ALPHA & OMEGA SEMICONDUCTOR

AOT25S65/AOB25S65/AOTF25S65/AOTF25S65L

650V 25A αMOS^{TM} Power Transistor

General Description

The AOT25S65 & AOB25S65 & AOTF25S65 & AOTF25S65L have been fabricated using the advanced αMOS^{TM} high voltage process that is designed to deliver high levels of performance and robustness in switching applications.
By providing low $R_{DS(on)}$, Q_g and E_{OSS} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

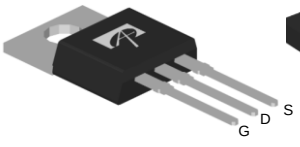
V_{DS} @ $T_{j,max}$	750V
I_{DM}	104A
$R_{DS(ON),max}$	0.19Ω
$Q_{g,typ}$	26.4nC
E_{oss} @ 400V	5.8µC

100% UIS Tested
100% R_g Tested

Green Product

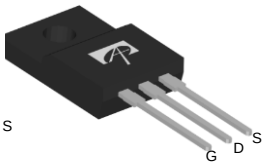
Top View

TO-220



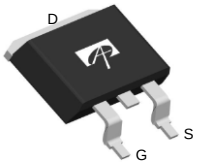
AOT25S65

TO-220F

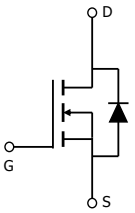


AOTF25S65(L)

TO-263
D^{2}PAK



AOB25S65



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	AOT25S65/AOB25S65	AOTF25S65	AOTF25S65L	Units
Drain-Source Voltage		V_{DS}	650			V
Gate-Source Voltage		V_{GS}	±30			V
Continuous Drain Current	T_C=25°C	I_D	25	25*	25*	A
	T_C=100°C		16	16*	16*	
Pulsed Drain Current [C]		I_{DM}	104			
Avalanche Current [C]		I_{AR}	7			A
Repetitive avalanche energy [C]		E_{AR}	96			mJ
Single pulsed avalanche energy [G]		E_{AS}	750			mJ
Power Dissipation [B]	T_C=25°C	P_D	357	50	40	W
	Derate above 25°C		2.9	0.4	0.3	W/ °C
MOSFET dv/dt ruggedness		dv/dt	100			V/ns
Peak diode recovery dv/dt [H]			20			
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150			°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds [J]		T_L	300			°C

Thermal Characteristics

Parameter	Symbol	AOT25S65/AOB25S65	AOTF25S65	AOTF25S65L	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	65	65	°C/W
Maximum Case-to-sink [A]	$R_{\theta CS}$	0.5	--	--	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.35	2.5	3.1	°C/W

* Drain current limited by maximum junction temperature.

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=250µA, V_{GS}=0V, T_J=25°C	650			V
		I_D=250µA, V_{GS}=0V, T_J=150°C	700	750		
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V			1	µA
		V_{DS}=520V, T_J=150°C		10		
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±30V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=5V,I_D=250µA	2.6	3.3	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=12.5A, T_J=25°C		0.165	0.19	Ω
		V_{GS}=10V, I_D=12.5A, T_J=150°C		0.47	0.53	Ω
V_{SD}	Diode Forward Voltage	I_S=12.5A,V_{GS}=0V, T_J=25°C		0.84		V
I_S	Maximum Body-Diode Continuous Current				25	A
I_{SM}	Maximum Body-Diode Pulsed Current				104	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		1278		pF
C_{oss}	Output Capacitance			87		pF
$C_{o(er)}$	Effective output capacitance, energy related [H]	V_{GS}=0V, V_{DS}=0 to 480V, f=1MHz		64.5		pF
$C_{o(tr)}$	Effective output capacitance, time related [I]			236.7		pF
C_{rss}	Reverse Transfer Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz		1.4		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		4.9		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=480V, I_D=12.5A		26.4		nC
Q_{gs}	Gate Source Charge			6.2		nC
Q_{gd}	Gate Drain Charge			9.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=400V, I_D=12.5A, R_G=25Ω		29		ns
t_r	Turn-On Rise Time			30		ns
$t_{D(off)}$	Turn-Off DelayTime			112		ns
t_f	Turn-Off Fall Time			34		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=12.5A,dI/dt=100A/µs,V_{DS}=400V		408		ns
I_{rm}	Peak Reverse Recovery Current	I_F=12.5A,dI/dt=100A/µs,V_{DS}=400V		33		A
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=12.5A,dI/dt=100A/µs,V_{DS}=400V		8.27		µC

