ALPHA & OMEGA SEMICONDUCTOR, LTD.

June 2004

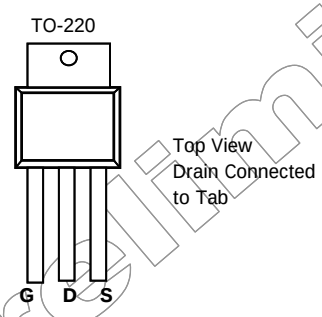
AOT400, AOT400L(Green Product)
N-Channel Enhancement Mode Field Effect Transistor

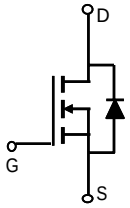
General Description

The AOT400 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.
AOT400L (Green Product) is offered in a Lead Free package.

Features

V_{DS} (V) = 75V
I_D = 110 A
$R_{DS(ON)}$ < 4.7 mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 5.2 mΩ (V_{GS} = 6V)





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	75	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	110	A
	T_C=100°C		110	
Pulsed Drain Current [C]		I_{DM}	200	
Avalanche Current [C]		I_{AR}	100	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	1500	mJ
Power Dissipation [B]	T_C=25°C	P_D	300	W
	T_C=100°C		150	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	Steady-State	$R_{\theta JA}$	65	75	°C/W
Maximum Junction-to-Case [B]	Steady-State	$R_{\theta JC}$	0.25	0.5	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=10mA, V_{GS}=0V	75			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=75V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA	2	2.8	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	200			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=30A		4.2	4.7	mΩ
		T_J=125°C		7.2	8.2	
		V_{GS}=6V, I_D=30A		4.6	5.2	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=30A		106		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				110	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz		8390	10500	pF
C_{oss}	Output Capacitance			1060		pF
C_{rss}	Reverse Transfer Capacitance			450		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.2	1.5	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=30V, I_D=30A		167	210	nC
Q_{gs}	Gate Source Charge			40		nC
Q_{gd}	Gate Drain Charge			45		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=30V, R_L=1Ω, R_{GEN}=3Ω		29		ns
t_r	Turn-On Rise Time			41		ns
$t_{D(off)}$	Turn-Off DelayTime			90		ns
t_f	Turn-Off Fall Time			34		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=30A, dI/dt=100A/µs		64	80	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=30A, dI/dt=100A/µs		180		nC

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A=25°C.

B. The power dissipation P_D is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=175°C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.

