

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

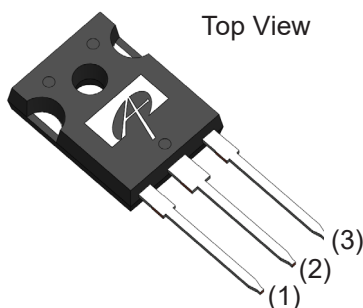
- UPS
- SMPS
- Motor Drives



Product Summary

$V_{DS} @ T_{J, max}$	650V
I_{DM}	90A
$R_{DS(ON), typ}$	60m Ω
Q_{rr}	74.3nC
$E_{OSS} @ 400V$	12 μ J
100 % UIS Tested	

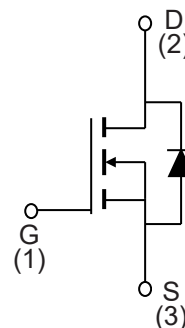
Pin Configuration



Top View



Bottom View



Ordering Part Number	Package Type	Form	Shipping Quantity
AOK060V65X2	TO-247-3L	Tube	30/Tube

Absolute Maximum Ratings

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

Symbol	Parameter		AOK060V65X2	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	$T_C = 25^\circ C$	32	A
		$T_C = 100^\circ C$	22	
I_{DM}	Pulsed Drain Current ^(C)		90	
E_{AS}	Single Pulsed Avalanche Energy ^(D)		420	mJ
P_D	Power Dissipation ^(C)	$T_C = 25^\circ C$	125	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		300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ^(E,F)		4.0	°C/W
$R_{\theta JC}$	Maximum Junction-to-Case ^(G)	1.00	1.20	°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	$V_{DS} = 0\text{V}$, $V_{GS} = +15/-5\text{V}$			200	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 6\text{mA}$	1.8	2.5	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 15\text{V}$, $I_D = 6\text{A}$		60	80	m Ω
		$T_J = 25^\circ\text{C}$				
		$T_J = 175^\circ\text{C}$		88		m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{V}$, $I_D = 6\text{A}$		3.7		S
V_{SD}	Diode Forward Voltage	$I_S = 6\text{A}$, $V_{GS} = -5\text{V}$		4	5	V
DYNAMIC						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 400\text{V}$, $f = 100\text{kHz}$		1165		pF
C_{oss}	Output Capacitance			122		pF
C_{rss}	Reverse Transfer Capacitance			16		pF
E_{oss}	C_{oss} Stored Energy			12		μJ
R_G	Gate Resistance	$f = 1\text{MHz}$		2.2		Ω
SWITCHING						
Q_g	Total Gate Charge	$V_{GS} = -5/+15\text{V}$, $V_{DS} = 520\text{V}$, $I_D = 6\text{A}$		39.4		nC
Q_{gs}	Gate Source Charge			13.1		nC
Q_{gd}	Gate Drain Charge			12.9		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = -5\text{V}/+15\text{V}$, $V_{DS} = 400\text{V}$, $I_D = 20\text{A}$, $R_{G,ON} = 2\Omega$, $R_{G,OFF} = 0\Omega$ $L = 120\mu\text{H}$ FWD: AOK060V65X2		9.3		ns
t_r	Turn-On Rise Time			19.3		ns
$t_{D(off)}$	Turn-Off Delay Time			12.6		ns
t_f	Turn-Off Fall Time			5.2		ns
E_{on}	Turn-On Energy			108		μJ
E_{off}	Turn-Off Energy			7		μJ
E_{tot}	Total Switching Energy			115		μJ
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}$, $dI/dt = 1500\text{A}/\mu\text{s}$, $V_{DS} = 400\text{V}$		23		ns
I_{rm}	Peak Reverse Recovery Current			5.3		A
Q_{rr}	Body Diode Reverse Recovery Charge			74.3		nC

Notes:

- $t_{ON} < 1\% \cdot (\text{Duty Cycle})/(\text{Frequency})$, $t < 25\text{hrs}$ over lifetime
- 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.
- 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.
- $L = 5\text{mH}$, $I_{AS} = 13\text{A}$, $R_G = 10\Omega$, Starting $T_J = 25^\circ\text{C}$.
- The value of $R_{\theta JA}$ is measured with the device in a still air environment

- with $T_A = 25^\circ\text{C}$.
- The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
- The value of $R_{\theta JC}$ is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 175^\circ\text{C}$.
- The static characteristics in Figures 1 to 8 are obtained using $< 300\mu\text{s}$ pulses, duty cycle 0.5% max.
- 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