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 $T_{J(MAX)}$=150° 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 $T_{J(MAX)}$=150° C, Ratings are based on low frequency and duty cycles to keep initial T_J =25° 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 µs 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 $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.
G. L=60mH, I_{AS}=5A, V_{DD}=150V, Starting T_J=25° C
H. $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.
I. $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.
J. Wavesoldering only allowed at leads.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

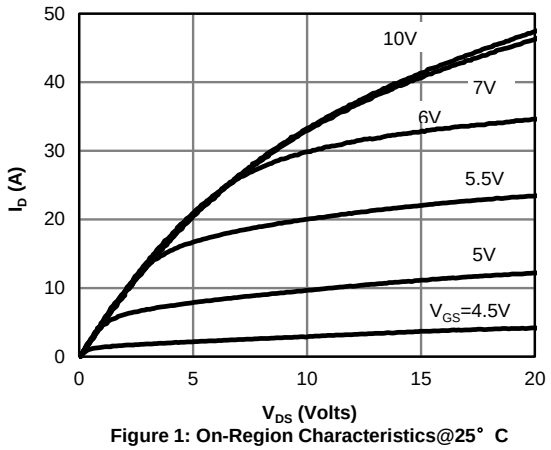


Figure 1: On-Region Characteristics@25° C

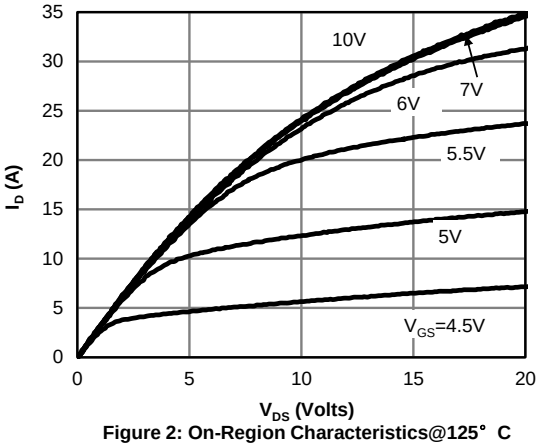


Figure 2: On-Region Characteristics@125° C

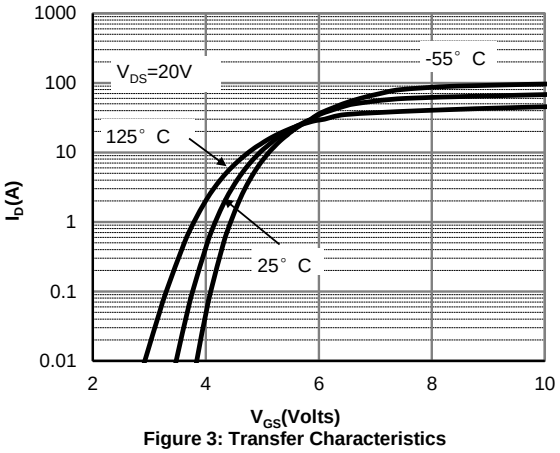


Figure 3: Transfer Characteristics

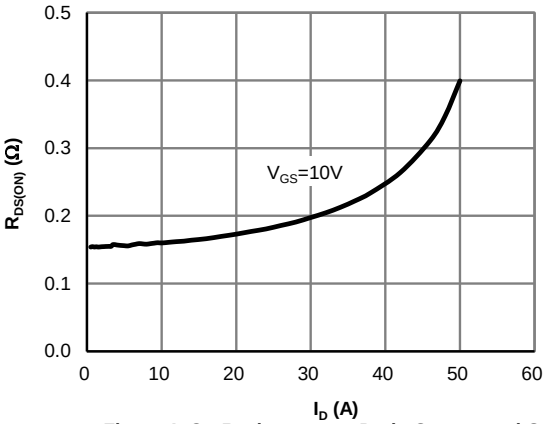


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

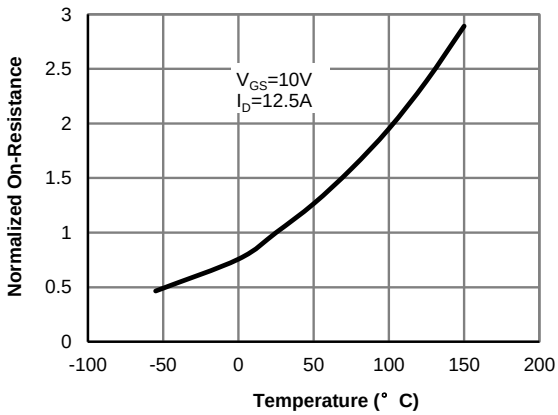


Figure 5: On-Resistance vs. Junction Temperature

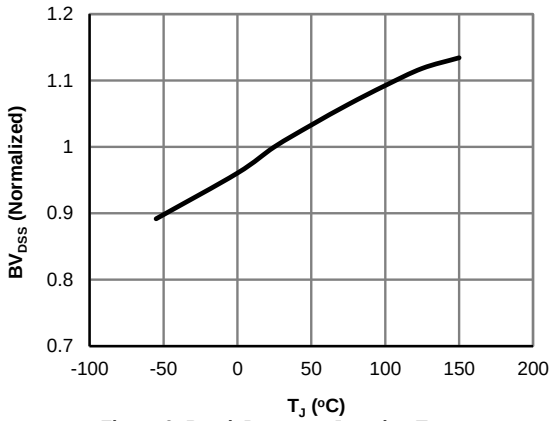


Figure 6: Break Down vs. Junction Temperature

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

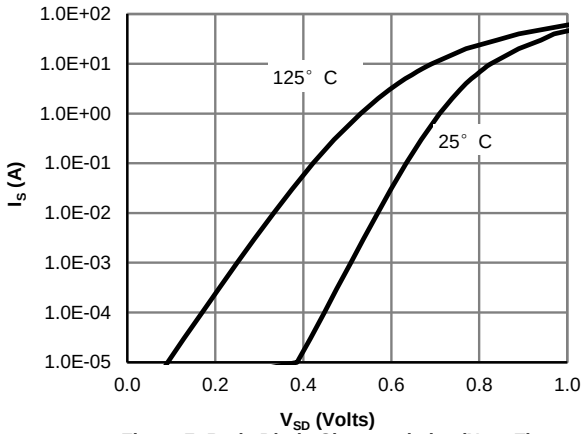


Figure 7: Body-Diode Characteristics (Note E)

