

Features

- Proprietary α SiC MOSFET technology
- Low loss, with low $R_{DS(ON)}$
- Fast switching with low R_G and low capacitance
- Flexible gate voltage range ($V_{GS} = 15V$ to $18V$)
- Low reverse recovery diode (Q_{rr})

Applications

Renewable

- SMPS/AI server
- DC/DC converters
- UPS

Industrial

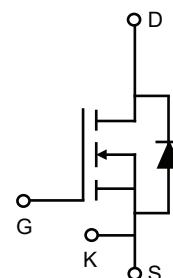
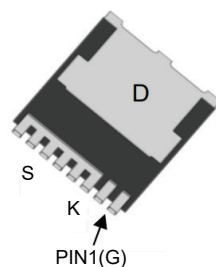
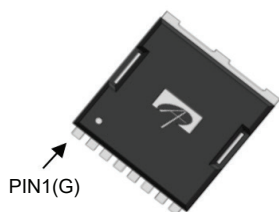
- Energy storage
- Solar inverters



Product Summary

$V_{DS} @ T_{J, max}$	750V
I_{DM}	405A
$R_{DS(ON)}, typ$	15m Ω
Q_{rr}	140nC
$E_{OSS} @ 400V$	28 μ J
100 % UIS Tested	

Pin Configuration



Ordering Part Number	Package Type	Form	Shipping Quantity
AOTL015V75X3	TOLL	Tape & Reel	2000/Reel

Absolute Maximum Ratings

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

Symbol	Parameter		AOTL015V75X3	Units
V_{DS}	Drain-Source Voltage		750	V
$V_{GS, MAX}$	Gate-Source Voltage	Maximum	-8/+23	V
$V_{GS, OP, TRANS}$		Max Transient ^(A)	-10/+25	
$V_{GS, OP, ON}$		Recommended Operating ^(B)	15...18	
$V_{GS, OP, OFF}$			-3...0	
I_D	Continuous Drain Current ^(C)	$T_C = 25^\circ C$	139	A
		$T_C = 100^\circ C$	98	
I_{DM}	Pulsed Drain Current ^(D)		405	
E_{AS}	Single Pulsed Avalanche Energy ^(F)		1.2	J
P_D	Power Dissipation ^(E)	$T_C = 25^\circ C$	141	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	$^\circ C$

Electrical Characteristics

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D = 250μA, V _{GS} = 0V, T _J = 25°C	750			V
		I _D = 250μA, V _{GS} = 0V, T _J = 150°C	750			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 750V, V _{GS} = 0V			100	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = +18/-3V			200	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 26mA	2.2	3	4.3	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 15V, I _D = 26A	T _J = 25°C	18	25	mΩ
				24		
		V _{GS} = 18V, I _D = 26A	T _J = 25°C	15	21	
			T _J = 175°C	23		
g _{FS}	Forward Transconductance	V _{DS} = 20V, I _D = 26A		5		S
V _{SD}	Diode Forward Voltage	I _S = 26A, V _{GS} = -3V		4	5	V
DYNAMIC						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 400V, f = 100kHz		3877		pF
C _{oss}	Output Capacitance			287		pF
C _{rss}	Reverse Transfer Capacitance			24		pF
E _{oss}	C _{oss} Stored Energy			28		μJ
C _{o(er)}	Effective output capacitance, energy related ^(L)	V _{GS} = 0V, V _{DS} = 0 to 400V, f = 100kHz		329		pF
C _{o(tr)}	Effective output capacitance, time related ^(M)			437		pF
R _G	Gate Resistance	f = 1MHz		1.6		Ω
SWITCHING						
Q _g	Total Gate Charge	V _{GS} = -3/+18V, V _{DS} = 520V, I _D = 26A		152		nC
Q _{gs}	Gate Source Charge			38		nC
Q _{gd}	Gate Drain Charge			39		nC
t _{D(on)}	Turn-On Delay Time	V _{GS} = -3V/+18V, V _{DS} = 400V, I _D = 50A, R _{G,ON} = R _{G,OFF} = 2Ω, L = 47.5μH		12		ns
t _r	Turn-On Rise Time			13		ns
t _{D(off)}	Turn-Off Delay Time			25		ns
t _f	Turn-Off Fall Time			7		ns
E _{on}	Turn-On Energy			186		μJ
E _{off}	Turn-Off Energy			29		μJ
E _{tot}	Total Switching Energy			215		μJ
t _{rr}	Body Diode Reverse Recovery Time	I _F = 50A, dI/dt = 1500A/μs, V _{DS} = 400V		18		ns
I _{rm}	Peak Reverse Recovery Current			16		A
Q _{rr}	Body Diode Reverse Recovery Charge			140		nC

