SuperMOS –TO-252 60V BV_{DSS}, 26mΩ $R_{DS(on)}$, N-channel MOSFET

1. Description

The ES50N06 is N-Channel enhancement MOS Field Effect Transistor. Uses advanced technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product ES50N06 is Pb-free.

2. Features

- 60V, $R_{DS(ON)}$=26mΩ(TYP.) @V_{GS}=10V
  $R_{DS(ON)}$=33mΩ(TYP.) @V_{GS}=4.5V
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

3. Applications

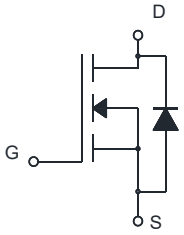
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

100% UIS TESTED!

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
ES50N06	TO-252	ES35N06A/LOT	Halogen free	Tape & Reel	2,500 PCS	UL 94V-0	13 inches

5. Pin Configuration and Functions

Pin	Function	Outline	Circuit Diagram
1	Gate	Note b 	
3	Source		
2	Drain		

6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 ℃ ambient temperature unless otherwise specified.

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		BV_{DSS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	20	A
	T_C=75°C		16	
Maximum Power Dissipation		P_D	25	W
Pulsed Drain Current		I_{DM}	80	A
Avalanche Current, Single Pulsed [a]		I_{AS}	16	A
Avalanche Energy, Single Pulsed [a]		E_{AS}	16	mJ
Operating Junction Temperature		T_J	150	°C
Lead Temperature		T_L	260	°C
Storage Temperature Range		T_{stg}	-55 to 150	°C

Thermal resistance ratings

Single Operation					
Parameter		Symbol	Typ	Max	Unit
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$		5	℃/W

Note:

a: Tj=25℃,VDD=60V, VG=10V, L=0.3mH, Rg=25Ω

b: This diagram is only an electrical schematic, and the actual pin size is based on POD.

Electrical Characteristics

At TA = 25℃ unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	60			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V, V_{GS}=0V			1.0	uA
Gate-to-source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_D=250uA	1.0	1.6	2.5	V
Drain-to-source On-resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=20A		26	33	mΩ
		V_{GS}=4.5V, I_D=10A		33	45	
Forward Trans conductance	g_{FS}	V_{DS}=5.0V, I_D=20A			40	S
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS}=0V, f=1MHz, V_{DS}=25V		860		pF
Output Capacitance	C_{OSS}			62		
Reverse Transfer Capacitance	C_{RSS}			51		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=10V, V_{DS}=30V, I_D=10A		20.3		nC
Gate-to-Source Charge	Q_{GS}			3.8		
Gate-to-Drain Charge	Q_{GD}			5.5		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	V_{GS}=10V, V_{DS}=30V, I_D=5A, R_G=1.8Ω		6		ns
Rise Time	t_r			6		
Turn-Off Delay Time	$t_{d(OFF)}$			19		
Fall Time	t_f			3		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	V_{GS}=0V, I_S=10A		0.7	1.5	V

