

Features

- Proprietary α SiC MOSFET technology
- Low loss, with low $R_{DS(ON)}$
- Fast switching with low R_G and low capacitance
- Optimized gate drive voltage ($V_{GS} = 15V$)
- Low reverse recovery diode (Q_{rr})

Applications

Renewable

- EV Charger
- Solar Inverters

Industrial

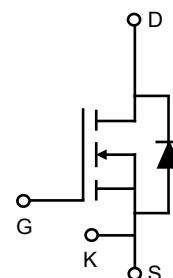
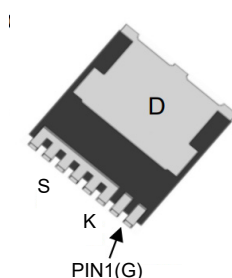
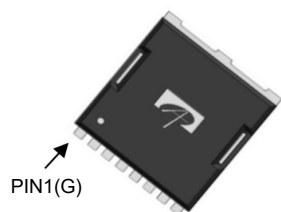
- UPS
- SMPS
- Motor Drives

Product Summary

$V_{DS} @ T_{J, max}$	650V
I_{DM}	120A
$R_{DS(ON), typ}$	22m Ω
Q_{rr}	70nC
$E_{OSS} @ 400V$	22 μ J
100 % UIS Tested	



Pin Configuration



Ordering Part Number	Package Type	Form	Shipping Quantity
AOTL022V65X2	TOLL	Tape & Reel	2000/Reel

Absolute Maximum Ratings

($T_A = 25^\circ C$, unless otherwise noted)

Symbol	Parameter		AOTL022V65X2	Units
V_{DS}	Drain-Source Voltage		650	V
$V_{GS, MAX}$	Gate-Source Voltage	Maximum	-8/+18	V
$V_{GS, OP, TRANS}$		Max Transient ^(A)	-8/+20	
$V_{GS, OP}$		Recommended Operating ^(B)	-5/+15	
I_D	Continuous Drain Current	$T_C = 25^\circ C$	102	A
		$T_C = 100^\circ C$	72	
I_{DM}	Pulsed Drain Current ^(C)		120	
E_{AS}	Single Pulsed Avalanche Energy ^(D)		1.0	J
P_D	Power Dissipation ^(C)	$T_C = 25^\circ C$	468	W
T_J, T_{STG}	Junction and Storage Temperature Range		-55 to 175	$^\circ C$
T_L	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		260	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ^(E,F)		40	°C/W
$R_{\theta JC}$	Maximum Junction-to-Case ^(G)	0.27	0.32	°C/W

Electrical Characteristics

($T_A = 25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$, $T_J = 25^\circ\text{C}$	650			V
		$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$, $T_J = 150^\circ\text{C}$	650			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{V}$, $V_{GS} = 0\text{V}$			100	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = +15/-5\text{V}$			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 21\text{mA}$	1.8	2.5	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 15\text{V}$, $I_D = 21\text{A}$		22	30	m Ω
		$T_J = 25^\circ\text{C}$		22		
		$T_J = 175^\circ\text{C}$		33		
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{V}$, $I_D = 21\text{A}$		18		S
V_{SD}	Diode Forward Voltage	$I_S = 21\text{A}$, $V_{GS} = -5\text{V}$		4	5	V
DYNAMIC						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 400\text{V}$, $f = 100\text{kHz}$		2999		pF
C_{oss}	Output Capacitance			218		pF
C_{rss}	Reverse Transfer Capacitance			11		pF
E_{oss}	C_{oss} Stored Energy			22		μJ
R_G	Gate Resistance	$f = 1\text{MHz}$		1.5		Ω
SWITCHING						
Q_g	Total Gate Charge	$V_{GS} = -5/+15\text{V}$, $V_{DS} = 520\text{V}$, $I_D = 21\text{A}$		99		nC
Q_{gs}	Gate Source Charge			35		nC
Q_{gd}	Gate Drain Charge			24		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = -5\text{V}/+15\text{V}$, $V_{DS} = 400\text{V}$, $I_D = 30\text{A}$, $R_{G,ON} = 2\Omega$, $R_{G,OFF} = 0\Omega$		12		ns
t_r	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off Delay Time			18		ns
t_f	Turn-Off Fall Time			7		ns
E_{on}	Turn-On Energy	$L = 47.5\mu\text{H}$		102		μJ
E_{off}	Turn-Off Energy	FWD: AOTL022V65X2		22		μJ
E_{tot}	Total Switching Energy			124		μJ
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 30\text{A}$, $dI/dt = 1500\text{A}/\mu\text{s}$, $V_{DS} = 400\text{V}$		11		ns
I_{rm}	Peak Reverse Recovery Current			9		A
Q_{rr}	Body Diode Reverse Recovery Charge			70		nC

