

# HMHL065N185C

## 650-V Cascode GaN HEMT

### Description

These miniature surface mount GaN HEMT utilize a GaN transistor technology to provide low RDS(on) and using the Cascode in the DFN package to realize the normal-off high electron mobility transistor.

Also provides high breakdown voltage, high current and high operating speed which is suitable for high power applications.

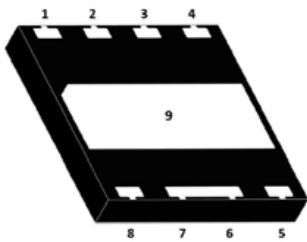
### Features

- Gate drive voltage compatibility (-20V to 20V)
- High operating frequency
- Low  $Q_{rr}$

### Typical Applications

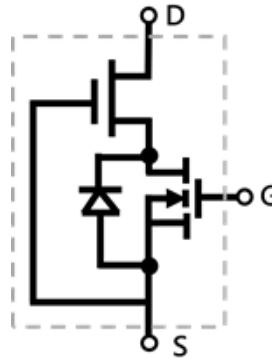
- Switch Mode Power Supplies (SMPS)
- AC-DC/ DC-DC Converters
- Motor Drives

### Package type : DFN 8X8

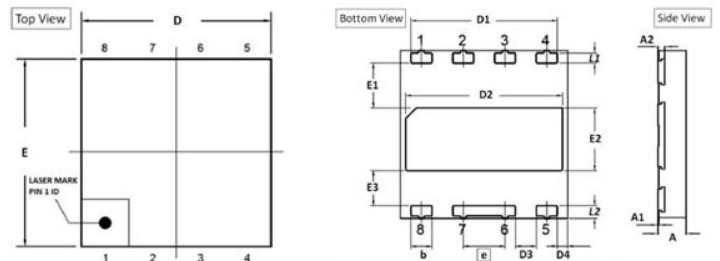


Drain: 1, 2, 3, 4  
Source: 5, 6, 7, 9  
Gate: 8

### Graphic Symbol

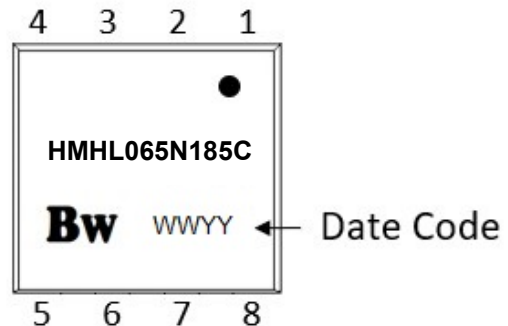


### Package Dimension



SYMBOL	DIMENSION(unit : mm)			SYMBOL	DIMENSION(unit : mm)		
	MIN	TYP	MAX		MIN	TYP	MAX
A	1.20	1.25	1.30	e	2.00 BSC		
A1	--	0.02	0.05	E	7.90	8.00	8.10
A2	0.203 REF			E1	2.00	2.10	2.20
b	0.95	1.00	1.05	E2	2.90	3.00	3.10
D	7.90	8.00	8.10	E3	1.60	1.70	1.80
D1	6.90	7.00	7.10	L1	0.38	0.48	0.58
D2	7.40	7.50	7.60	L2	0.50	0.60	0.70
D3	0.90	1.00	1.10				
D4	0.40	0.50	0.60				

### Marking



RoHS Compliant

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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DS}$	Drain-Source Voltage	650	V
$V_{(TR)DSS}$	Transient drain to source voltage <sup>1</sup>	800	V
$V_{GS}$	Gate-Source Voltage	-20 / +20	V
$I_D$	Continuous Drain Current at $T_C = 25^\circ\text{C}$	12	A
	Continuous Drain Current at $T_C = 100^\circ\text{C}$	8	A
$I_{D\ pulse}$	Pulse Drain Current (Pulse width = 10 $\mu\text{s}$ ) <sup>2</sup>	21	A
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55...150	$^\circ\text{C}$
$T_{SOLD}$	Soldering peak temperature	260	$^\circ\text{C}$

#### Notes

1. In off-state, spike duty cycle  $D < 0.01$ , spike duration  $< 1\ \mu\text{s}$
2. Value is not tested to full current in production.