7. Typical Characteristic

Figure1: Output Characteristics

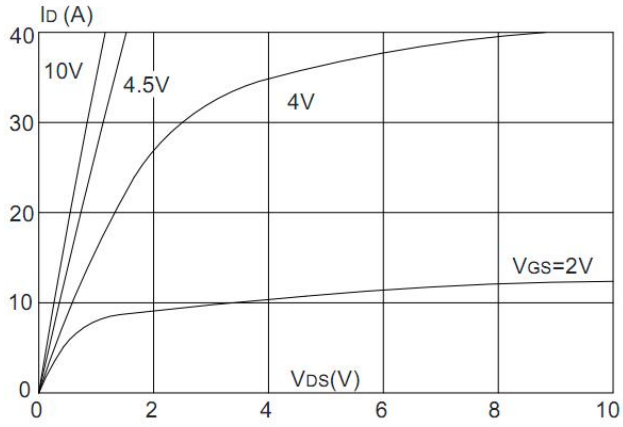


Figure 2: Typical Transfer Characteristics

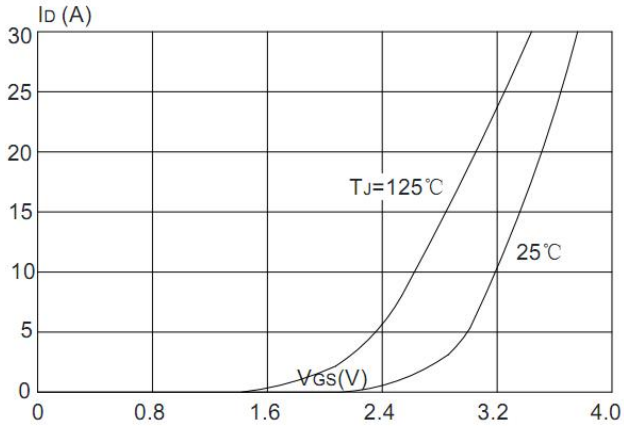


Figure 3: On-resistance vs. Drain Current

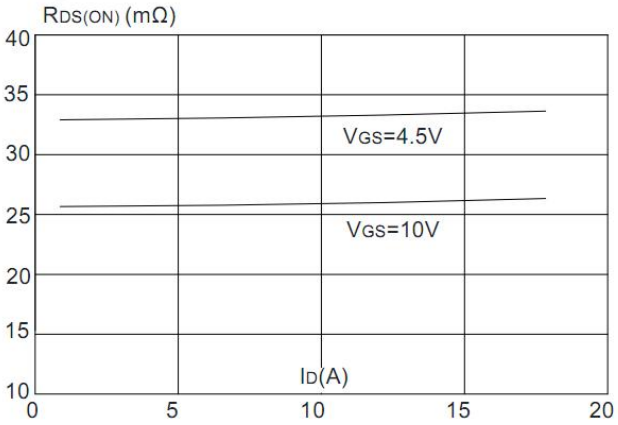


Figure 4: Body Diode Characteristics

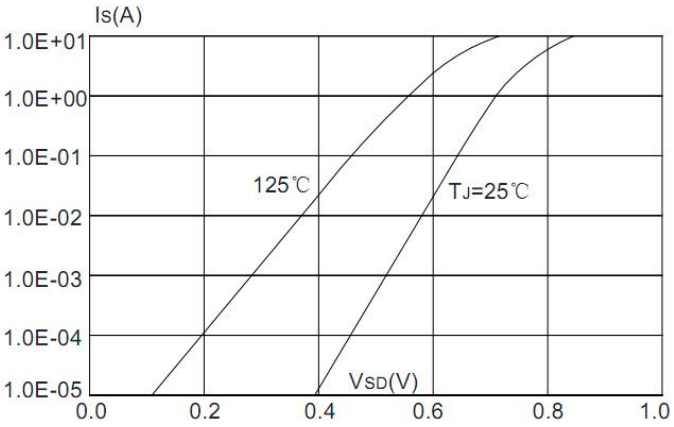


Figure 5: Gate Charge Characteristics

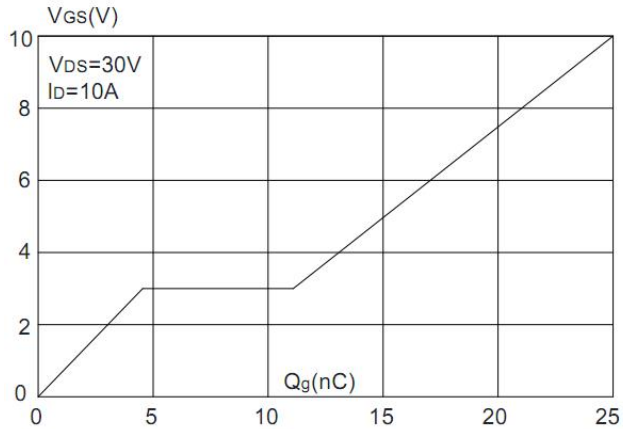