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ^(G,H)		40	°C/W
$R_{\theta JC}$	Maximum Junction-to-Case ^(I)	0.28	0.34	°C/W

Notes:

- A. $t_{ON} < 1\mu s$, $t < 25$ hrs over lifetime. t_{ON} is duration of V_{GS} transient and t is total time spent at $V_{GS,OP,TRANS}$ over product lifetime.
- B. Device can be operated at $V_{GS} = 0/18V$. Actual operating V_{GS} will depend on application specifics such as parasitic inductance and dV/dt but should not exceed maximum ratings.
- C. Continuous drain current is calculated based on maximum $R_{\theta JC}$ and typical $R_{DS(on)}$ at 175°C.
- D. I_{DM} obtained using a $V_{GS} = 18V$, 10ms pulse, and limiting the device to a maximum junction temperature of 175°C.
- E. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ C$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- F. $L = 5mH$, $I_{AS} = 22A$, $R_G = 10\Omega$, Starting $T_J = 25^\circ C$.
- G. The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A = 25^\circ C$.
- H. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
- I. The value of $R_{\theta JC}$ is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 175^\circ C$.
- J. The static characteristics in Figures 1 to 8 are obtained using $< 300\mu s$ pulses, duty cycle 0.5% max.
- K. 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 $T_{J(MAX)} = 175^\circ C$. The SOA curve provides a single pulse rating.
- L. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.
- M. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.