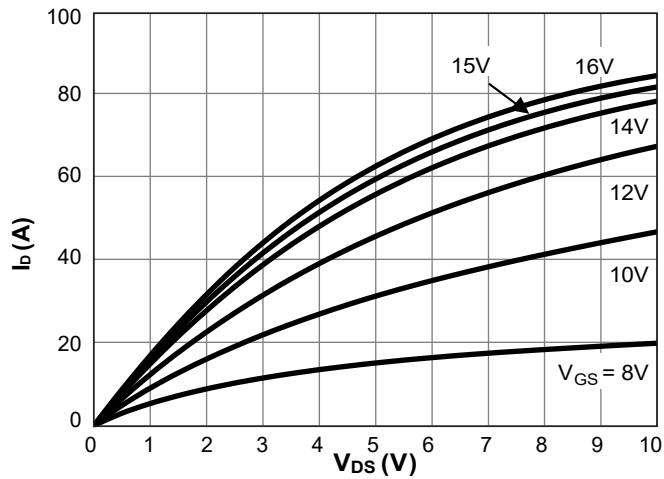


Figure 1. On-Region Characteristics $T_J = 25^\circ\text{C}$

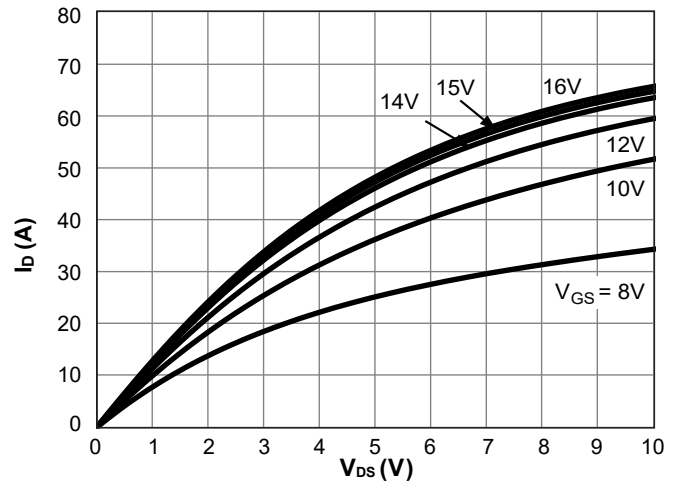


Figure 2. On-Region Characteristics $T_J = 175^\circ\text{C}$

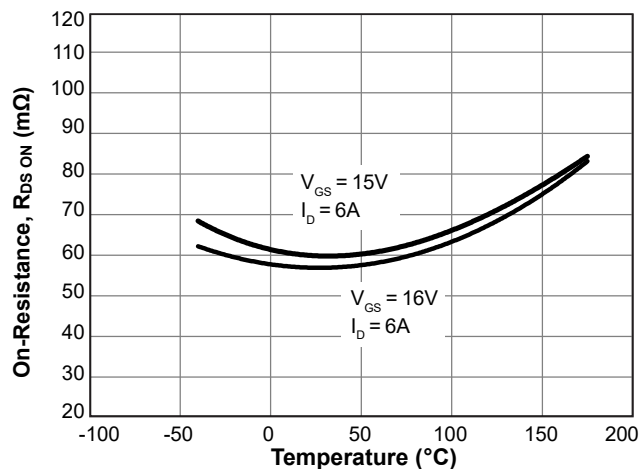


Figure 3. On-Resistance vs. Junction Temperature

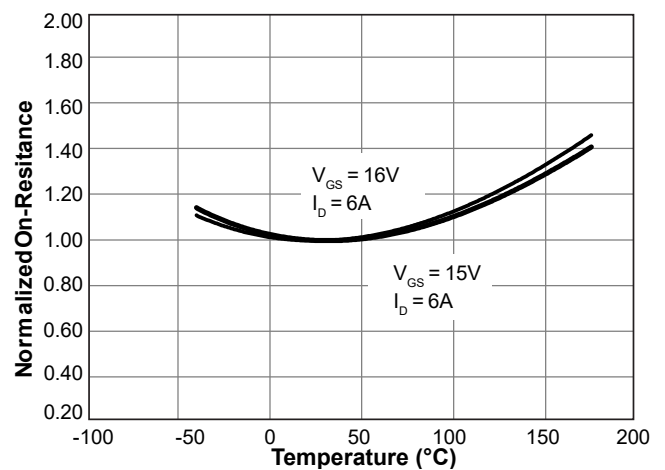


Figure 4. Normalized On-Resistance vs. Junction Temperature

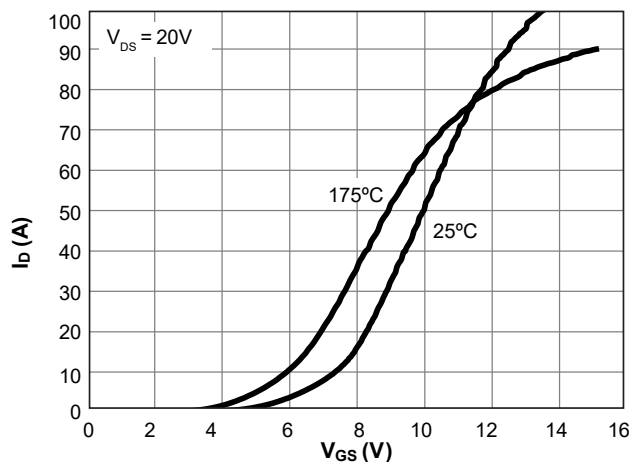


Figure 5. Transfer Characteristics

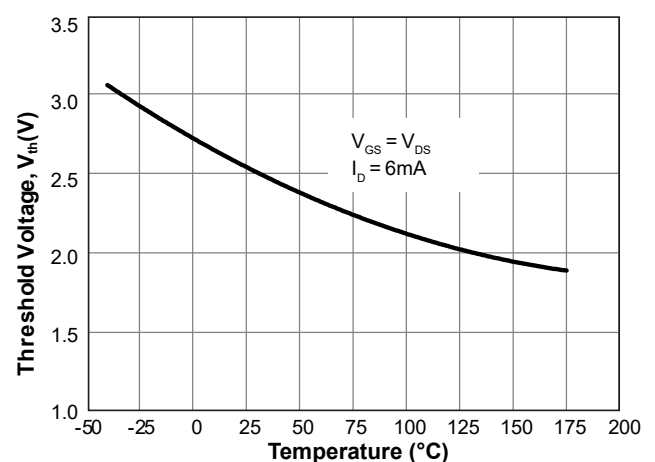


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics (Continued)

