ALPHA & OMEGA SEMICONDUCTOR

AOGT015V75X3

750V αSiC Silicon Carbide Power MOSFET

Features

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

Product Summary

V_{DS} @ $T_{J, max}$	750V
I_{DM}	405A
$R_{DS(ON), typ}$	15mΩ
Q_{rr}	122nC
E_{OSS} @ 800V	27μJ
100% UIS Tested	

Applications

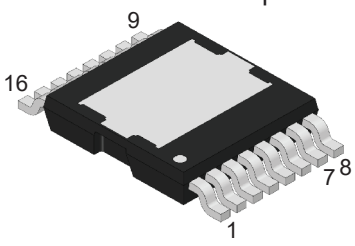
Industrial
- SMPS/AI server
- DC/DC converters
- UPS

Renewable
- Energy storage
- Solar inverters

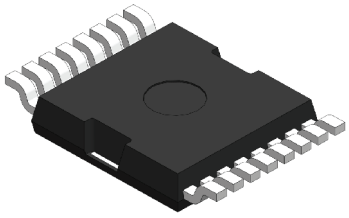
GREEN Product

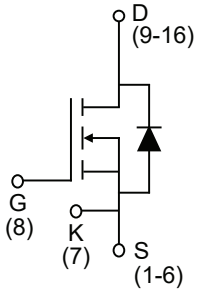
Pin Configuration

Top View



Bottom View





Ordering Part Number	Package Type	Form	Shipping Quantity
AOGT015V75X3	GTPAK™	Tape & Reel	800/Reel

Absolute Maximum Ratings

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter		AOGT015V75X3	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°C	139	A
		T_C=100°C	98	
I_{DM}	Pulsed Drain Current(D)		405	
I_{SD}	Continuous Body Diode Forward Current V_{GS}=-5V		90	
E_{AS}	Single Pulsed Avalanche Energy(F)		1.2	J
P_D	Power Dissipation(E)	T_C=25°C	441	W
T_J, T_{STG}	Junction and Storage Temperature Range		-55 to 175	°C
T_L	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds(N)		260	°C

Electrical Characteristics

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC							
B_{VDSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V, T_J=25°C		750			V
		I_D=250µA, V_{GS}=0V, T_J=175°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
			T_J=175°C		24		mΩ
		V_{GS}=18V, I_D=26A	T_J=25°C		15	21	mΩ
			T_J=175°C		23		mΩ
g_{FS}	Forward Transconductance	V_{DS}=20V, I_D=26A			21		S
V_{SD}	Diode Forward Voltage	I_S=26A,V_{GS}=-5V			4	5	V
DYNAMIC							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=520V, f=100KHz			3733		pF
C_{oss}	Output Capacitance				284		pF
C_{rss}	Reverse Transfer Capacitance				21		pF
E_{oss}	Coss Stored Energy				27		µJ
$C_{o(er)}$	Effective output capacitance, energy related[L]	V_{GS}=0V, V_{DS}=0V to 400V, f=100KHz			325		pF
$C_{o(tr)}$	Effective output capacitance, energy related[M]				435		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			147		nC
Q_{gs}	Gate Source Charge				36		nC
Q_{gd}	Gate Drain Charge				37		nC
$t_{D(on)}$	Turn-On Delay Time	V_{GS}=-3V/+18V, V_{DS}=400V, I_D=50A, R_G=2Ω, L_a=47.5µH, FWD: AOGT015V75X3			12		ns
t_r	Turn-On Rise Time				13		ns
$t_{D(off)}$	Turn-Off Delay Time				26		ns
t_f	Turn-Off Fall Time				7		ns
E_{on}	Turn-On Energy				184		µJ
E_{off}	Turn-Off Energy				27		µJ
E_{tot}	Total Switching Energy				211		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				14		A
Q_{rr}	Body Diode Reverse Recovery Charge				122		nC

Thermal Characteristics

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

Notes:
A. t_{ON}< 1µs, t<25hrs 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_{DSON} at 175°C.
D. I_{DM} obtained using a V_{GS} = 18V, 10µs 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°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 = 10Ω, Starting T_J = 25°C.
G. The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A =25°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 heat-sink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.
J. The static characteristics in Figures 1 to 8 are obtained using <300µs 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°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% $V_{(BR)DSS}$.
N. GTPAK™ is not recommended for wave soldering.

