

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

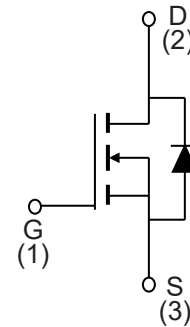
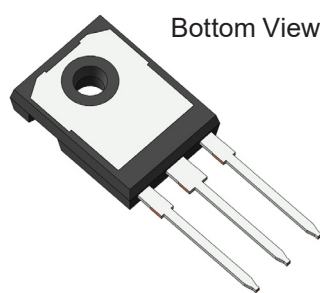
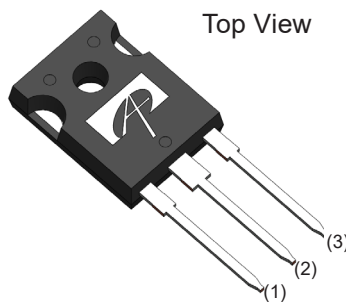
- UPS
- SMPS
- Motor Drives

Product Summary

$V_{DS} @ T_{J,max}$	1200V
I_{DM}	120A
$R_{DS(ON),typ}$	33m Ω
Q_{rr}	226nC
$E_{OSS} @ 800V$	63 μ J
100% UIS Tested	



Pin Configuration



Ordering Part Number	Package Type	Form	Shipping Quantity
AOK033V120X2	TO-247-3L	Tube	30/Tube

Absolute Maximum Ratings

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

Symbol	Parameter	AOK033V120X2	Units
V_{DS}	Drain-Source Voltage	1200	V
$V_{GS,MAX}$	Gate-Source Voltage	Maximum	-8/+18
$V_{GS,OP,TRANS}$		Max Transient ^(A)	-8/+20
$V_{GS,OP}$		Recommended Operating ^(B)	-5/+15
I_D	Continuous Drain Current	$T_C = 25^\circ C$	68
		$T_C = 100^\circ C$	48
I_{DM}	Pulsed Drain Current ^(C)	120	A
E_{AS}	Single Pulsed Avalanche Energy ^(D)	1000	mJ
P_D	Power Dissipation ^(C)	300	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	AOK033V120X2	Units
R _{θJA}	Maximum Junction-to-Ambient ^(E,F)	40	°C/W
R _{θJC}	Maximum Junction-to-Case ^(G)	0.5	°C/W

Electrical Characteristics

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
STATIC PARAMETERS							
BV _{DSS}	Drain-Source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0V, T _J = 25°C	1200			V	
		I _D = 250 μA, V _{GS} = 0V, T _J = 150°C		1200			
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 1200V, V _{GS} = 0V, T _J = 25°C			100	μA	
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = +15/-5V			±100	nA	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 17.5 mA		2.8		V	
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} = 15V, I _D = 20A	T _J = 25°C	33	43	mΩ	
			T _J = 150°C	45			
g _{FS}	Forward Transconductance	V _{DS} = 20V, I _D = 20A		15	-	S	
V _{SD}	Diode Forward Voltage	I _S = 17.5A, V _{GS} = -5V		4	5	V	
DYNAMIC PARAMETERS							
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 800V, f = 1 MHz		2908		pF	
C _{oss}	Output Capacitance			128		pF	
C _{rss}	Reverse Transfer Capacitance			9.9		pF	
E _{oss}	Coss Stored Energy			63		μJ	
R _G	Gate Resistance	f = 1 MHz		1.7		Ω	
SWITCHING PARAMETERS							
Q _g	Total Gate Charge	V _{GS} = -5/+15V, V _{DS} = 800V, I _D = 20A		104		nC	
Q _{gs}	Gate Source Charge			37		nC	
Q _{gd}	Gate Drain Charge			32		nC	
t _{d(on)}	Turn-On Delay Time	V _{GS} = -5V/+15V, V _{DS} = 800V, I _D = 40A, R _G = 2Ω		12.7		ns	
t _r	Turn-On Rise Time			40.5		ns	
t _{d(off)}	Turn-Off Delay Time			16.4		ns	
t _f	Turn-Off Fall Time			4.7		ns	
E _{on}	Turn-On Energy		L = 60 μH		980		μJ
E _{off}	Turn-Off Energy	FWD: AOK033V120X2		72		μJ	
E _{tot}	Total Switching Energy			1052		μJ	
t _{rr}	Body Diode Reverse Recovery Time	I _F = 20A, dI/dt = 1500A/us, V _{GS} = -5V, V _{DS} = 800V		61.3		ns	
I _{rm}	Peak Reverse Recovery Current				11.4		A
Q _{rr}	Body Diode Reverse Recovery Charge				227		nC

Notes:

- t_{pulse} < 1 μs, f > 1 Hz
- Device can be operated at V_{GS} = 0/15V. Actual operating VGS 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°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 = 5mH, I_{AS} = 20A, R_G = 25Ω, Starting T_J = 25°C.
- The value of R_{θJA} is measured with the device in a still air environment with T_A = 25°C.
- The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.
- The value of R_{θJC} is measured with the device mounted to a large heat-sink, assuming a maximum junction temperature of T_{J(MAX)} = 175°C.
- The static characteristics in Figures 1 to 8 are obtained using <300ms pulses, duty cycle 0.5% max.
- These curves are based on R_{θJC} 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.