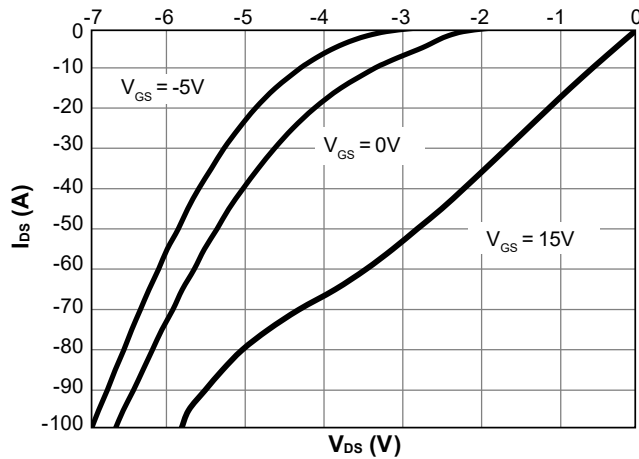


Figure 7. Body-Diode Characteristics at 25°C

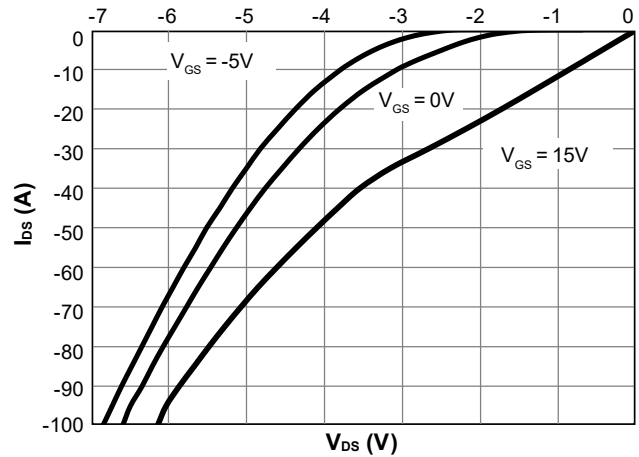


Figure 8. Body-Diode Characteristics at 175°C

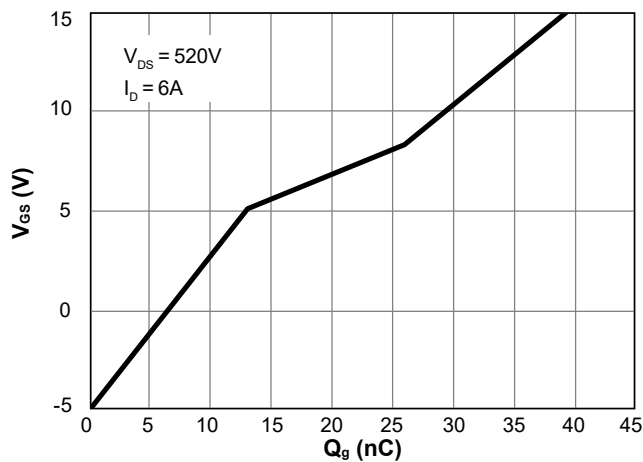


Figure 9. Gate-Charge Characteristics

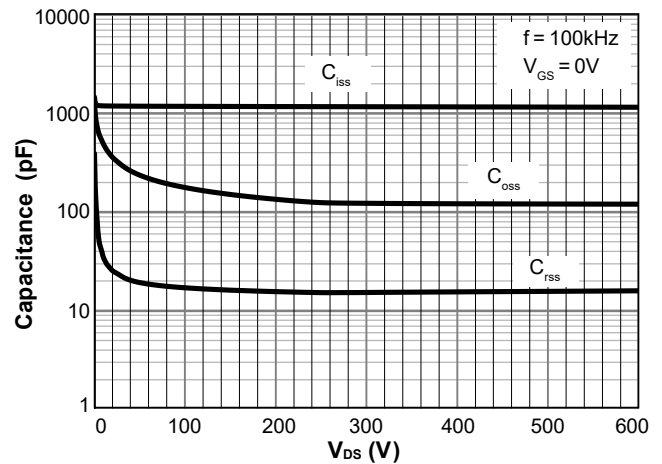


Figure 10. Capacitance Characteristics

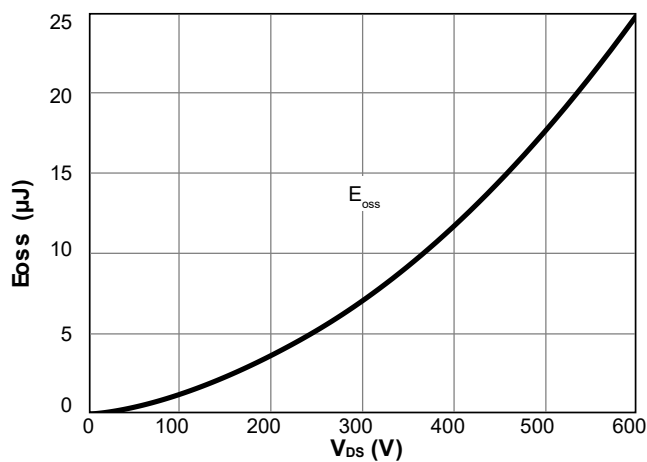


Figure 11. Coss stored Energy

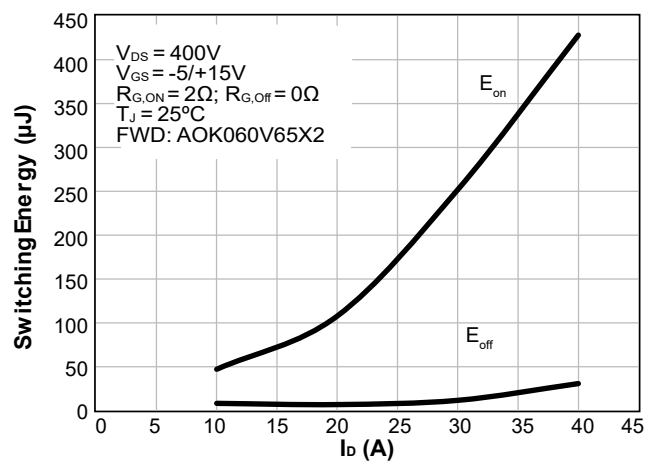


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics (Continued)