Typical Electrical and Thermal Characteristics

T_A = 25°C, unless otherwise specified.

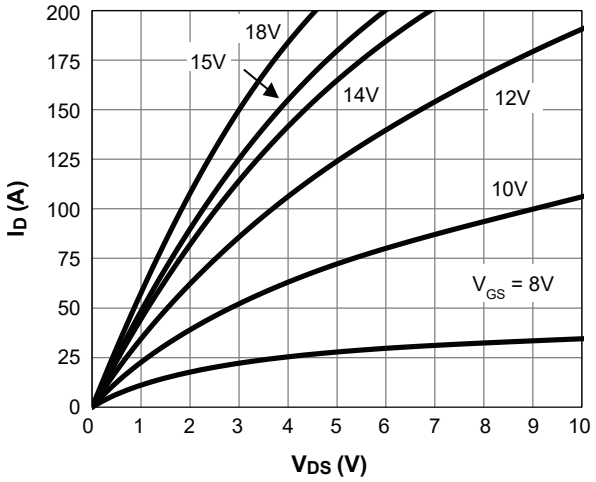


Figure 1. On-Region Characteristics T_J = 25°C

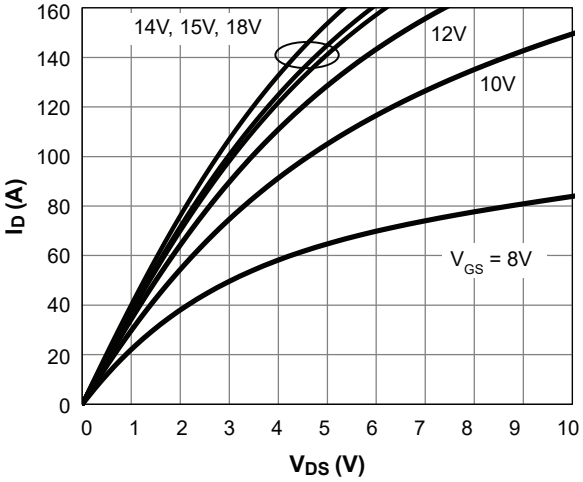


Figure 2. On-Region Characteristics T_J = 175°C

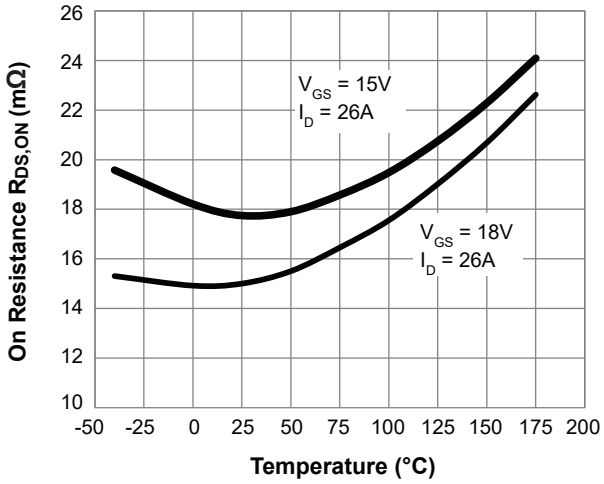


Figure 3. On Resistance vs. Junction Temperature