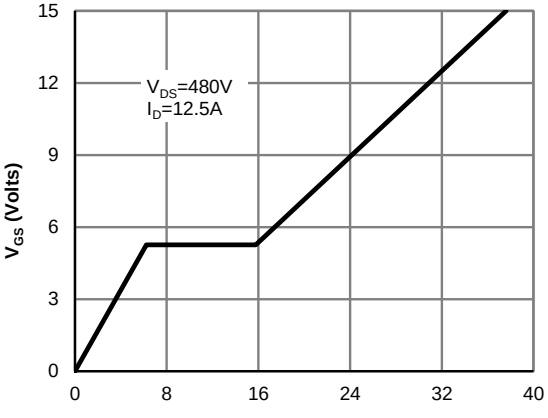


Figure 8: Gate-Charge Characteristics

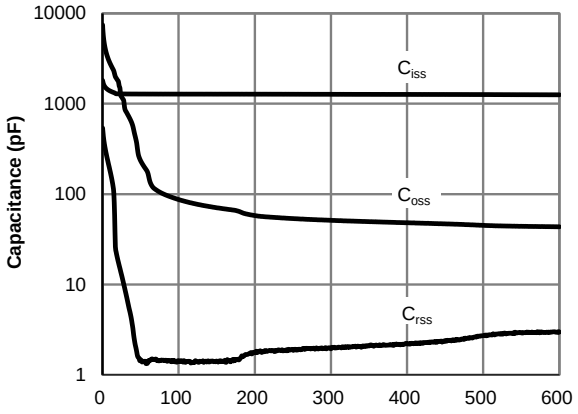


Figure 9: Capacitance Characteristics

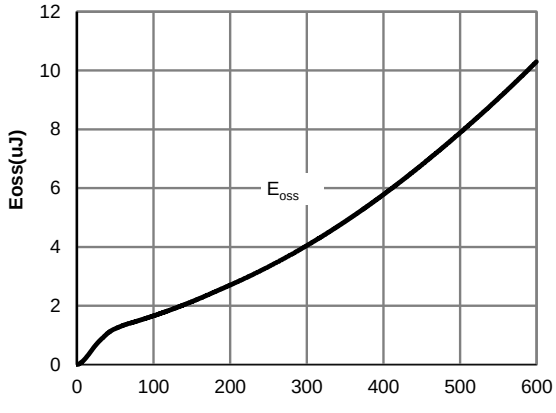


Figure 10: Coss stored Energy

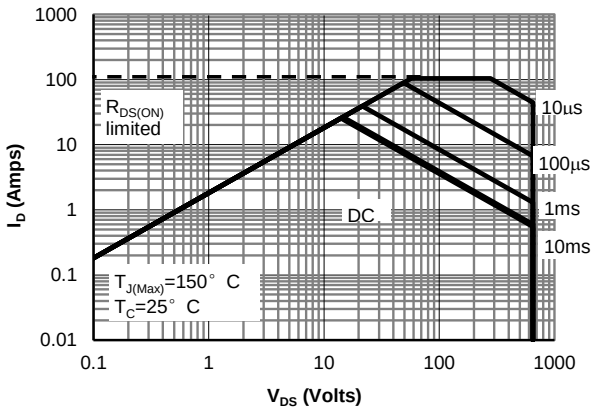


Figure 11: Maximum Forward Biased Safe Operating Area for AOT(B)25S65 (Note F)

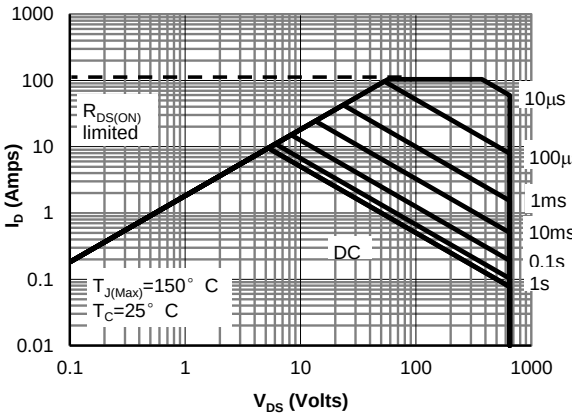


Figure 12: Maximum Forward Biased Safe Operating Area for AOTF25S65(Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

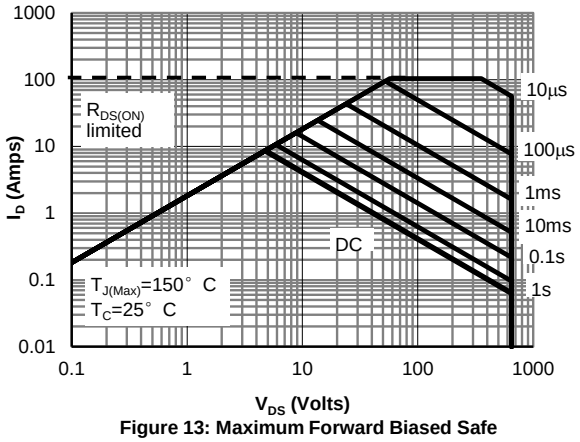


Figure 13: Maximum Forward Biased Safe Operating Area for AOTF25S65L(Note F)

