



**ALPHA & OMEGA**  
SEMICONDUCTOR

# AOD508/AOI508

## 30V N-Channel AlphaMOS

### General Description

- Latest Trench Power MOSFET technology
- Very Low RDS(on) at 10VGS
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

### Product Summary

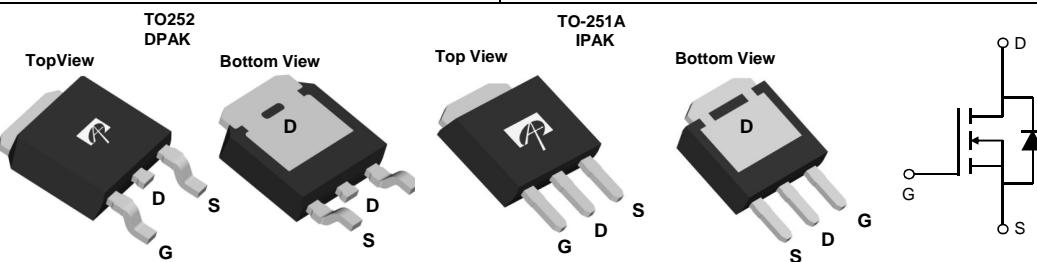
$V_{DS}$	30V
$I_D$ (at $V_{GS}=10V$ )	70A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 3mΩ
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	< 4.5mΩ

### Application

- DC/DC Converters in Computing
- Isolated DC/DC Converters in Telecom and Industrial

100% UIS Tested

100%  $R_g$  Tested



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$I_D$	70	A
$T_C=100^\circ\text{C}$		55	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	159	
Continuous Drain Current	$I_{DSM}$	22	A
$T_A=70^\circ\text{C}$		18	
Avalanche Current <sup>C</sup>	$I_{AS}$	37	A
Avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AS}$	68	mJ
$V_{DS}$ Spike	100ns	$V_{SPIKE}$	V
Power Dissipation <sup>B</sup>	$P_D$	50	W
$T_C=100^\circ\text{C}$		25	
Power Dissipation <sup>A</sup>	$P_{DSM}$	2.5	W
$T_A=70^\circ\text{C}$		1.6	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	16	20	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup>		41	50	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	2.1	3	°C/W

**Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			100	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.8	2.2	V
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$	2.4	3		$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$	3.5	4.4		$\text{m}\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$	3.3	4.5		$\text{S}$
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$	0.7	1		V
$I_s$	Maximum Body-Diode Continuous Current <sup>G</sup>				58	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		2010		pF
$C_{\text{oss}}$	Output Capacitance			898		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			124		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.9	1.8	2.7	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		36	49	nC
$Q_g(4.5\text{V})$	Total Gate Charge			17	23	nC
$Q_{\text{gs}}$	Gate Source Charge			6		nC
$Q_{\text{gd}}$	Gate Drain Charge			8		nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega, R_{\text{GEN}}=3\Omega$		7.5		ns
$t_r$	Turn-On Rise Time			4.0		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			37.0		ns
$t_f$	Turn-Off Fall Time			7.5		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		14		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		20.3		nC

A. The value of  $R_{\text{JJA}}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{\text{DSM}}$  is based on  $R_{\text{JJA}}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.

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

C. Single pulse width limited by junction temperature  $T_{J(\text{MAX})}=175^\circ\text{C}$ .

D. The  $R_{\text{JJA}}$  is the sum of the thermal impedance from junction to case  $R_{\text{JJC}}$  and case to ambient.

