

NSH045N100P5

N-channel 100V Enhancement Mode Power MOSFET



VOLTAGE: 100 Volts

CURRENT: 120 Amperes

PDFN5*6

Marking and Polarity

FEATURES

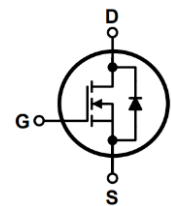
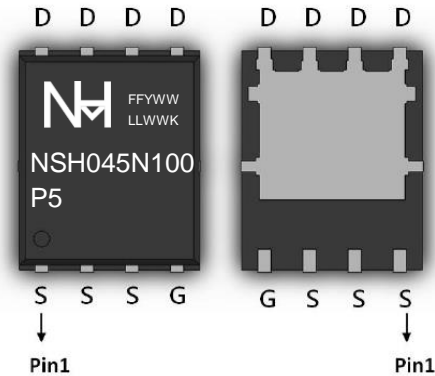
- Advanced trench MOSFET technology
- Low RDS(ON)
- Ultra Low Gate Charge
- RoHS Compliant
- 100% UIS and RG Tested
- High Power and current handing capability

TYPICAL APPLICATIONS

- PD Charger V-BUS
- SMPS 2nd Synchronous Rectifier
- MB/VGA Vcore
- BLDC Motor driver
- POL application

PRODUCT SUMMARY

B_{VDS} , Min. at Max. Tj	100	V
I_D	120	A
$R_{DS(ON)}$, Max. at Vgs=10V	4.5	mΩ
Qg, Typ.	90	nC



Remark:

- NH=niuhang trademark;
- FF=Product line code, According to actual changes
YWW=Data code, According to actual changes
LLWWF=Internal code, According to actual changes
- NSH045N100P5=Module.

Absolute Maximum Ratings (Ratings at 25°C ambient temperature unless otherwise specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (Note 1)	Ta=25°C	I_D	120	A
	Ta=100°C		77	
Drain Current-Pulsed (Note 1)		I_{DM}	480	A
Maximum Power Dissipation	Ta=25°C	P_D	227	W
Power Dissipation Derating Factor above 25°C	Ta=100°C		91	
Derating Factor		D_F	1.82	W/°C
Junction Temperature		T_J	-55 to 150	°C
Storage temperature range		T_{STD}	-55 to 150	°C
Avalanche Current, Single pulse	L= 0.5 mH	I_{AS}	32	A
Single Pulse Avalanche Energy	L=0.5mH, IAS=38A, VDD=50V, RG=25Ω, Starting Tj =25°C	E_{AS}	256	mJ

Thermal Characteristics (Ratings at 25°C ambient temperature unless otherwise specified)

Parameter	Symbol	Max	Unit
Thermal Resistance Junction to Ambient	$R_{θJA}$	62	°C/W
Thermal Resistance Junction-Case (Note 2)	$R_{θJC}$	0.55	°C/W

- Notes:
- Repetitive Rating : Pulse width limited by maximum junction temperature
 - The value of $R_{θJA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with TA =25° C.
The value in any given application depends on the user's specific board design. This transistor is sensitive to electrostatic discharge and should be handled with care.

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Electrical Characteristics (Ratings at 25°C ambient temperature unless otherwise specified)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=80V, V_{GS}=0V$	-	0.05	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	± 10	± 100	nA
Static on Characteristics						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	3.0	4.0	V
Drain-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=50A$	-	3.6	4.5	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=50A$	-	50	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V, f=1.0MHz$	-	6772	-	pF
Output Capacitance	C_{oss}		-	952	-	pF
Reverse Transfer Capacitance	C_{rss}		-	33	-	pF
Switching Parameters						
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=10V, V_{DD}=50V, R_{G_ext}=3.0\Omega$	-	28	-	ns
Turn-On Rise Time	t_r		-	32	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	48	-	ns
Turn-Off Rise Time	t_f		-	27	-	ns
Gate Resistance	R_g	$V_{DS}=0V, V_{GS}=0V, f=1.0MHz$	-	2.0	-	Ω
Total Gate Charge	Q_g	$V_{GS}=10V, V_{DS}=50V, I_D=20A, f=1MHz$	-	90	-	nC
Gate-Source Charge	Q_{gs}		-	28.0	-	nC
Gate-Drain Charge	Q_{gd}		-	19.0	-	nc
Drain-Source Diode Characteristics and Maximum Ratings						
Max. Diode Forward Current	I_{SD}		-	-	120	A
Max. Pulsed Forward Current	I_{SM}		-	-	480	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=50A$	-	0.89	1.3	V
Reverse Recovery Time	t_{rr}	$I_F=50A, di/dt=100A/\mu s$	-	80	-	ns
Reverse Recovery Charge	Q_{rr}		-	190	-	μC