G. The maximum current rating is limited by bond-wires.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

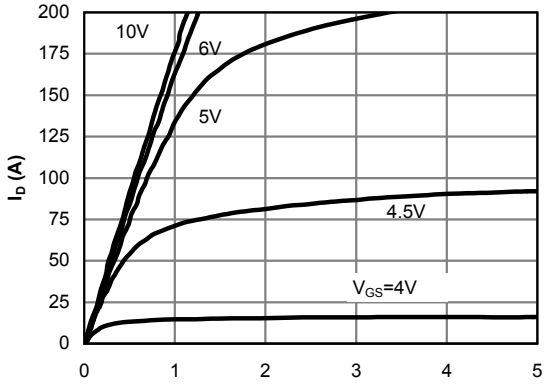


Fig 1: On-Region Characteristics

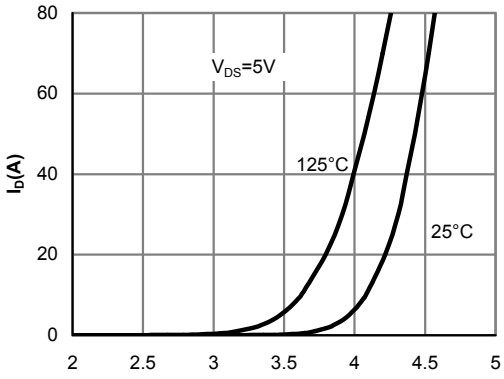


Figure 2: Transfer Characteristics

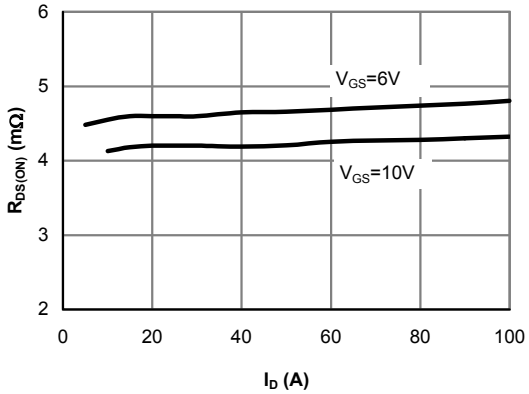


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

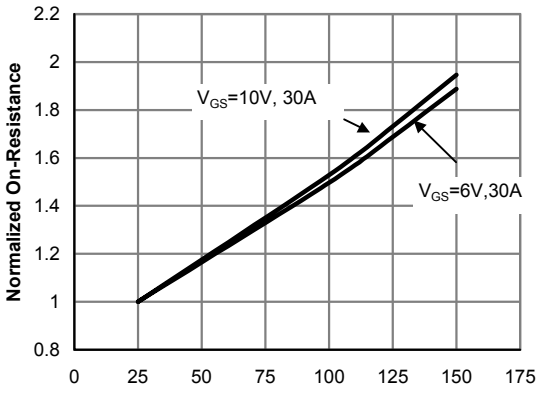


Figure 4: On-Resistance vs. Junction Temperature

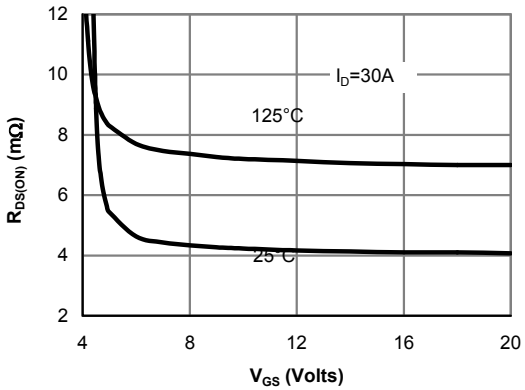


Figure 5: On-Resistance vs. Gate-Source Voltage

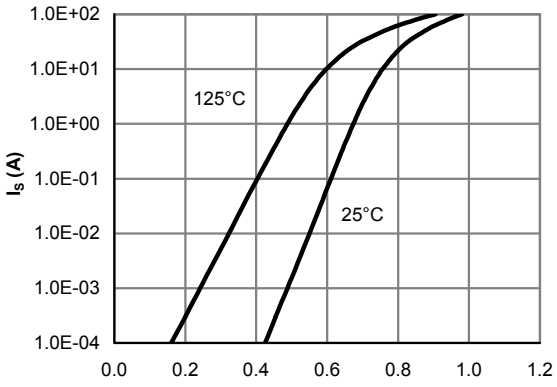


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