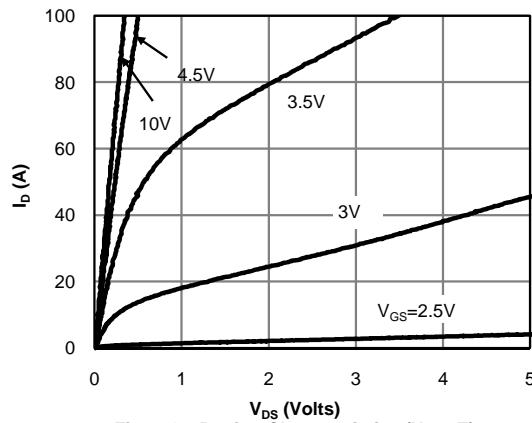
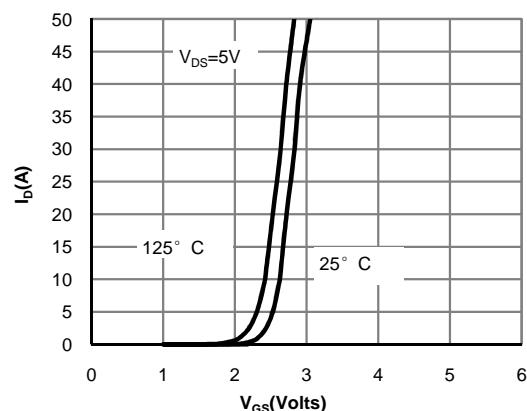
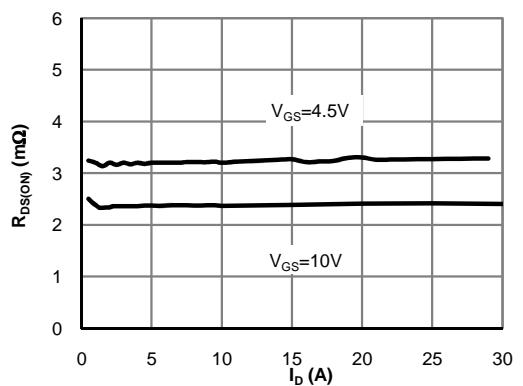
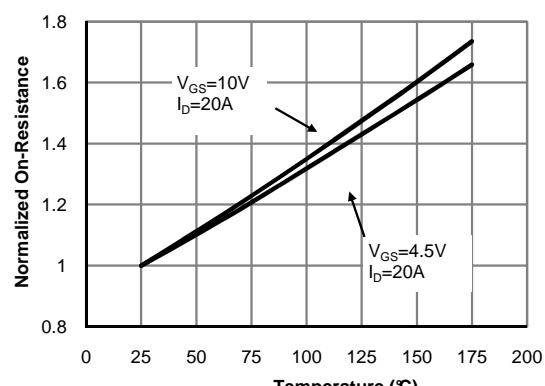
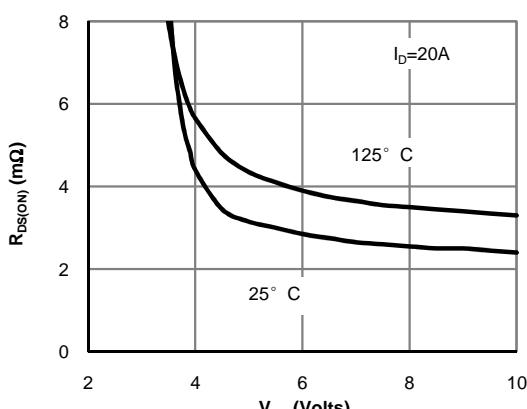
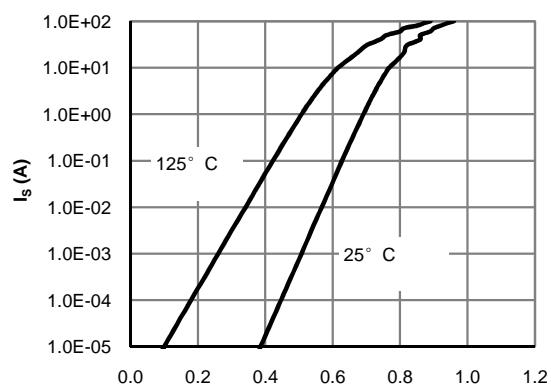
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