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Typical Characteristics Curves

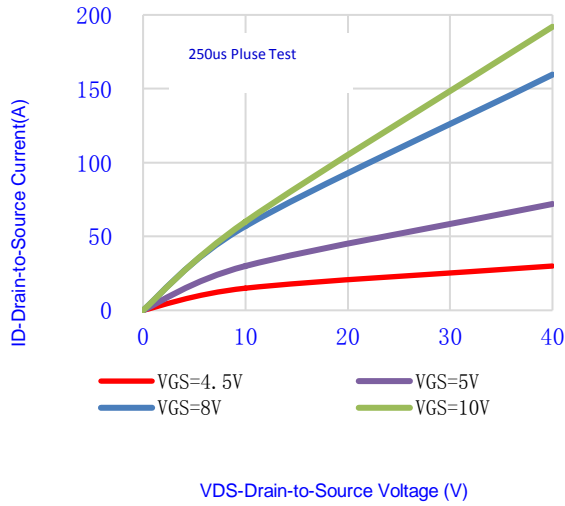


Fig.1-Output Characteristics

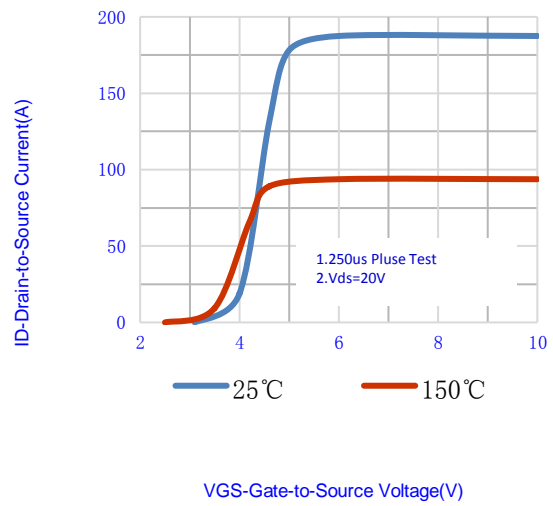


Fig.2- Transfer Characteristics

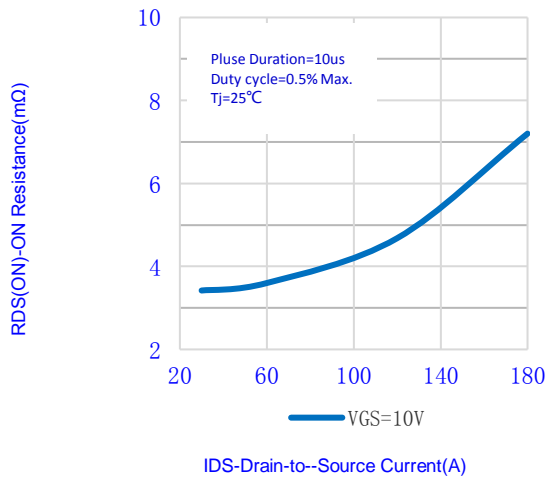


Fig.3- On Resistance vs. Drain Current