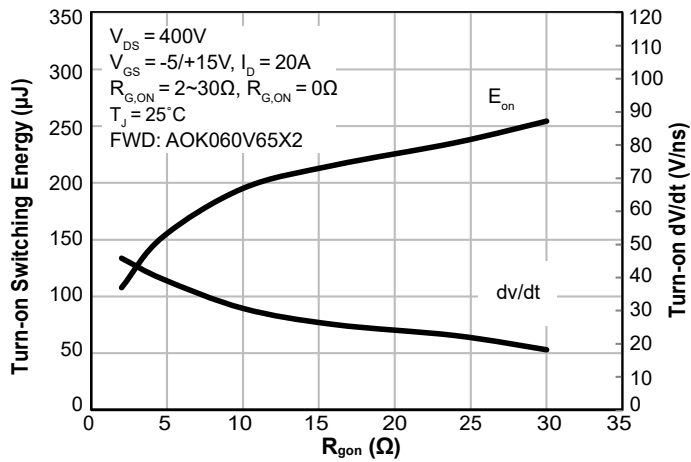


Figure 13. Turn-On Energy and dV/dt vs. External Gate Resistance

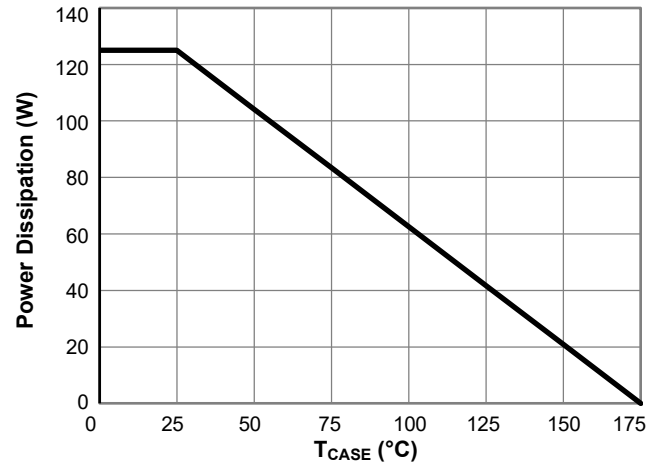


Figure 14. Power De-rating (Note I)

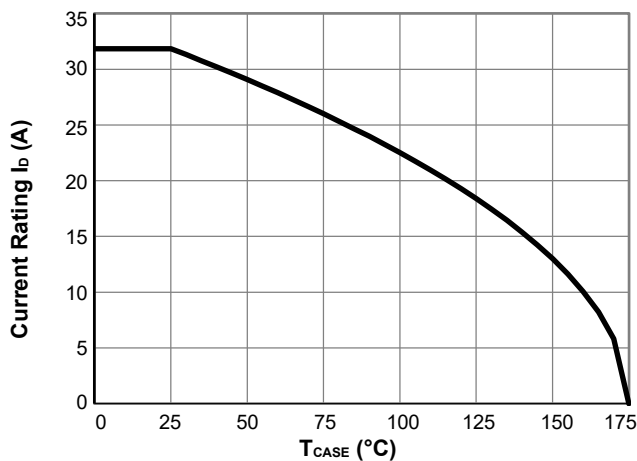


Figure 15. Current De-rating (Note I)

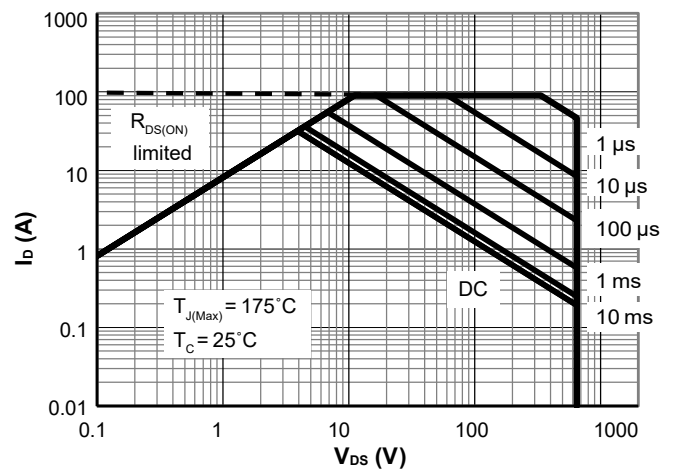


Figure 16. Maximum Forward Biased Safe Operating Area for AOK060V65X2 (Note I)