Typical Electrical and Thermal Characteristics

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

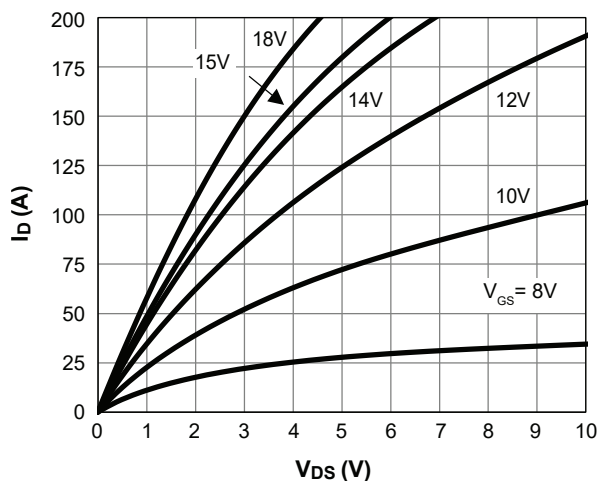


Figure 1. On-region Characteristics $T_J = 25^\circ\text{C}$

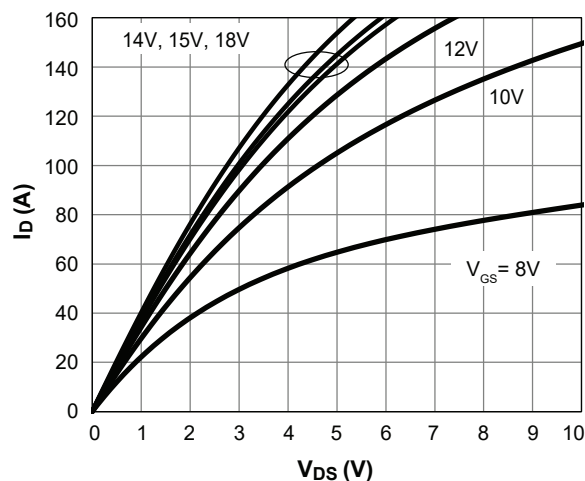


Figure 2. On-region Characteristics $T_J = 175^\circ\text{C}$

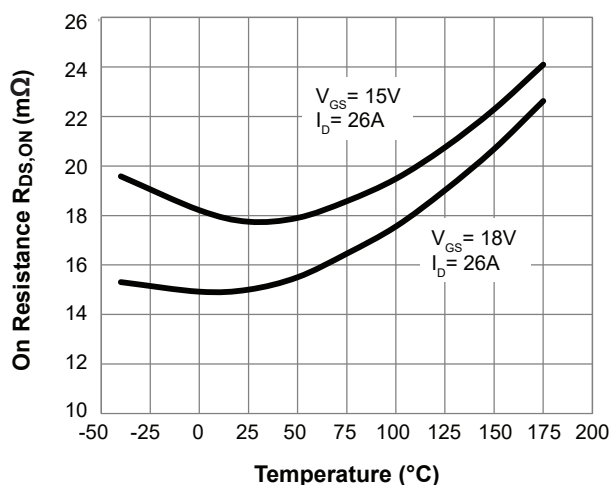


Figure 3. On-resistance vs. Junction Temperature

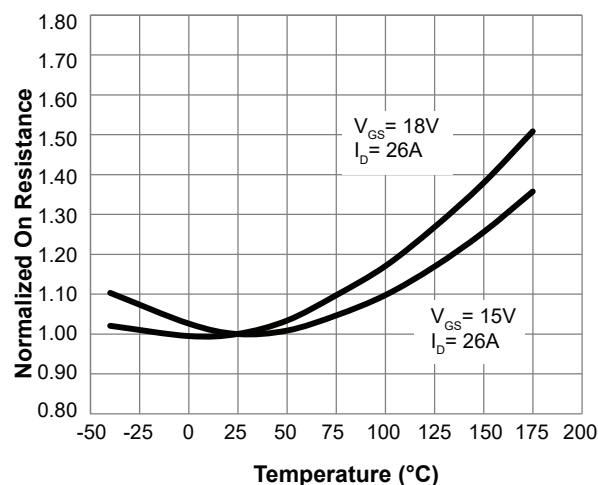


Figure 4. Normalized On-resistance vs. Junction Temperature

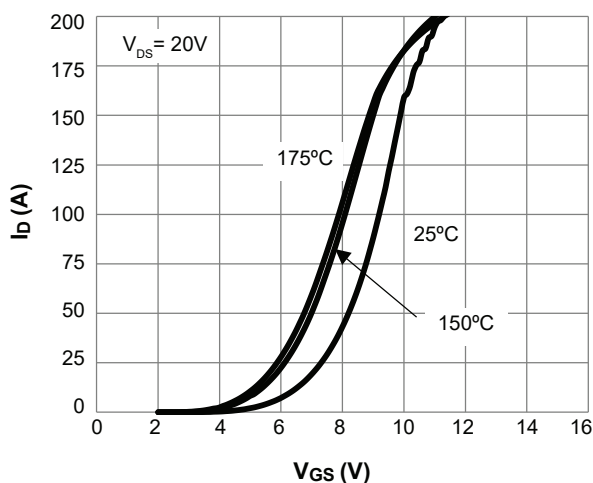


