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SEMICONDUCTOR



ESD



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PLED

## AOD603A-MS

Product specification

**FEATURES**

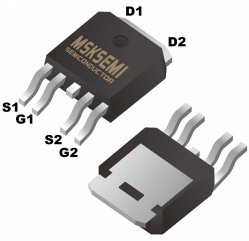
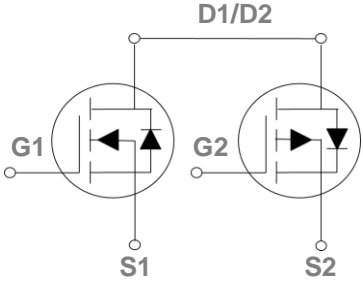

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

**Applications**

- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology

BVDSS	RDSON	ID
60V	45mΩ	13A
-60V	90mΩ	-13A

**Reference News**

PACKAGE OUTLINE	Pin Configuration	Marking
 <p>TO-252-4L</p>		

**Absolute Maximum Ratings Tc=25°C unless otherwise noted**

Symbol	Parameter	Rating		Units
V <sub>DS</sub>	Drain-Source Voltage	60	-60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	±20	V
I <sub>b</sub>	Drain Current - Continuous (T <sub>c</sub> =25°C)	13	13	A
	Drain Current - Continuous (T <sub>c</sub> =100°C)	9.5	9.5	A
I <sub>DM</sub>	Drain Current - Pulsed <sup>1</sup>	30	30	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	18	31	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	19	25	A
P <sub>D</sub>	Power Dissipation (T <sub>c</sub> =25°C)	20.1		W
	Power Dissipation - Derate above 25°C	0.16		W/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150		°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150		°C

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJC</sub>	Thermal Resistance Junction to Case	---	6.2	°C/W
R <sub>θJA</sub>	Thermal Resistance Junction to Ambient	---	62	°C/W

**N-CH Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise)**
**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =1mA	---	0.07	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =60V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C	---	---	10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V	---	---	±100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =12A	---	45	60	mΩ
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =8A	---	60	80	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	1.6	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-4.6	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V , I <sub>D</sub> =3A	---	10	---	S

**Dynamic and switching Characteristics**

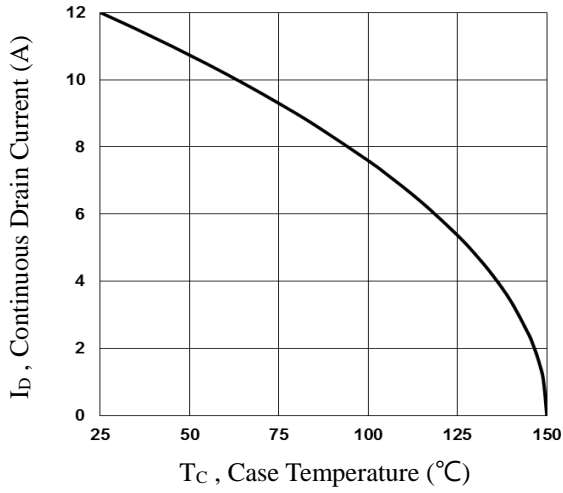
Q <sub>g</sub>	Total Gate Charge <sup>3,4</sup>	V <sub>DS</sub> =30V , V <sub>GS</sub> =10V , I <sub>D</sub> =10A	---	16.6	---	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>3,4</sup>		---	2.2	---	
Q <sub>gd</sub>	Gate-Drain Charge <sup>3,4</sup>		---	3.9	---	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>3,4</sup>	V <sub>DD</sub> =30V , V <sub>GS</sub> =10V , R <sub>G</sub> =6Ω I <sub>D</sub> =1A	---	4.6	---	ns
T <sub>r</sub>	Rise Time <sup>3,4</sup>		---	14.8	---	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>3,4</sup>		---	27.2	---	
T <sub>f</sub>	Fall Time <sup>3,4</sup>		---	7.8	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V , V <sub>GS</sub> =0V , F=1MHz	---	1180	---	pF
C <sub>oss</sub>	Output Capacitance		---	68	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	45	---	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V , V <sub>DS</sub> =0V , F=1MHz	---	2.1	---	Ω