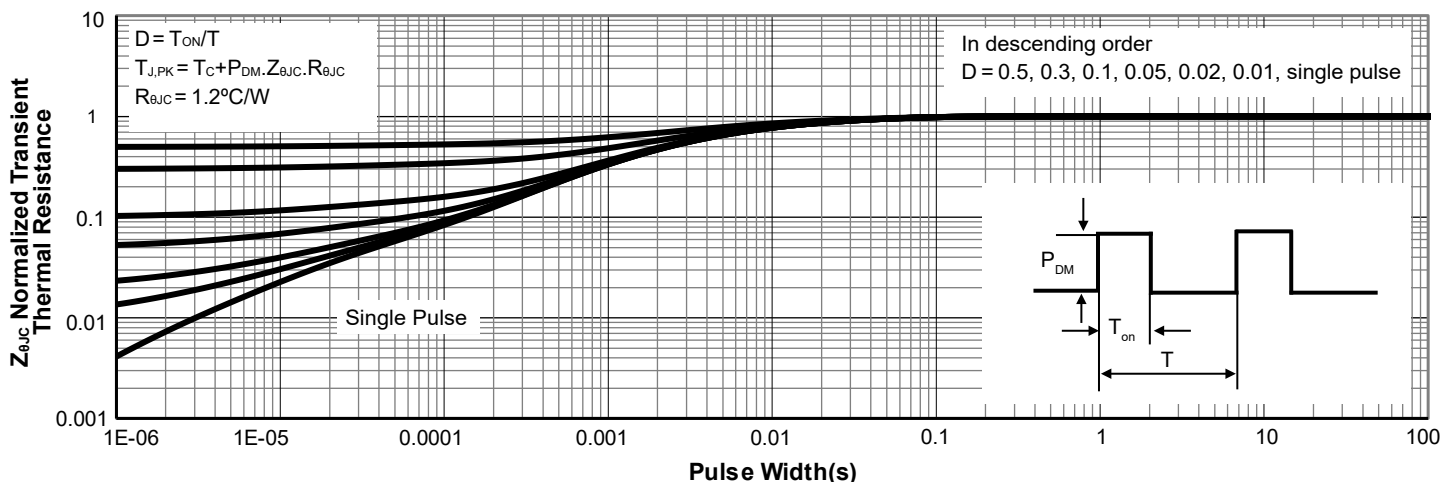


Figure 17. Normalized Maximum Transient Thermal Impedance for AOK060V65X2 (Note I)

