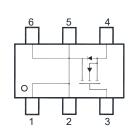
## **N-Channel Enhancement Mode MOSFET**

#### **Features**

- AEC-Q101 Qualified
- · Surface-mounted package
- Halogen and Antimony Free(HAF), RoHS compliant





1.Drain 2.Drain 3.Gate 4.Source 5.Drain 6.Drain SOT-26 Plastic package

## **Applications**

- Portable appliances
- Battery management

## Absolute Maximum Ratings (at Ta = 25°C unless otherwise specified)

	• ,		
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	V
Continuous Drain Current	ID	3	Α
Drain Current - Pulsed 1)	I <sub>DM</sub>	12	Α
Total Power Dissipation 2)	P <sub>tot</sub>	2	W
Operating Junction and Storage Temperature Range	$T_{j}, T_{stg}$	- 55 to + 150	°C

### **Thermal Resistance Ratings**

_	<u> </u>				
	Parameter	Symbol	Max.	Unit	
	Thermal Resistance from Junction to Ambient 2)	Reja	62.5	°C/W	

<sup>&</sup>lt;sup>1)</sup> Pulse Test: Pulse Width ≤ 100  $\mu$ s, Duty Cycle ≤ 2%,Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}$ =150°C.



<sup>&</sup>lt;sup>2)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air,  $t \le 10 \text{ s}$ .

# MD06N090L-AH

## Characteristics at Ta = 25°C unless otherwise specified

Parameter	Symbol	Min.	Тур.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at I <sub>D</sub> = 250 μA	V <sub>(BR)DSS</sub>	60	-	-	V
Drain-Source Leakage Current at V <sub>DS</sub> = 48 V	I <sub>DSS</sub>	-	-	1	μΑ
Gate-Source Leakage Current at V <sub>GS</sub> = ± 16 V	I <sub>GSS</sub>	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{GS}$ = $V_{DS}$ , $I_D$ = 250 $\mu A$	V <sub>GS(th)</sub>	1.2	-	2.5	٧
Drain-Source On-State Resistance at $V_{GS}$ = 10 V, $I_D$ = 2 A at $V_{GS}$ = 4.5 V, $I_D$ = 1 A	R <sub>DS(on)</sub>	- -	-	80 90	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 5 \text{ V}$ , $I_D = 1 \text{ A}$	<b>g</b> FS	-	4.2	-	S
Gate Resistance at $V_{DS} = 0 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	Rg	-	1.4	-	Ω
Input Capacitance at $V_{DS}$ = 30 V, $V_{GS}$ = 0 V, f = 1 MHz	C <sub>iss</sub>	-	445	-	pF
Output Capacitance at $V_{DS}$ = 30 V, $V_{GS}$ = 0 V, f = 1 MHz	Coss	-	22	-	pF
Reverse Transfer Capacitance at $V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	C <sub>rss</sub>	-	18	-	pF
Gate Charge Total at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A at $V_{DS}$ = 30 V, $V_{GS}$ = 4.5 V, $I_D$ = 2 A	$Q_g$	-	8.6 4	-	nC
Gate to Source Charge at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A	Q <sub>gs</sub>	-	1.8	-	nC
Gate to Drain Charge at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A	$Q_{gd}$	-	1.2	-	nC
Turn-On Delay Time at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A, $R_g$ = 4.7 $\Omega$	t <sub>d(on)</sub>	-	7	-	ns
Turn-On Rise Time at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A, $R_g$ = 4.7 $\Omega$	t <sub>r</sub>	-	2	-	ns
Turn-Off Delay Time at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A, $R_g$ = 4.7 $\Omega$	$t_{d(off)}$	-	6	-	ns
Turn-Off Fall Time at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 2 A, $R_g$ = 4.7 $\Omega$	t <sub>f</sub>	-	5	-	ns
BODY DIODE PARAMETERS					
Drain-Source Diode Forward Voltage at Is = 1 A	V <sub>SD</sub>	-	-	1.2	V
Body-Diode Continuous Current	ls	-	-	3	Α
Body Diode Reverse Recovery Time at I <sub>S</sub> = 2 A, di/dt = 100 A / µs	t <sub>rr</sub>	-	8	-	ns
Body Diode Reverse Recovery Charge at Is = 2 A, di/dt = 100 A / µs	Qrr	-	4	-	nC



### **Electrical Characteristics Curves**

Fig. 2 Typical Transfer Characteristics Fig. 1 Typical Output Characteristics 22 14 TOP Tj=25°C V<sub>DS</sub>=5V 20 V<sub>GS</sub>=10V 12 V<sub>GS</sub>=6V 18 V<sub>GS</sub>=5V 16 V<sub>GS</sub>=4.5V 10 Tj=125°C Drain Current (A) V<sub>GS</sub>=4V Drain Current (A) 14 V<sub>GS</sub>=3V 8 12 V<sub>GS</sub>=2.5V 10 6 8 6 4 2 0 0 0 1 0 1 5 V<sub>GS</sub>, Gate-Source Voltage (V) V<sub>DS</sub>, Drain-to-Source Voltage (V) Fig. 3 On-Resistance vs. Drain Current Fig. 4 On-Resistance vs. Gate-Source Voltage 180 270 ID=2A  $R_{ extsf{DS}( ext{on})}$  , Drain-to-Source On Resistance (m $\Omega$ ) 160 240 140 R<sub>DS(on)</sub> , Drain-to-Source on Resistance (mΩ) 210 120 180 100 150 Vgs=4.5V Tj=125°C 80 120 60 90 V<sub>G</sub>s=10V 40 60 Tj=25°C 20 30 0 0 0 1 2 3 6 9 10 I<sub>D</sub>, Drain Current (A) V<sub>GS</sub>, Gate-to-Source Voltage (V) Fig. 5 On-Resistance vs.Ti Fig. 6 Typical Body-Diode Forward Characteristics 2.4 2.2 R<sub>DS(on)</sub>, Normalized Drain-to-Source OnResistance Reverse Drain Current (A) 01 2 Vgs=10V,ID=2A 1.8 Tj=125°C 1.6 T<sub>i</sub>=25°C Vgs=4.5V,lp=1A 1.4 1.2 1 0.8 25 75 100 125 150 175 1.2 0.2 0.4 0.6 0.8 0 1.4 1.6