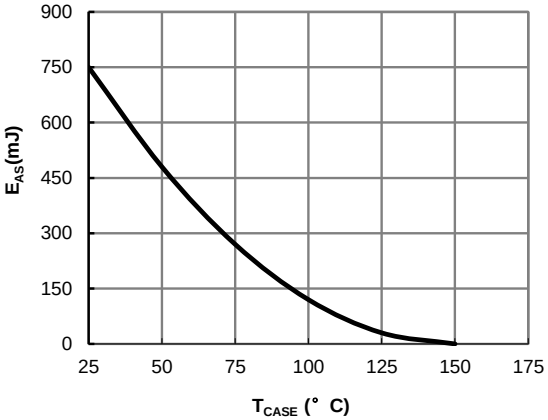


Figure 14: Avalanche energy

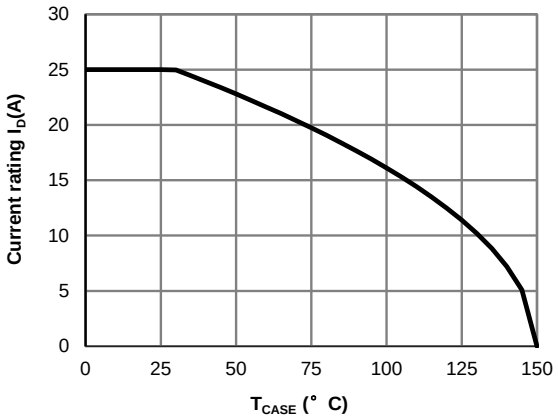


Figure 15: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

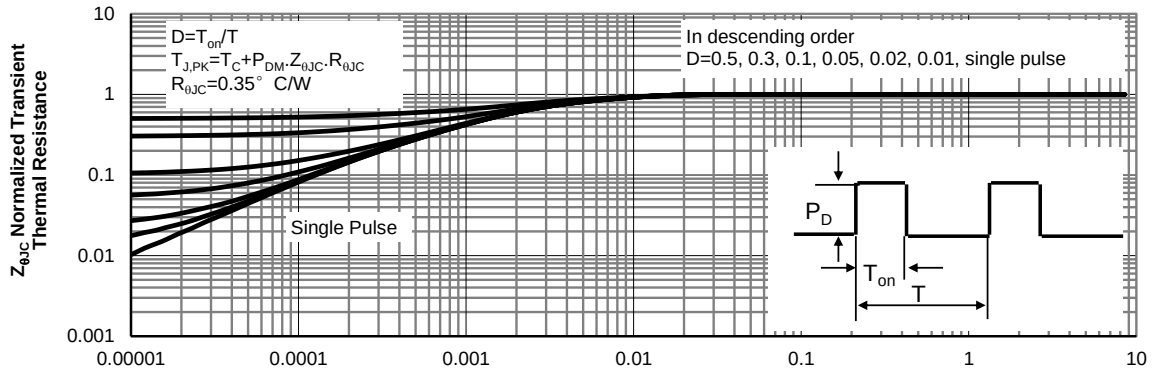


Figure 16: Normalized Maximum Transient Thermal Impedance for AOT(B)25S65 (Note F)

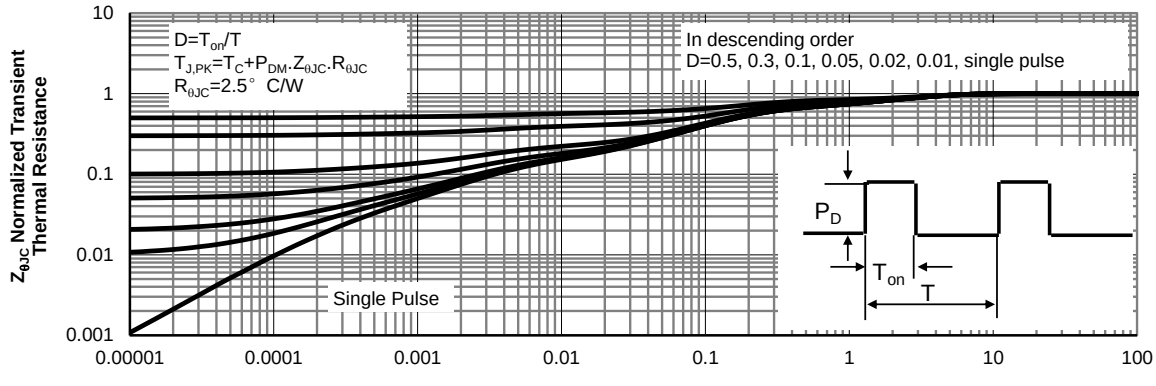


Figure 17: Normalized Maximum Transient Thermal Impedance for AOTF25S65 (Note F)