**Drain-Source Diode Characteristics and Maximum Ratings**

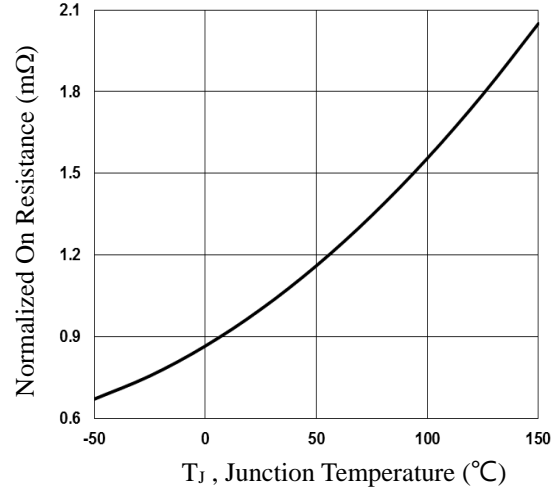
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	13	A
I <sub>SM</sub>	Pulsed Source Current		---	---	26	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C	---	---	1.2	V

Note :

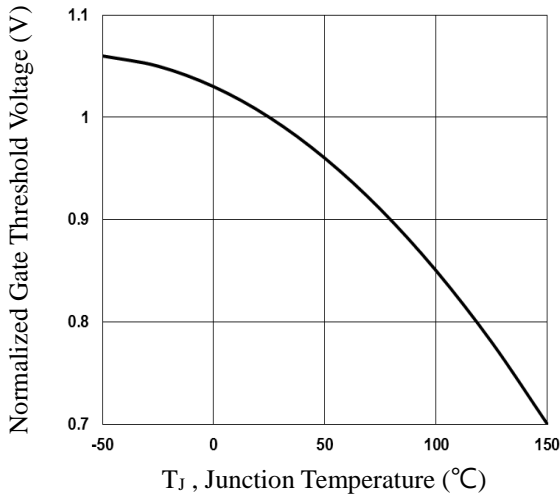
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, N-CH I<sub>AS</sub>=23A., P-CH I<sub>AS</sub>=33A, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



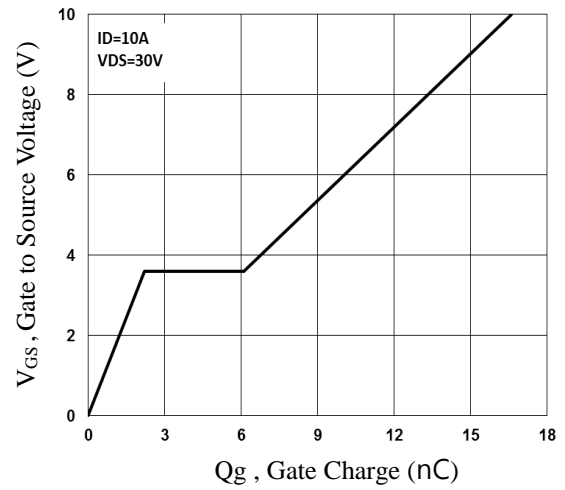
**Fig.1 Continuous Drain Current vs.  $T_C$**



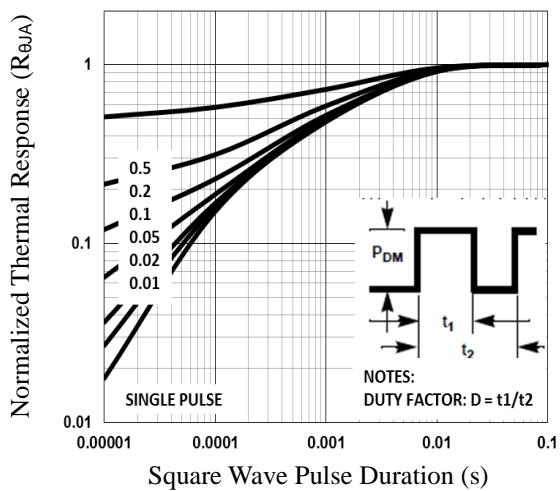
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