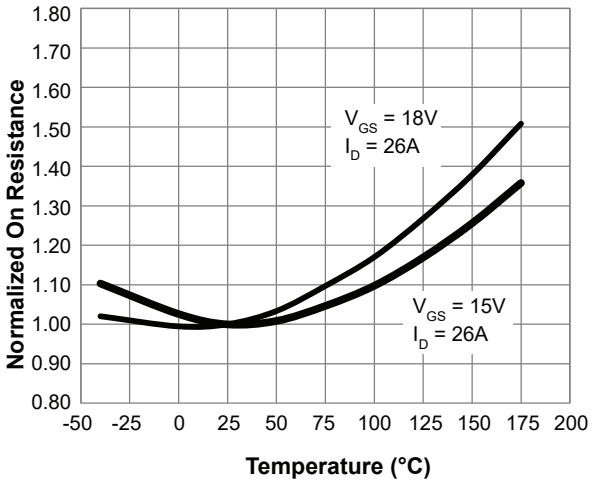


Figure 4. Normalized On Resistance vs. Junction Temperature

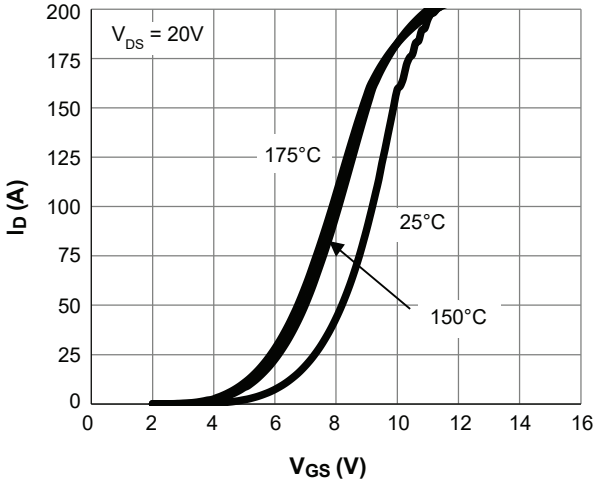


Figure 5. Transfer Characteristics

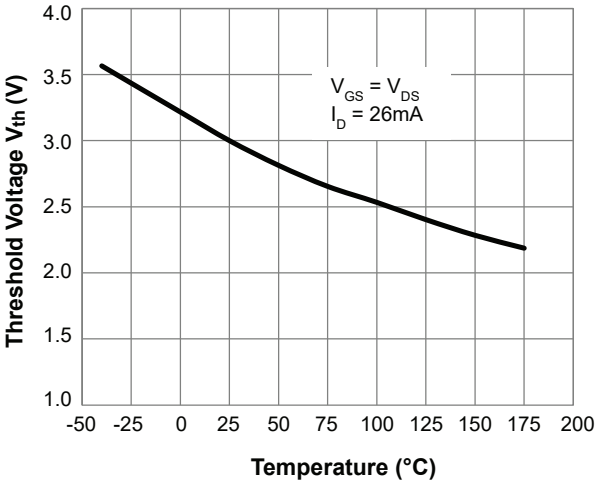


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics *(Continued)*

T_A = 25°C, unless otherwise specified.