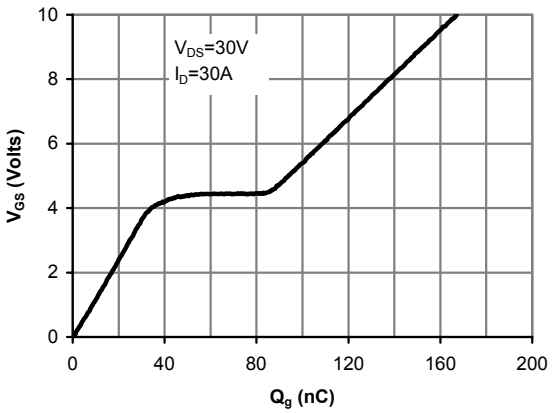


Figure 7: Gate-Charge Characteristics

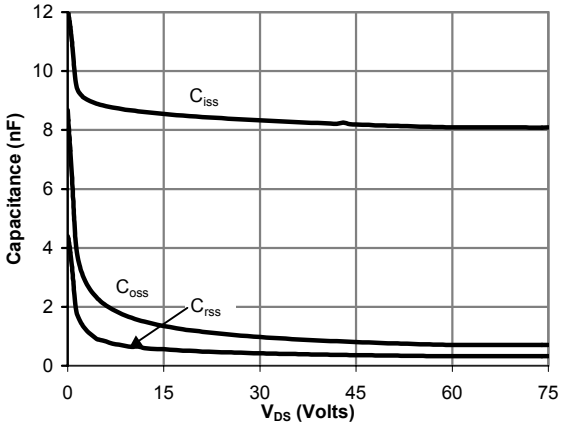


Figure 8: Capacitance Characteristics

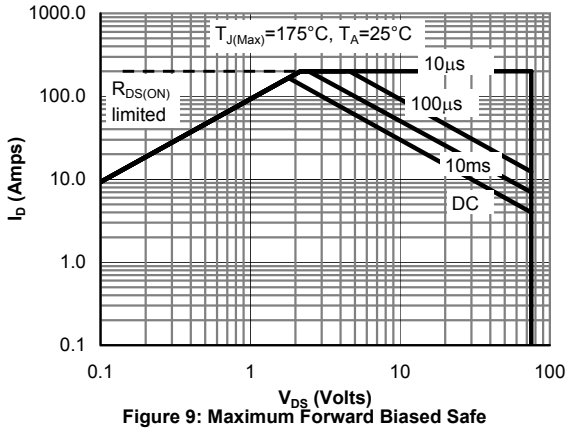


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

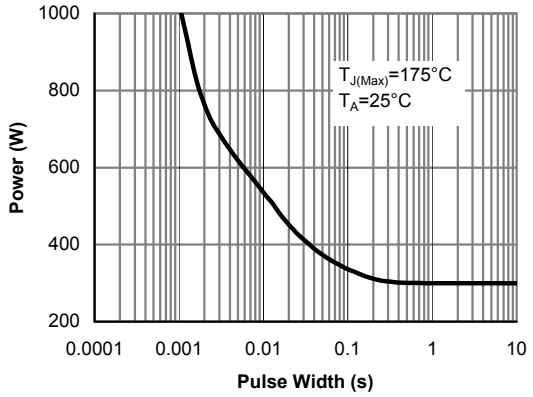


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

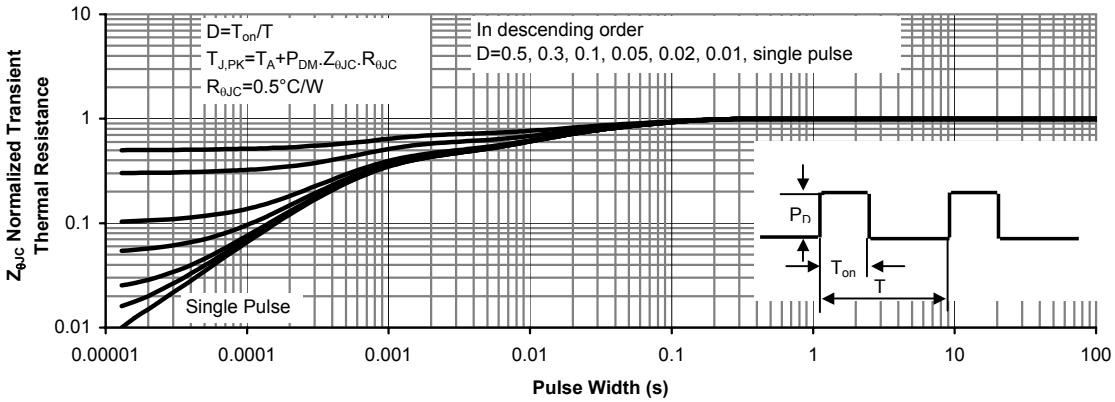


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

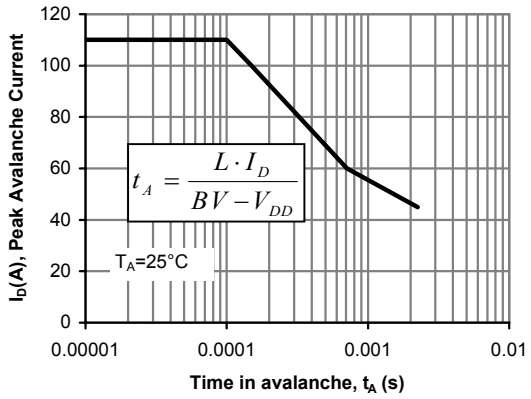


Figure 12: Single Pulse Avalanche capability

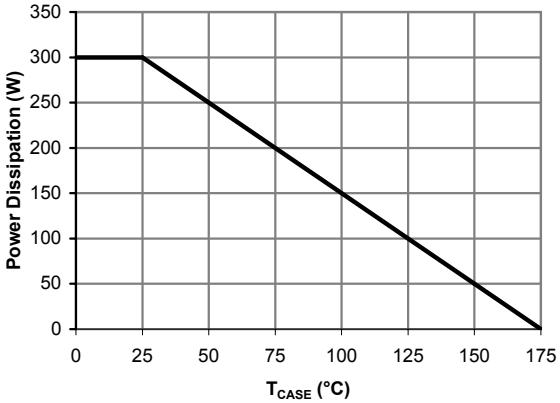


Figure 13: Power De-rating (Note B)

