

HMHL065N210E

650-V GaN E-mode Power Transistor

Description

GaN based power transistor which possesses not only enhancement mode (e-mode) GaN's benefits but also compatibility.

This GaN provides low RDS(on) 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.

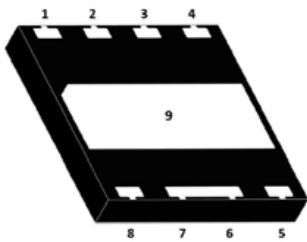
Features

- Gate drive voltage compatibility (-10V to 18V)
- High operating frequency
- Zero reverse recovery loss

Typical Applications

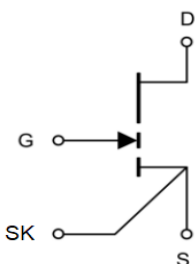
- Switch Mode Power Supplies (SMPS)
- AC-DC/ DC-DC Converters
- Motor Drives

Package type : DFN 8X8

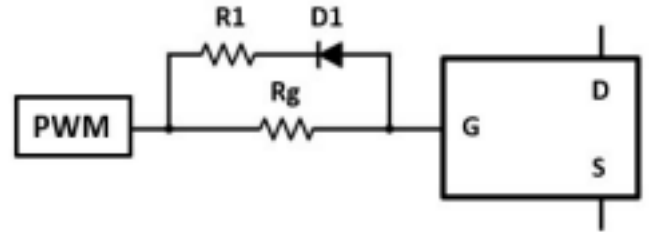


Drain: 1, 2, 3, 4
Source: 5, 6, 7, 9
Gate: 8

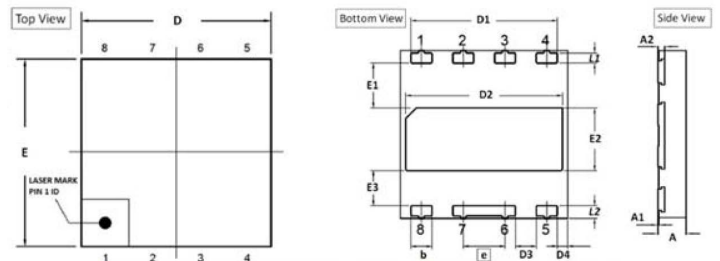
Graphic Symbol



Typical Application Circuit

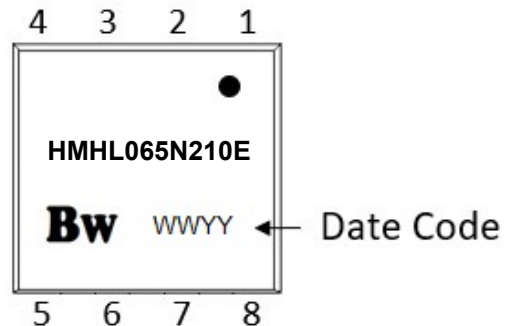


Package Dimension



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 ¹	800	V
V _{GS}	Gate-Source Voltage	-10 / +18	V
I _D	Continuous Drain Current at T _C = 25°C	10	A
	Continuous Drain Current at T _C = 100°C	6	A
I _{D pulse}	Pulse Drain Current (Pulse width = 10 μs) ²	20	A
P _D	Power Dissipation (T _C = 25°C)	70	W
T _J /T _{STG}	Operating Junction and Storage Temperature	-55...150	°C
T _{SOLD}	Soldering peak temperature	260	°C

Notes

1. In off-state, spike duty cycle D < 0.01, spike duration < 1 μs
2. Value is not tested to full current in production.

Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
R _{θJA}	Maximum Junction-to-Ambient	50	°C/W
R _{θJC}	Maximum Junction-to-Case	2.5	°C/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	$V_{DS}=10\text{V}$, $I_D=1\text{mA}$	1.2	1.6	2.0	V
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}$	650	-	-	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$, $T_J=25^\circ\text{C}$	-	0.5	12	μA
		$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$, $T_J=150^\circ\text{C}$	-	100	-	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=5\text{A}$, $T_J=25^\circ\text{C}$	-	150	210	$\text{m}\Omega$
		$V_{GS}=10\text{V}$, $I_D=5\text{A}$, $T_J=150^\circ\text{C}$	-	320	-	