Figure 5. Transfer Characteristics

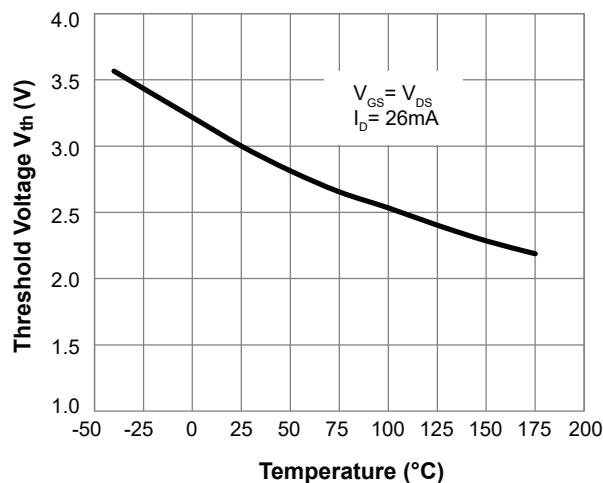


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics

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

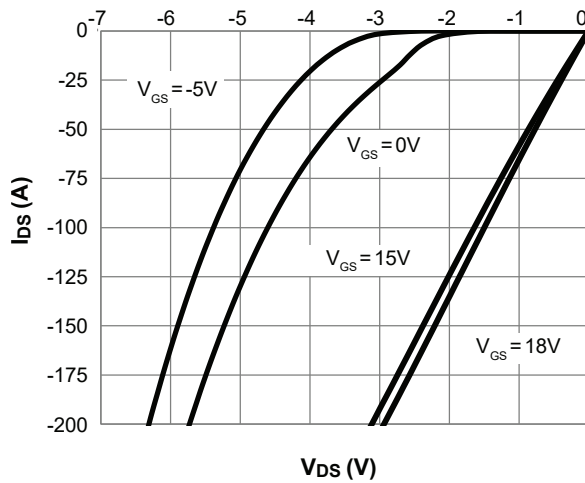


Figure 7. Body-diode Characteristics at 25°C

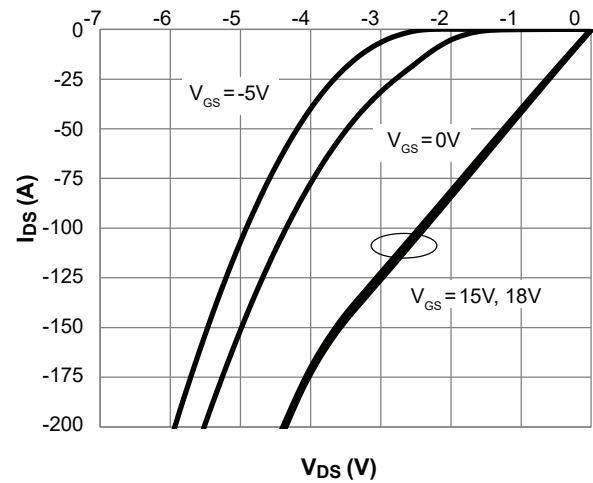


Figure 8. Body-diode Characteristics at 175°C

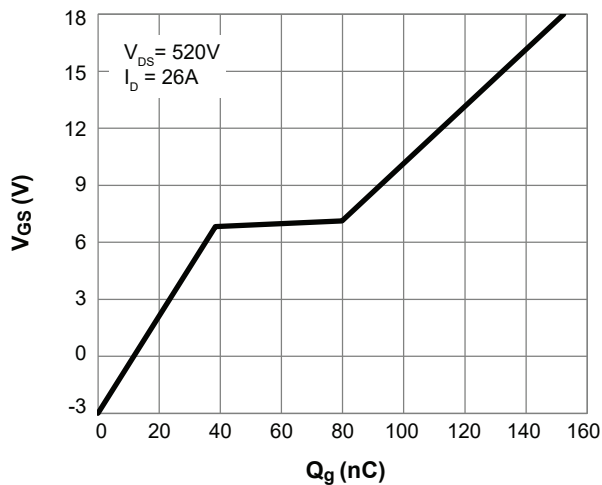


Figure 9. Gate-charge Characteristics

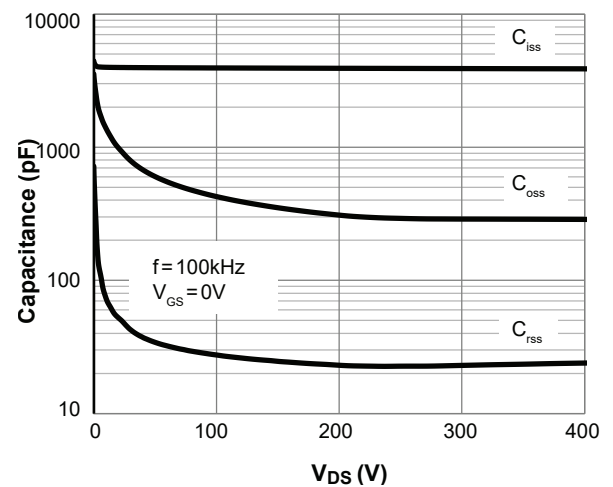