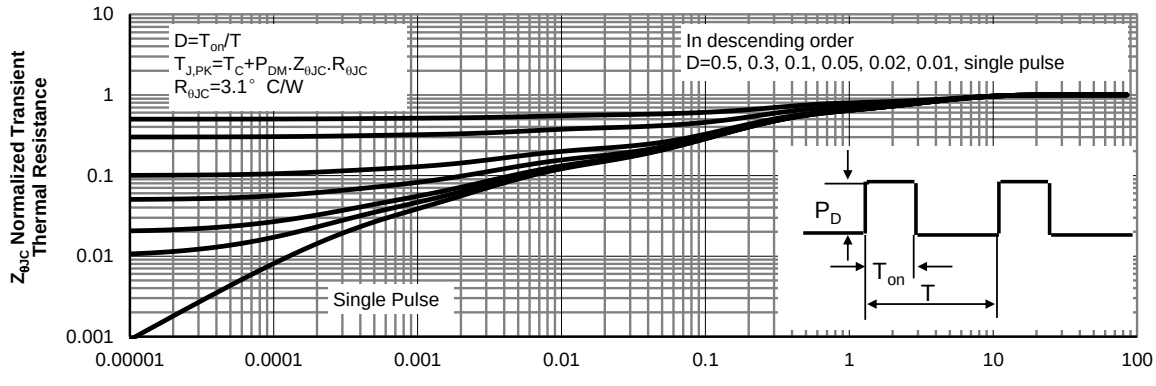
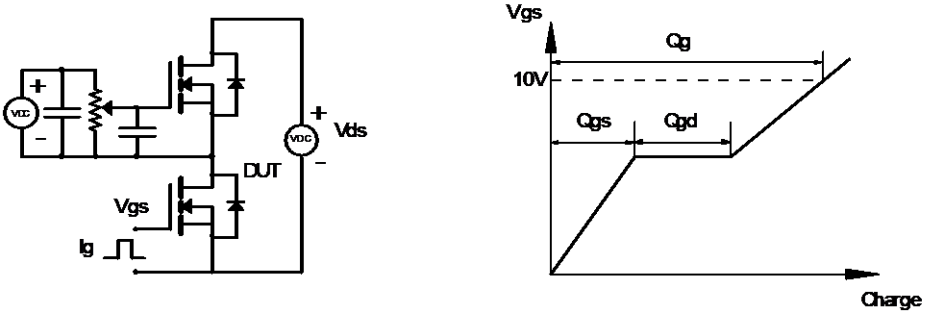
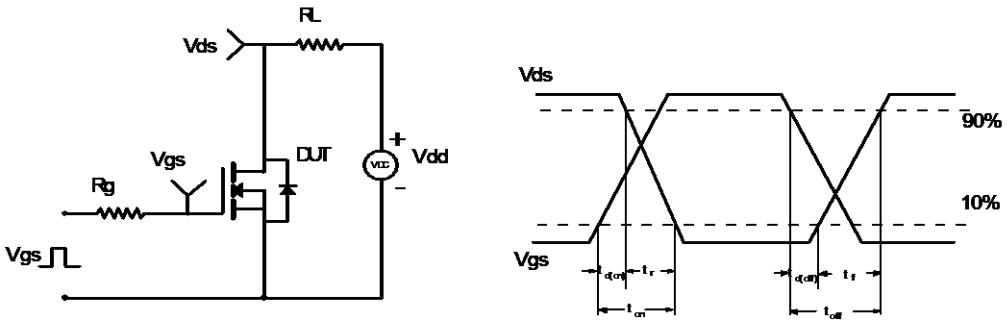


Figure 18: Normalized Maximum Transient Thermal Impedance for AOTF25S65L (Note F)

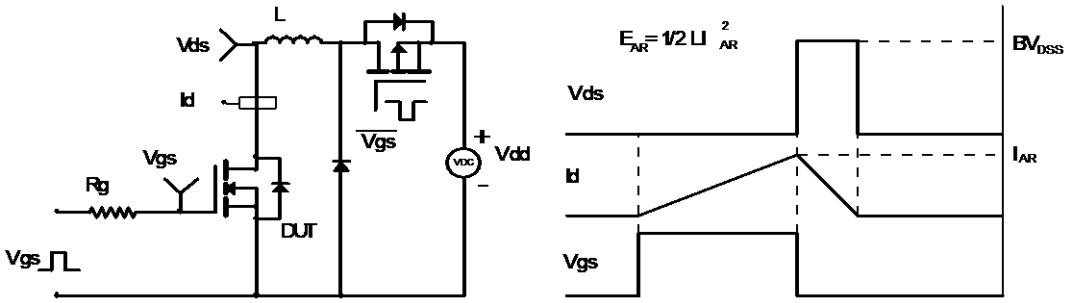
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms