

# EVVOSEMI<sup>®</sup>

THINK CHANGE DO



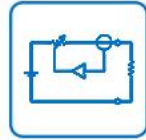
ESD



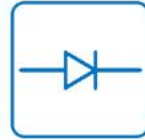
TVS



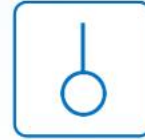
MOS



LDO



Diode



Sensor



DC-DC

## Product Specification

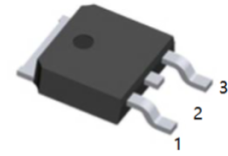
▶ Domestic	Part Number	AOD407
▶ Overseas	Part Number	AOD407
▶ Equivalent	Part Number	AOD407

EV is the abbreviation of name EVVO

## P-Channel -60 V (D-S) MOSFET

### General Description

The AOD407 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. With the excellent thermal resistance of the TO-252 package, this device is well suited for high current load applications.



1.G 2.D 3.S  
TO-252(DPAK) top view

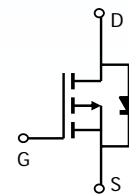
### Features

$V_{DS}$  (V) = -60V

$I_D$  = -12A ( $V_{GS}$  = -10V)

$R_{DS(ON)}$  < 115m $\Omega$  ( $V_{GS}$  = -10V)

$R_{DS(ON)}$  < 150m $\Omega$  ( $V_{GS}$  = -4.5V)



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

Parameter	Symbol	Maximum	Units		
Drain-Source Voltage	$V_{DS}$	-60	V		
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V		
Continuous Drain Current <sup>G</sup>	$I_D$	$T_C = 25^\circ\text{C}$	-12		
		$T_C = 100^\circ\text{C}$	-10		
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	-30	A		
Avalanche Current <sup>C</sup>	$I_{AR}$	-12	A		
Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AR}$	23	mJ		
Power Dissipation <sup>B</sup>	$P_D$	$T_C = 25^\circ\text{C}$	50		
		$T_C = 100^\circ\text{C}$	25		
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A = 25^\circ\text{C}$	2.5		
		$T_A = 70^\circ\text{C}$	1.6		
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$		
<b>Thermal Characteristics</b>					
Parameter	Symbol	Typ	Ma	Units	
Maximum Junction-to-Ambient	$R_{\theta JA}$	$t \leq 10\text{s}$	16.7	25	$^\circ\text{C/W}$
		Steady-State	40	50	$^\circ\text{C/W}$
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	2.5	3	$^\circ\text{C/W}$	

**P-Channel -60 V (D-S) MOSFET**
**Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$ , $V_{GS}=0\text{V}$	-60			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-48\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		-0.003	-1	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-1.5	-2.1	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$ , $V_{DS}=-5\text{V}$	-30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$ , $I_D=-12\text{A}$		91	115	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$ , $I_D=-8\text{A}$		114	150	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}$ , $I_D=-12\text{A}$		12.8		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1\text{A}$ , $V_{GS}=0\text{V}$		-0.76	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-12	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=-30\text{V}$ , $f=1\text{MHz}$		987	1185	pF
$C_{oss}$	Output Capacitance			114		pF
$C_{rss}$	Reverse Transfer Capacitance			46		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		7	10	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$ , $V_{DS}=-30\text{V}$ , $I_D=-12\text{A}$		15.8	20	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			7.4	9	nC
$Q_{gs}$	Gate Source Charge			3		nC
$Q_{gd}$	Gate Drain Charge			3.5		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$ , $V_{DS}=-30\text{V}$ , $R_L=2.5\Omega$ , $R_{GEN}=3\Omega$		9		ns
$t_r$	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off DelayTime			25		ns
$t_f$	Turn-Off Fall Time			11		ns
$t_{rr}$	Body Diode Reverse Recovery Time		$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		27.5	35
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		30		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  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  $T_{J(MAX)}=175^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

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

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

E: The static characteristics in Figures 1 to 6 are obtained using  $<300 \mu\text{s}$  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  $T_{J(MAX)}=175^\circ\text{C}$ .