V<sub>SD</sub>, Source-to-Drain Voltage (V)

T<sub>J</sub>, Junction Temperature (℃)

### **Electrical Characteristics Curves**

Fig. 7 Typical Junction Capacitance

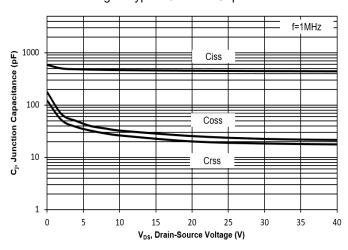


Fig. 8 Drain-Source Leakage Current vs. Tj

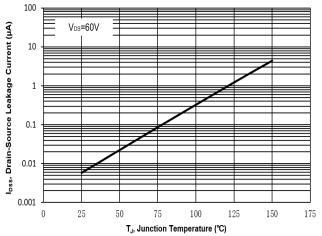


Fig. 9  $V_{(BR)DSS}$  vs. Junction Temperature

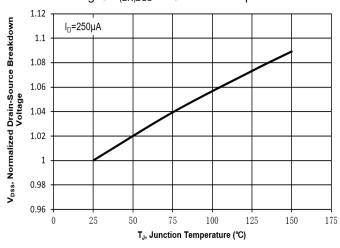


Fig. 10 Gate Threshold Variation vs. T<sub>j</sub>

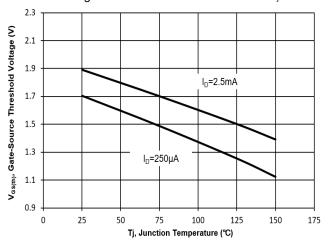
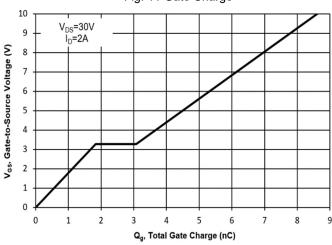


Fig. 11 Gate Charge





## **Test Circuits**

Fig.1-1 Switching times test circuit

RL

Vds

Vdd

Vdd

VDC

Vgs

Vgs

Vgs

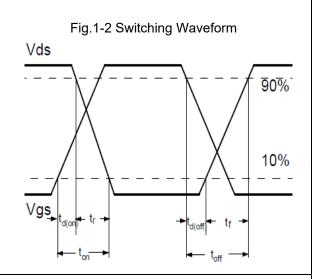


Fig.2-1 Gate charge test circuit

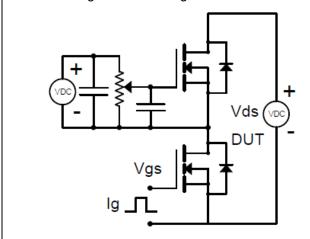
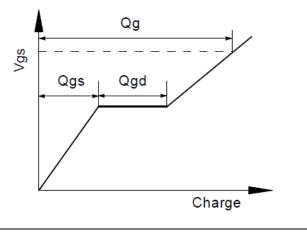
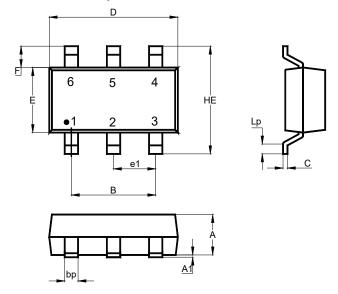


Fig.2-2 Gate charge waveform



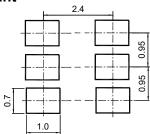
## Package Outline (Dimensions in mm)

**SOT-26** 



Unit	Α	A1	В	С	D	Е	e1	F	HE	Lp	bp
	1.2	0.1	2.1	0.20	3.1	1.7	0.95	0.65	3.0	0.6	0.5
mm	1.0	0	1.7	0.08	2.7	1.3	typ.	0.6	2.6	0.2	0.3

## **Recommended Soldering Footprint**



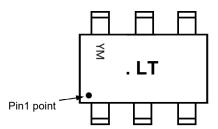
## **Packing information**

Package	Tape Width	Pitch		Re	el Size	Per Reel Packing Quantity	
Fackage	(mm)	mm	inch	mm	inch	Fel Neel Facking Quantity	
SOT-26	8	4 ± 0.1	0.157 ± 0.004	178	7	3,000	

## **Marking information**

- " LT " = Part No.
- "•" = HAF (Halogen and Antimony Free)
- " YM " = Date Code Marking
- " Y " = Year
- " M " = Month

Font type: Arial



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