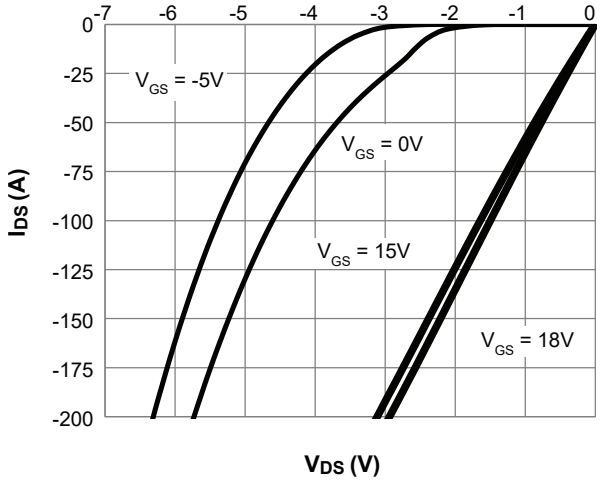


Figure 7. Body-diode Characteristics at 25°C

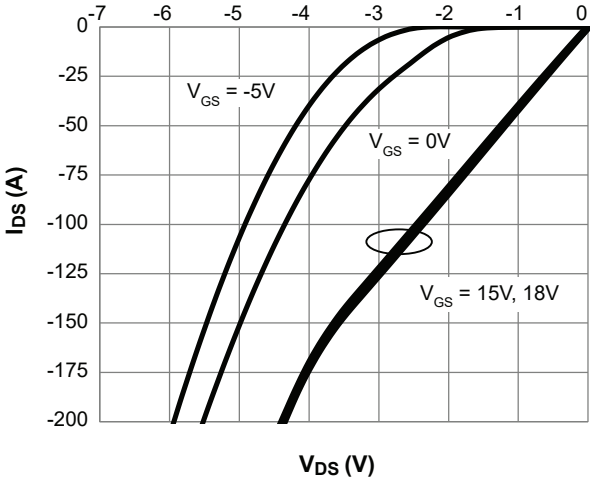


Figure 8. Body-diode Characteristics at 175°C

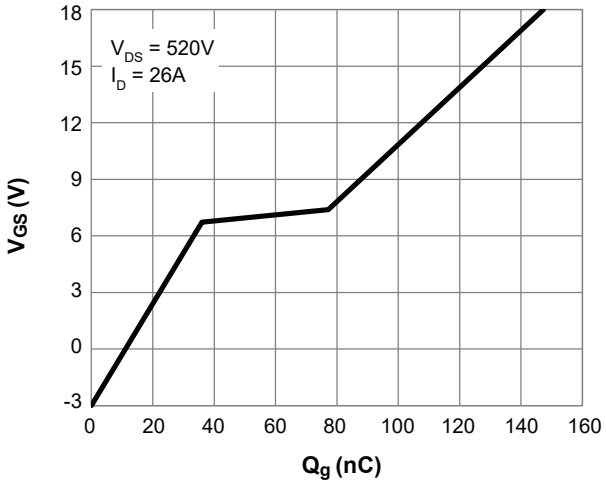


Figure 9. Gate-charge Characteristics

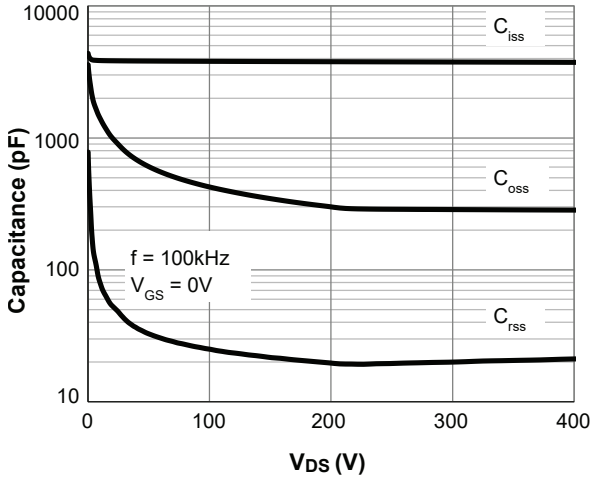


Figure 10. Capacitance Characteristics

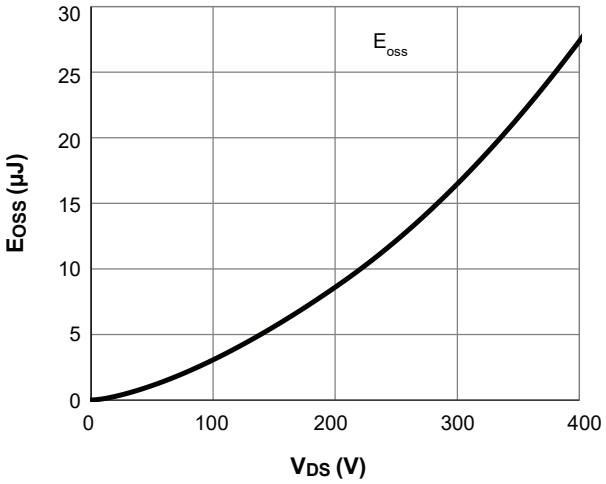


Figure 11. Coss Stored Energy

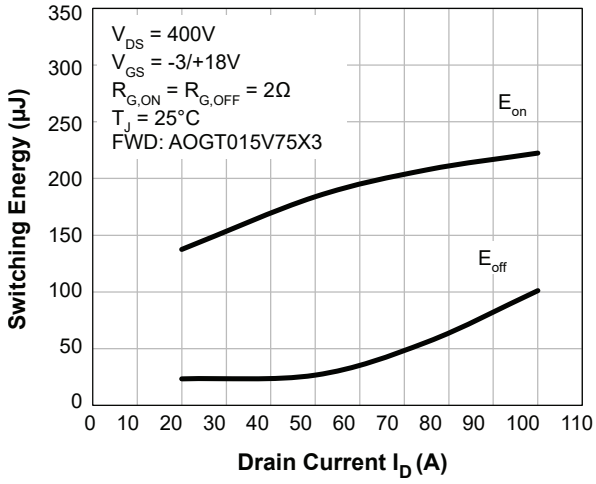


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics *(Continued)*

T_A = 25°C, unless otherwise specified.

