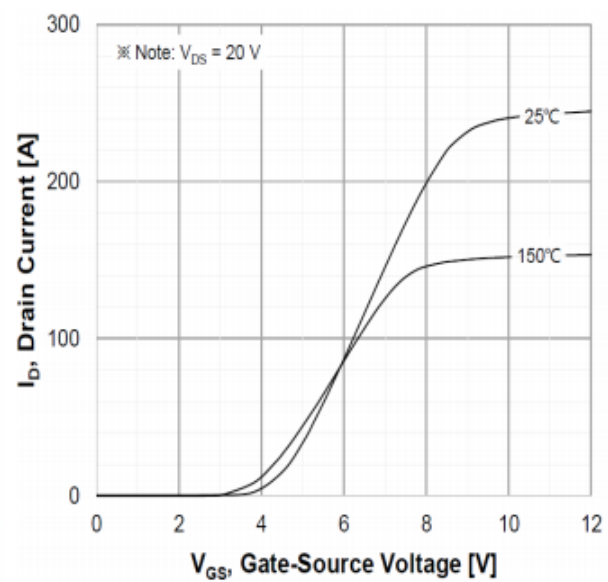
Power dissipation



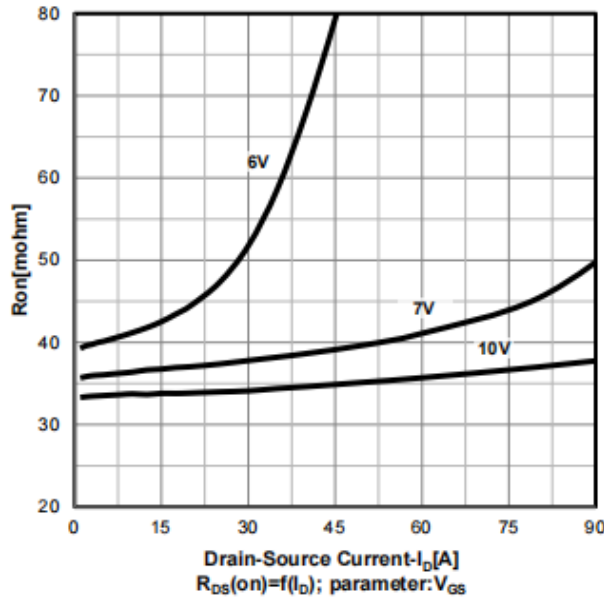
Typ. output characteristics $T_J=25\text{ }^\circ\text{C}$