Figure 10. Capacitance Characteristics

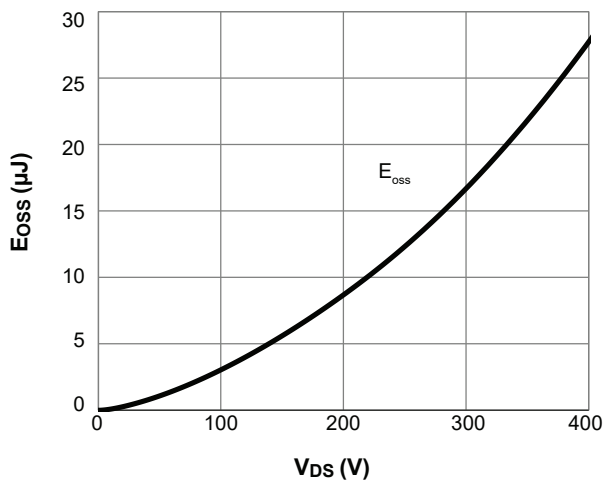


Figure 11. C_{oss} Stored Energy

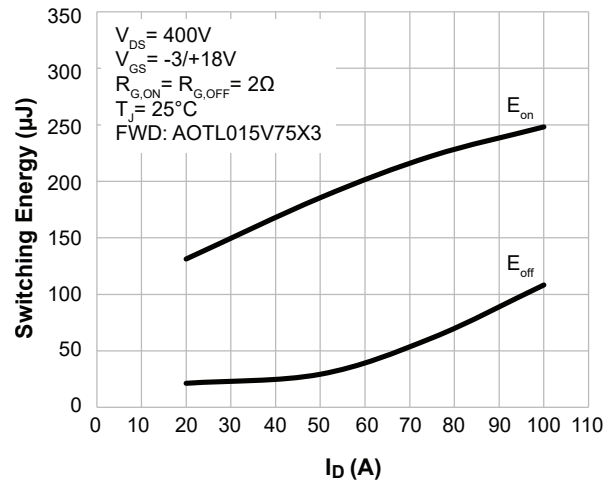


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics (Continued)

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

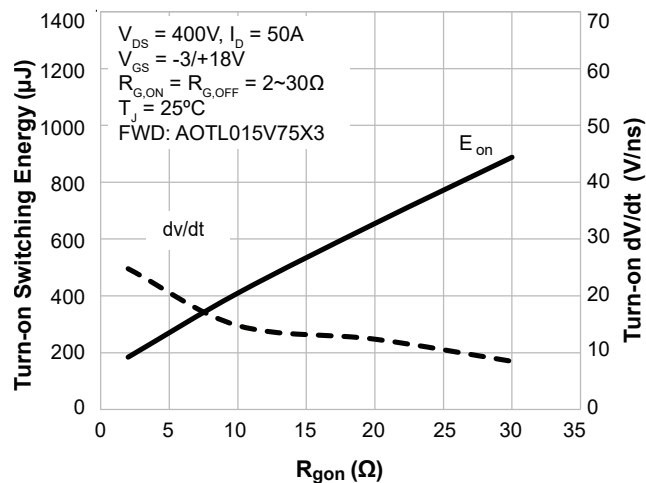


Figure 13. Energy and dV/dt vs. External Gate Resistance

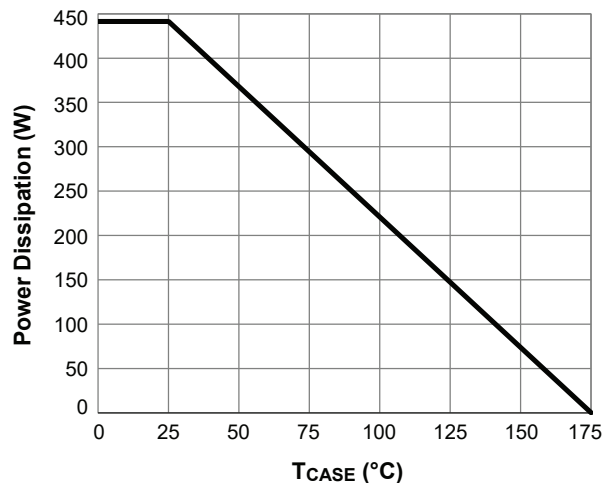


Figure 14. Power De-rating (Note K)

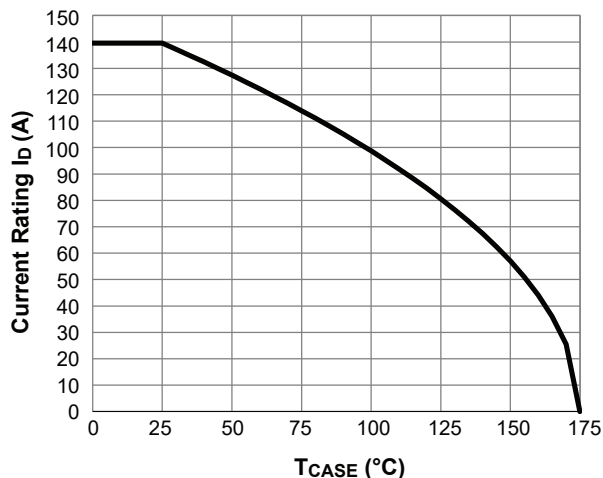


Figure 15. Current De-rating (Note C, K)