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

H: These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

P-Channel -60 V (D-S) MOSFET

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

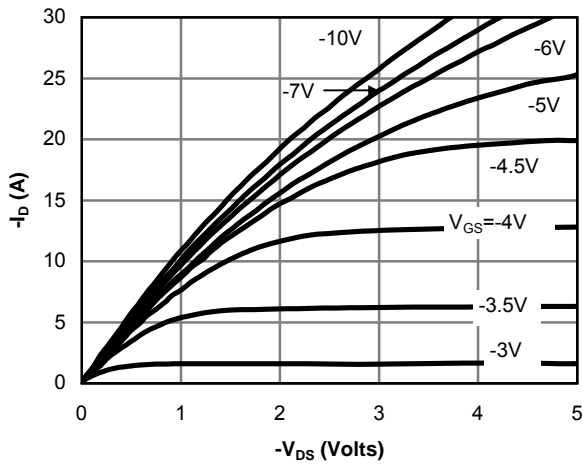


Fig 1: On-Region Characteristics

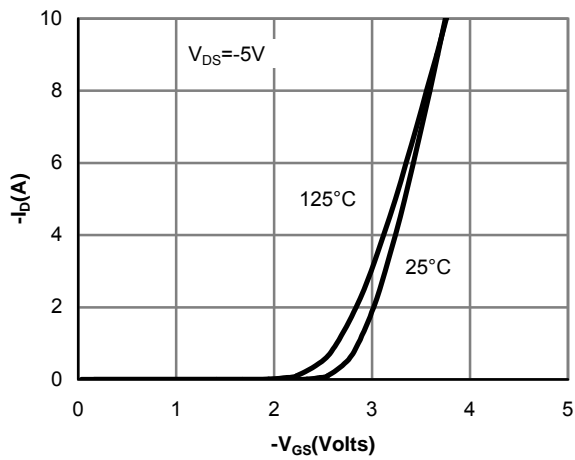


Figure 2: Transfer Characteristics

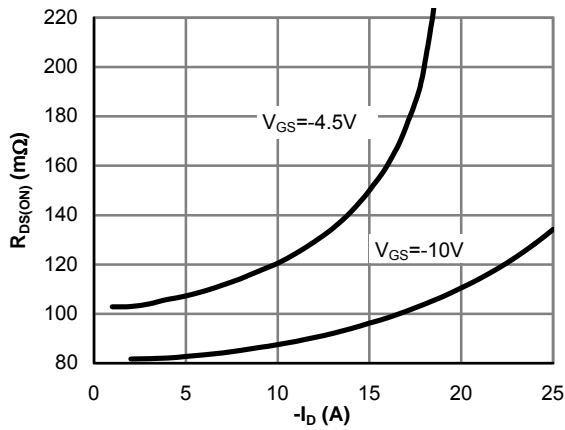


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

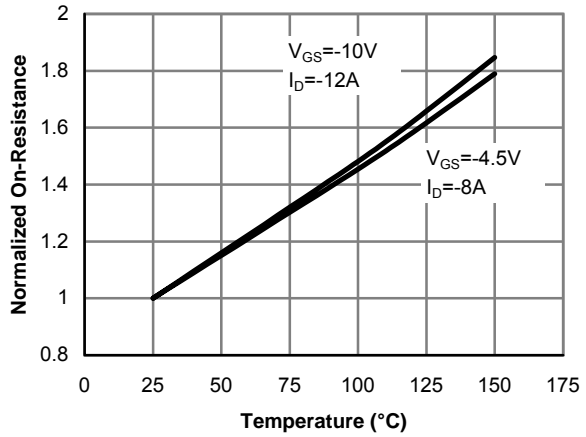


Figure 4: On-Resistance vs. Junction Temperature