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{ISS}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=400\text{V}$, $f=100\text{kHz}$	-	80	-	pF
C_{OSS}	Output Capacitance		-	50	-	
C_{RSS}	Reverse Transfer Capacitance		-	1	-	
Q_g	Total Gate Charge	$V_{DS}=400\text{V}$, $V_{GS}=0$ to 10V , $I_{DS}=10\text{A}$	-	2.6	-	nC
Q_{GS}	Gate-Source Charge		-	1	-	
Q_{OSS}	Output Charge	$V_{GS}=0\text{V}$, $V_{DS}=0\sim 400\text{V}$	-	20	-	
Q_{RR}	Reverse Recovery Charge	$V_{GS}=-10\text{V}$, $V_{DS}=0\text{V}$	-	0	-	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$, $V_{GS}=0$ to 12V , $I_{DS}=7\text{A}$, $R_{G(on)}=25\Omega$,	-	3	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	7	-	

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- Typical Electrical Characteristics

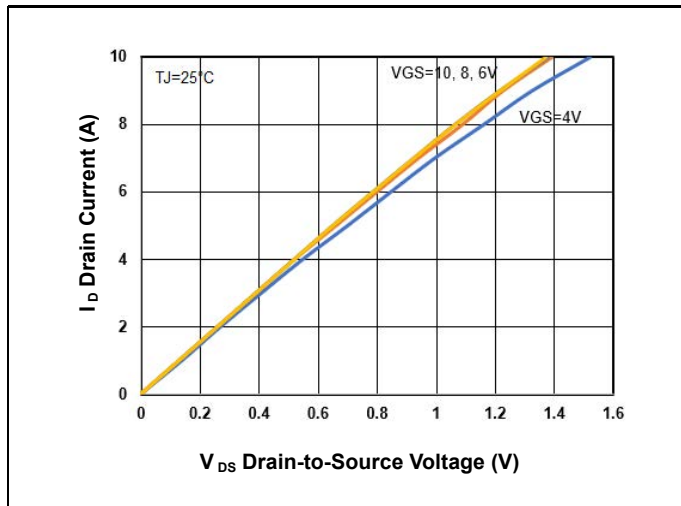


FIG.1-Output Characteristics $T_J=25^\circ\text{C}$

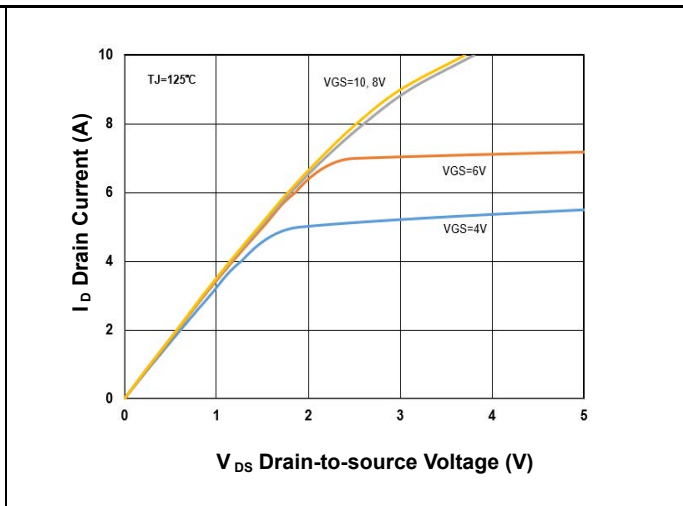


FIG.2- Output Characteristics $T_J=125^\circ\text{C}$

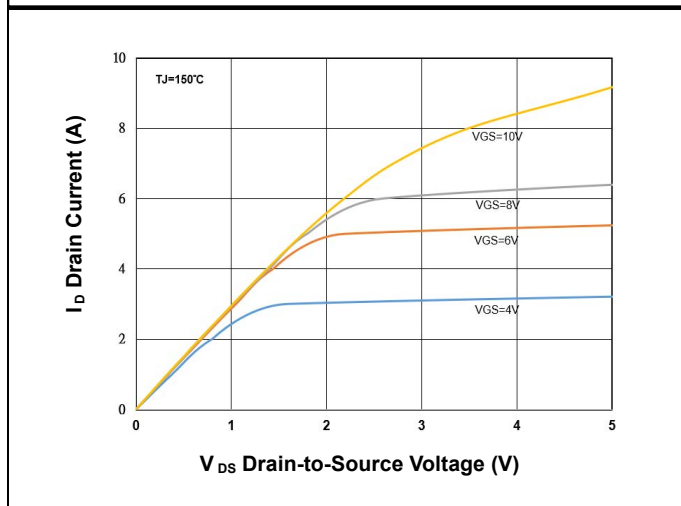


FIG.3-Output Characteristics $T_J=150^\circ\text{C}$

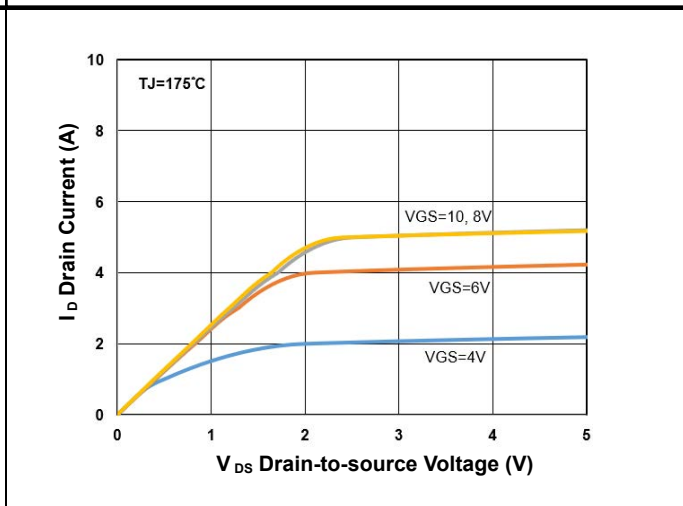


FIG.4- Output Characteristics $T_J=175^\circ\text{C}$

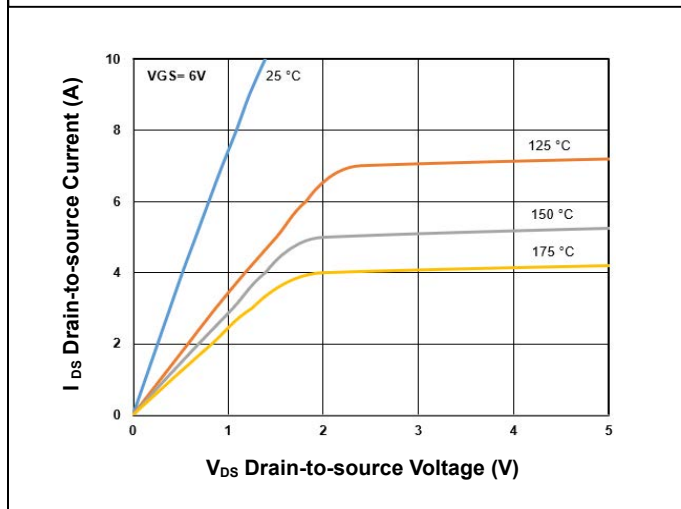


FIG.5-Drain Current vs Drain voltage For Various Temperature

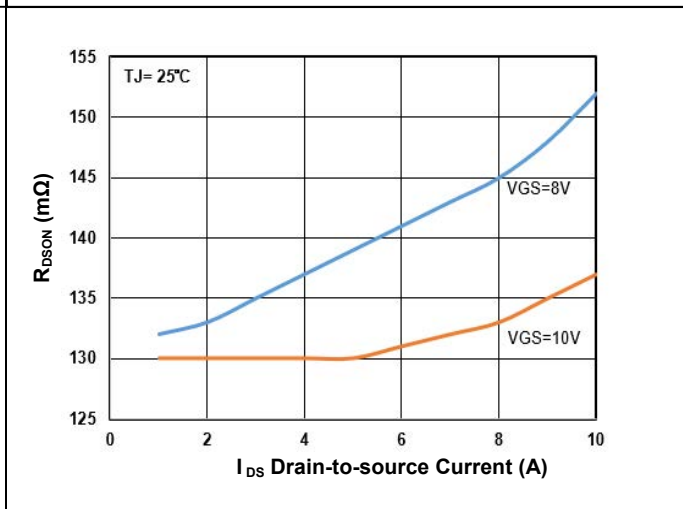


FIG.6- On-Resistance vs. Drain Current $T_J=25^\circ\text{C}$

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- Typical Electrical Characteristics