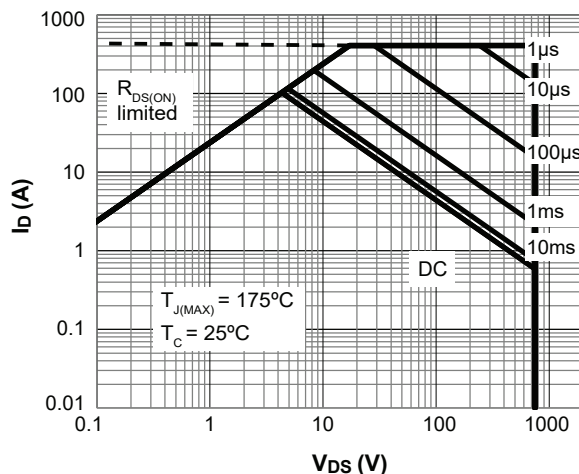


Figure 16. Maximum Forward Biased Safe Operating Area for AOTL015V75X3 (Note K)

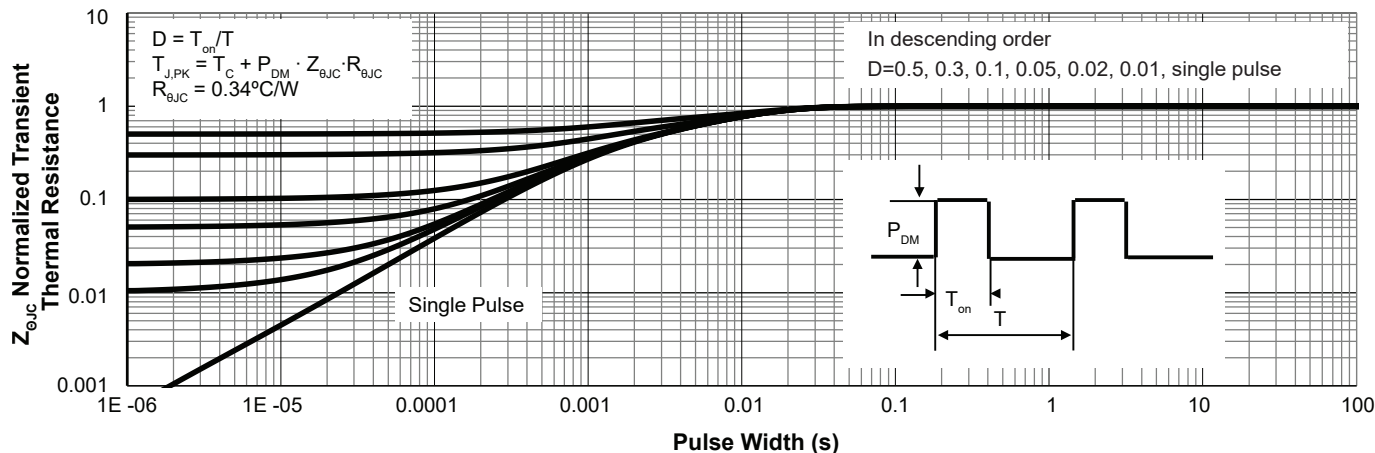


Figure 17. Normalized Maximum Transient Thermal Impedance for AOTL015V75X3 (Note K)