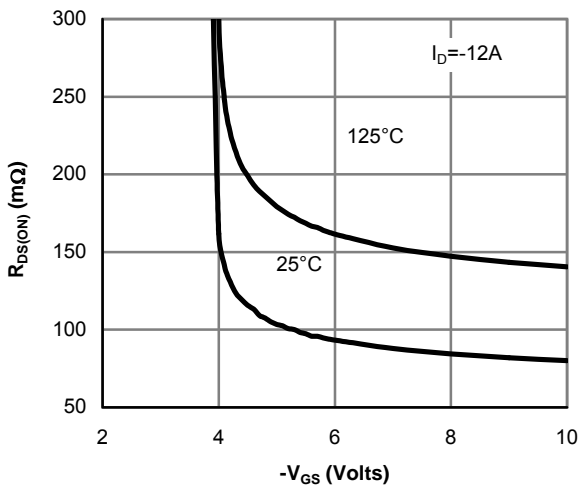


Figure 5: On-Resistance vs. Gate-Source Voltage

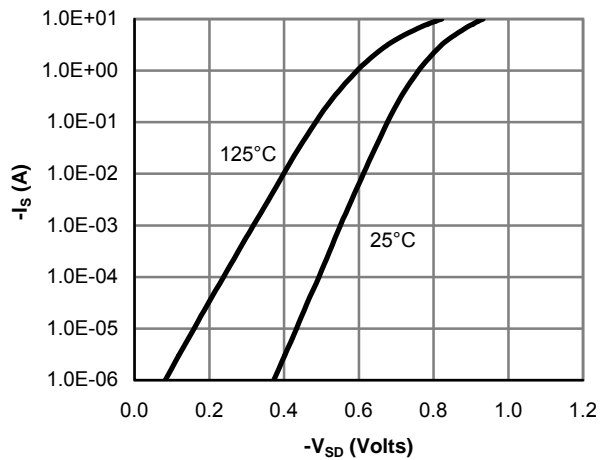


Figure 6: Body-Diode Characteristics

P-Channel -60 V (D-S) MOSFET

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

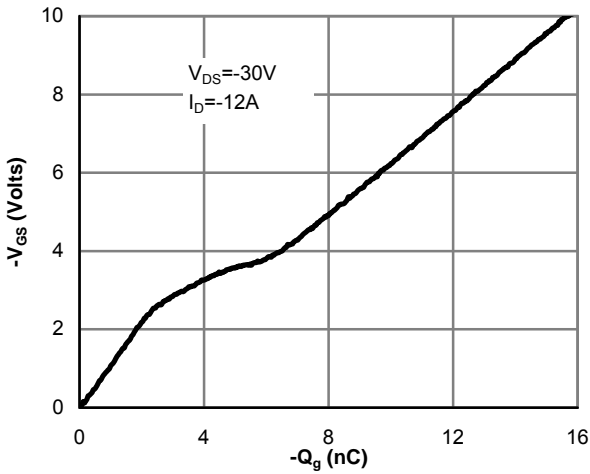


Figure 7: Gate-Charge Characteristics

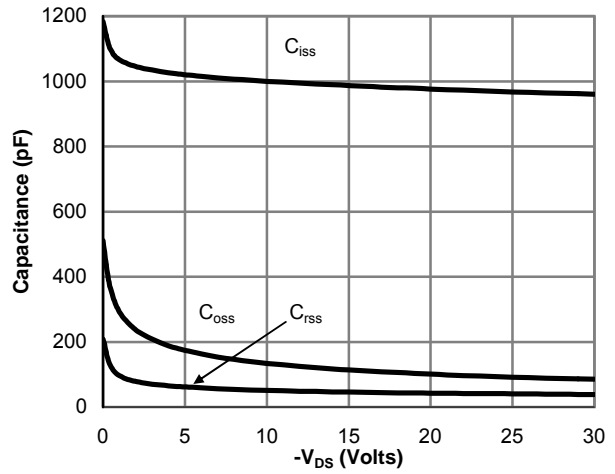


Figure 8: Capacitance Characteristics

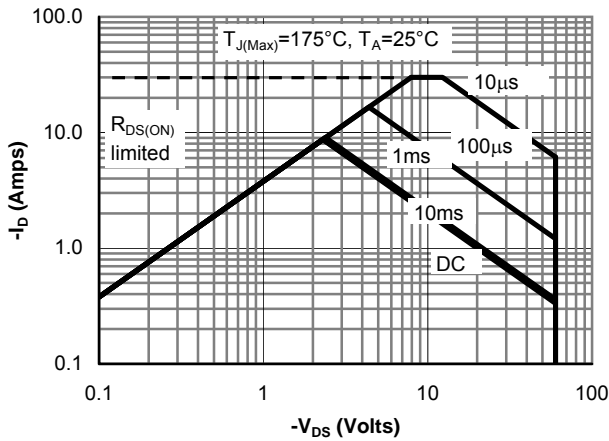


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