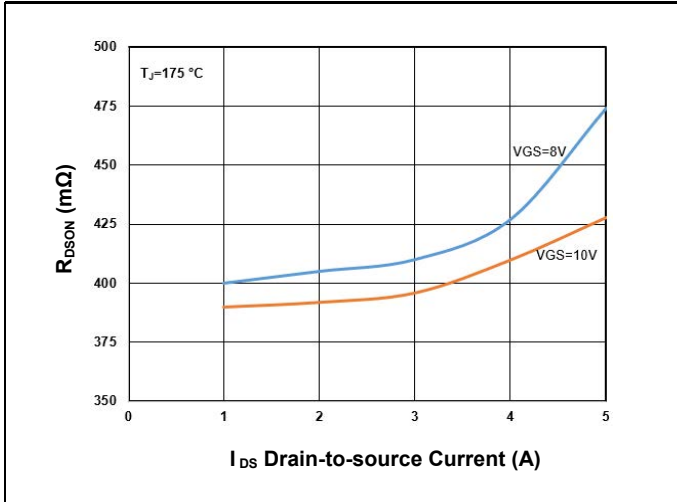


FIG.7- On-Resistance vs. Drain Current $T_J=175^\circ\text{C}$

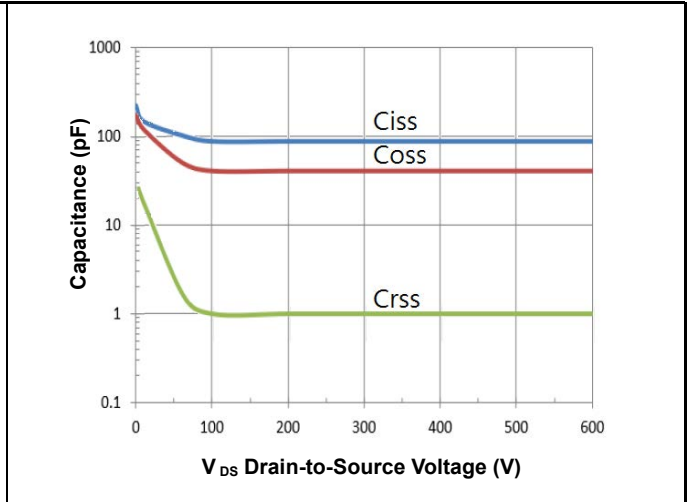


FIG.8- Capacitance vs Drain-Source Voltage

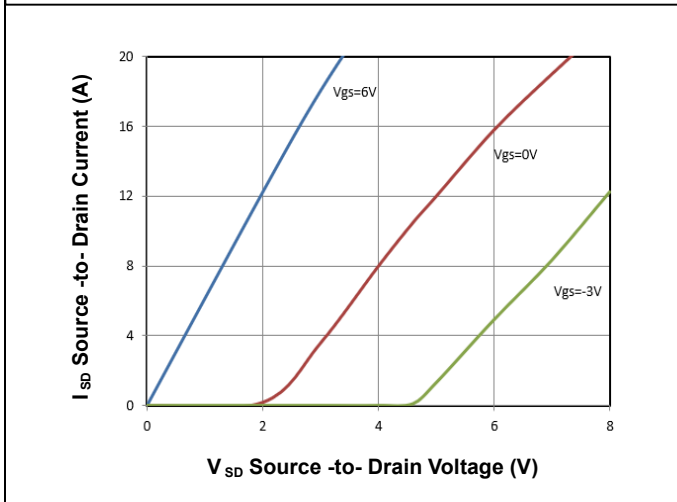


FIG.9- Reverse Conduction Characteristics at $T_J=25^\circ\text{C}$

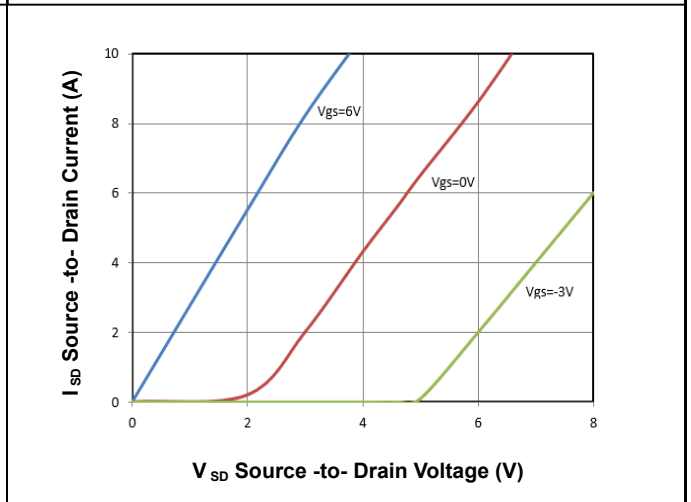