Figure 6: Capacitance Characteristics

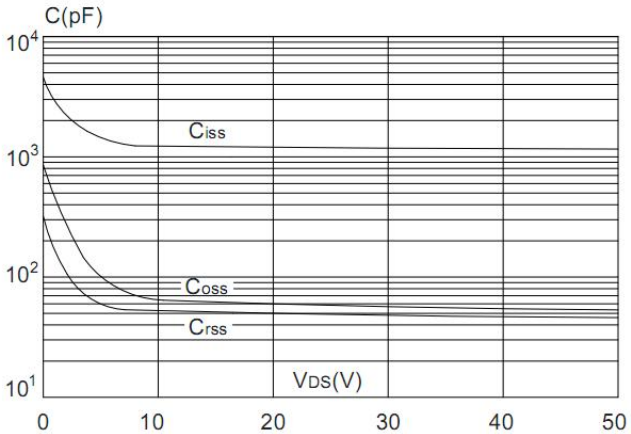


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

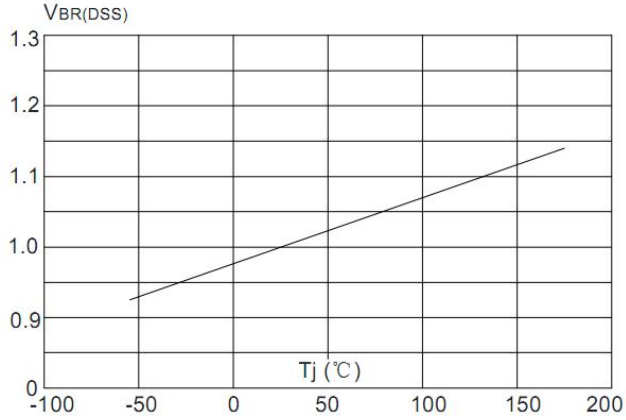


Figure 8: Normalized on Resistance vs. Junction Temperature

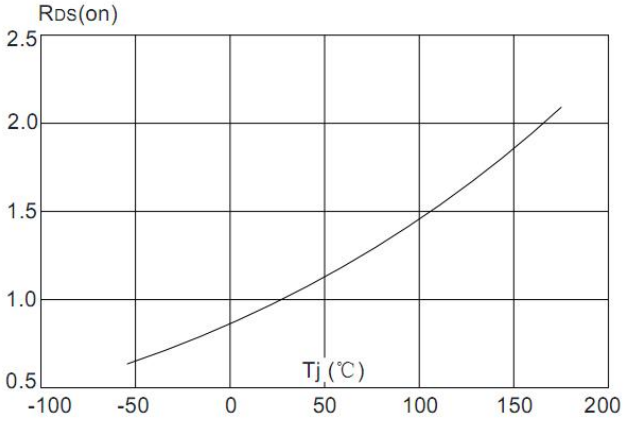


Figure 9: Maximum Safe Operating Area

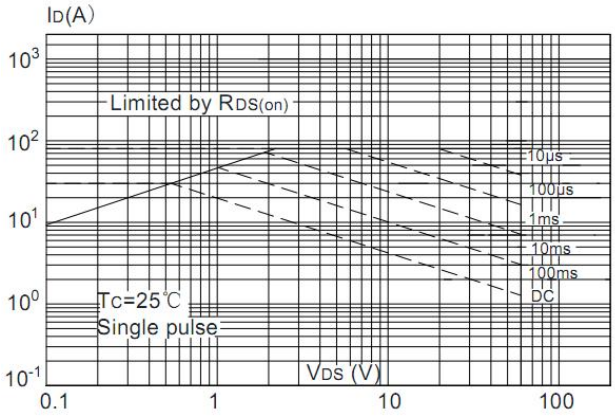
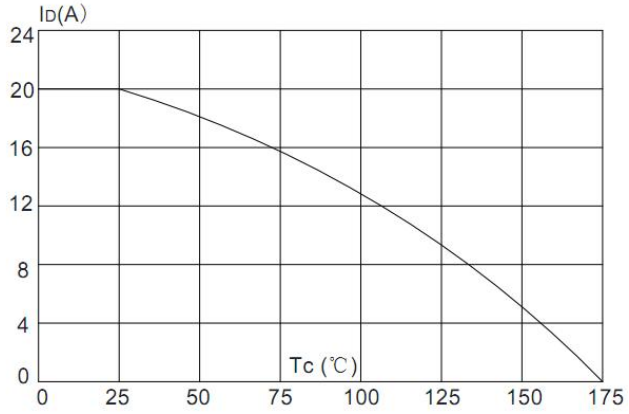