Notes:

- A. $t_{ON} < 1\% \cdot (\text{Duty Cycle}) / (\text{Frequency})$, $t < 25$ hrs over lifetime
 B. Device can be operated at $V_{GS} = 0/15\text{V}$. Actual operating V_{GS} will depend on application specifics such as parasitic inductance and dV/dt but should not exceed maximum ratings.
 C. 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.
 D. $L = 5\text{mH}$, $I_{AS} = 20\text{A}$, $R_G = 10\Omega$, Starting $T_J = 25^\circ\text{C}$.
 E. The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A = 25^\circ\text{C}$.

- F. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
 G. The value of $R_{\theta JC}$ is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 175^\circ\text{C}$.
 H. The static characteristics in Figures 1 to 8 are obtained using $< 300\mu\text{s}$ pulses, duty cycle 0.5% max.
 I. These curves are based on $R_{\theta JC}$ which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 175^\circ\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

$T_A = 25^\circ\text{C}$, unless otherwise specified.

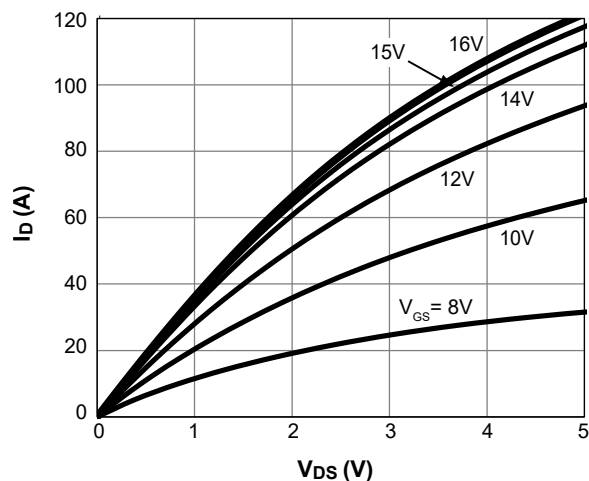


Figure 1. On-region Characteristics $T_J = 25^\circ\text{C}$

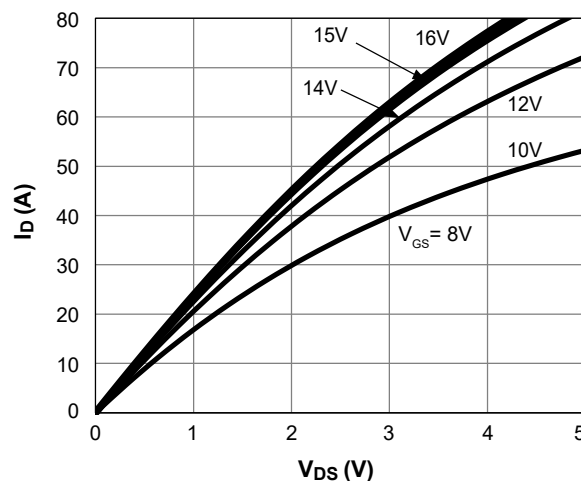


Figure 2. On-region Characteristics $T_J = 175^\circ\text{C}$

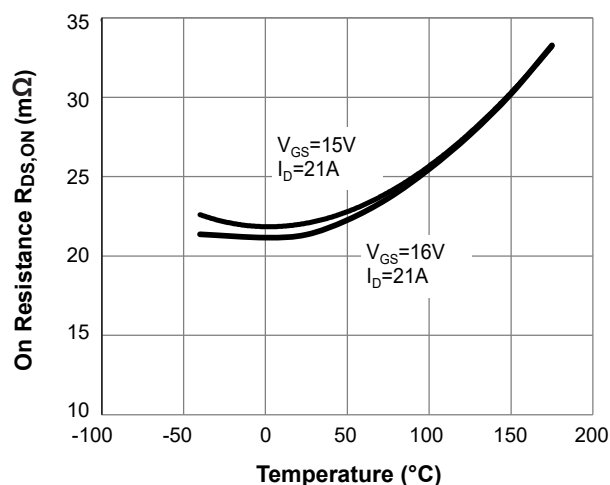


Figure 3. On-resistance vs. Junction Temperature

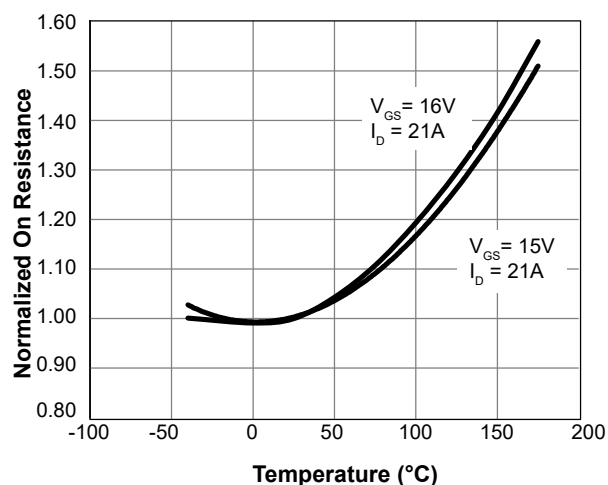


Figure 4. Normalized On-resistance vs. Junction Temperature

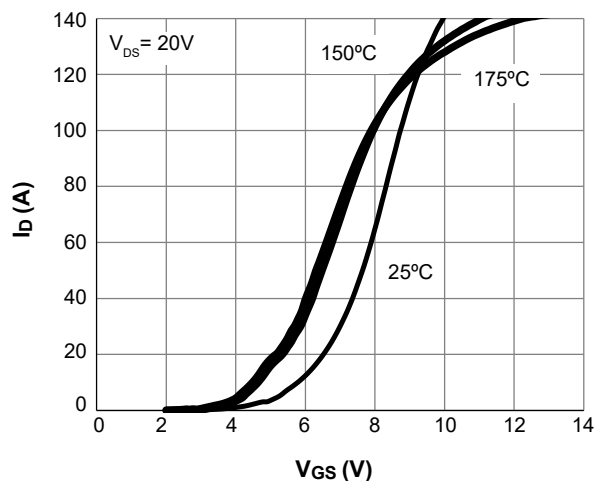


Figure 5. Transfer Characteristics

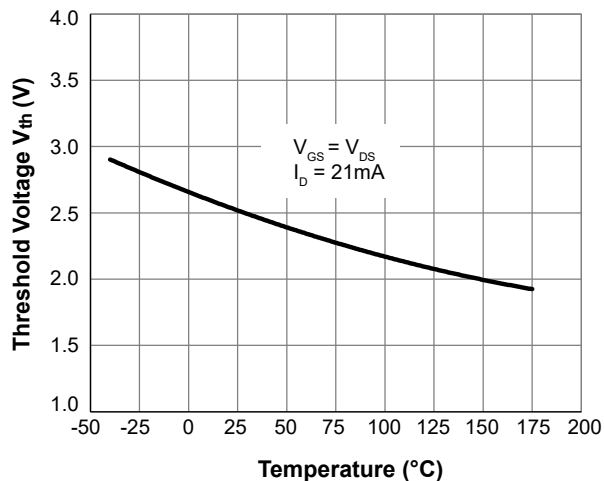


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics

$T_A = 25^\circ\text{C}$, unless otherwise specified.