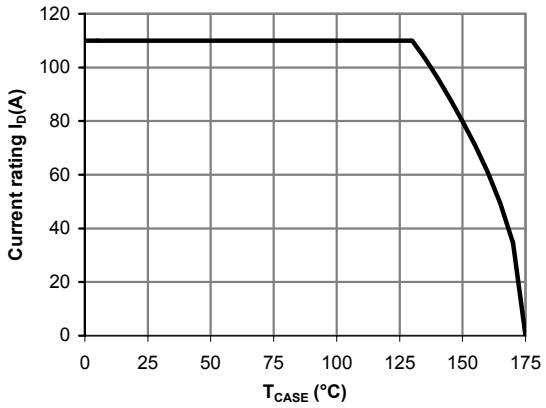
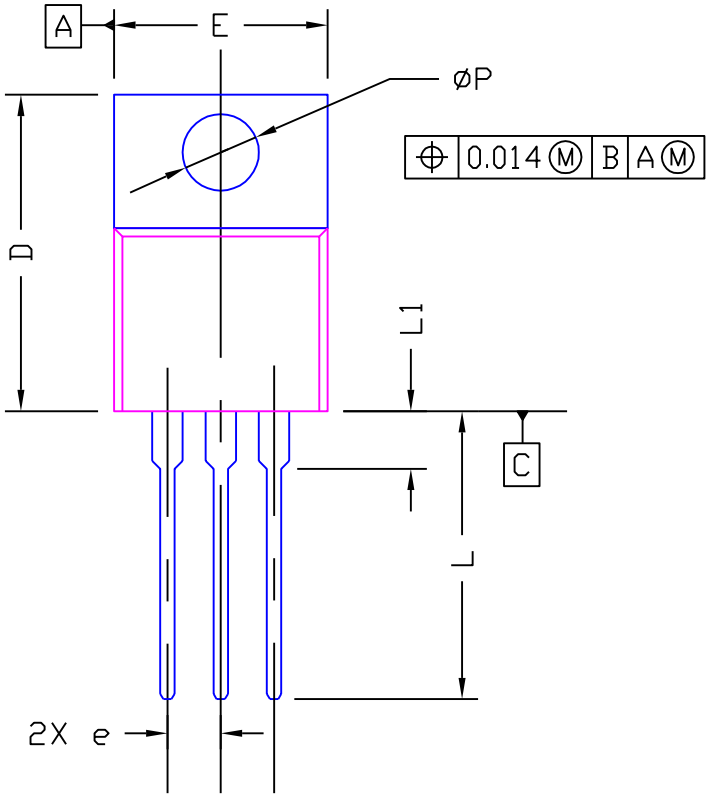
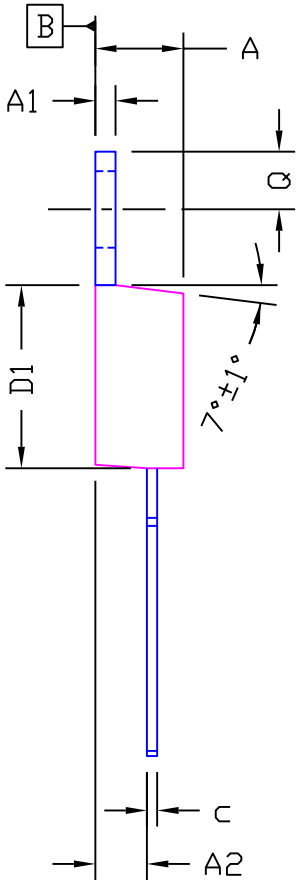
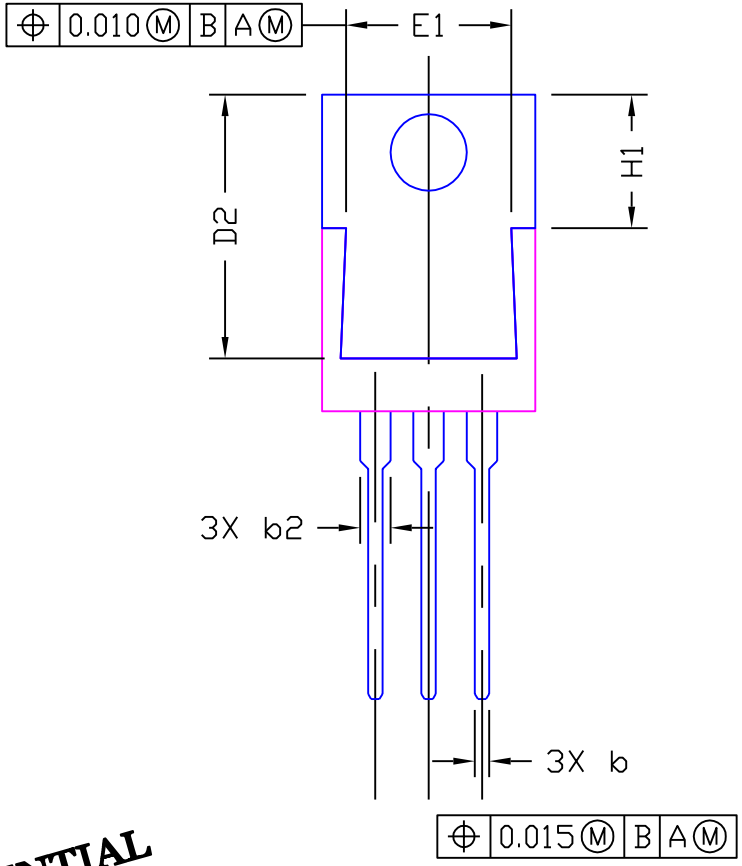