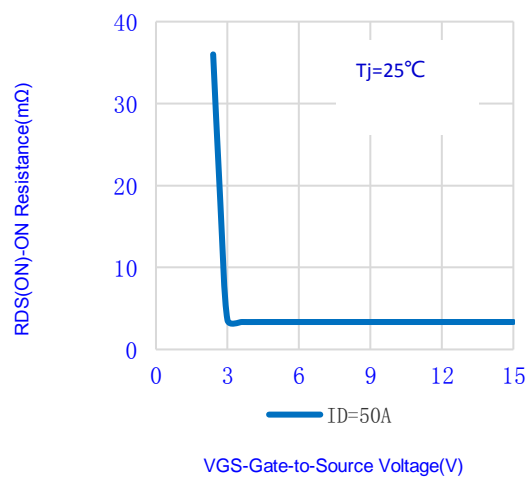


Fig.4- On Resistance vs. Gate Source Voltage

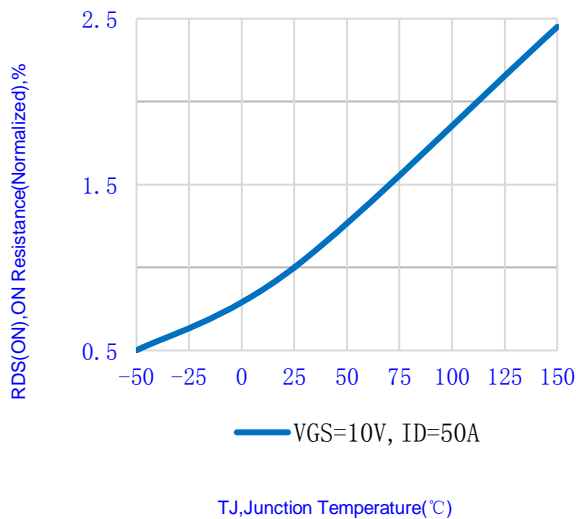


Fig.5- On Resistance vs. Junction Temperature

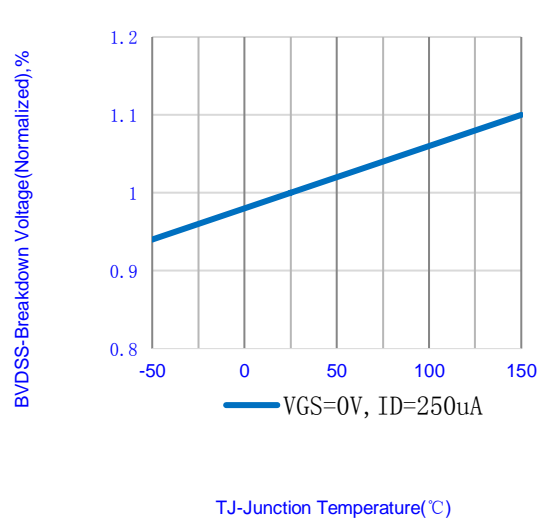


Fig.6- Breakdown Voltage vs. Junction Temperature

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Typical Characteristics Curves