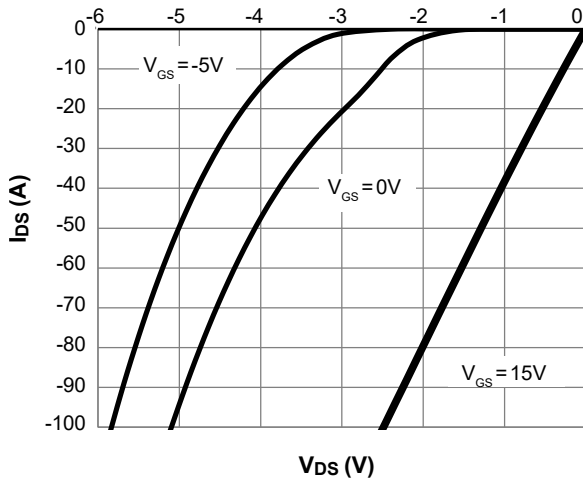


Figure 7. Body-diode Characteristics $T_J = 25^\circ\text{C}$

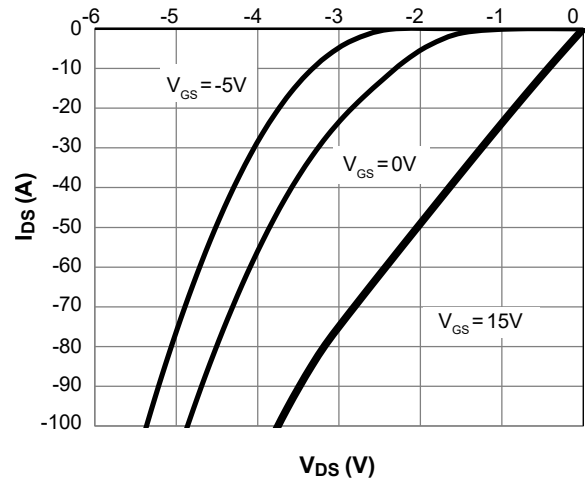


Figure 8. Body-diode Characteristics $T_J = 175^\circ\text{C}$

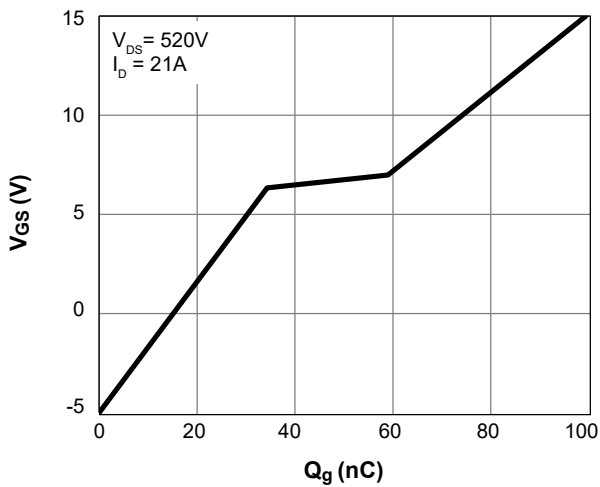


Figure 9. Gate-charge Characteristics

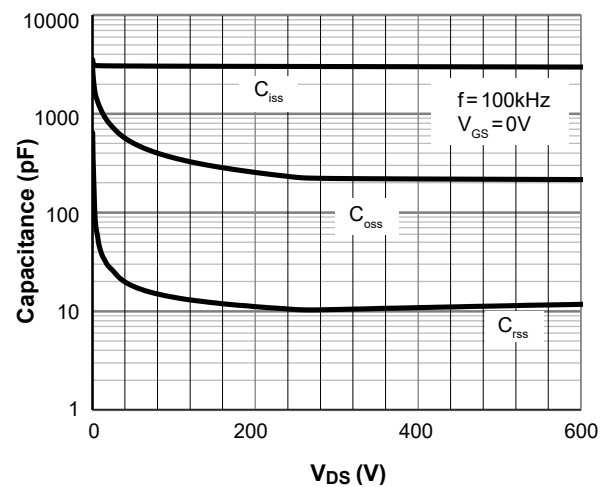


Figure 10. Capacitance Characteristics

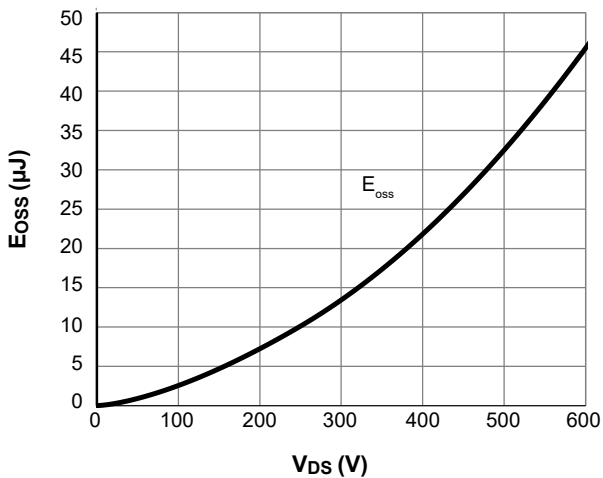


Figure 11. C_{oss} Stored Energy