FIG.10- Reverse Conduction Characteristics at $T_J=150^\circ\text{C}$

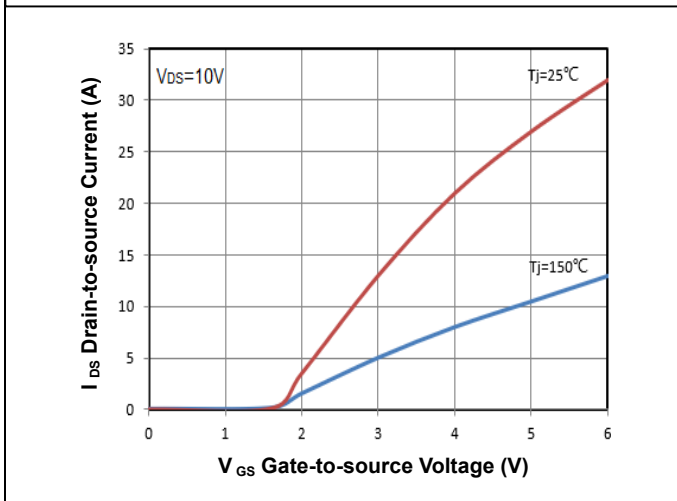


FIG.11- Drain Current vs. Gate voltage For Various Temperature

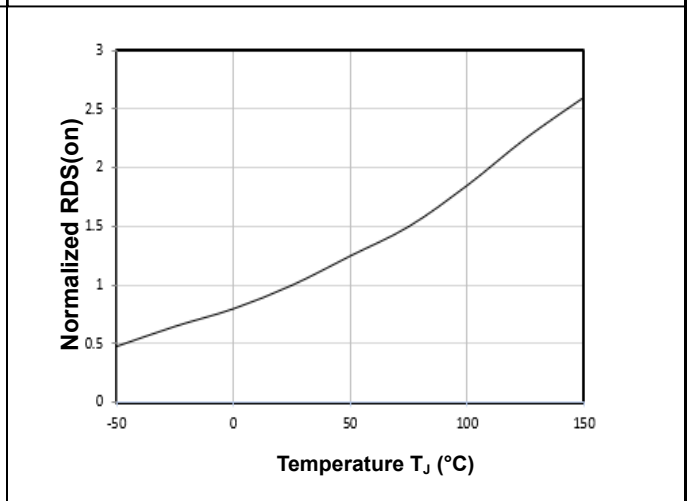


FIG.12- Normalized $R_{DS(on)}$ vs. Temperature

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- Typical Electrical Characteristics