Test Circuits and Waveforms

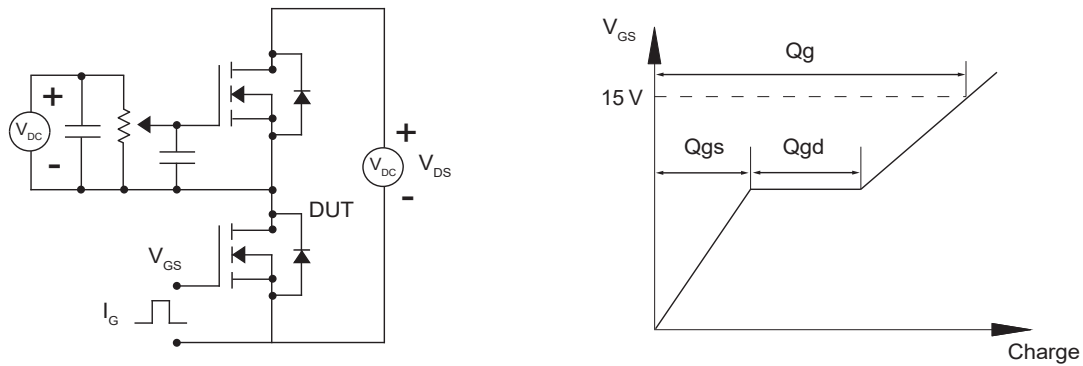


Figure 18. Gate Charge Test Circuits and Waveforms

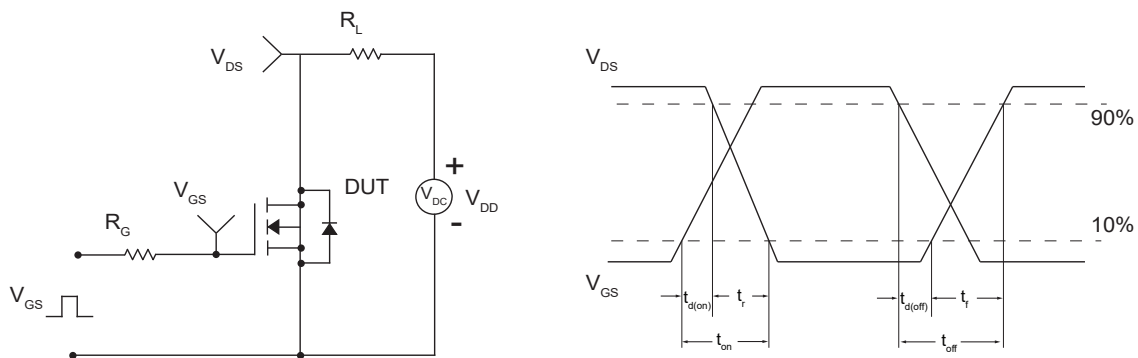


Figure 19. Resistive Switching Test Circuit and Waveforms