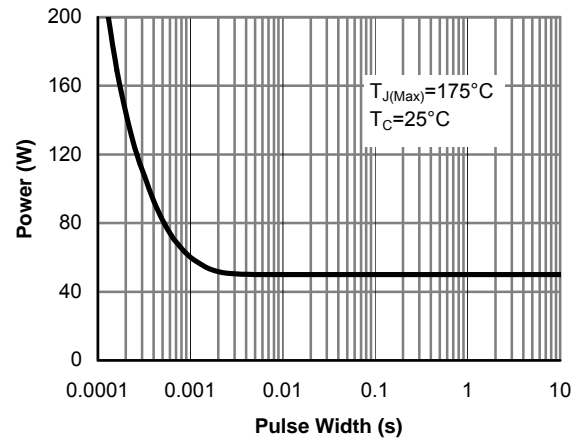


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

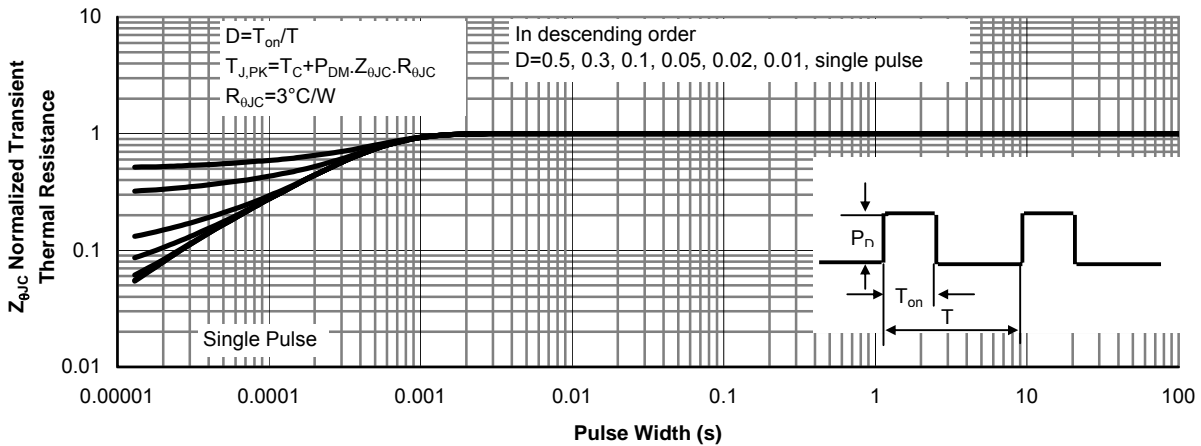


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

P-Channel -60 V (D-S) MOSFET

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

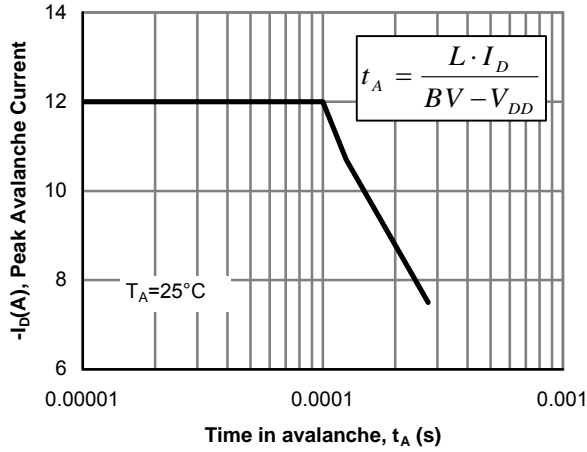


Figure 12: Single Pulse Avalanche capability

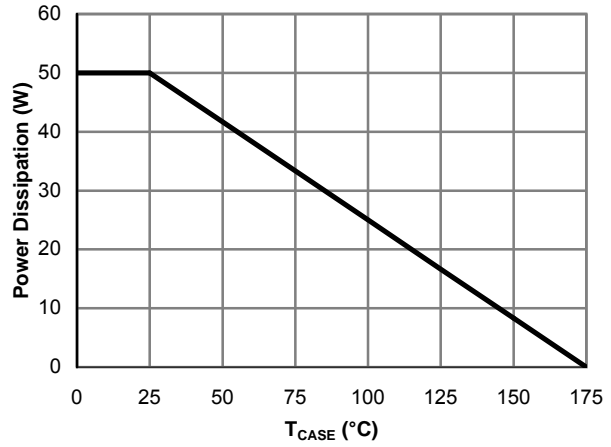


Figure 13: Power De-rating (Note B)

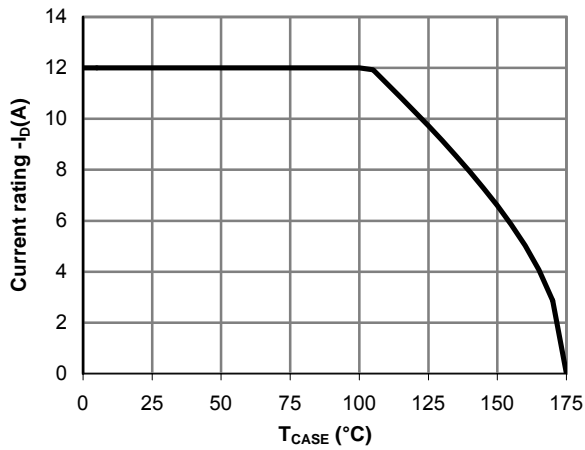


Figure 14: Current De-rating (Note B)