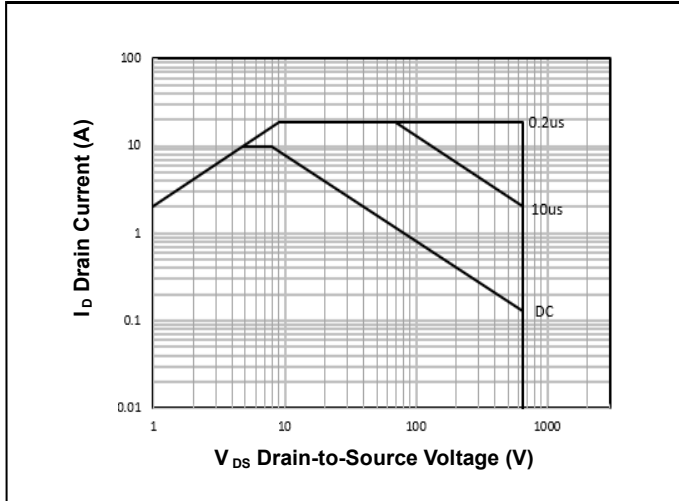


FIG.13- Safe Operating Area

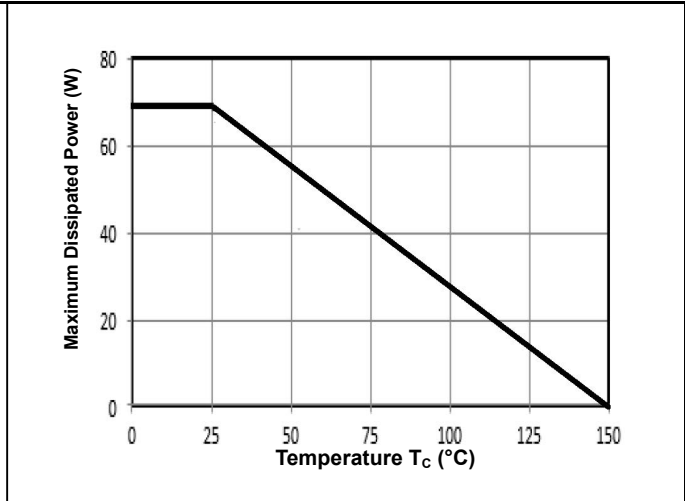


FIG.14- Maximum Power Dissipation Derating vs Case Temperature

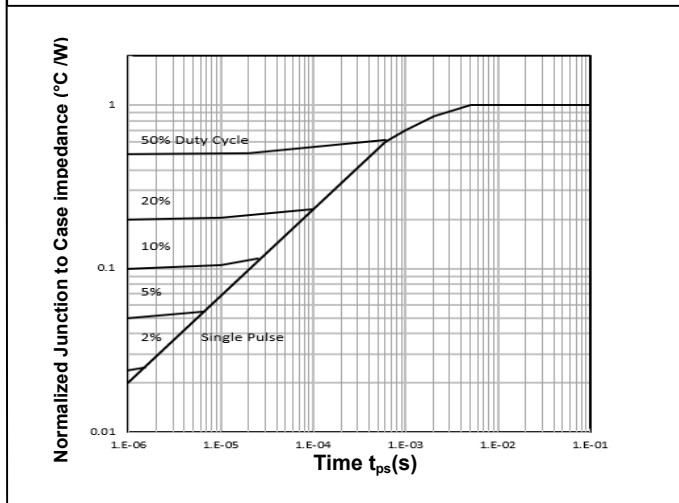


FIG.15- Transient Thermal impedance (Junction to Case)