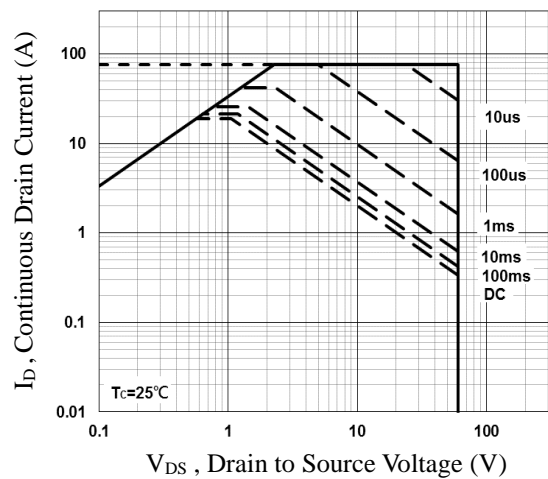
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Gate Charge Waveform**



**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**

**P-CH Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise)**
**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =-250uA	-60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =-1mA	---	-0.05	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-60V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-48V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C	---	---	-10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = ±20V , V <sub>DS</sub> =0V	---	---	±100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V , I <sub>D</sub> =-15A	---	90	110	mΩ
		V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-10A	---	110	150	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.0	-1.6	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	5	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V , I <sub>D</sub> =-3A	---	10	---	S

**Dynamic and switching Characteristics**

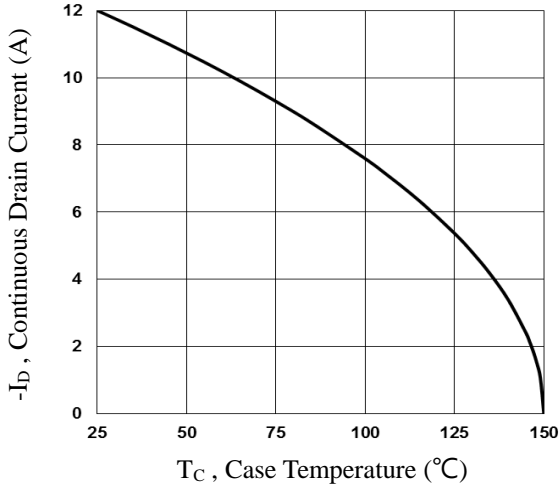
Q <sub>g</sub>	Total Gate Charge <sup>2, 3</sup>	V <sub>DS</sub> =-30V , V <sub>GS</sub> =-10V , I <sub>D</sub> =-8A	---	22.4	---	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2, 3</sup>		---	4.1	---	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2, 3</sup>		---	5.2	---	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2, 3</sup>	V <sub>DD</sub> =-30V , V <sub>GS</sub> =-10V , R <sub>G</sub> =6Ω I <sub>D</sub> =-1A	---	13	---	ns
T <sub>r</sub>	Rise Time <sup>2, 3</sup>		---	42.4	---	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2, 3</sup>		---	64.6	---	
T <sub>f</sub>	Fall Time <sup>2, 3</sup>		---	16.4	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-30V , V <sub>GS</sub> =0V , F=1MHz	---	1250	---	pF
C <sub>oss</sub>	Output Capacitance		---	85	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	65	---	