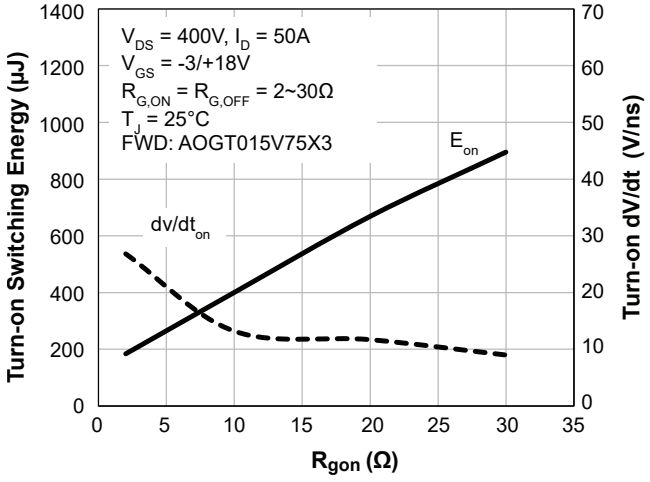


Figure 13. Turn-on Energy and dV/dt vs. External Gate Resistance

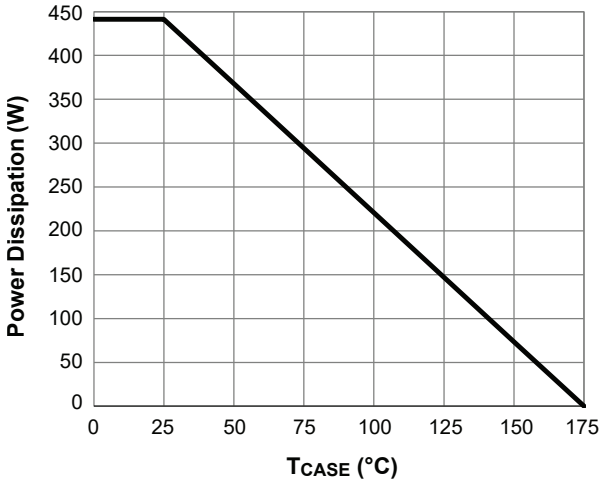


Figure 14. Power De-rating (Note K)

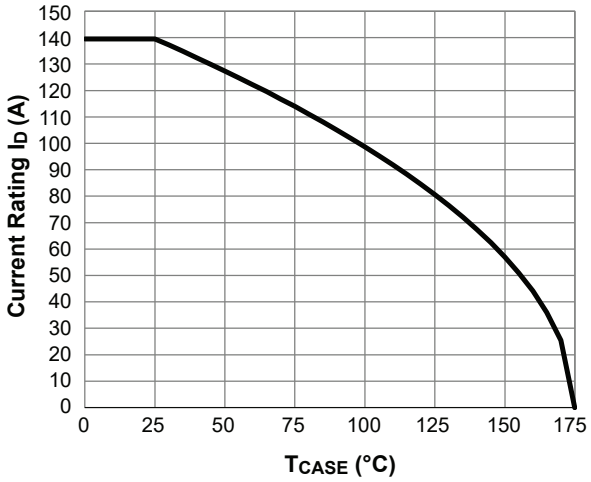


Figure 15. Current De-rating (Note C, K)

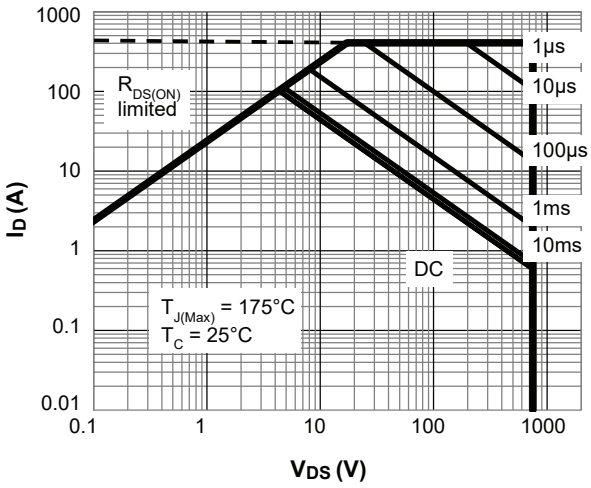


Figure 16. Maximum Forward Biased Safe Operating Area for AOGT015V75X3 (Note K)