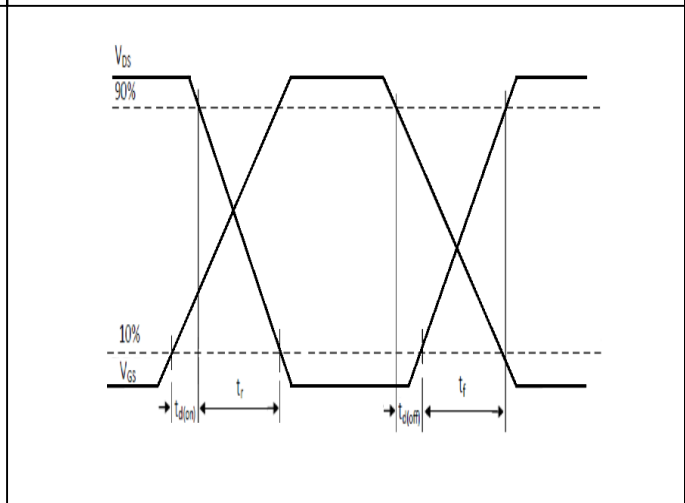
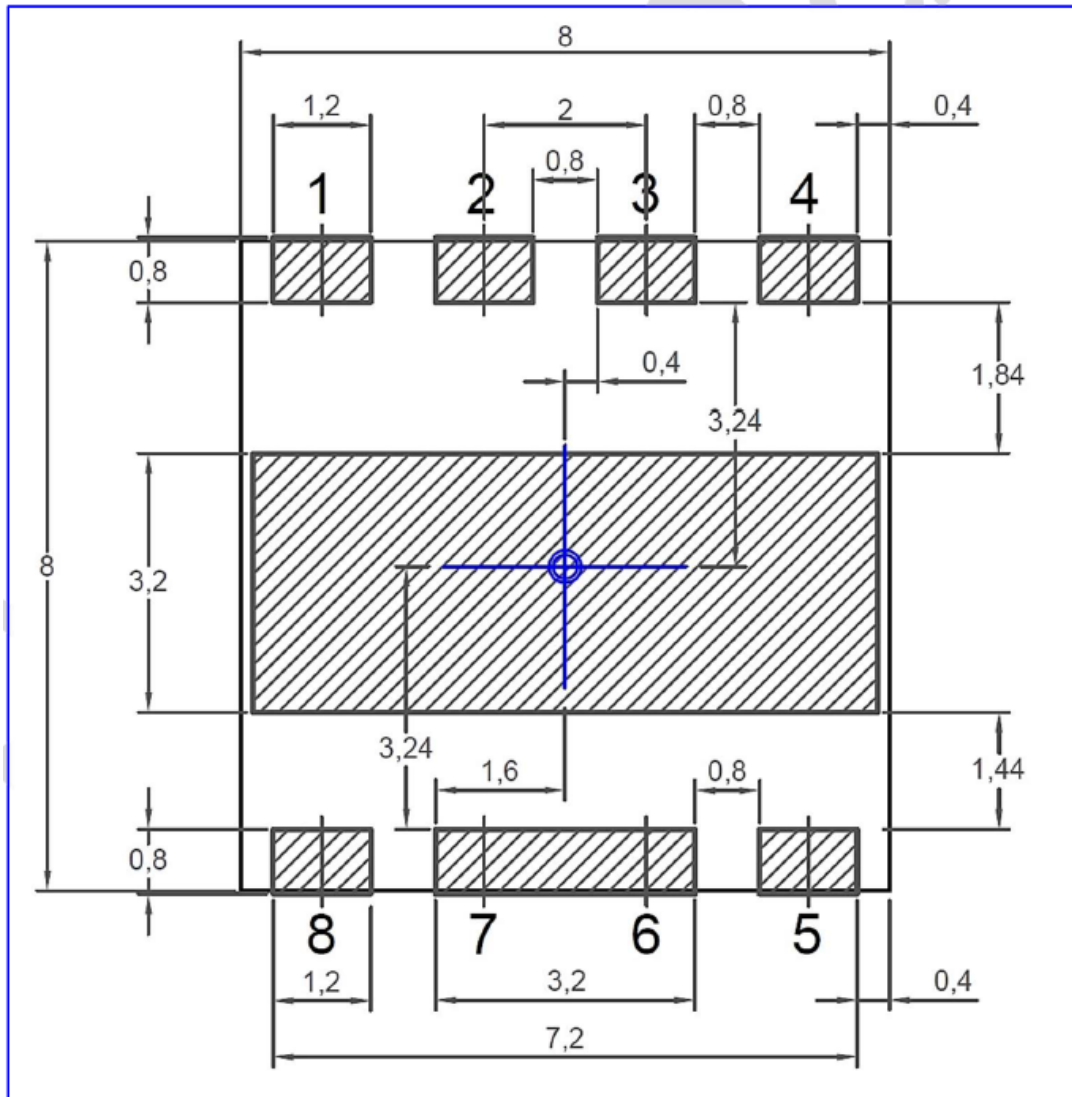


FIG.16- Switching Time Waveforms

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DFN-8X8 Recommended PCB Soldering Footprint



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