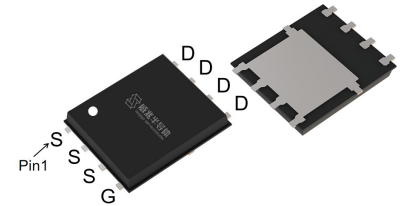


Features

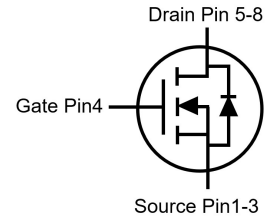
- Enhancement mode
- Very low on-resistance
- VitoMOS® II Technology
- 100% Avalanche Tested, 100% Rg Tested

V_{DS}	40	V
$R_{DS(on),TYP@ V_{GS}=10V}$	2.6	mΩ
$I_D(\text{Silicon Limited})$	78	A
$I_D(\text{Package Limited})$	33	A

PDFN5x6



Part ID	Package Type	Marking	Packing
VSP003N04HS-G	PDFN5x6	003N04H	3000pcs/Reel



Maximum ratings, at $T_A=25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		40	V
V_{GS}	Gate-Source voltage		± 20	V
I_S	Diode continuous forward current	$T_C = 25^\circ\text{C}$	25	A
I_D	Continuous drain current @ $V_{GS}=10V$ (Silicon limited)	$T_C = 25^\circ\text{C}$	78	A
I_D	Continuous drain current @ $V_{GS}=10V$ (Silicon limited)	$T_C = 100^\circ\text{C}$	49	A
I_D	Continuous drain current @ $V_{GS}=10V$ (Wire bond limited)	$T_C = 25^\circ\text{C}$	33	A
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	312	A
I_{DSM}	Continuous drain current @ $V_{GS}=10V$	$T_A = 25^\circ\text{C}$	23	A
		$T_A = 70^\circ\text{C}$	18	A
E_{AS}	Avalanche energy, single pulsed ②		256	mJ
P_D	Maximum power dissipation ③	$T_C = 25^\circ\text{C}$	30	W
		$T_C = 100^\circ\text{C}$	12	W
P_{DSM}	Maximum power dissipation ④	$T_A = 25^\circ\text{C}$	2.6	W
		$T_A = 70^\circ\text{C}$	1.7	W
T_{STG}, T_J	Storage and Junction Temperature Range		-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ⑤	3.4	4.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ⑥	40	48	$^\circ\text{C/W}$

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
V(BR)DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(T _j =25°C)	V _{DS} =40V,V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)⑦	V _{DS} =40V,V _{GS} =0V	--	--	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V,V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} ,I _D =250μA	2.3	2.8	3.3	V
R _{DS(on)}	Drain-Source On-State Resistance ⑧	V _{GS} =10V, I _D =40A	--	2.6	3.4	mΩ
		T _j =100°C ⑦	--	3.1	--	mΩ
Dynamic Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance ⑦	V _{DS} =20V,V _{GS} =0V, f=1MHz	1025	2050	3585	pF
C _{oss}	Output Capacitance ⑦		430	865	1510	pF
C _{rss}	Reverse Transfer Capacitance ⑦		45	90	160	pF
R _g	Gate Resistance	f=1MHz	0.2	2.1	5	Ω
Q _g	Total Gate Charge ⑦	V _{DS} =20V,I _D =40A, V _{GS} =10V	--	35	61	nC
Q _{gs}	Gate-Source Charge ⑦		--	9.3	16	nC
Q _{gd}	Gate-Drain Charge ⑦		--	10	18	nC
Switching Characteristics ⑦						
T _{d(on)}	Turn-on Delay Time	V _{DD} =20V, I _D =40A, R _G =3Ω, V _{GS} =10V	--	9.8	--	ns
T _r	Turn-on Rise Time		--	80	--	ns
T _{d(off)}	Turn-Off Delay Time		--	23	--	ns
T _f	Turn-Off Fall Time		--	17	--	ns
Source- Drain Diode Characteristics@ T _j = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =40A,V _{GS} =0V	--	0.8	1.2	V
T _{rr}	Reverse Recovery Time ⑦	I _{SD} =40A, V _{GS} =0V di/dt=100A/μs	--	31	62	ns
Q _{rr}	Reverse Recovery Charge ⑦		--	19	38	nC