**Drain-Source Diode Characteristics and Maximum Ratings**

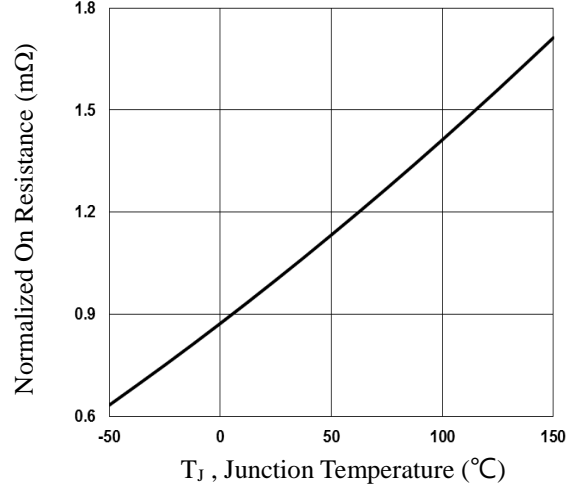
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>GS</sub> =V <sub>D</sub> =0V , Force Current	---	---	-13	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-26	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =-1A , T <sub>J</sub> =25°C	---	---	-1.2	V

Note :

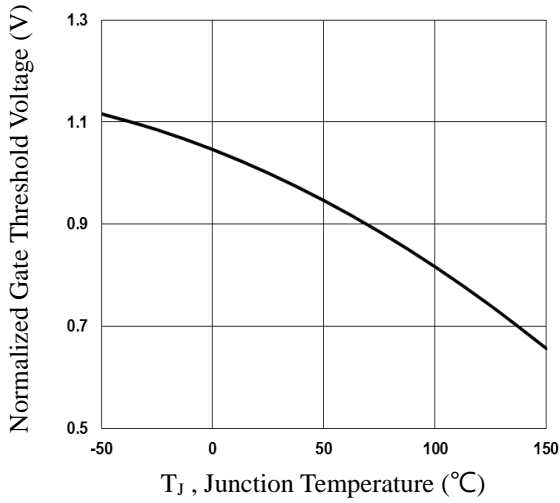
5. Repetitive Rating : Pulsed width limited by maximum junction temperature.
6. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
7. Essentially independent of operating temperature.



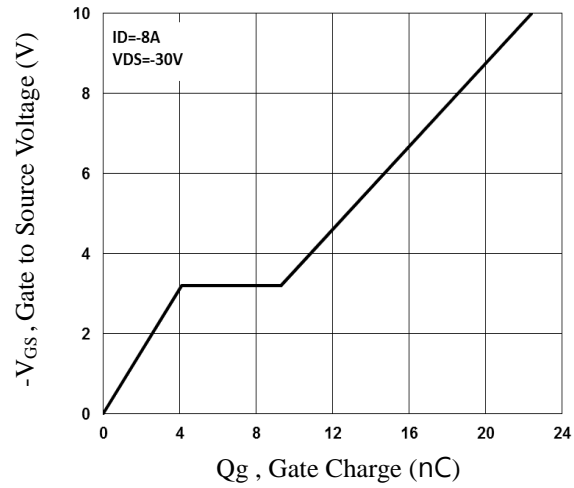
**Fig.7 Continuous Drain Current vs.  $T_C$**



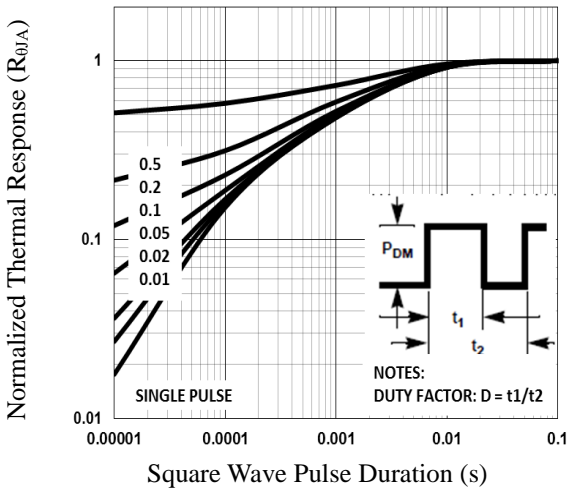
**Fig.8 Normalized  $R_{DS(on)}$  vs.  $T_J$**



