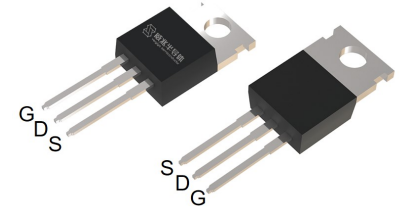


## Features

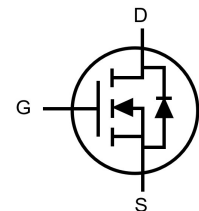
- Enhancement mode
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5\text{ V}$
- VitoMOS<sup>®</sup> II Technology
- 100% Avalanche test
- Pb-free lead plating; RoHS compliant



$V_{DS}$	100	V
$R_{DS(on),TYP}@ V_{GS}=10\text{ V}$	10	m $\Omega$
$R_{DS(on),TYP}@ V_{GS}=4.5\text{ V}$	13.5	m $\Omega$
$I_D$	65	A

**TO-220AB**


Part ID	Package Type	Marking	Packing
VST011N10MS-G	TO-220AB	011N10MG	50pcs/Tube



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

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	100	V
$V_{GS}$	Gate-Source voltage	$\pm 20$	V
$I_S$	Diode continuous forward current	$T_C = 25^\circ\text{C}$	65 A
$I_D$	Continuous drain current @ $V_{GS}=10\text{V}$	$T_C = 25^\circ\text{C}$	65 A
		$T_C = 100^\circ\text{C}$	46 A
$I_{DM}$	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	260 A
$I_{DSM}$	Continuous drain current @ $V_{GS}=10\text{V}$	$T_A = 25^\circ\text{C}$	10 A
		$T_A = 70^\circ\text{C}$	8 A
EAS	Avalanche energy, single pulsed ②	16	mJ
$P_D$	Maximum power dissipation	$T_C = 25^\circ\text{C}$	86 W
$P_{DSM}$	Maximum power dissipation ③	$T_A = 25^\circ\text{C}$	2 W
$T_{STG}, T_J$	Storage and Junction Temperature Range	-55 to 175	$^\circ\text{C}$

## Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.75	2.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	75	$^\circ\text{C/W}$

**Electrical Characteristics**

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>j</sub>=25°C (unless otherwise stated)</b>						
V <sub>BR(DSS)</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	100	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T <sub>j</sub> =125°C)	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V	--	--	100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.4	1.8	2.5	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =10V, I <sub>D</sub> =40A	--	10	13	mΩ
		T <sub>j</sub> =100°C	--	13	--	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =4.5V, I <sub>D</sub> =25A	--	13.5	18	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	1145	1525	2030	pF
C <sub>oss</sub>	Output Capacitance		525	700	930	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		23	30	40	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	0.2	0.7	1.5	Ω
Q <sub>g</sub> (10V)	Total Gate Charge	V <sub>DS</sub> =50V, I <sub>D</sub> =40A, V <sub>GS</sub> =10V	--	25.5	34	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge		--	13	17	nC
Q <sub>gs</sub>	Gate-Source Charge		--	5.5	7.3	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	5.3	8	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =50V, I <sub>D</sub> =40A, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V	--	9	--	ns
t <sub>r</sub>	Turn-on Rise Time		--	38	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	22	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	44	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =40A, V <sub>GS</sub> =0V	--	0.9	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>sd</sub> =40A, V <sub>GS</sub> =0V	--	40	80	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs	--	32	64	nC

**NOTE:**

- ① Repetitive rating; pulse width limited by max junction temperature.
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 8A, V<sub>GS</sub> = 10V. Part not recommended for use above this value
- ③ The power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 380μs; duty cycle ≤ 2%.