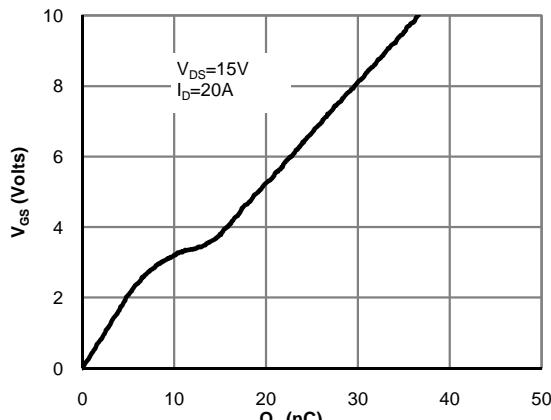
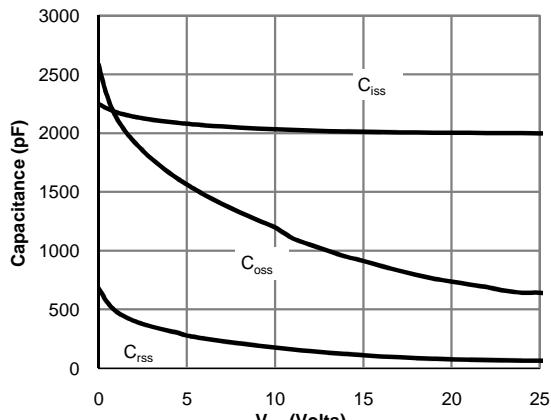
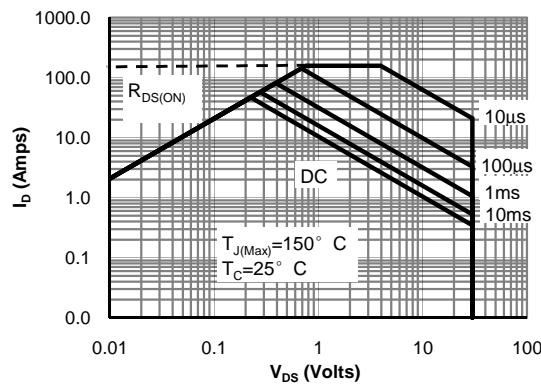
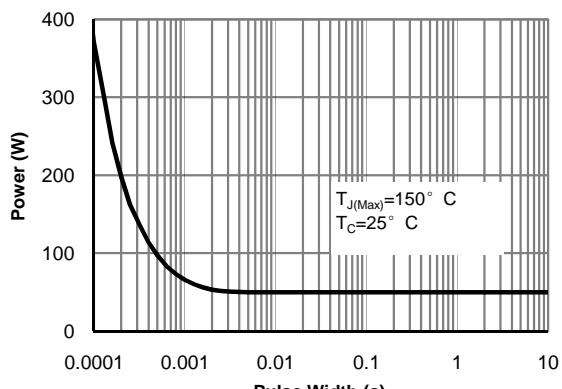
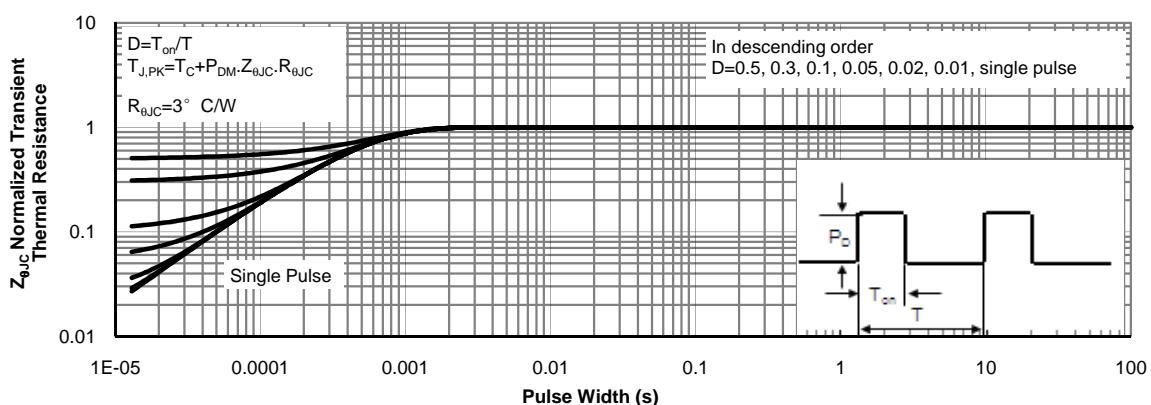
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=175^\circ\text{C}$ . The SOA curve provides a single pulse rating.