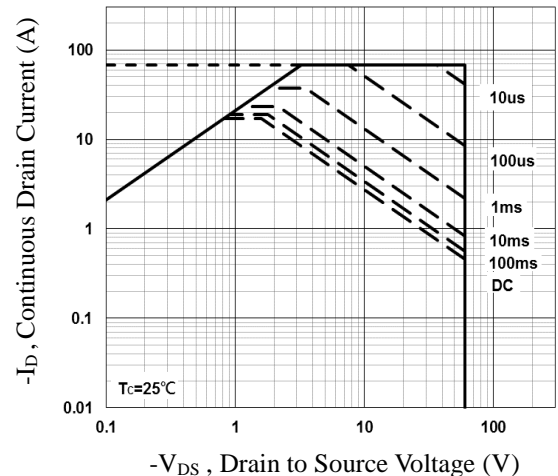
**Fig.9 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.10 Gate Charge Waveform**

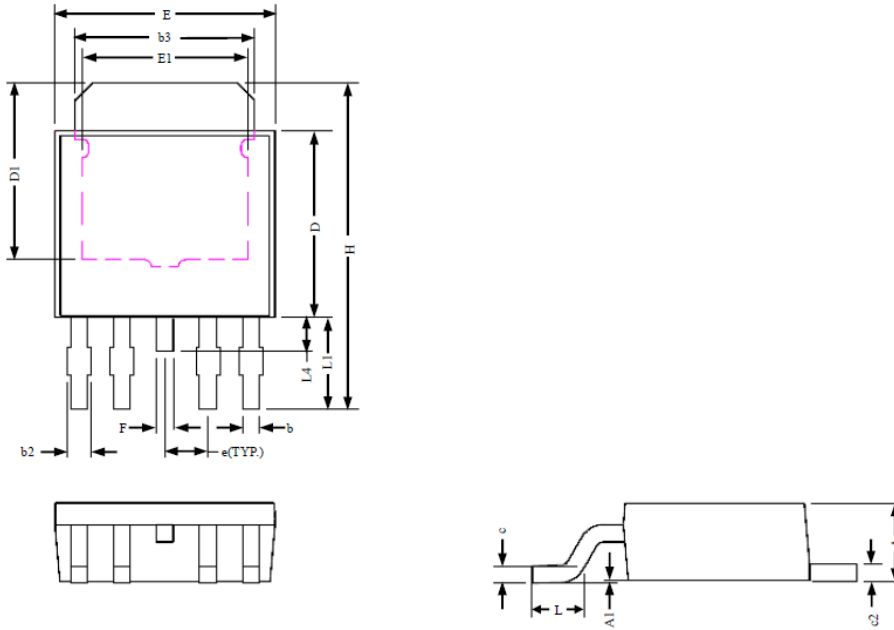


**Fig.11 Normalized Transient Impedance**



**Fig.12 Maximum Safe Operation Area**

**TO252-4L PACKAGE INFORMATION**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	2.400	2.200	0.094	0.087
A1	0.150	0.000	0.006	0.000
B	0.600	0.400	0.024	0.016
b2	0.800	0.500	0.031	0.020
b3	5.500	5.200	0.217	0.205
C	0.508typ.		0.02typ.	
c2	0.550	0.450	0.022	0.018
D	5.800	5.400	0.228	0.213
D1	---	4.570	---	0.180
E	6.800	6.400	0.268	0.252
E1	---	3.810	---	0.150
E	1.27ref.		0.05ref.	
F	0.600	0.400	0.024	0.016
H	10.200	9.400	0.402	0.370
L	1.770	1.400	0.070	0.055
L1	3.000	2.400	0.118	0.094
L4	1.200	0.800	0.047	0.031

**REEL SPECIFICATION**

P/N	PKG	QTY
AOD603A-MS	TO-252-4L	2500

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