Figure 10: Maximum Continuous Drain Current vs. Case Temperature



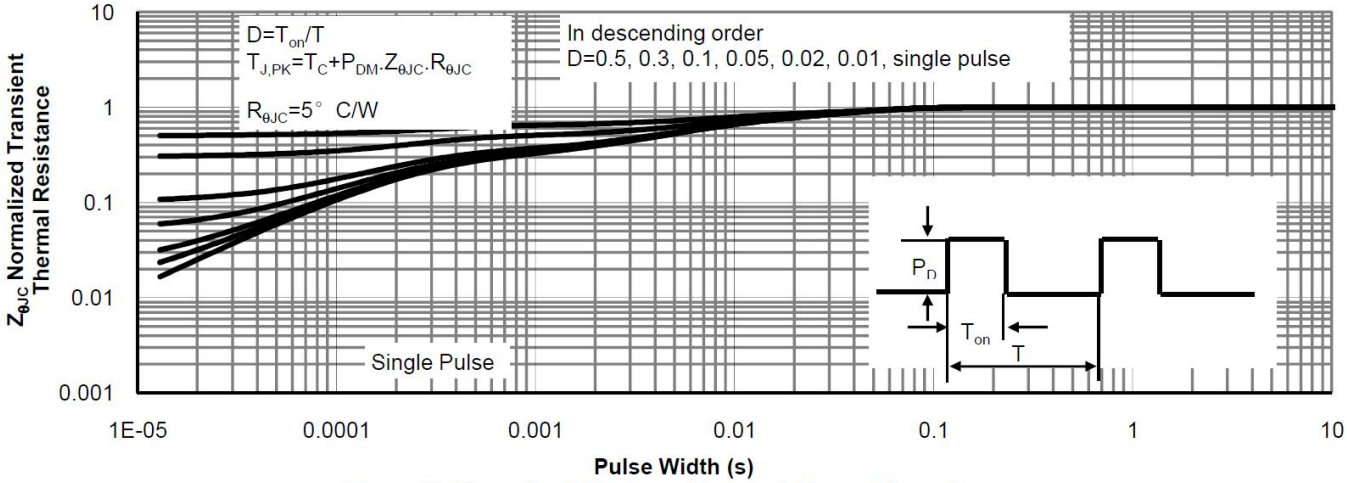
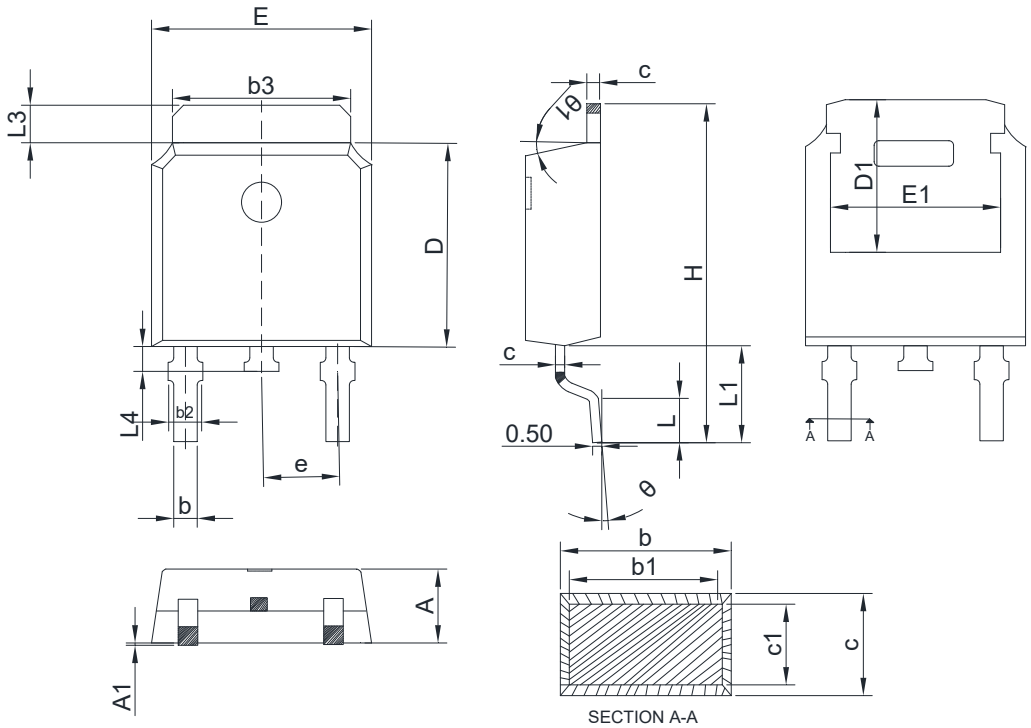