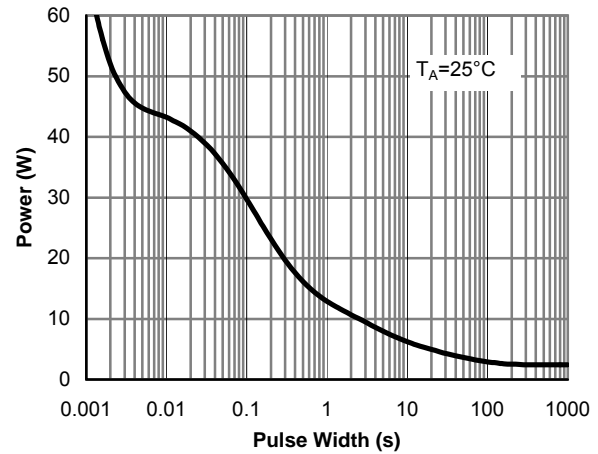


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

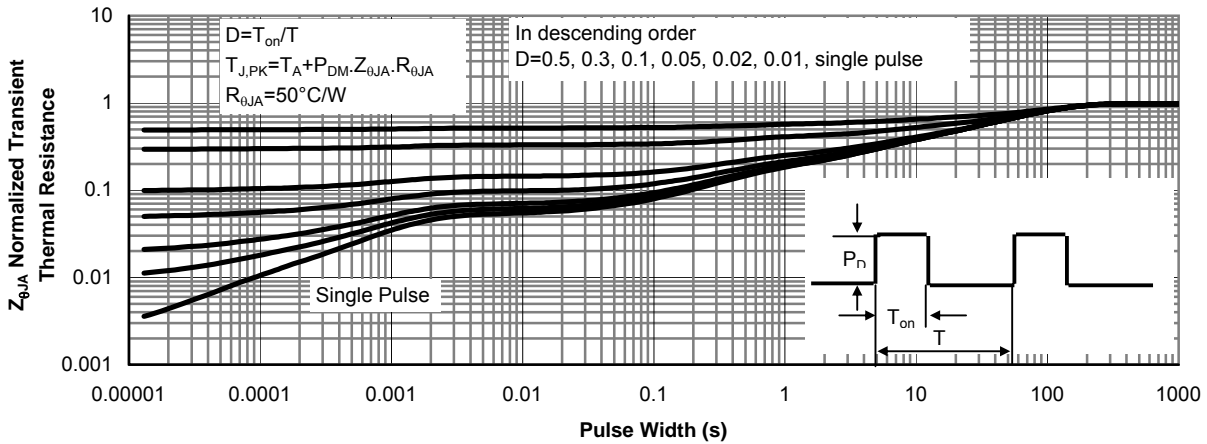
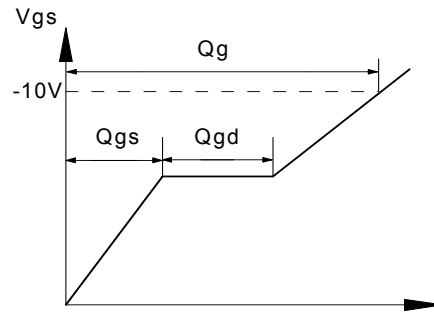
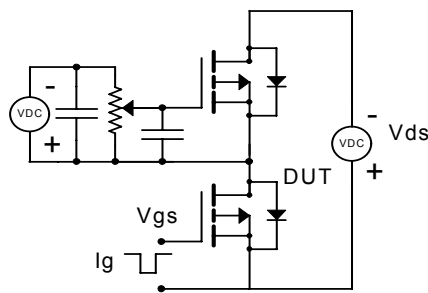


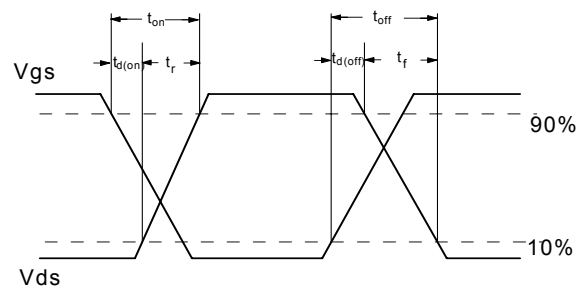