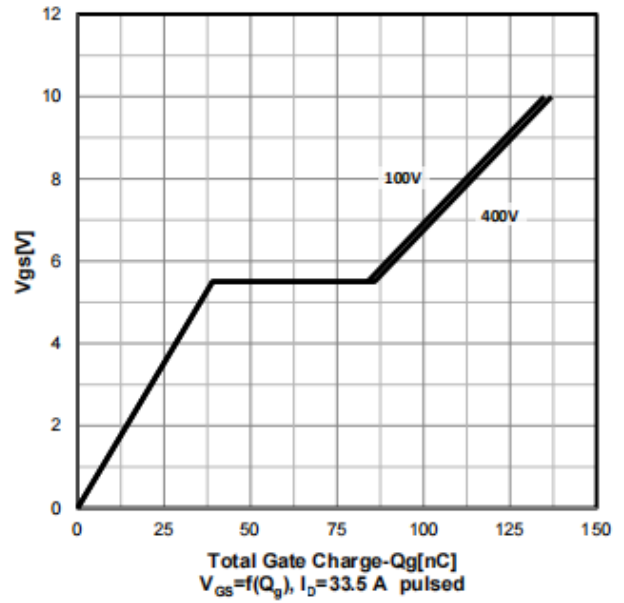
Transfer characteristics



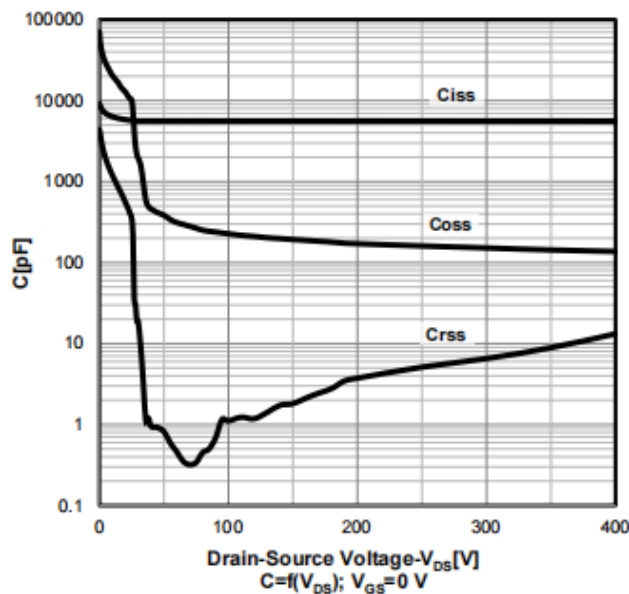
Typ. drain-source on-state resistance



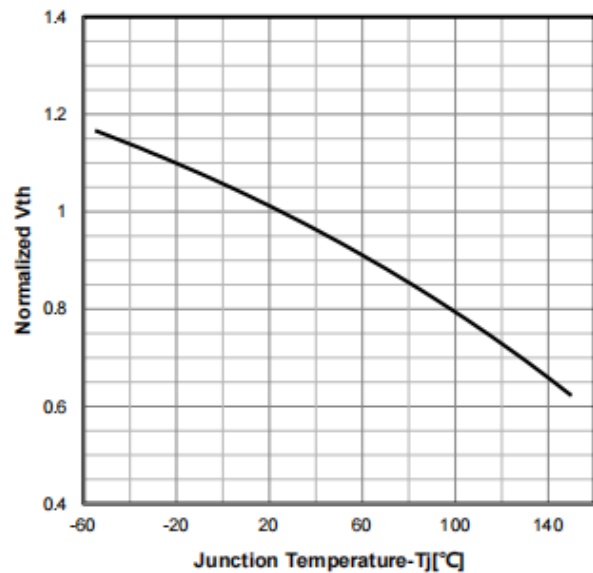
Typ. gate charge characteristics



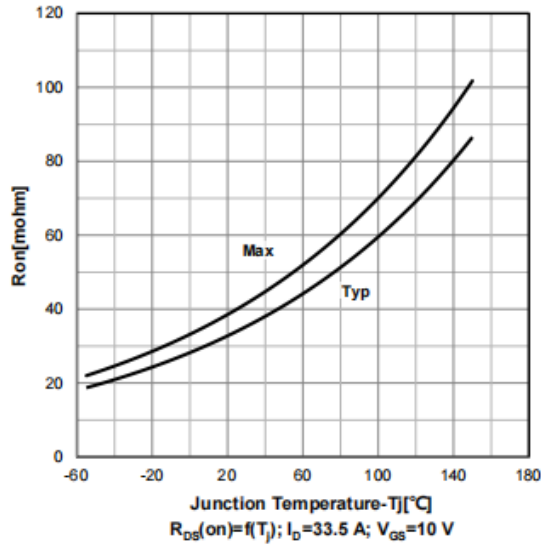
Typ. capacitances



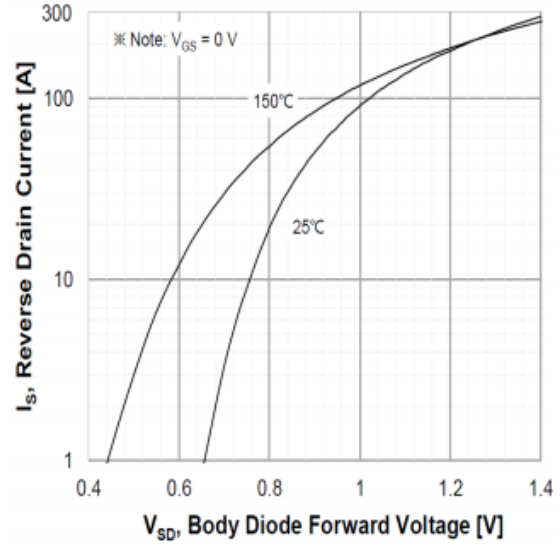
Normalized $V_{GS(th)}$ characteristics



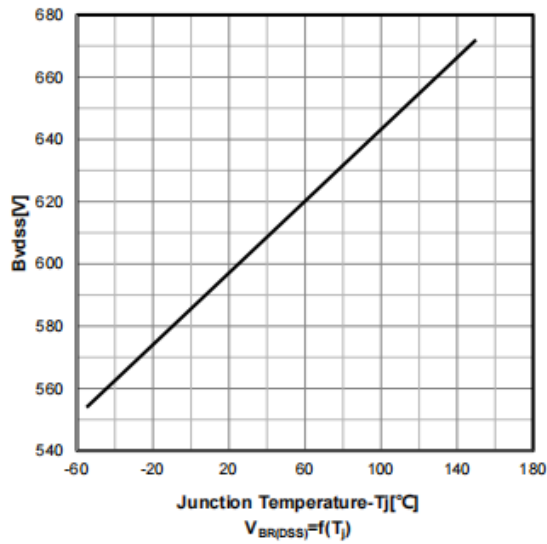
On-resistance vs temperature



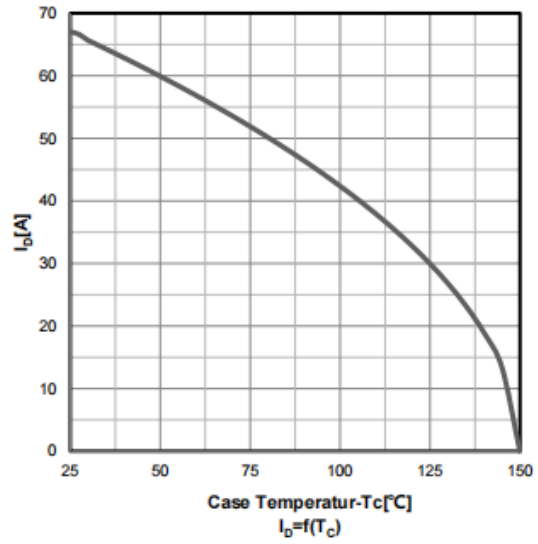
Forward characteristics of reverse diode



Drain-source breakdown voltage



Drain current vs temperature



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