Test Circuits and Waveforms

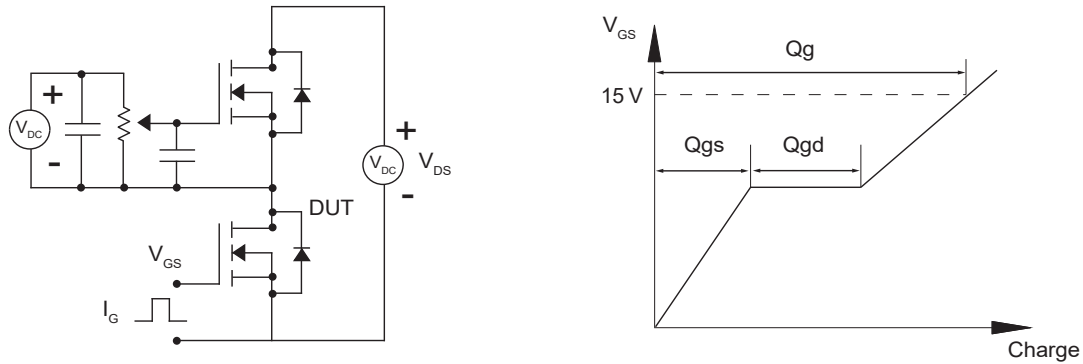


Figure 18. Gate Charge Test Circuits and Waveforms

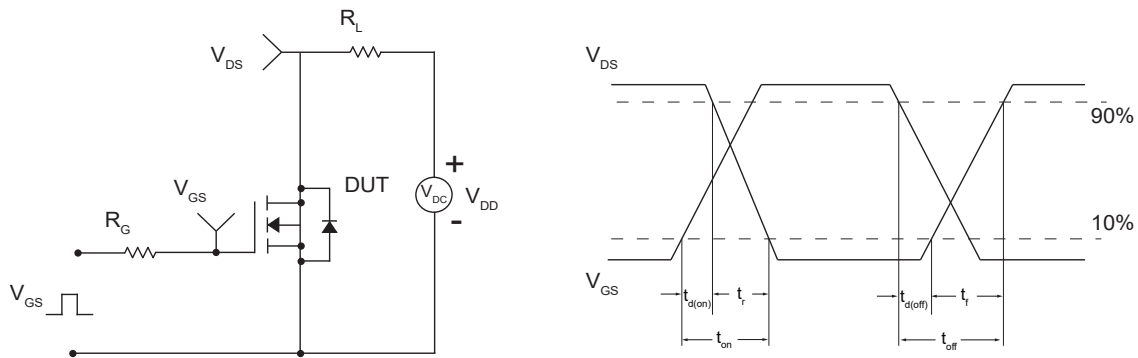


Figure 19. Resistive Switching Test Circuit and Waveforms

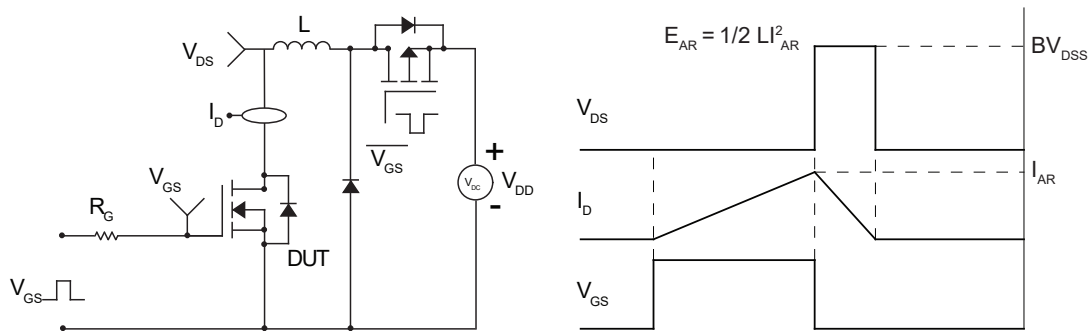


Figure 20. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