Typical Electrical and Thermal Characteristics

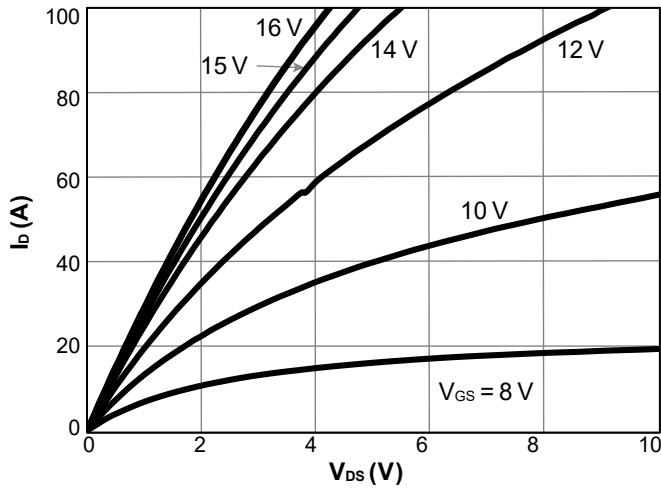


Figure 1. On-Region Characteristics $T_J = 25^\circ\text{C}$

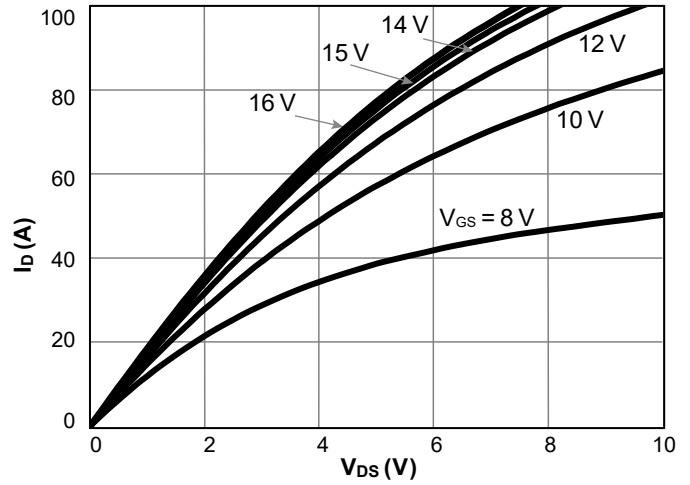


Figure 2. On-Region Characteristics $T_J = 175^\circ\text{C}$

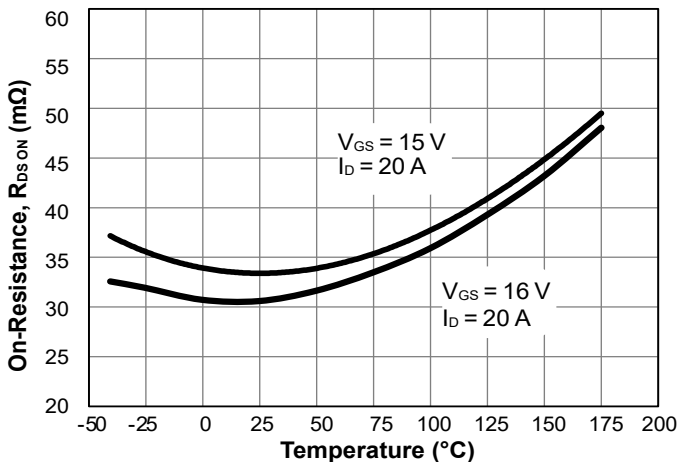