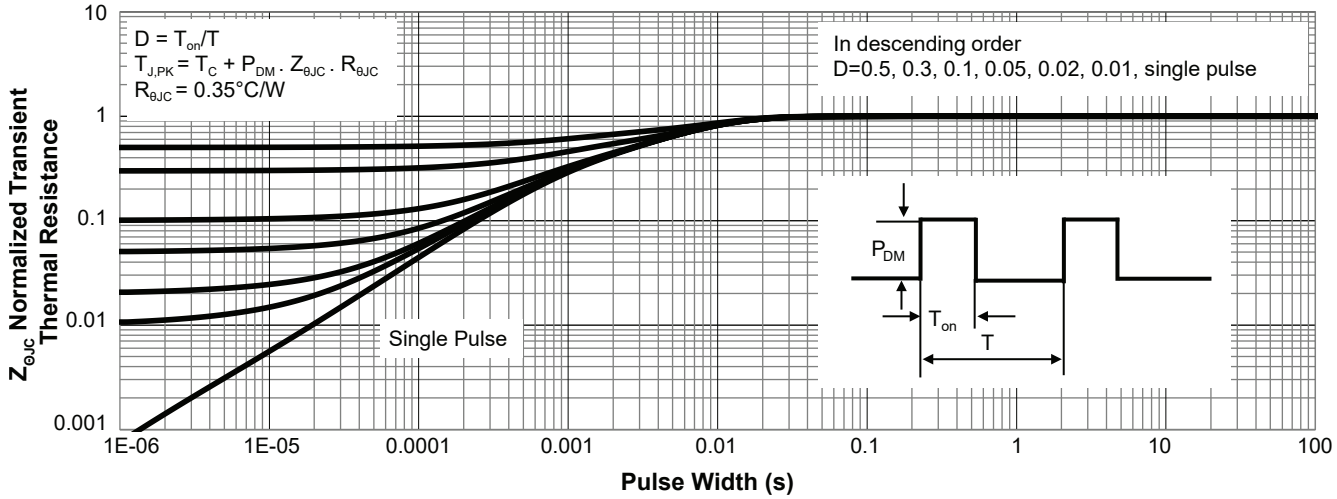


Figure 17. Normalized Maximum Transient Thermal Impedance for AOGT015V75X3 (Note K)