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient	54	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Maximum Junction-to-Case	2.8	$^\circ\text{C}/\text{W}$

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### Static Electrical Characteristics, ( $T_J=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=10\text{V}$ , $I_D=1\text{mA}$	-	1.7	2.2	V
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}$	650	-	-	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=650\text{V}$ , $V_{GS}=0\text{V}$ , $T_J=25^\circ\text{C}$	-	2.5	30	$\mu\text{A}$
		$V_{DS}=650\text{V}$ , $V_{GS}=0\text{V}$ , $T_J=150^\circ\text{C}$	-	10	-	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=6\text{V}$ , $I_D=5\text{A}$ , $T_J=25^\circ\text{C}$	-	150	185	$\text{m}\Omega$
		$V_{GS}=6\text{V}$ , $I_D=5\text{A}$ , $T_J=150^\circ\text{C}$	-	302	-	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20\text{V}$	-	-	$\pm 100$	nA

### AC Electrical Characteristics, ( $T_J=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$C_{ISS}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=400\text{V}$ , $f=100\text{kHz}$	-	505	-	$\text{pF}$
$C_{OSS}$	Output Capacitance		-	29	-	
$C_{RSS}$	Reverse Transfer Capacitance		-	1	-	
$Q_g$	Total Gate Charge	$V_{DS}=400\text{V}$ , $V_{GS}=0$ to $10\text{V}$ , $I_{DS}=5\text{A}$	-	10	-	$\text{nC}$
$Q_{GS}$	Gate-Source Charge		-	4.3	-	
$Q_{OSS}$	Output Charge	$V_{GS}=0\text{V}$ , $V_{DS}=0\sim 400\text{V}$	-	36	-	
$Q_{RR}$	Reverse Recovery Charge	$I_S=5\text{V}$ , $V_{DS}=0\text{V}$	-	46	-	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$ , $V_{GS}=0$ to $10\text{V}$ , $I_{DS}=2\text{A}$ , $R_{G(on)}=25\Omega$ ,	-	9	-	$\text{ns}$
$t_{d(off)}$	Turn-Off Delay Time		-	20	-	

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- Typical Electrical Characteristics