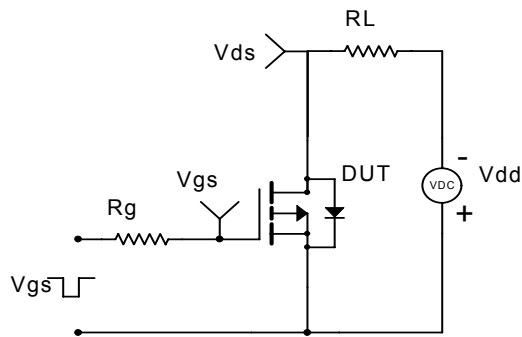
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

P-Channel -60 V (D-S) MOSFET

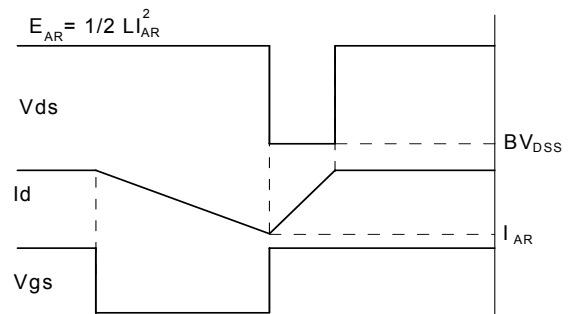
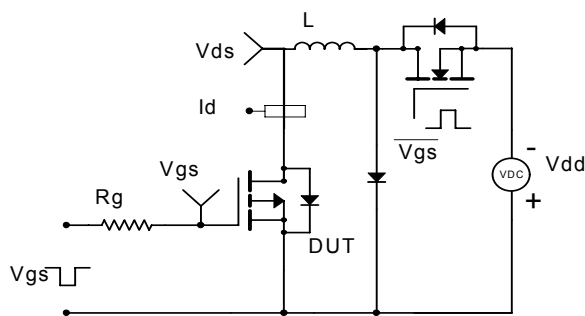
Gate Charge Test Circuit & Waveform