Figure 14: Current De-rating (Note B)

REVISION HISTORY				
REV	DESCRIPTION	DATE	ORIGINATED	RELEASED
A	INITIAL DESIGN	3/26/04	L.Shi	L.Shi







SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.30	4.45	4.72	0.169	0.175	0.186
A1	1.17	1.27	1.37	0.046	0.050	0.054
A2	2.52	2.67	2.82	0.099	0.105	0.111
b	0.69	0.81	0.94	0.027	0.032	0.037
b2	1.17	1.27	1.37	0.046	0.050	0.054
c	0.36	0.38	0.56	0.014	0.015	0.022
D	15.14	15.44	15.74	0.596	0.608	0.620
D1	8.64	9.14	9.65	0.340	0.360	0.380
D2	11.43	11.73	12.03	0.450	0.462	0.474
e	2.54 BSC			0.100 BSC.		
E	9.70	10.03	10.54	0.382	0.395	0.415
E1	6.22	---	---	0.245	---	---
H1	6.10	6.30	6.50	0.240	0.248	0.256
L	12.27	12.82	13.48	0.483	0.505	0.531
L1	2.47	---	3.90	0.097	---	0.154
Q	2.59	2.74	2.89	0.102	0.108	0.114
ØP	3.79	3.84	3.89	0.149	0.151	0.153

NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS
2. TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED
3. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
DECIMAL x.x ± x.xx ± x.xxx ± ANGULAR ±
INTERPRET DIM AND TOL PER ASME Y14.5M - 1994
PRINTING IS SCALED TO FIT DO NOT SCALE DRAWING

THIRD ANGLE PROJECTION

APPROVALS	DATE
DESIGN L.Shi	3/26/04
CHECKED	3/26/04
APPROVED	

ALPHA & OMEGA SEMICONDUCTOR, INC.

TITLE: TO220 3L PACKAGE OUTLINE DRAWING

SCALE	DWG NUMBER	SHEET	REV
NTS	PO-00015	1 OF 1	A

Document No.	PD-00356
Version	rev A
Title	AOT400 Marking Description

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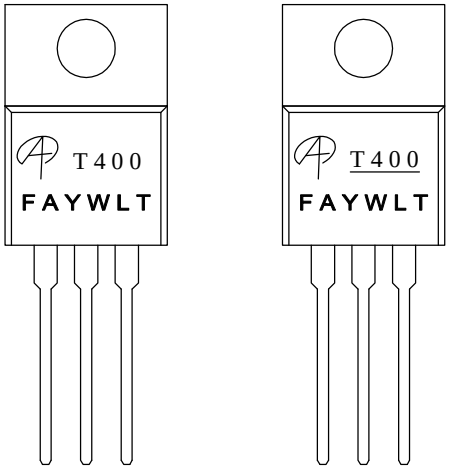
SEMICONDUCTOR, LTD.

D2PAK(TO-220) PACKAGE MARKING DESCRIPTION



Standard product Green product

NOTE:
LOGO - AOS LOGO
T400 - PART NUMBER CODE.
F&A - FOUNDRY AND ASSEMBLY LOCATION
Y - YEAR CODE
W - WEEK CODE.
L T - ASSEMBLY LOT CODE

PART NO.	DESCRIPTION	CODE
AOT400	Standard product	T400
AOT400L	Green product	T400