Figure 3. On-Resistance vs. Junction Temperature

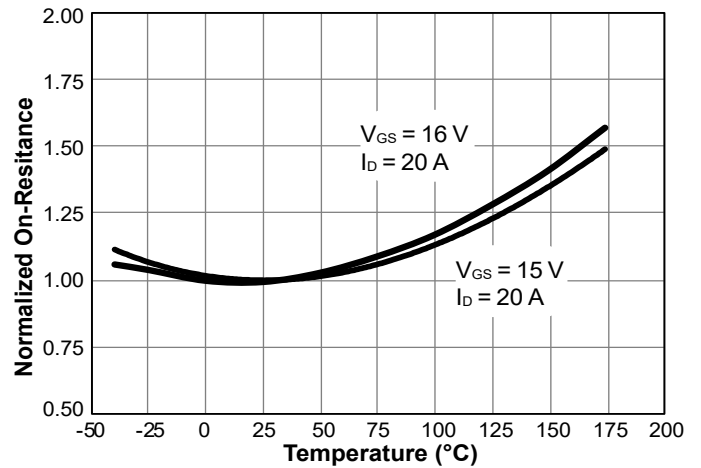


Figure 4. Normalized On-Resistance vs. Junction Temperature

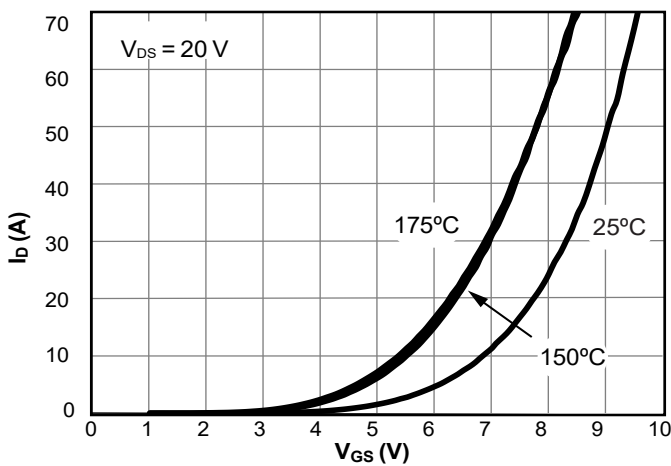


Figure 5. Transfer Characteristics

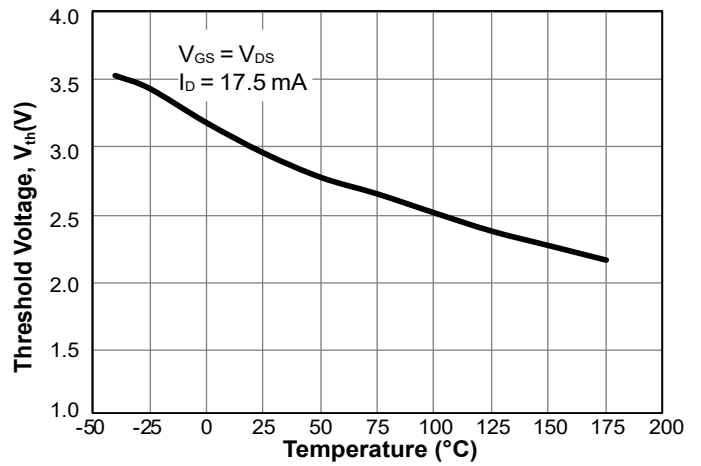


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics (Continued)