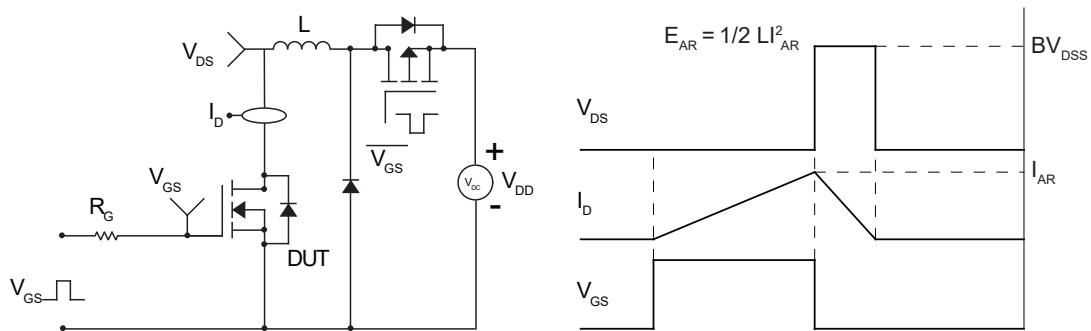


Figure 20. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

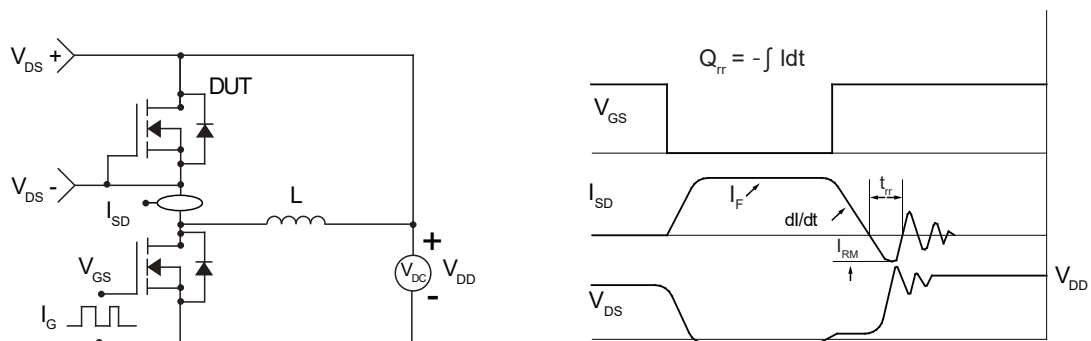
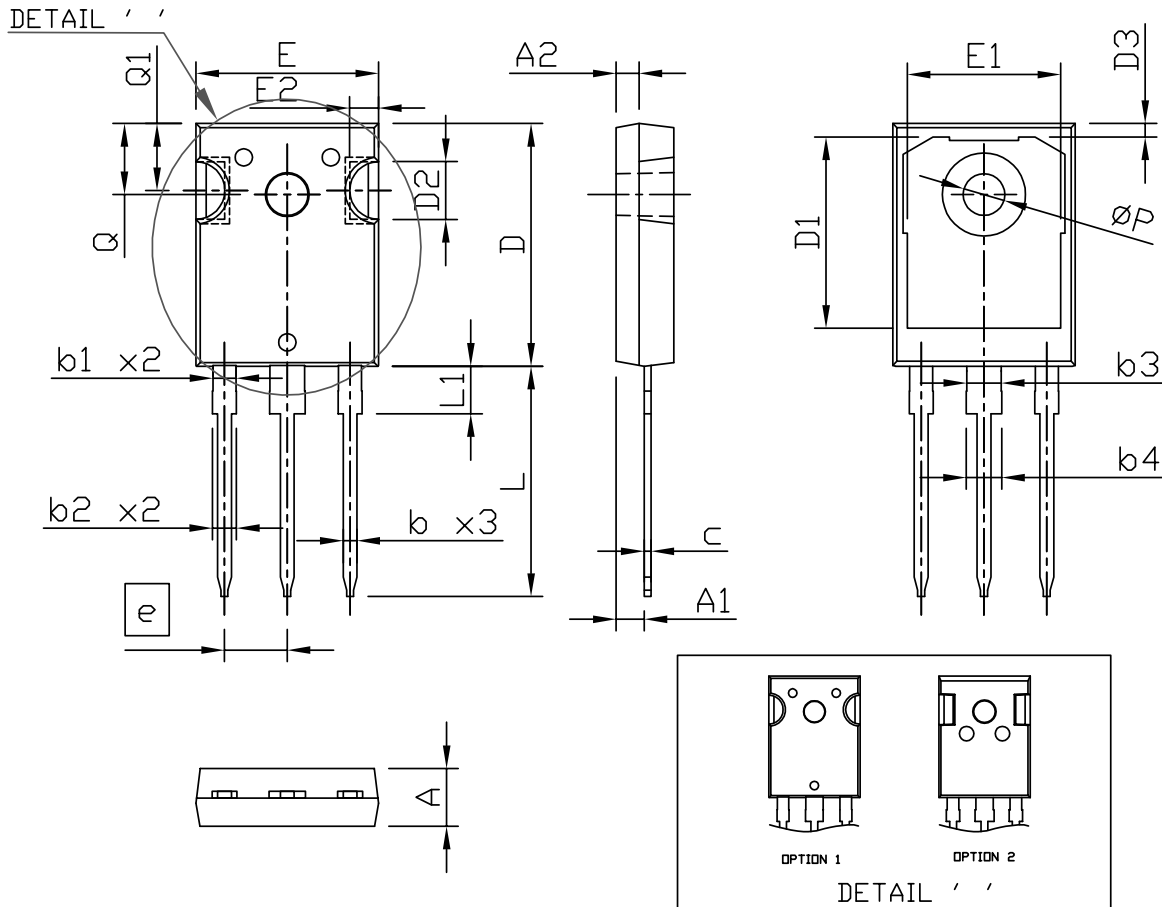
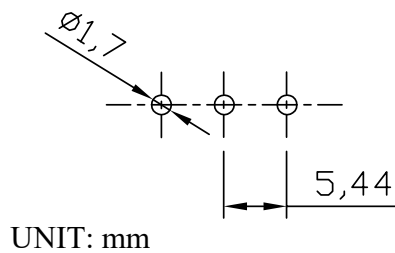