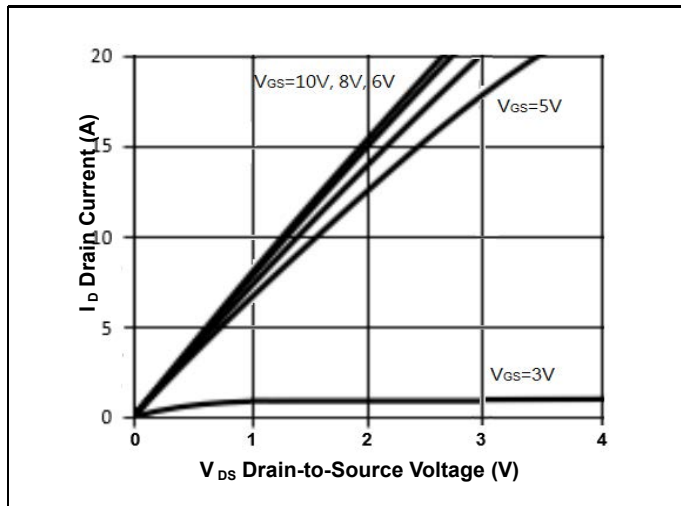


FIG.1-Output Characteristics  $T_J=25^{\circ}\text{C}$

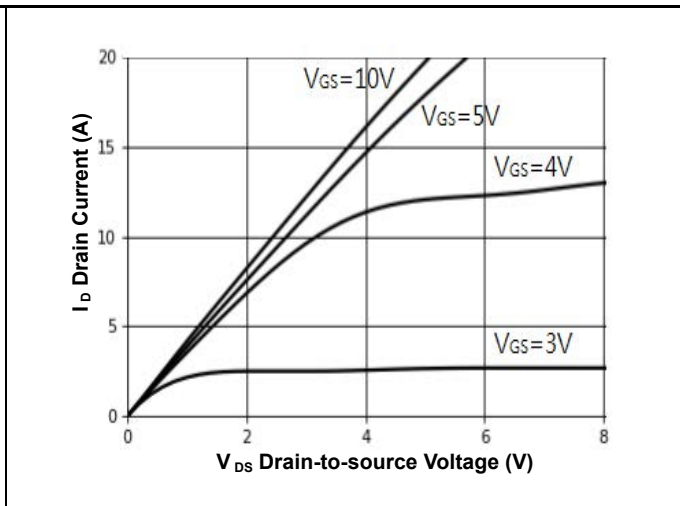


FIG.2- Output Characteristics  $T_J=150^{\circ}\text{C}$

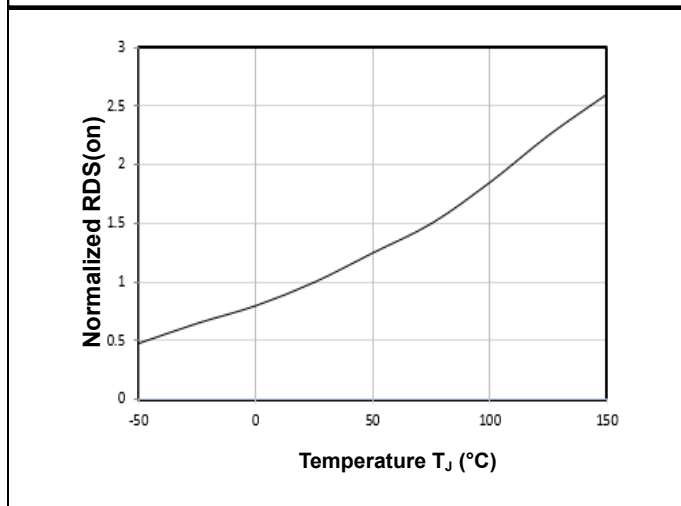


FIG.3- Normalized  $R_{DS(on)}$  vs. Temperature

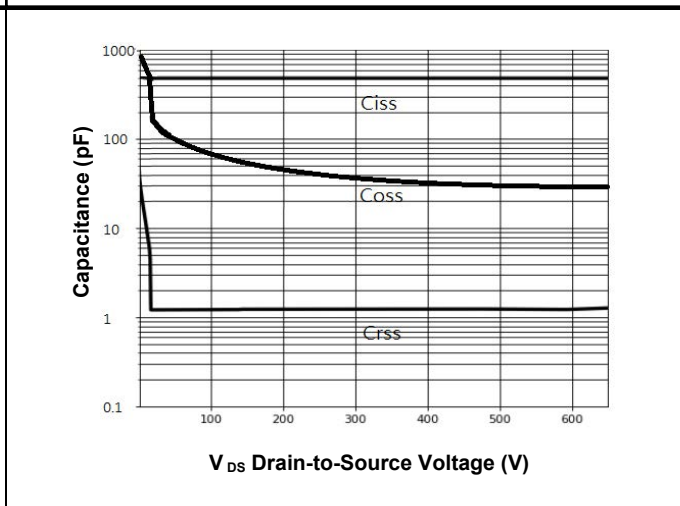


FIG.4- Capacitance vs Drain-Source Voltage