NOTE:

- ① Single pulse; pulse width $\leq 100\mu s$.
- ② EAS of 256mJ is based on starting $T_j = 25^\circ\text{C}$, $L = 0.5\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 32A$, $V_{GS}=10V$; 100% FT tested at $L = 0.5\text{mH}$, $I_{AS} = 18A$.
- ③ The power dissipation P_d is based on $T_j(\text{max})$, using junction-to-case thermal resistance $R_{\theta JC}$.
- ④ The power dissipation P_{dsm} is based on $T_j(\text{max})$, using junction-to-ambient thermal resistance $R_{\theta JA}$.
- ⑤ These tests are performed respectively with the device mounted on a 1 in2 pad and a minimum pad of 2oz. Copper FR-4 board in a still air environment with $T_A=25^\circ\text{C}$, using Transient Dual Interface method to acquire $R_{\theta JC}$.
- ⑥ These tests are performed with the device mounted on 1 in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.
- ⑦ Guaranteed by design, not subject to production testing.
- ⑧ Pulse width $\leq 380\mu s$; duty cycles $\leq 2\%$.

Typical Characteristics

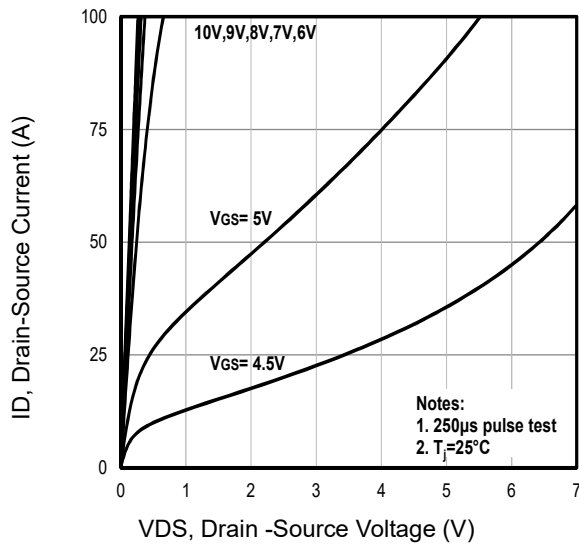


Fig1. Typical Output Characteristics

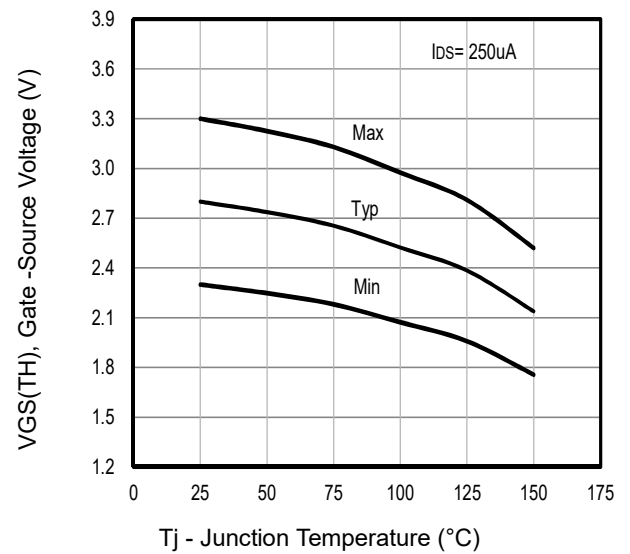


Fig2. Typical $V_{GS(TH)}$ Gate-Source Voltage Vs. T_j

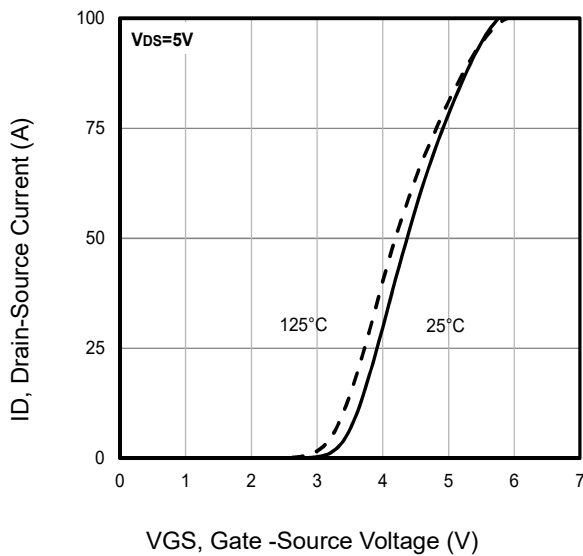


Fig3. Typical Transfer Characteristics

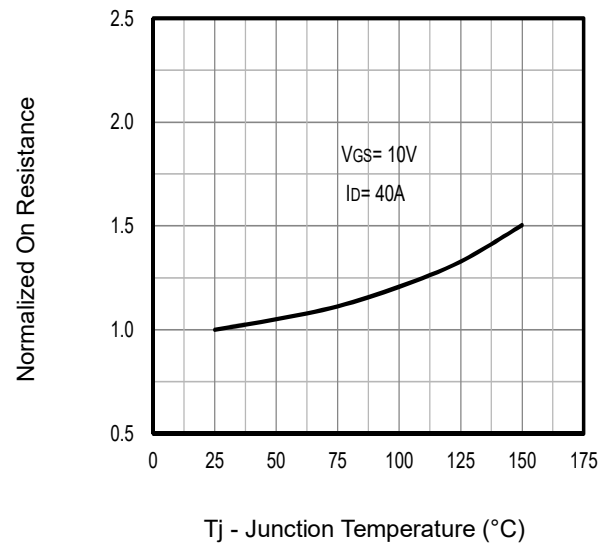


Fig4. Typical Normalized On-Resistance Vs. T_j

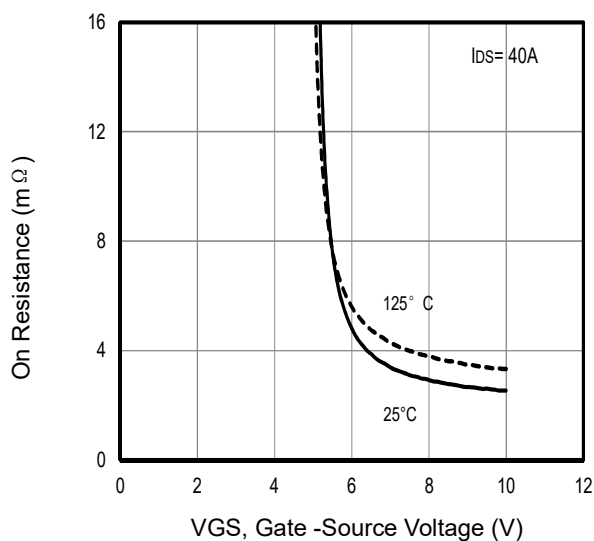


Fig5. Typical On Resistance Vs Gate-Source Voltage

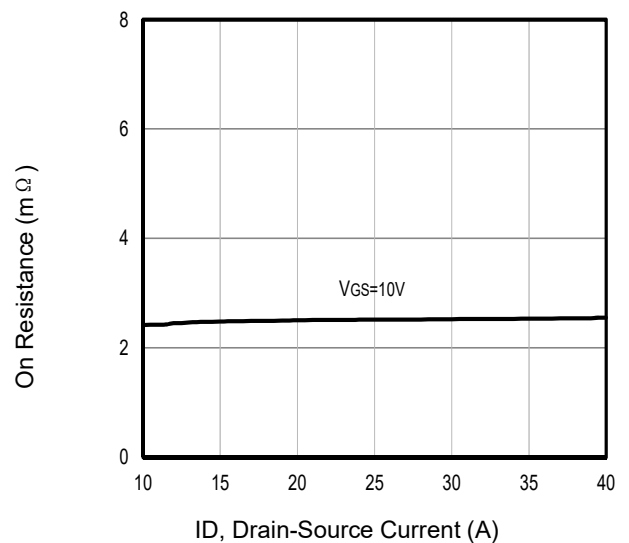


Fig6. Typical On Resistance Vs Drain Current