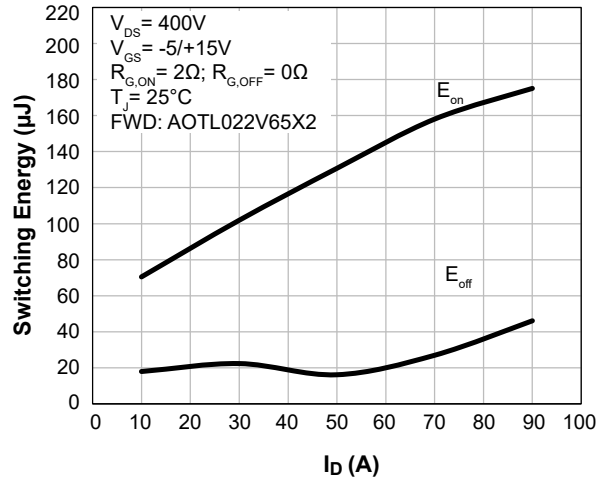


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics (Continued)

$T_A = 25^\circ\text{C}$, unless otherwise specified.

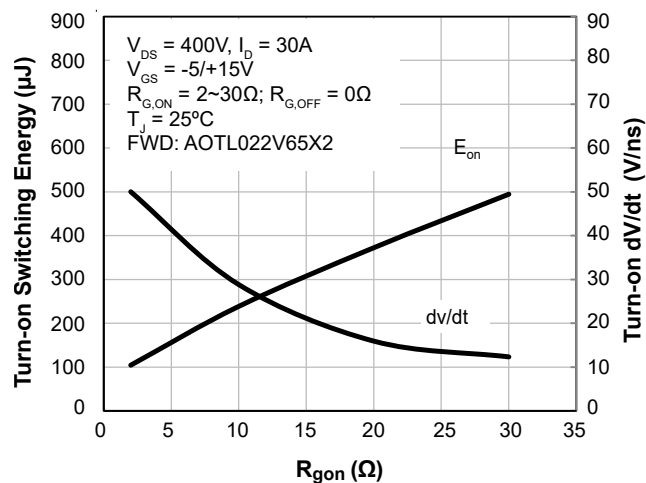


Figure 13. Turn-on Energy and dv/dt vs. External Gate Resistance

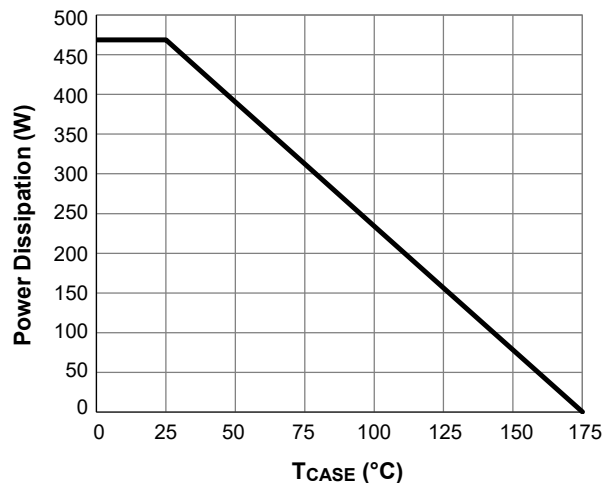


Figure 14. Power De-rating (Note I)

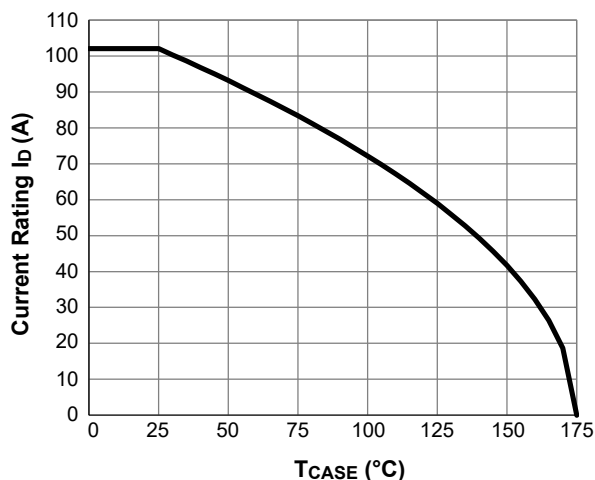


Figure 15. Current De-rating (Note I)