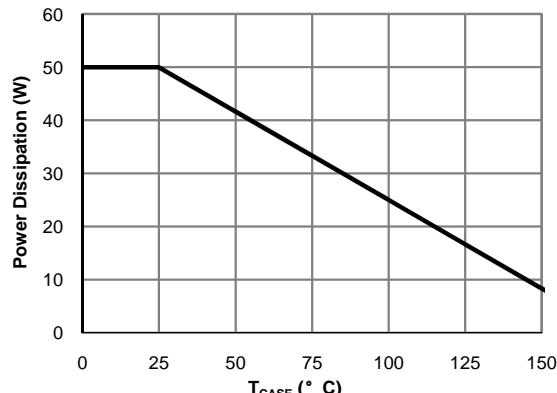
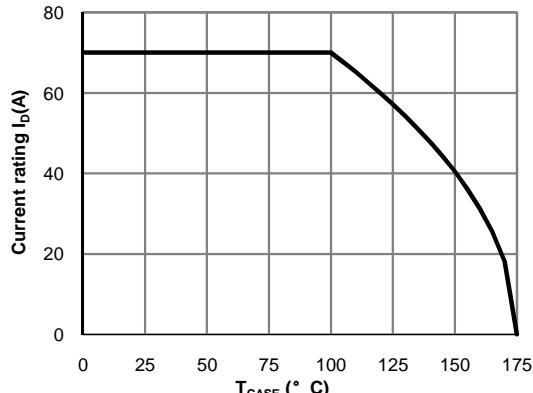
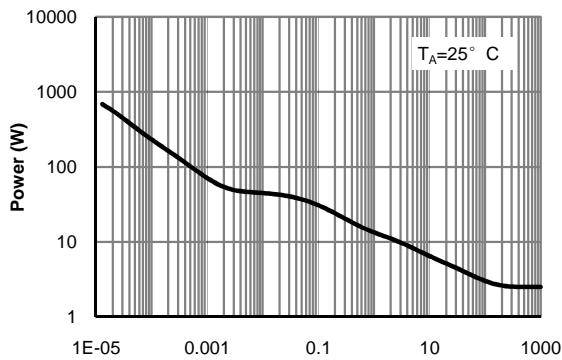
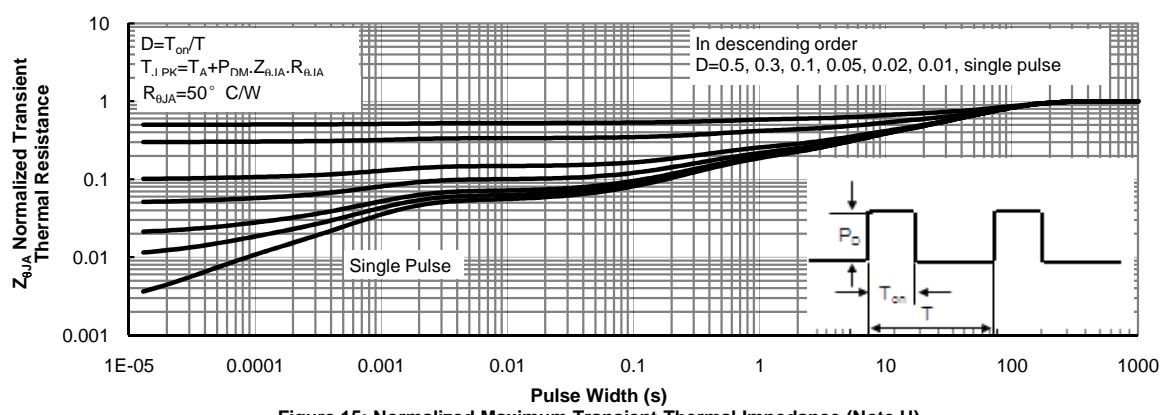
G. The maximum current rating is package limited.