Typical Characteristics

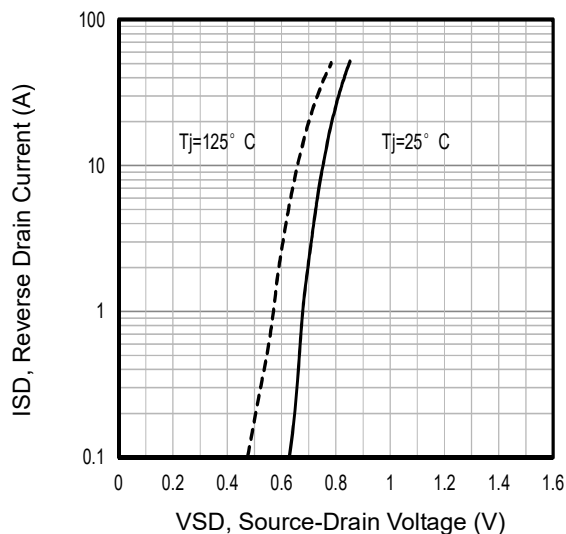


Fig7. Typical Source-Drain Diode Forward Voltage

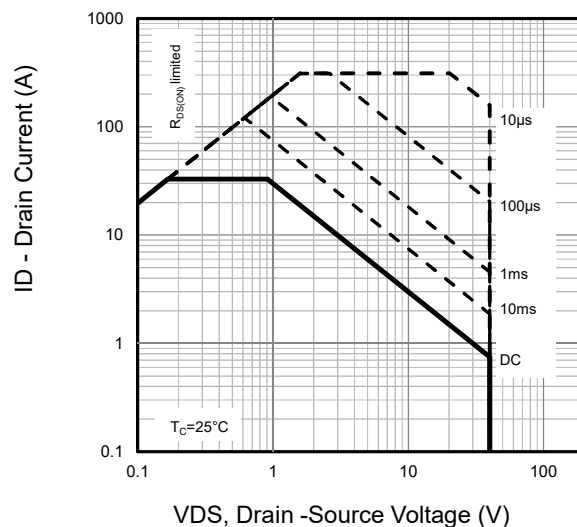


Fig8. Maximum Safe Operating Area

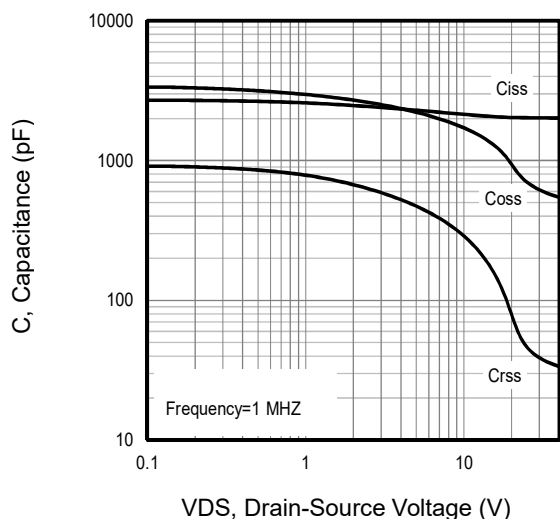


Fig9. Typical Capacitance Vs. Drain-Source Voltage

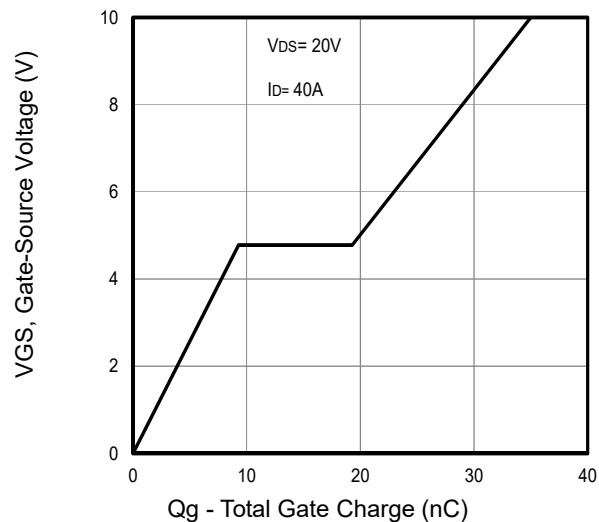


Fig10. Typical Gate Charge Vs. Gate-Source Voltage

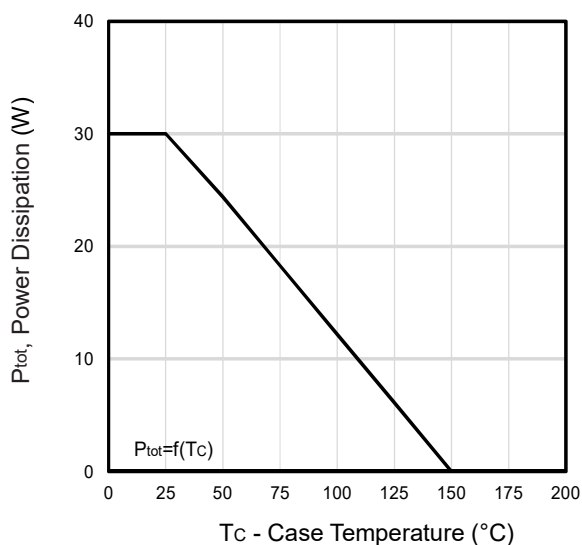


Fig11. Power Dissipation Vs. Case Temperature

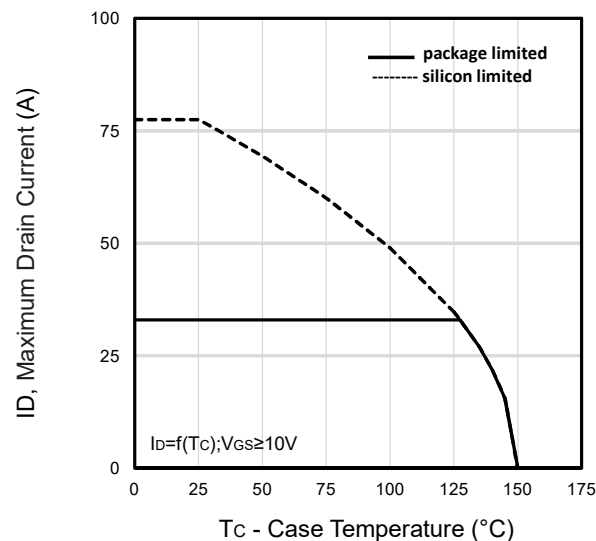