Figure 21. Diode Recovery Test Circuits and Waveforms

Package Dimensions, TO-247-3L



RECOMMENDED LAND PATTERN



UNIT: mm

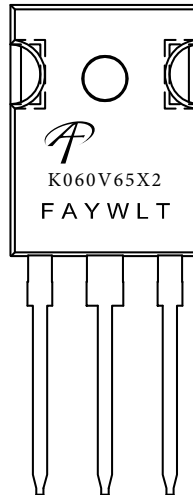
SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.90	5.00	5.10	0.193	0.197	0.201
A1	2.31	2.42	2.52	0.091	0.095	0.099
A2	1.90	2.00	2.10	0.075	0.079	0.083
b	1.16	1.22	1.27	0.046	0.048	0.050
b1	1.96	2.02	2.07	0.078	0.080	0.081
b2	2.00	2.10	2.20	0.079	0.083	0.087
b3	2.96	3.02	3.07	0.117	0.119	0.121
b4	3.00	3.10	3.20	0.118	0.122	0.126
c	0.59	0.62	0.66	0.023	0.024	0.026
D	20.90	21.00	21.10	0.823	0.827	0.831
D1	16.25	16.55	16.85	0.640	0.652	0.663
D2	5.00 TYP			0.197 TYP		
D3	1.05	1.20	1.35	0.041	0.047	0.053
e	5.44 BSC			0.214 BSC		
E	15.70	15.80	15.90	0.618	0.622	0.626
E1	13.06	13.26	13.50	0.514	0.522	0.530
E2	2.50 TYP			0.098 TYP		
L	19.72	19.92	20.12	0.776	0.784	0.792
L1	---	---	4.30	---	---	0.169
Q	6.15 BSC			0.242 BSC		
Q1	5.60	5.80	6.00	0.220	0.228	0.236
ØP	3.55	3.60	3.70	0.140	0.142	0.146

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

Part Marking

AOK060V65X2
TO-247-3L



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