Typical Characteristics

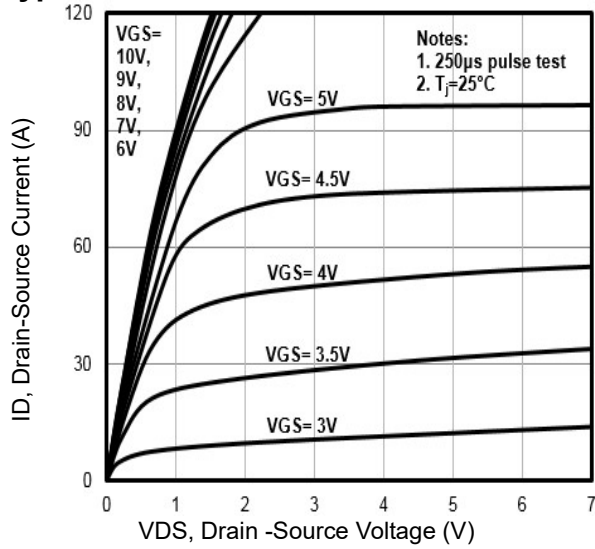


Fig1. Typical Output Characteristics

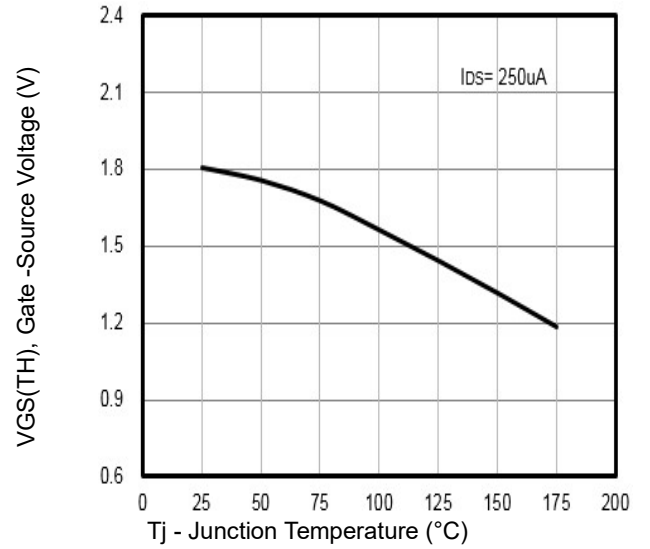


Fig2. V<sub>GS(TH)</sub> Gate-Source Voltage Vs. T<sub>j</sub>

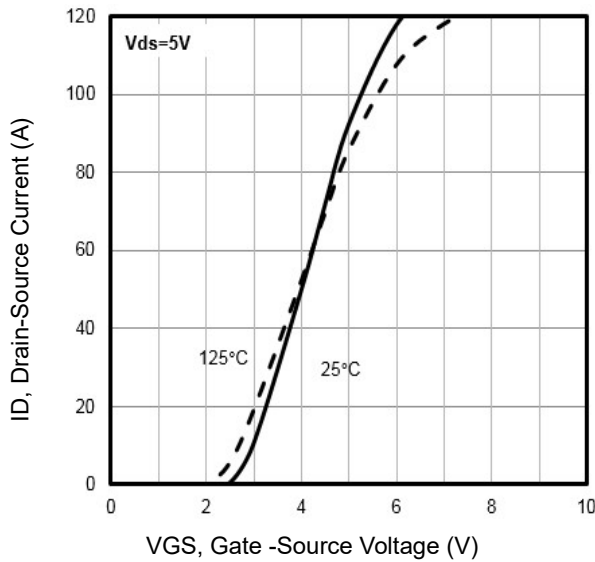


Fig3. Typical Transfer Characteristics

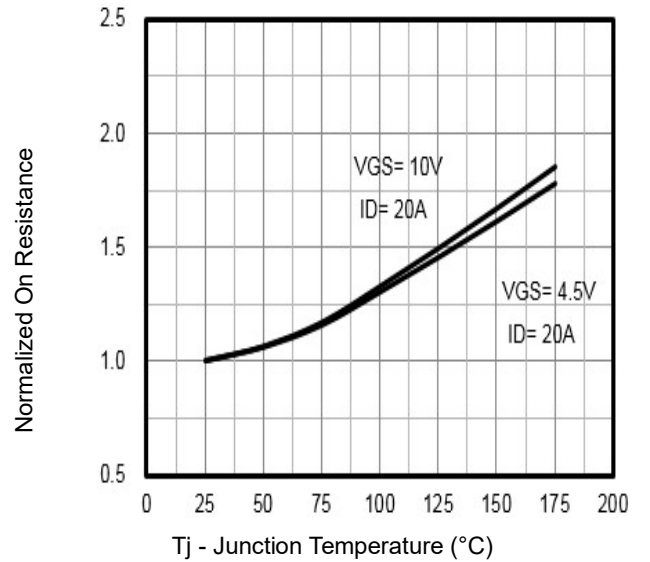


Fig4. Normalized On-Resistance Vs. T<sub>j</sub>

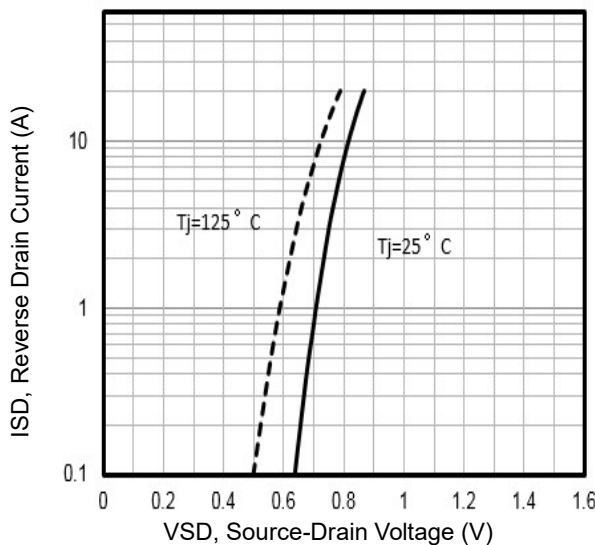