Fig12. Maximum Drain Current Vs. Case Temperature

Typical Characteristics

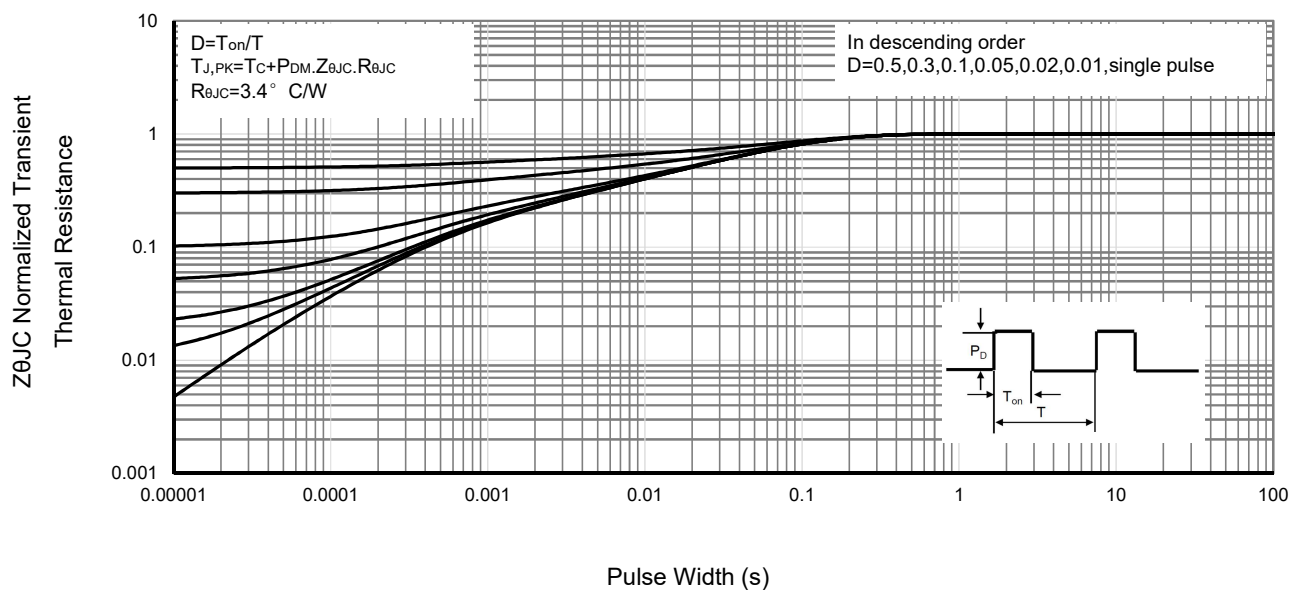


Fig13 . Normalized Maximum Transient Thermal Impedance

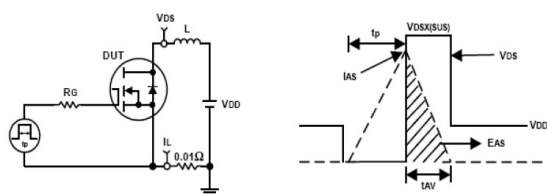


Fig14. Unclamped Inductive Test Circuit and waveforms

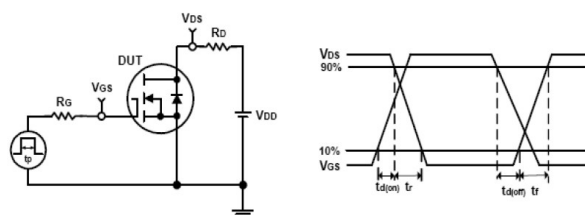
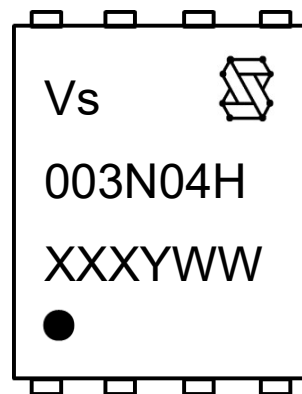


Fig15. Switching Time Test Circuit and waveforms

Marking Information



1st line: Vergiga Code (Vs) , Vergiga Logo

2nd line: Part Number (003N04H)