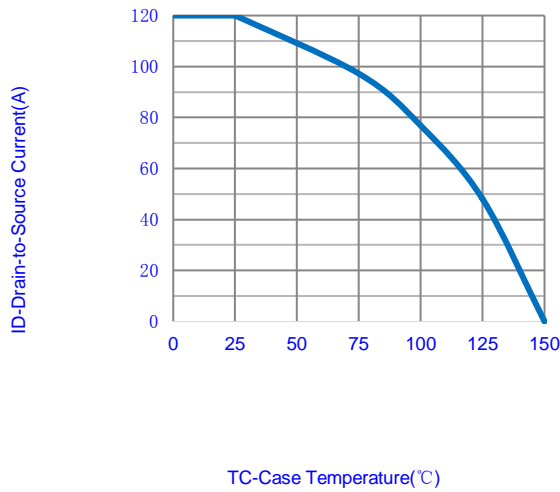


Fig.7-Maximum Continuous Drain Current vs. Case Temperature

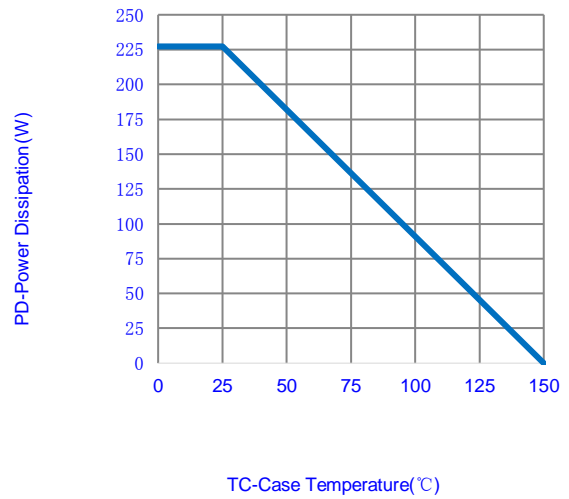


Fig.8-Maximum Power Dissipation vs. Case Temperature

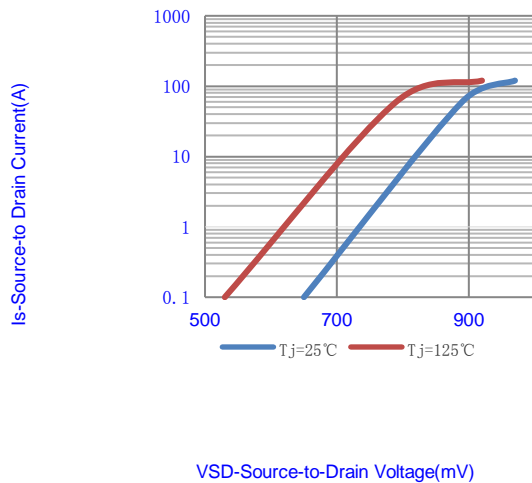


Fig.9- Source-Drain Diode Forward Voltage

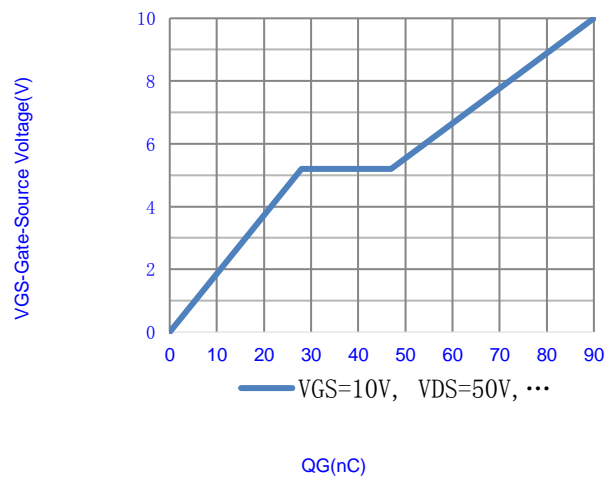


Fig.10-Gate Charge Waveform

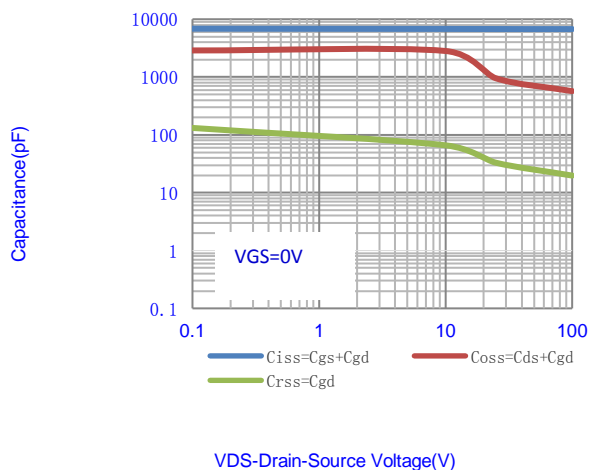


Fig.11- Gate-Source Voltage-VGS(V)