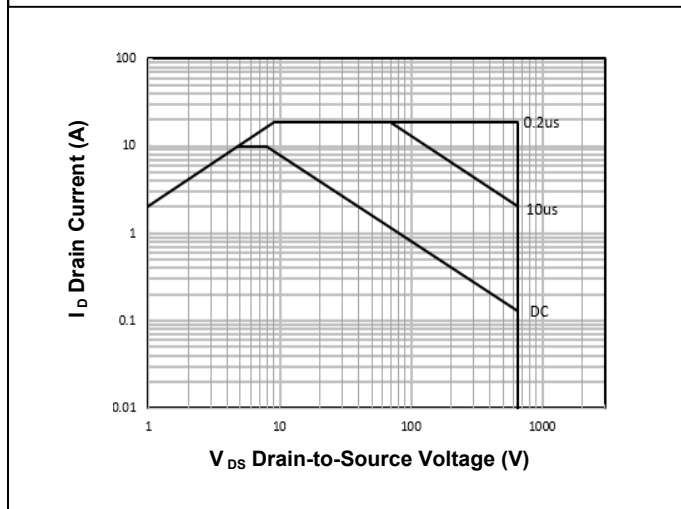


FIG.5- Safe Operating Area

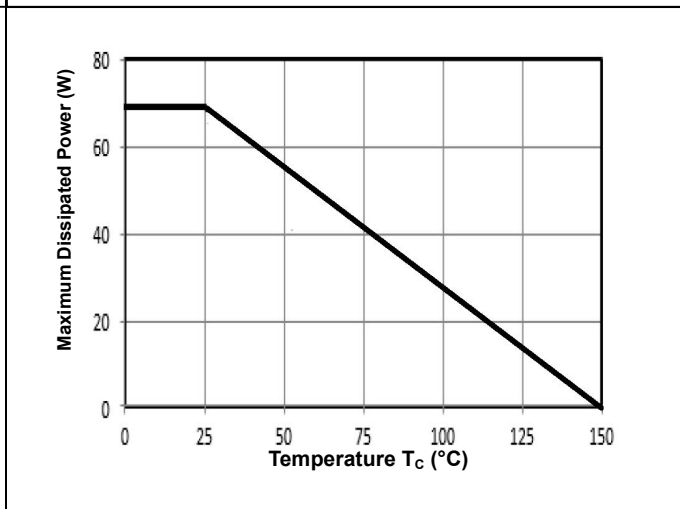


FIG.6- Maximum Power Dissipation Derating vs Case Temperature

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- Typical Electrical Characteristics

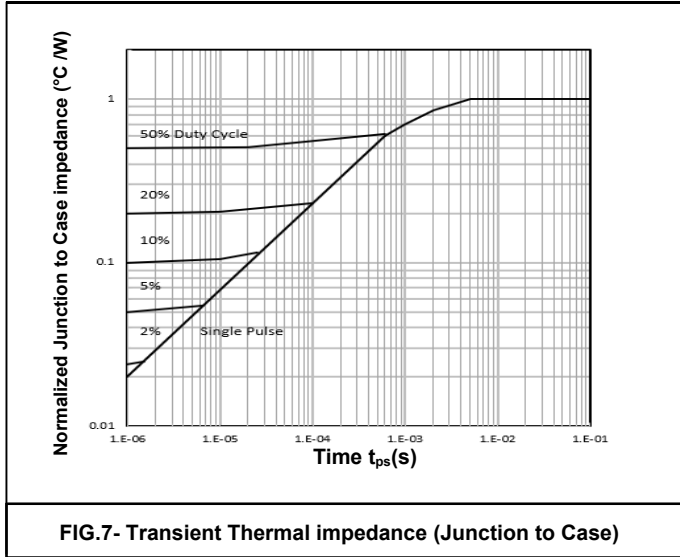


FIG.7- Transient Thermal impedance (Junction to Case)