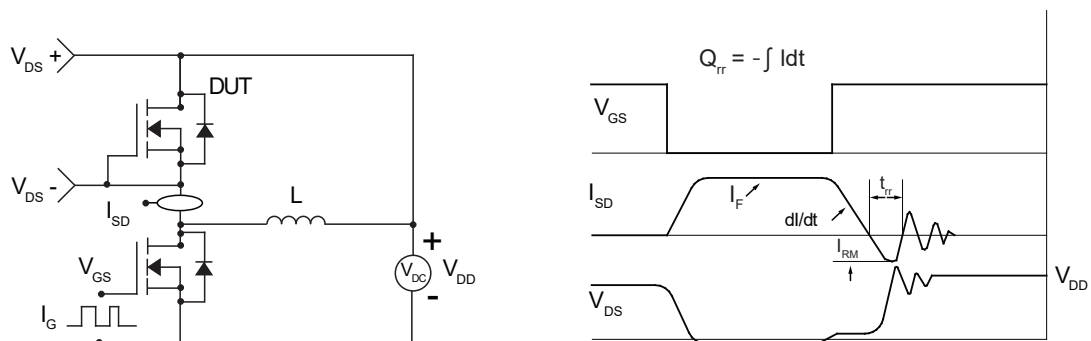
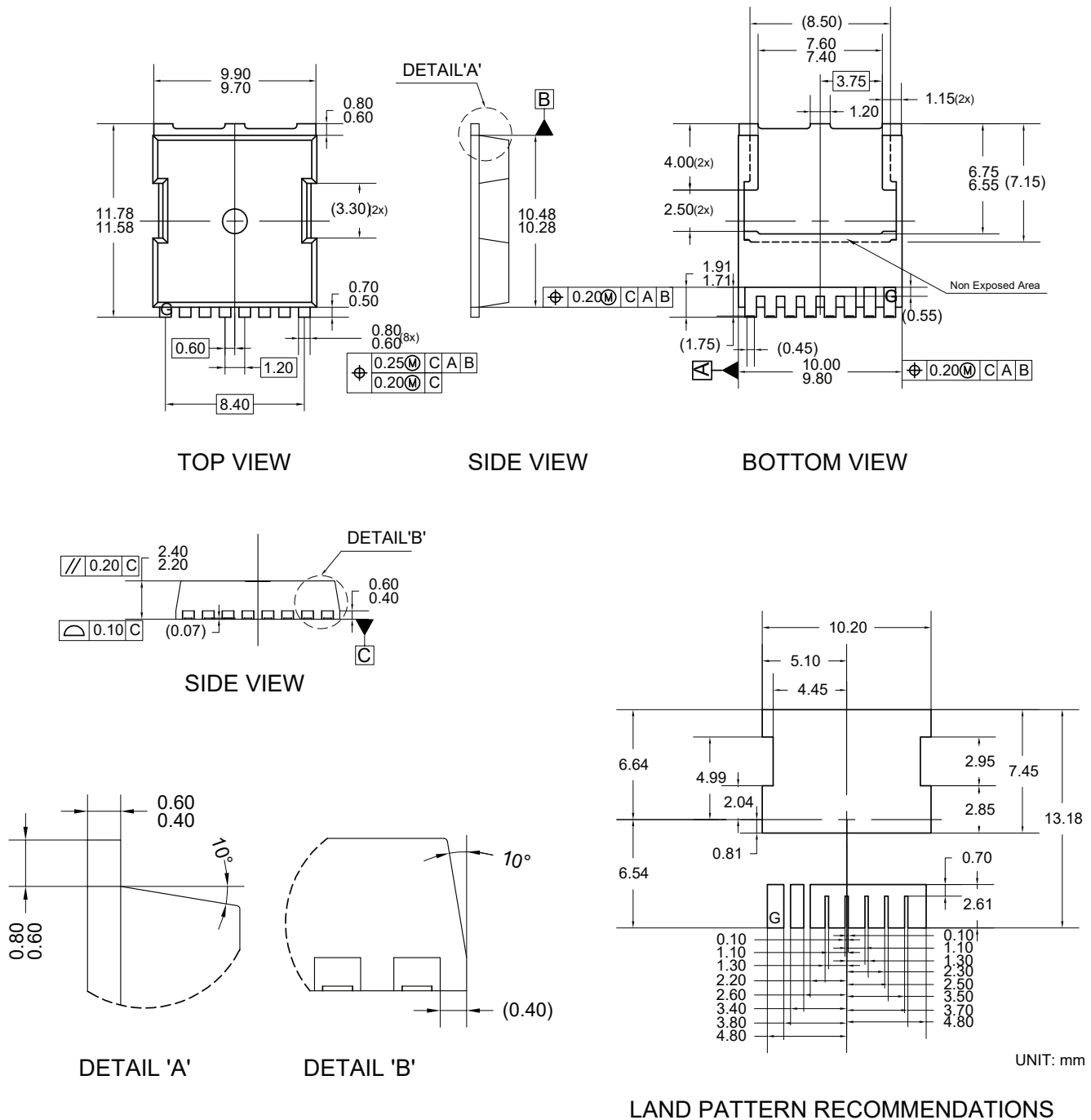


Figure 21. Diode Recovery Test Circuits and Waveforms

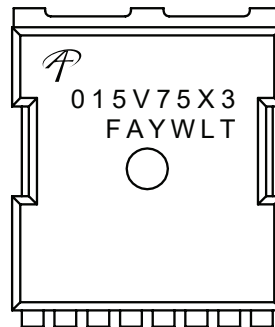
Package Dimensions, TOLL



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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