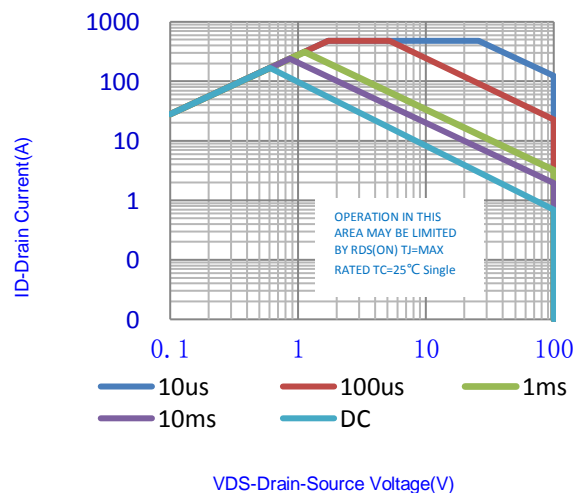


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

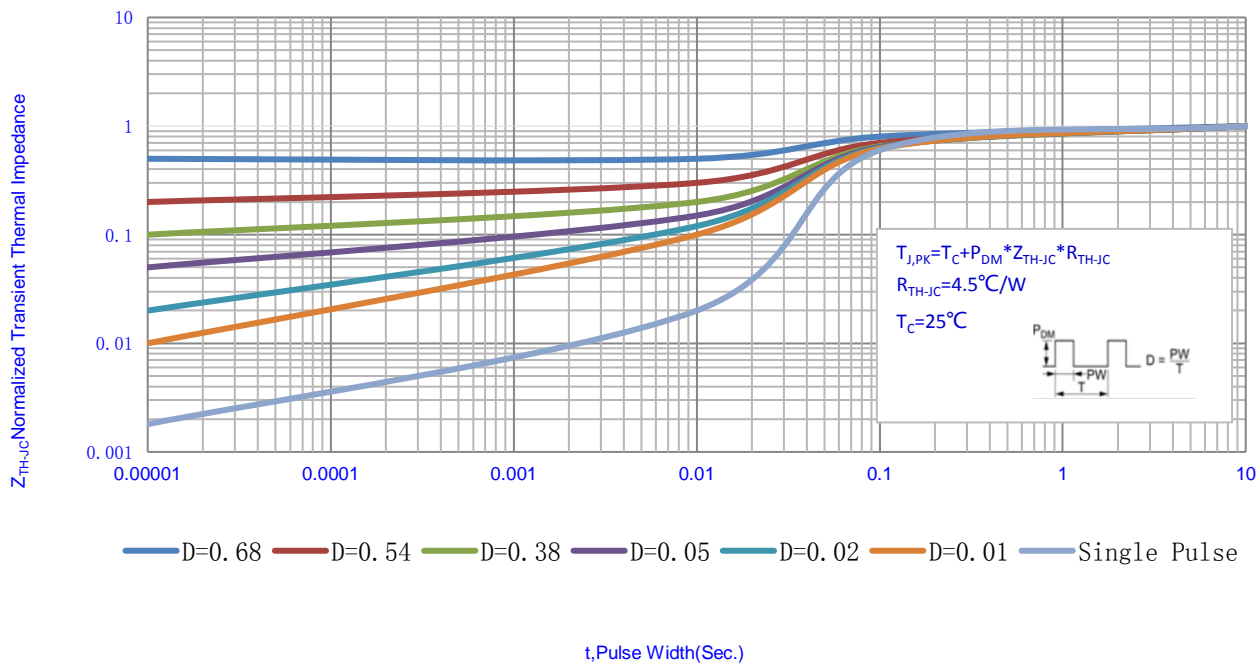


Fig.13- Normalized Transient Thermal Impedance vs. Pulse Width

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Test Circuit & Waveform

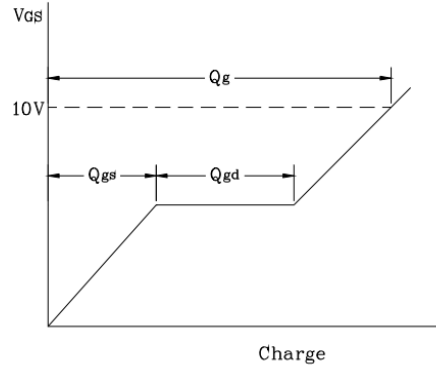
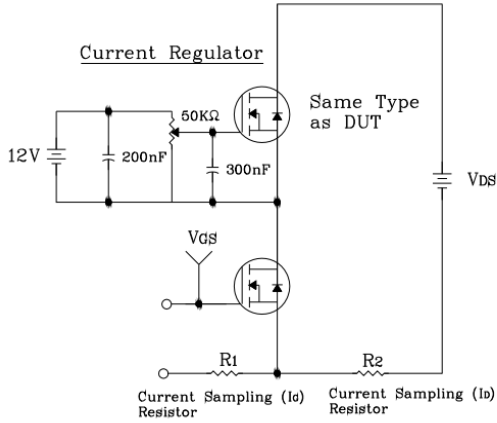