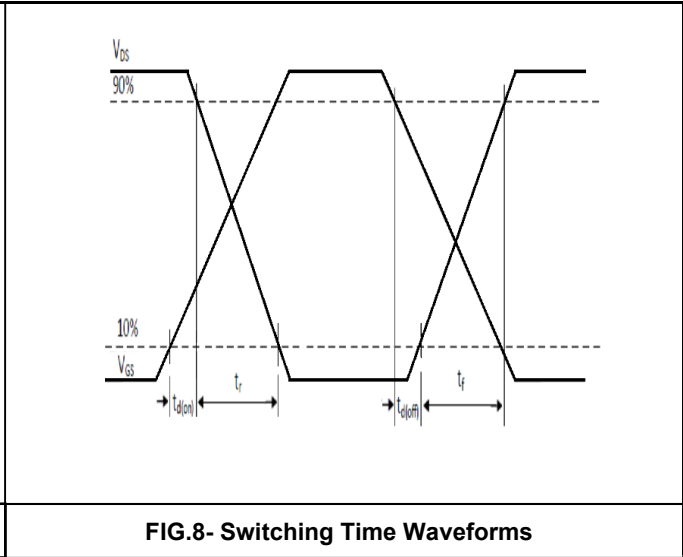
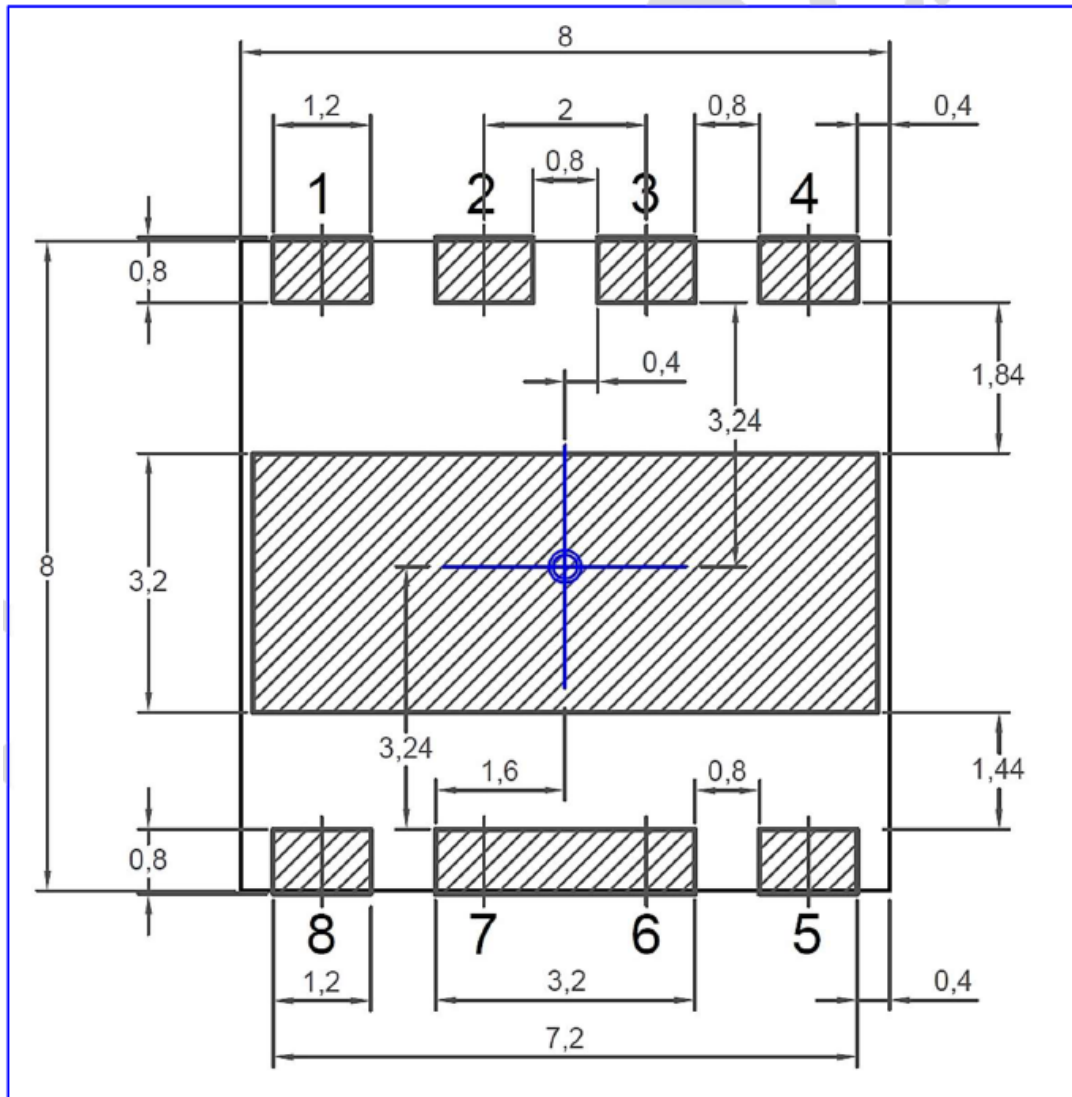


FIG.8- Switching Time Waveforms

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DFN-8X8 Recommended PCB Soldering Footprint



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