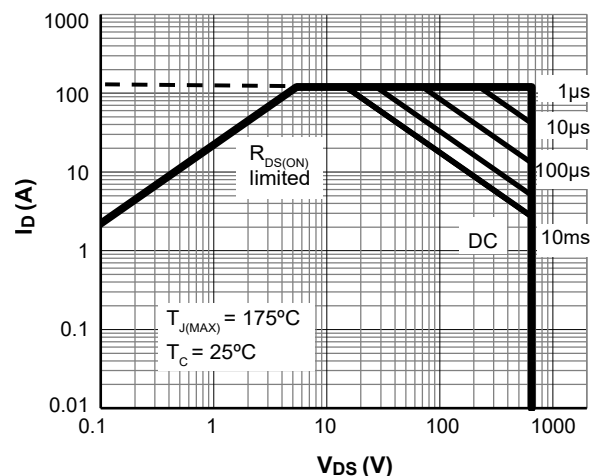


Figure 16. Maximum Forward Biased Safe Operating Area for AOTL022V65X2 (Note I)

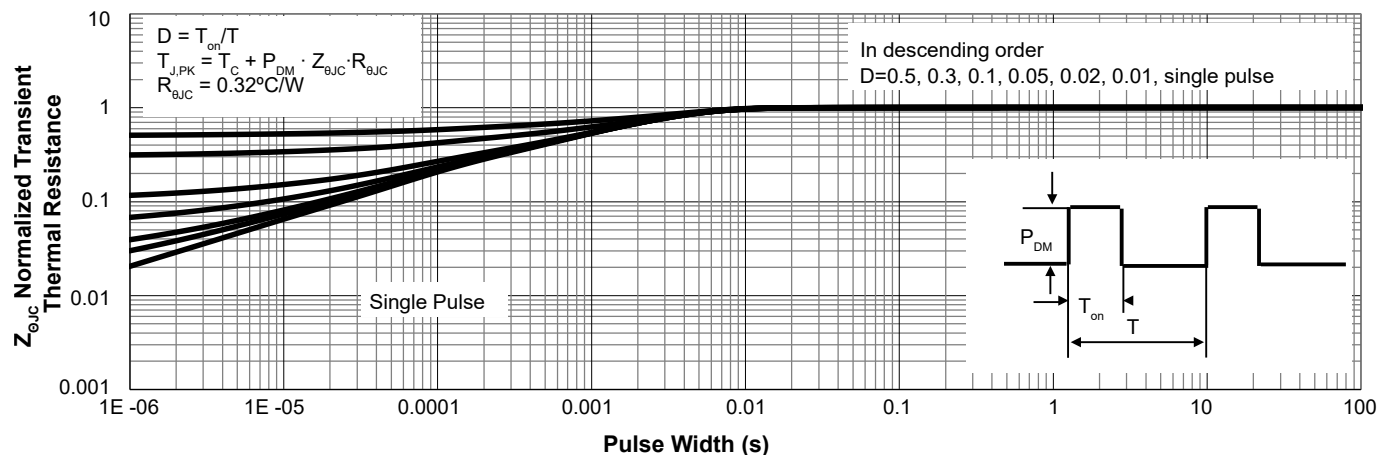


Figure 17. Normalized Maximum Transient Thermal Impedance for AOTL022V65X2 (Note I)