Figure 11: Normalized Maximum Transient Thermal Impedance

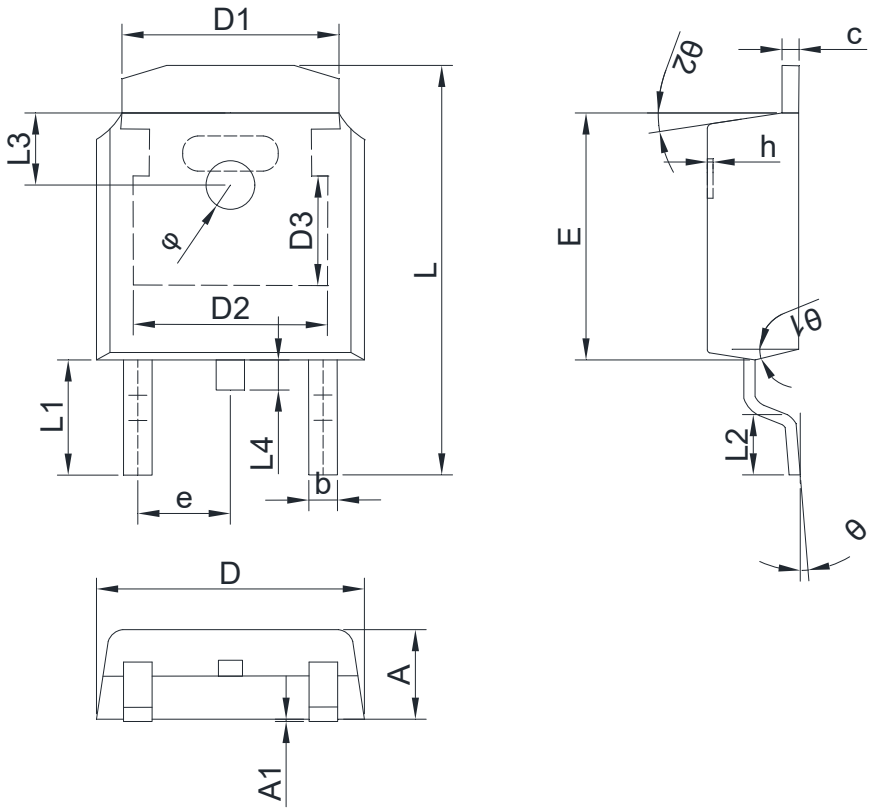
8. Dimension (TO-252)