Fig5. Typical Source-Drain Diode Forward Voltage

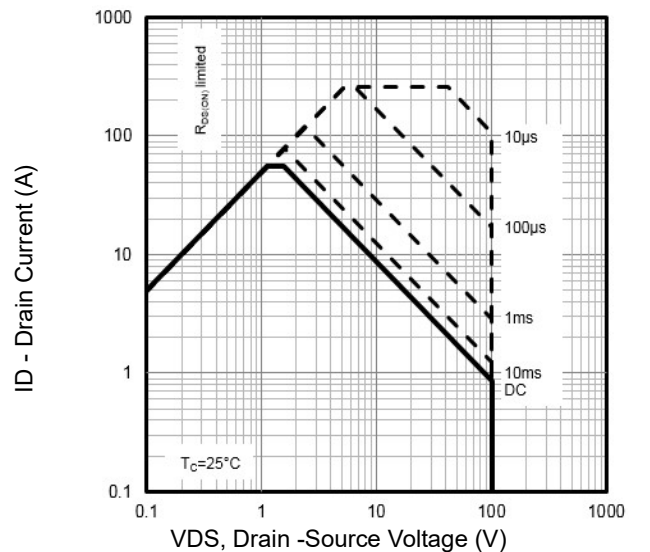
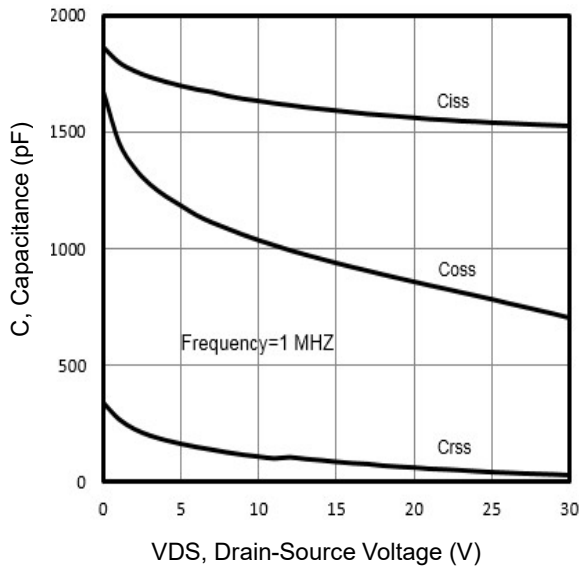
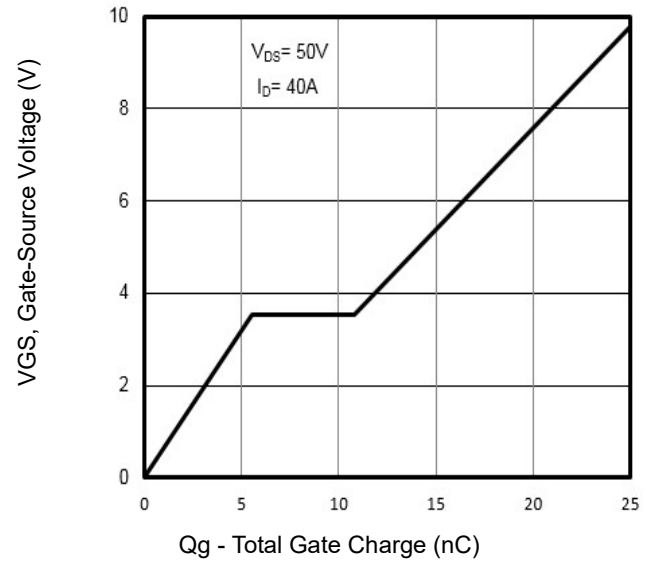
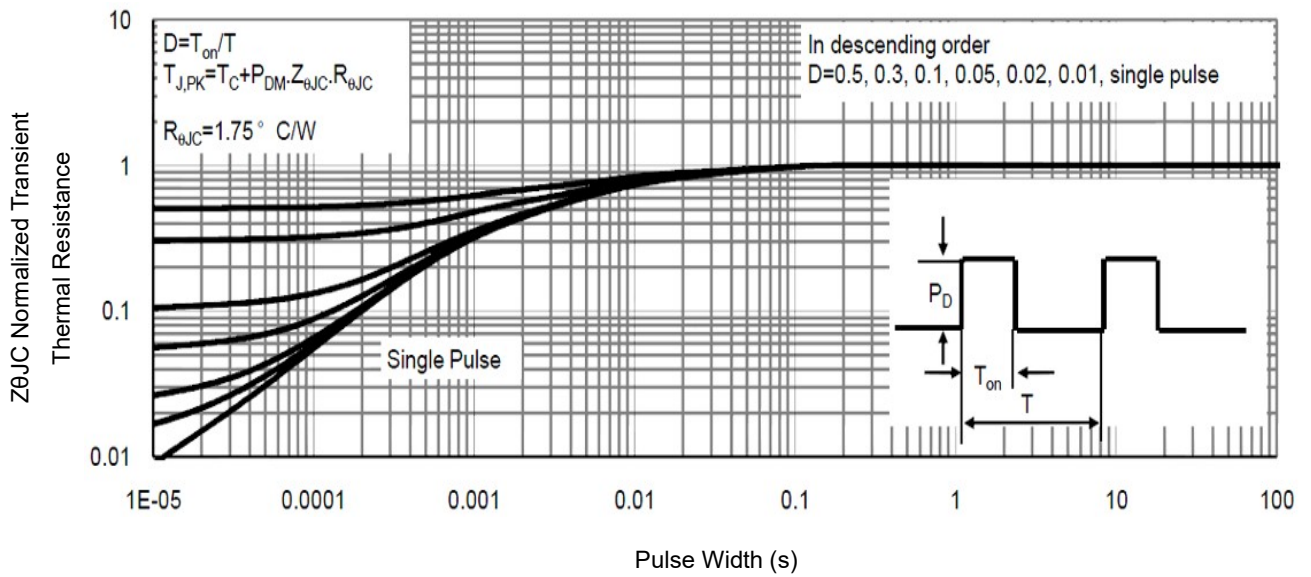
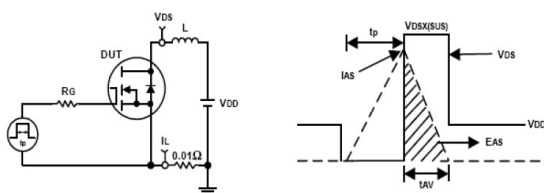
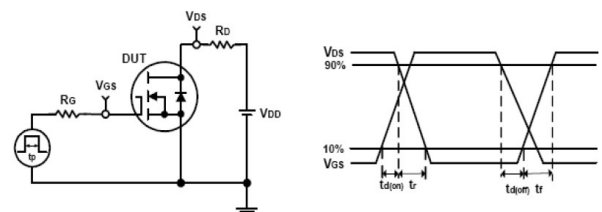
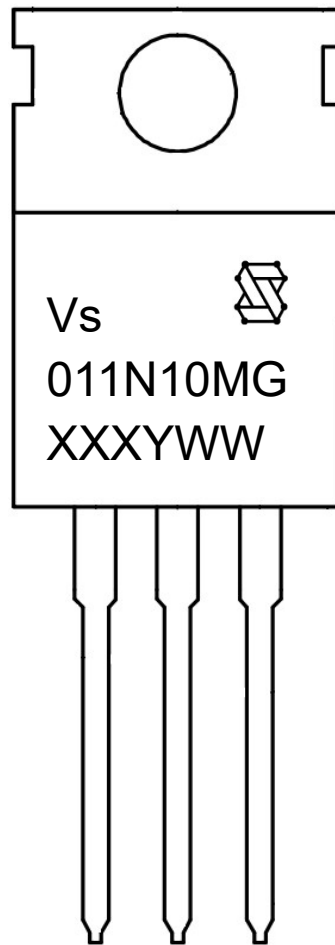


Fig6. Maximum Safe Operating Area

**Typical Characteristics**

**Fig7.** Typical Capacitance Vs. Drain-Source Voltage

**Fig8.** Typical Gate Charge Vs. Gate-Source Voltage

**Fig9.** Normalized Maximum Transient Thermal Impedance

**Fig10.** Unclamped Inductive Test Circuit and waveforms

**Fig11.** Switching Time Test Circuit and waveforms

**Marking Information**



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

2nd line: Part Number (011N10MG)