Fig.12-Gate Charge Test Circuit & Waveform

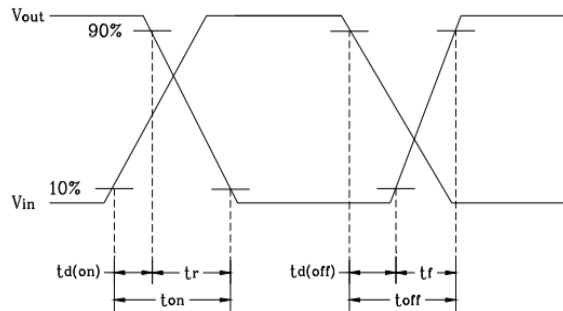
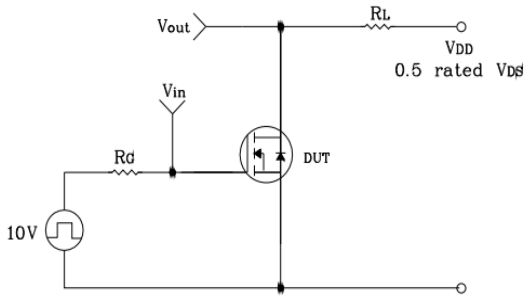


Fig.13- Resistive Switching Test Circuit & Waveform

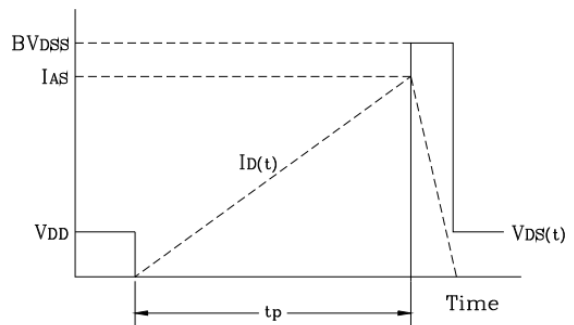
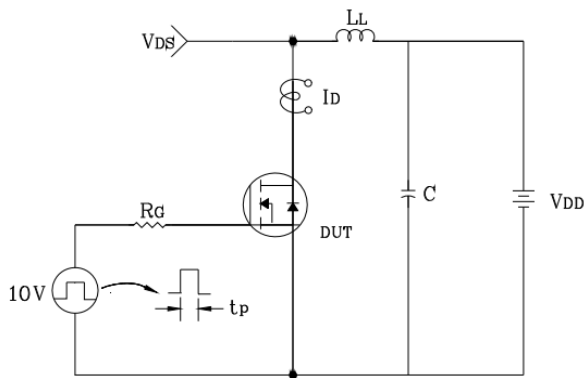


Fig.14- EAS Test Circuit & Waveform

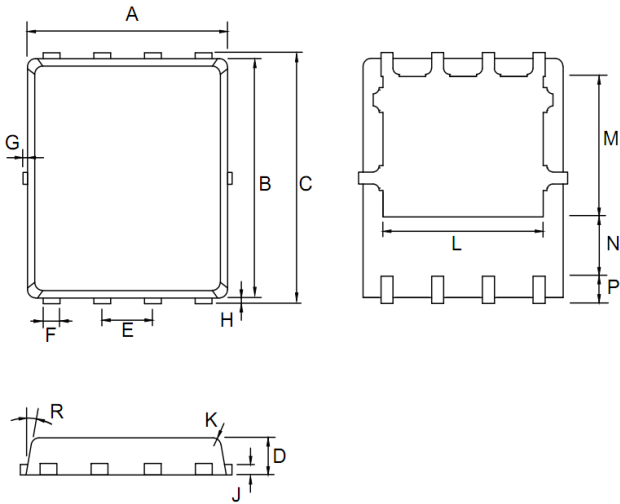
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OUTLINE DRAWINGS

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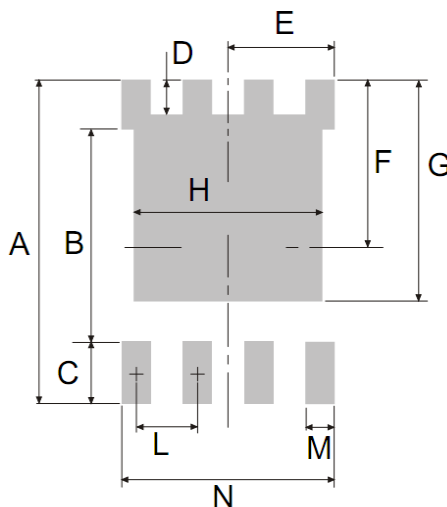