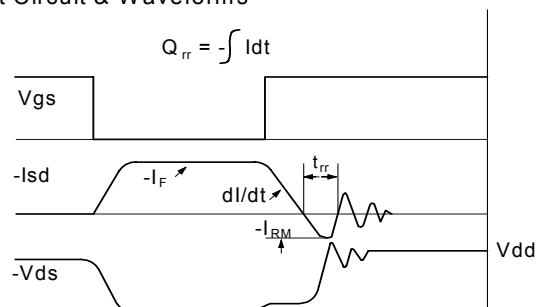
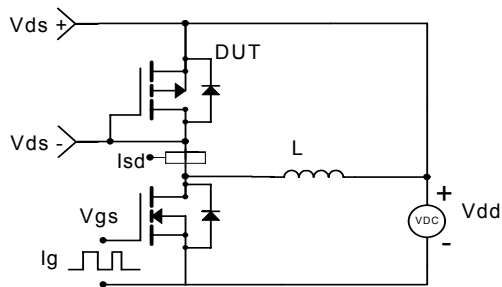
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

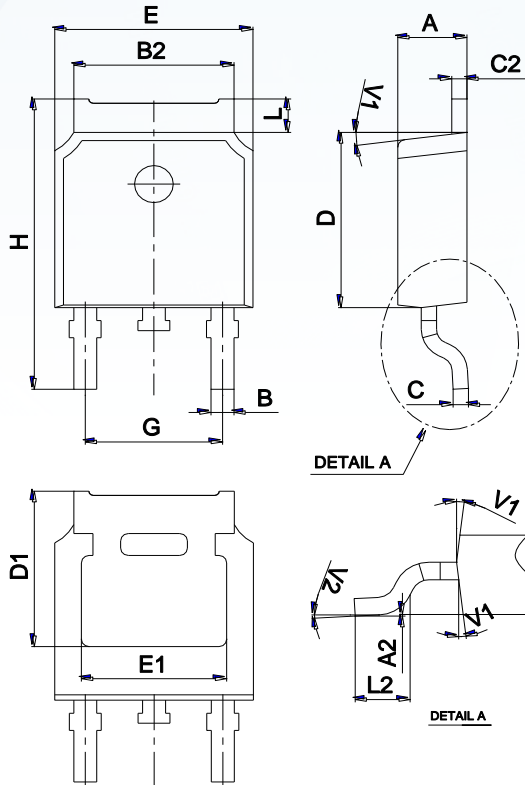


Diode Recovery Test Circuit & Waveforms



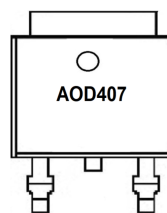
**P-Channel -60 V (D-S) MOSFET**

**Package Mechanical Data TO-252**



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

**Marking**



**Ordering information**

Order code	Package	Baseqty	Deliverymode
AOD407	TO-252	2500	Tape and reel



## Disclaimer

EVVOSEMI ("EVVO") reserves the right to make corrections, enhancements, improvements, and other changes to its products and services at any time, and to discontinue any product or service without notice.

EVVO warrants the performance of its hardware products to the specifications applicable at the time of sale in accordance with its standard warranty. Testing and other quality control techniques are used as deemed necessary by EVVO to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

Customers should obtain and confirm the latest product information and specifications before final design, purchase, or use. EVVO makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does EVVO assume any liability for application assistance or customer product design. EVVO does not warrant or accept any liability for products that are purchased or used for any unintended or unauthorized application.

EVVO products are not authorized for use as critical components in life support devices or systems without the express written approval of EVVOSEMI.

The EVVO logo and EVVOSEMI are trademarks of EVVOSEMI or its subsidiaries in relevant jurisdictions. EVVO reserves the right to make changes without further notice to any products herein.