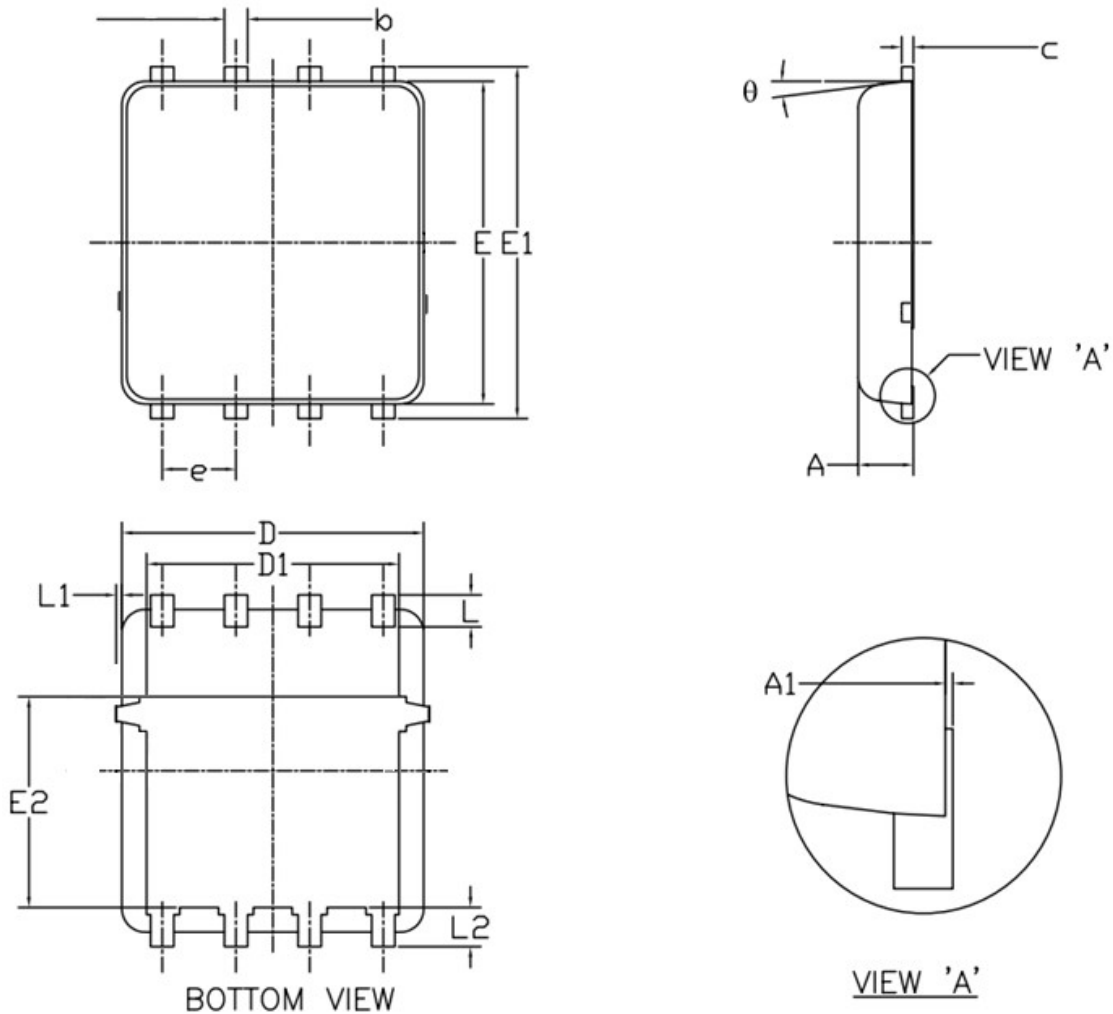
3rd line: Date code (XXXYWW)

XXX: Wafer Lot Number Code, code changed with Lot Number

Y: Year Code, refer to table below

WW: Week Code (01 to 53)

Code	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

PDFN5x6 Package Outline Data


Symbol	DIMENSIONS (unit : mm)		
	Min	Typ	Max
A	0.90	1.00	1.20
A1	0.00	--	0.05
b	0.30	0.40	0.51
c	0.20	0.25	0.33
D	4.80	4.90	5.40
D1	3.61	4.00	4.25
E	5.65	5.80	6.06
E1	5.90	6.10	6.35
E2	3.38	3.58	3.92
e	1.27 BSC		
L	0.51	0.61	0.71
L1	--	--	0.15
L2	0.41	0.51	0.61
θ	0°	--	12°

Notes:

1. Refer to JEDEC MO-240 variation AA.
2. Dimensions "D" and "E" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D" and "E" include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25mm per side.

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