OUTLINE DIMENSIONS

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.800	4.900	5.000	0.189	0.193	0.197
B	5.650	5.750	5.850	0.222	0.226	0.230
C	5.900	6.000	6.100	0.232	0.236	0.240
D	0.900	1.000	1.100	0.035	0.039	0.043
E	-	1.270	-	-	0.050	-
F	0.250	0.300	0.350	0.010	0.012	0.014
G	-	-	0.150	-	-	0.006
H	0.100	0.130	0.160	0.004	0.005	0.006
J	-	0.254	-	-	0.010	-
K	-	R0.1	-	-	R0.0039	-
L	-	4.000	-	-	0.157	-
M	-	3.450	-	-	0.136	-
N	-	1.350	-	-	0.053	-
P	-	0.550	-	-	0.022	-
R	-	0.1	-	-	0.004	-

OUTLINE DRAWINGS

PDFN5*6



RECOMMENDED LAYOUT DIMENSIONS

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	6.600	-	-	0.260	-
B	-	4.320	-	-	0.170	-
C	-	1.270	-	-	0.050	-
D	-	0.700	-	-	0.028	-
E	-	2.200	-	-	0.087	-
F	-	3.300	-	-	0.130	-
G	-	4.500	-	-	0.177	-
L	-	1.270	-	-	0.050	-
M	-	0.600	-	-	0.024	-
N	-	4.400	-	-	0.173	-

PACKING INFORMATION

PDFN5*6

Package Method	Reel Size (mm)	Quantity (pcs/reel)	Inner Box Size LxWxH(mm)	Quantity (pcs/Inner Box)	Outer Carton Size LxWxH(mm)	Quantity (pcs/carton)
Tape Reel	Φ340	5000	340x340x50	10000	360x360x260	50000

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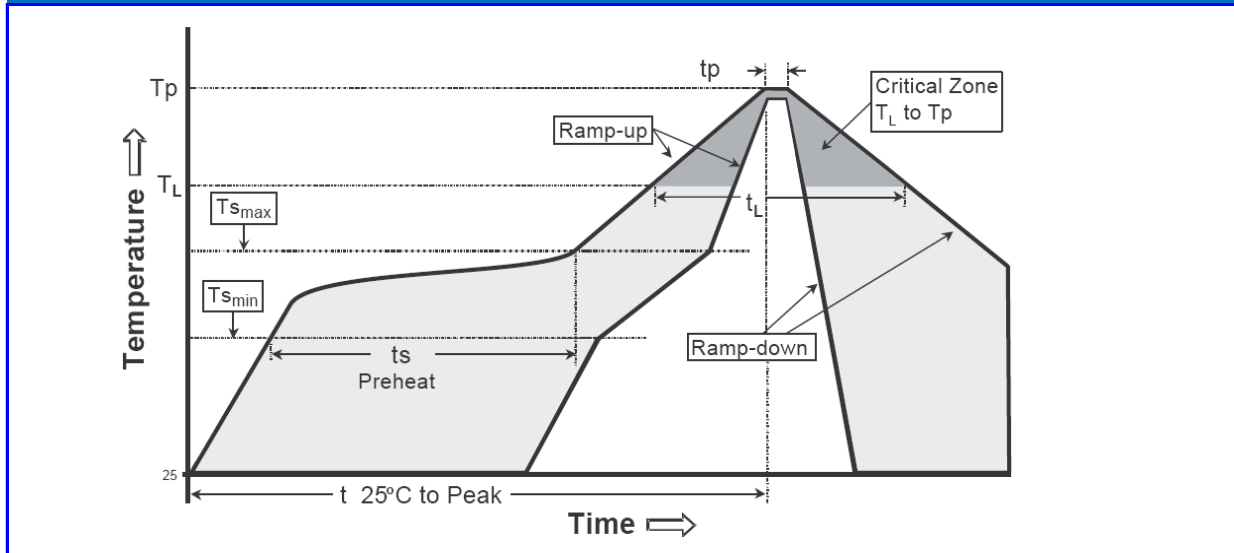
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Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmmax to Tp)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-40 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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