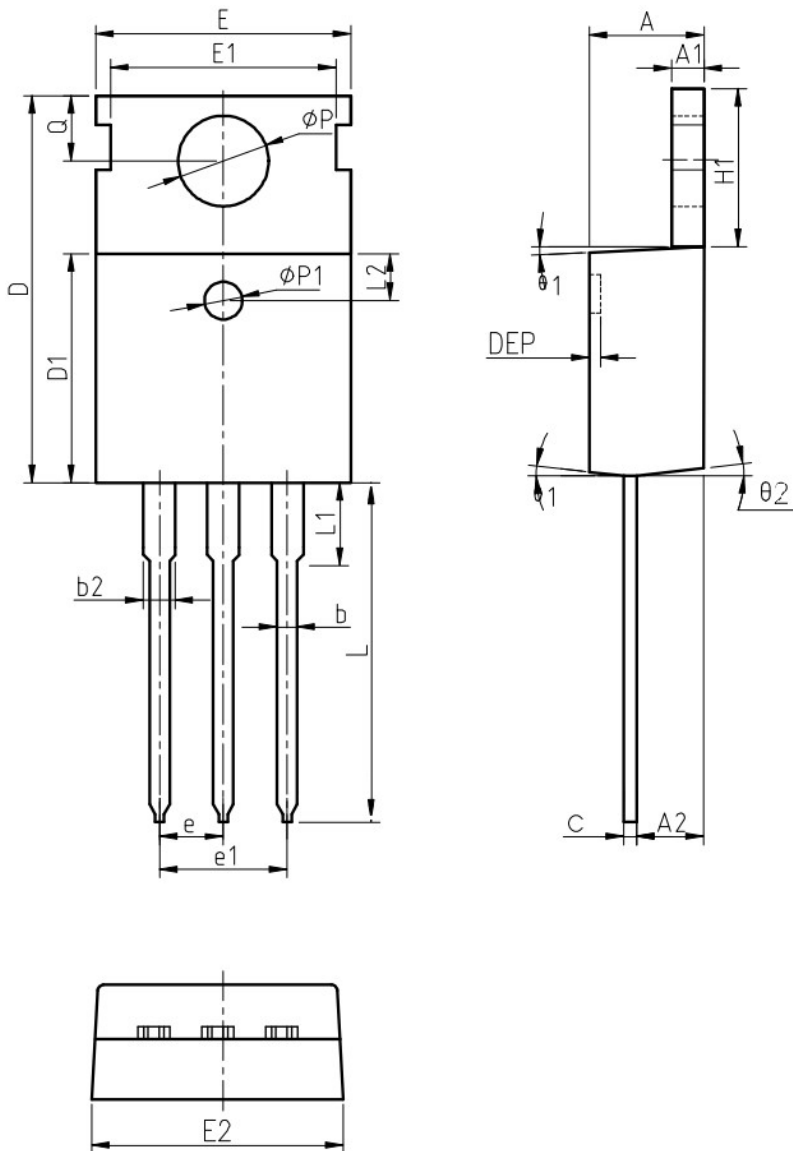
3rd line: Date code (XXXYWW)

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

**TO-220AB Package Outline Data**


Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
<b>A</b>	4.30	4.52	4.70
<b>A1</b>	1.15	1.30	1.40
<b>A2</b>	2.20	2.40	2.60
<b>b</b>	0.70	0.80	1.00
<b>b2</b>	1.17	1.32	1.50
<b>c</b>	0.45	0.50	0.61
<b>D</b>	15.30	15.65	15.90
<b>D1</b>	9.00	9.20	9.40
<b>DEP</b>	0.05	0.10	0.25
<b>E</b>	9.66	9.90	10.28
<b>E1</b>	-	8.70	-
<b>E2</b>	9.80	10.00	10.20
$\phi P1$	1.40	1.50	1.60
<b>e</b>	2.54 BSC		
<b>e1</b>	5.08 BSC		
<b>H1</b>	6.40	6.50	6.80
<b>L</b>	12.70	-	14.27
<b>L1</b>	-	-	3.95
<b>L2</b>	2.40	2.50	2.60
$\phi P$	3.53	3.60	3.70
<b>Q</b>	2.70	2.80	2.90
$\theta1$	5 °	7 °	9 °
$\theta2$	1 °	3 °	5 °

**Notes:**

1. Refer to JEDEC TO-220 variation AB
2. Dimension "D" and "E" do NOT include mold flash. Mold flash shall not exceed 0.127mm per side.

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