Test Circuits and Waveforms

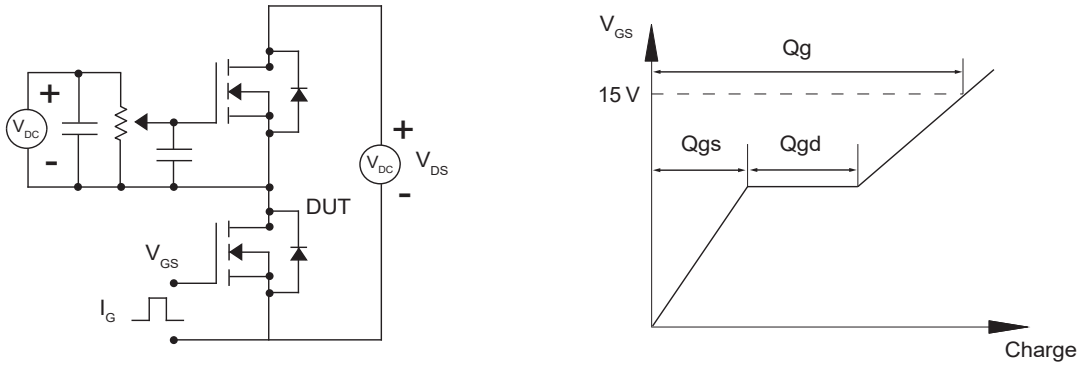


Figure 18. Gate Charge Test Circuits and Waveforms

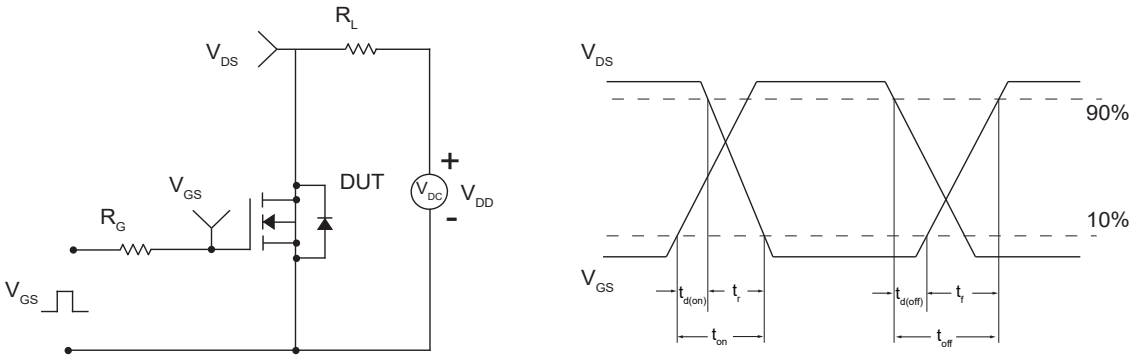


Figure 19. Resistive Switching Test Circuit and Waveforms

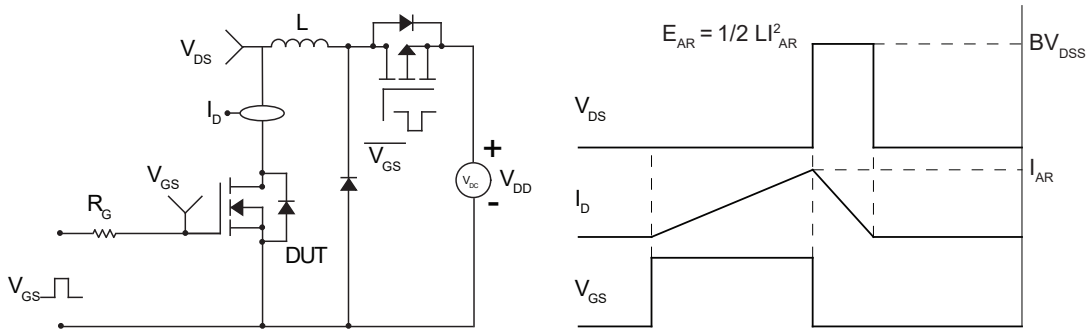


Figure 20. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

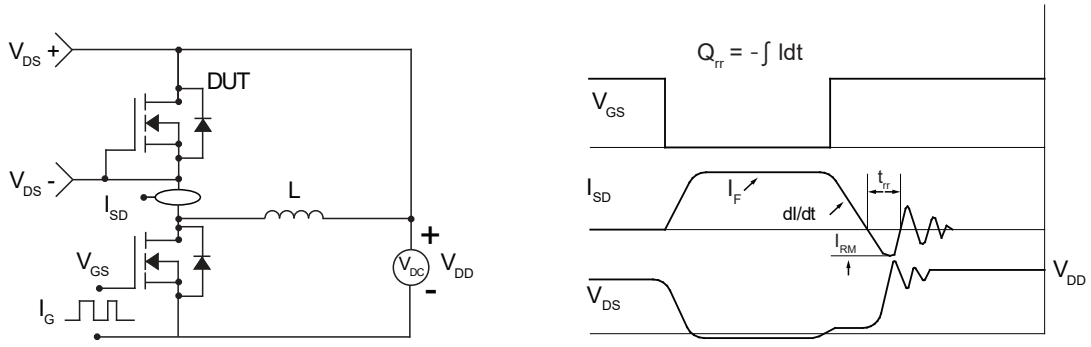
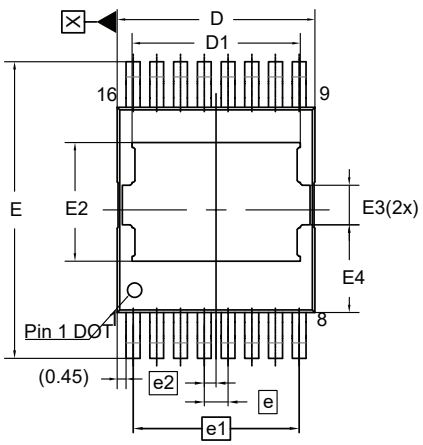
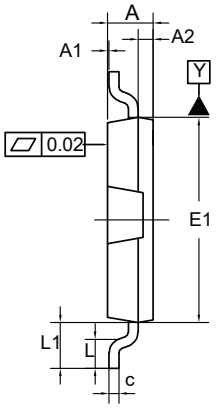