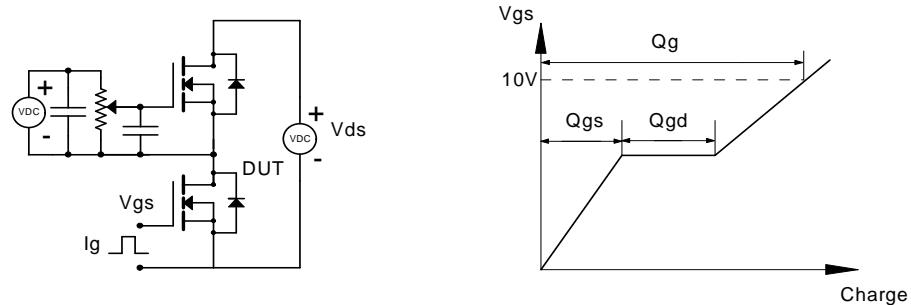
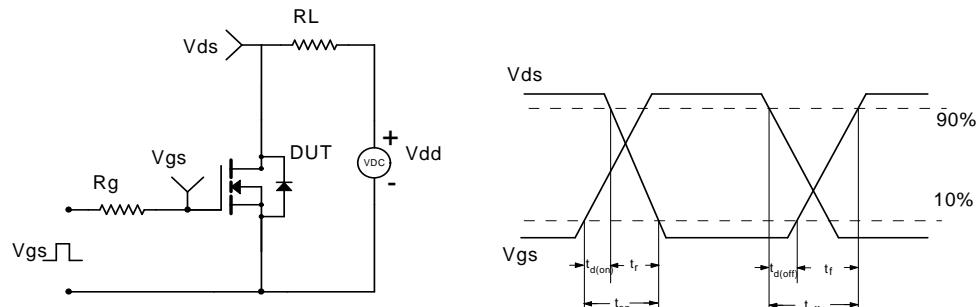
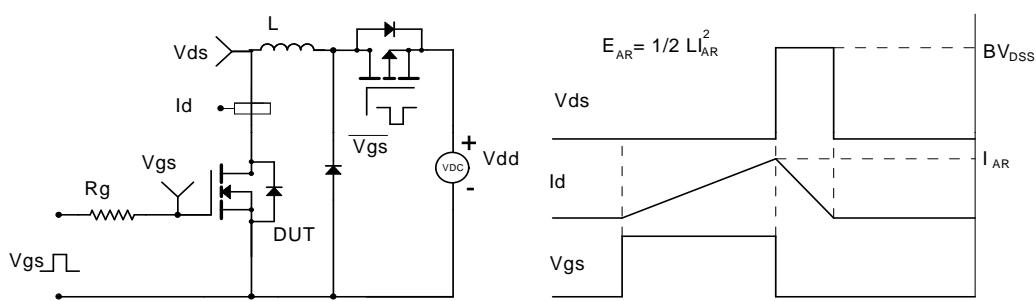
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ .

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**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**Fig 1: On-Region Characteristics (Note E)**

**Figure 2: Transfer Characteristics (Note E)**

**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**

**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

**Figure 6: Body-Diode Characteristics (Note E)**

**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: Power De-rating (Note F)**

**Figure 13: Current De-rating (Note F)**

**Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)**

**Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)**

**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveforms**

**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**

**Diode Recovery Test Circuit & Waveforms**