Test Circuits and Waveforms

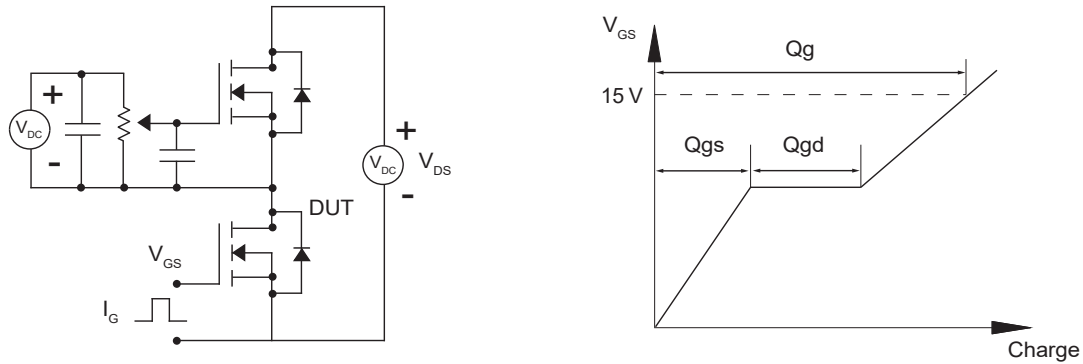


Figure 18. Gate Charge Test Circuits and Waveforms

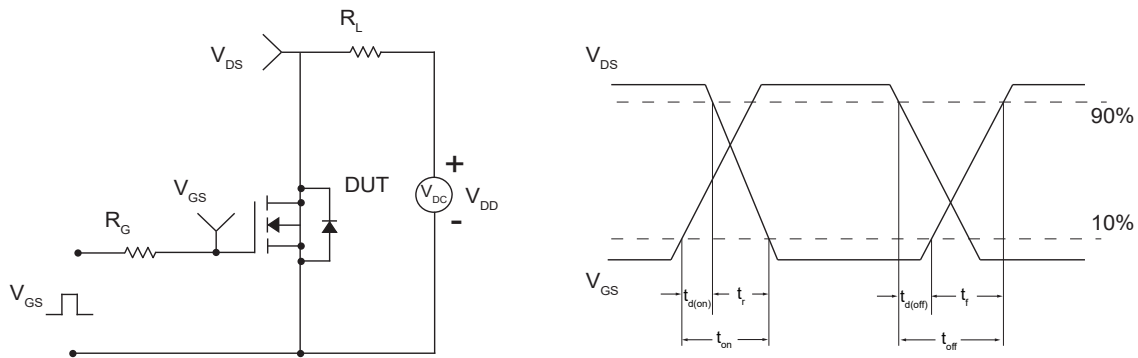


Figure 19. Resistive Switching Test Circuit and Waveforms

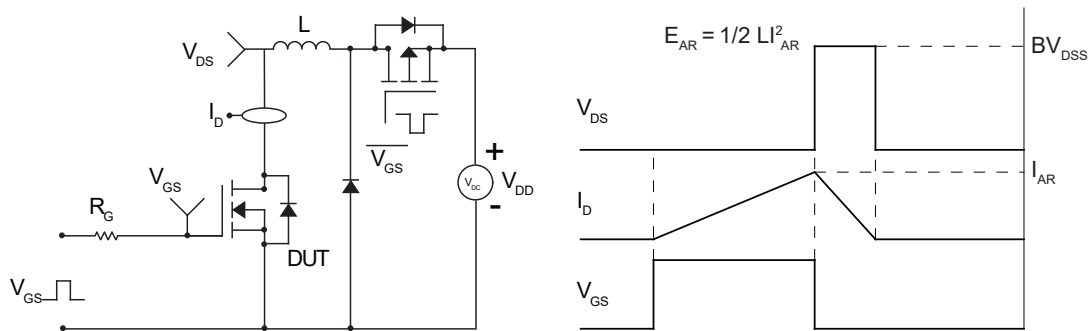


Figure 20. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

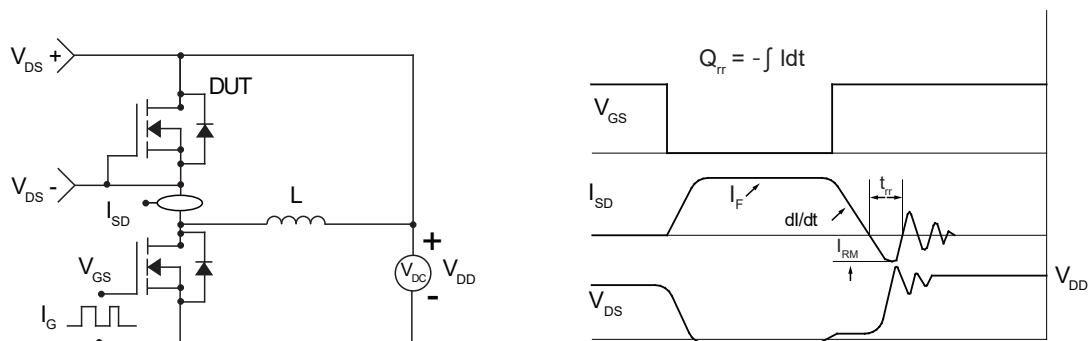
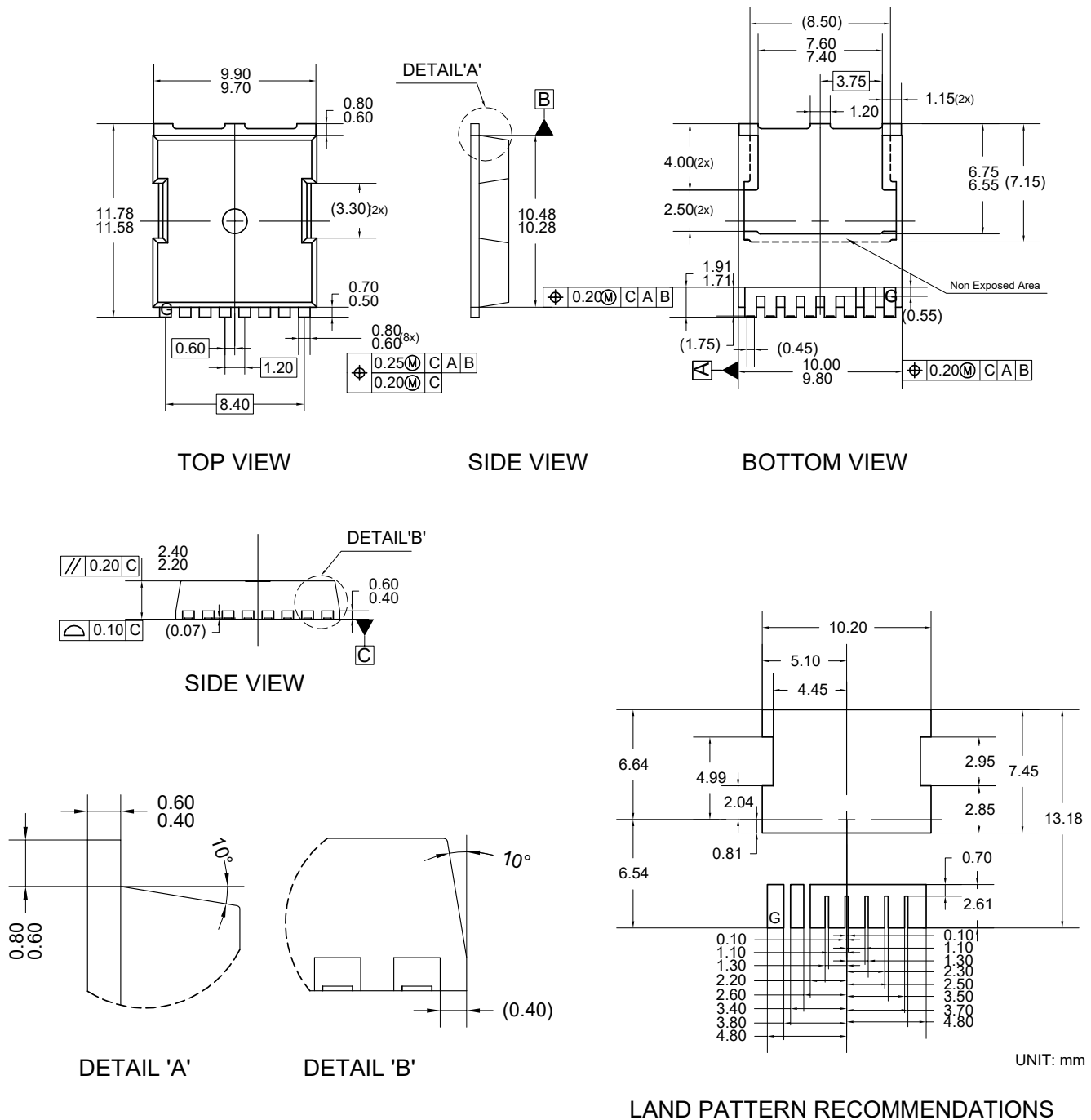


Figure 21. Diode Recovery Test Circuits and Waveforms

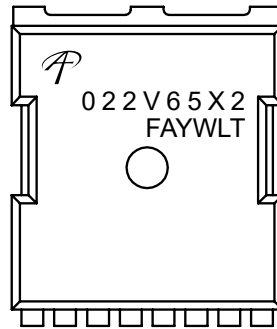
Package Dimensions, TOLL



NOTE:

- A) PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MIL.
- B) TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- C) CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
- D) () IS REFERENCE.
- E) THIS PACKAGE WAS QUALIFIED USING IR REFLOW PROCESS (JEDEC STANDARD). FOR USAGE IN OTHER SOLDERING PROCESSES, PLEASE CONTACT LOCAL AOS REPRESENTATIVES.

Part Marking



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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.