Figure 21. Diode Recovery Test Circuits and Waveforms

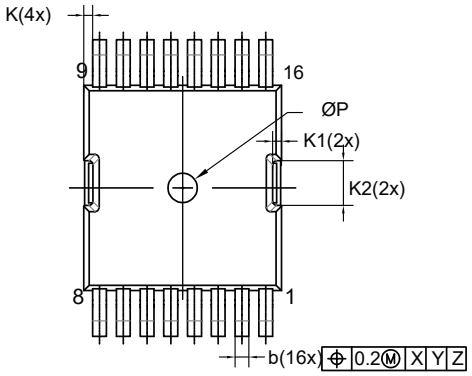
Package Dimensions, GTPAK™-16L



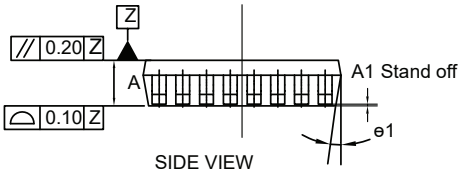
TOP VIEW



SIDE VIEW

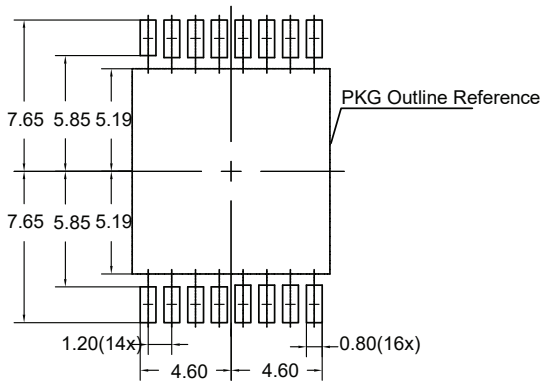


BOTTOM VIEW



SIDE VIEW

LAND PATTERN RECOMMENDATIONS



UNIT: mm

SYMBOLS	DIMENSION IN MILLIMETERS			DIMENSION IN INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	2.200	2.300	2.400	0.087	0.091	0.094
A1	0.010	0.075	0.145	0.000	0.003	0.006
A2	0.600	0.750	0.900	0.024	0.030	0.035
b	0.600	0.700	0.800	0.024	0.028	0.031
c	0.400	0.500	0.600	0.016	0.020	0.024
D	9.800	10.000	10.200	0.386	0.394	0.402
D1	8.300	8.500	8.700	0.327	0.335	0.343
E	14.800	15.000	15.200	0.583	0.591	0.598
E1	10.180	10.380	10.580	0.401	0.409	0.417
E2	5.805	6.005	6.205	0.229	0.236	0.244
E3	1.800	2.000	2.200	0.071	0.079	0.087
E4	4.240	4.440	4.640	0.167	0.175	0.183
e	1.200 BSC			0.047 BSC		
e1	8.400 BSC			0.331 BSC		
e2	0.600 BSC			0.024 BSC		
K	0.250	0.450	0.650	0.010	0.018	0.026
K1	0.260	0.460	0.660	0.010	0.018	0.026
K2	2.065	2.265	2.465	0.081	0.089	0.097
L	1.360	1.460	1.560	0.054	0.057	0.061
L1	2.210	2.310	2.410	0.087	0.091	0.095
P	1.300	1.500	1.700	0.051	0.059	0.067
θ1	10° TYP.			10° TYP.		

NOTES:

A) PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH SHOULD BE LESS THAN 6 MIL.

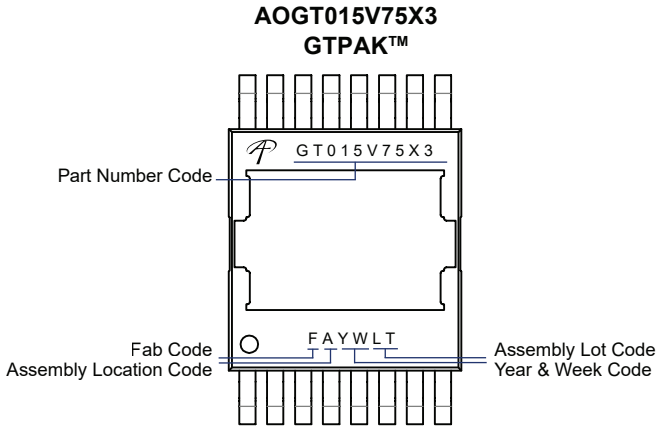
B) TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.

C) CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

D) UNSPECFIED DRAFT ANGLE FOR MOLD BODY IS 10deg

E) ( ) IS FOR REFERENCE

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.