POD A



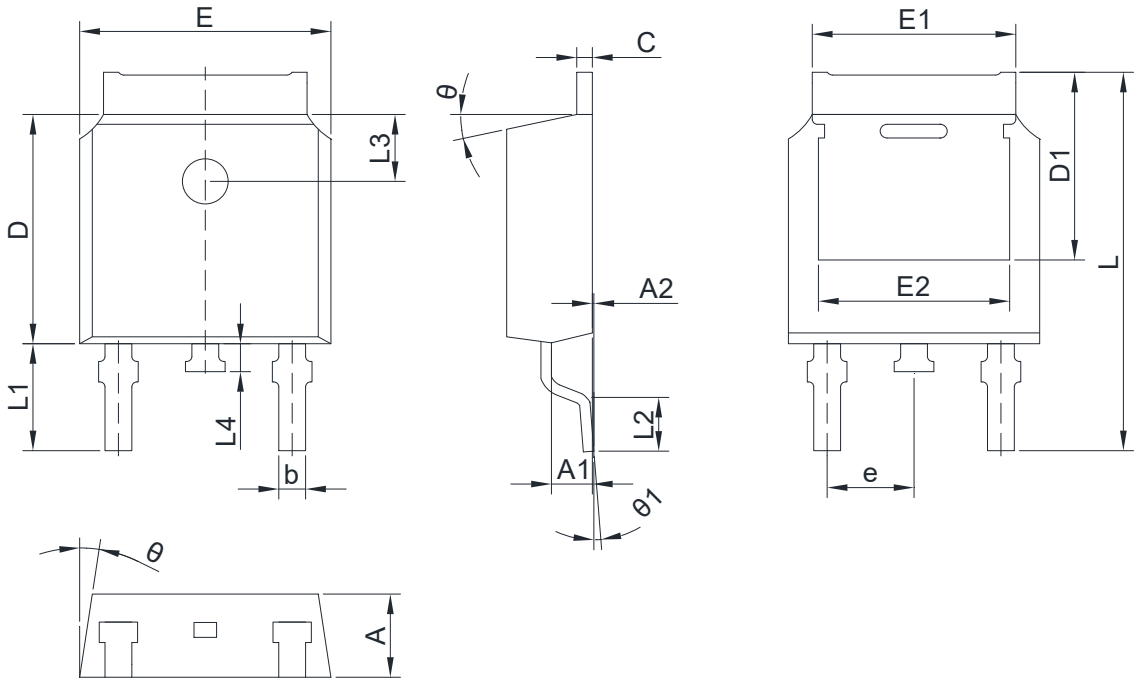
COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.20	2.30	2.40	D1	5.21	-	-
A1	0.00	-	0.12	E	6.50	6.60	6.70
b	0.65	-	0.89	E1	4.32	-	-
b1	0.64	0.76	0.79	H	9.70	9.95	10.20
b2	0.76	0.86	1.10	L	1.40	1.50	1.60
b3	5.20	5.33	5.46	L1	2.84REF		
c	0.48	-	0.60	e	2.29BSC		
c1	0.47	0.51	0.55	θ	0°	-	10°
D	6.00	6.10	6.20	θ1	0°	-	15°
L3	0.90	-	1.27	L4	0.60	0.80	1.00

POD B



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.200	2.300	2.400	h	0.000	0.100	0.200
A1	0.000		0.127	L	9.900	10.100	10.300
b	0.640	0.690	0.740	L1	2.888 REF		
c(电镀后)	0.460	0.520	0.580	L2	1.400	1.550	1.700
D	6.500	6.600	6.700	L3	1.600 REF		
D1	5.334 REF			L4	0.600	0.800	1.000
D2	4.826 REF			ϕ	1.100	1.200	1.300
D3	3.166 REF			θ	0°		8°
E	6.000	6.100	6.200	θ1	9° TYP		
e	2.286 TYP			θ2	9° TYP		

POD C



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.10	2.30	2.50	E2	4.63	4.83	5.03
A1	0.97	1.07	1.17	L	9.90	10.10	10.30
A2	0.00	-	0.12	L1	2.74	2.94	3.14
b	0.66	0.76	0.86	L2	1.40	1.50	1.70
C	0.45	0.51	0.60	L3	1.65	1.80	1.95
D	5.90	6.10	6.30	L4	0.60	0.80	1.00
D1	5.10	5.30	5.45	e	2.286 BSC		
E	6.40	6.60	6.80	θ	5°	7°	10°
E1	5.10	5.33	5.45	θ1	0°	-	3°

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