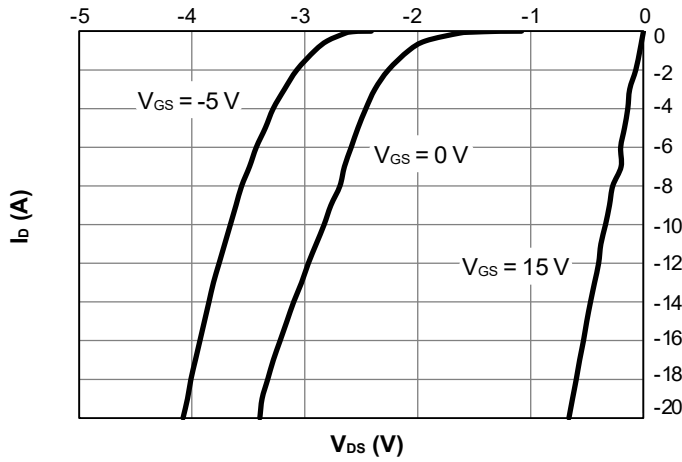


Figure 7. Body-Diode Characteristics at 25°C

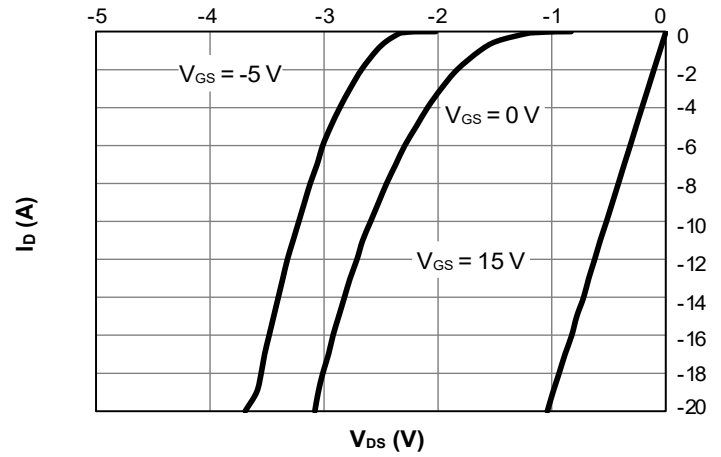


Figure 8. Body-Diode Characteristics at 175°C

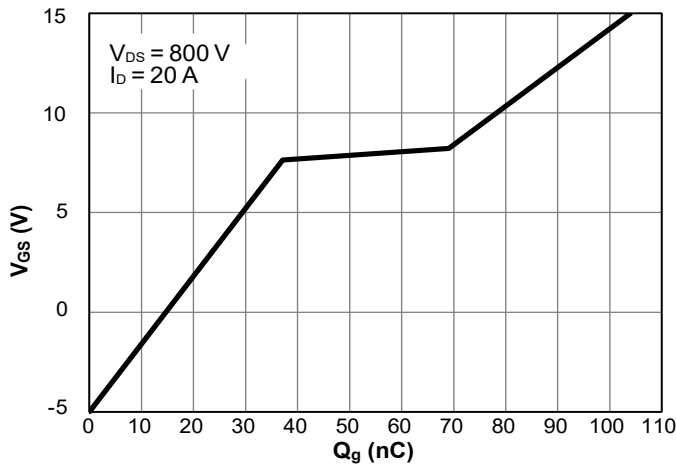


Figure 9. Gate-Charge Characteristics

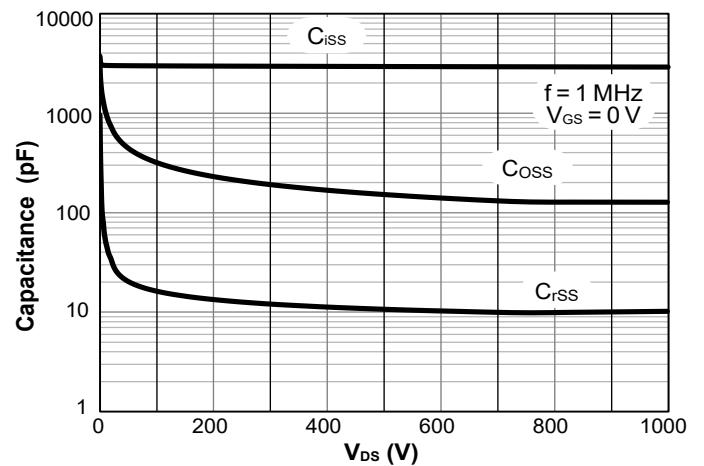


Figure 10. Capacitance Characteristics

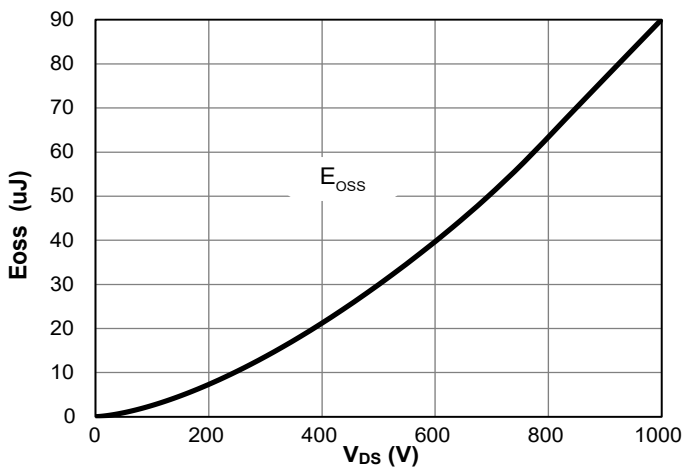


Figure 11. Coss Stored Energy

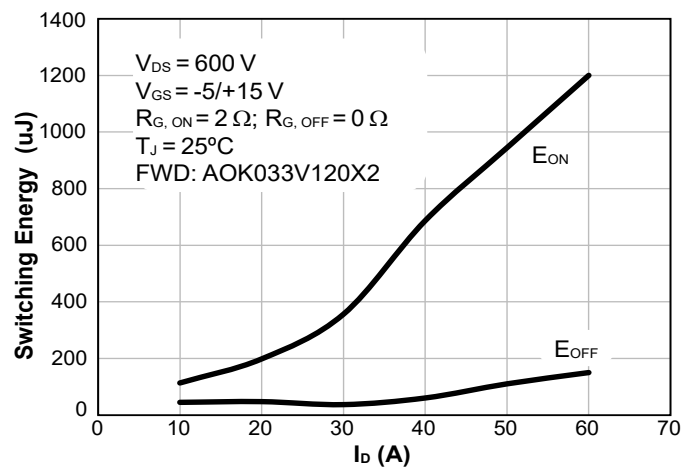


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics (Continued)

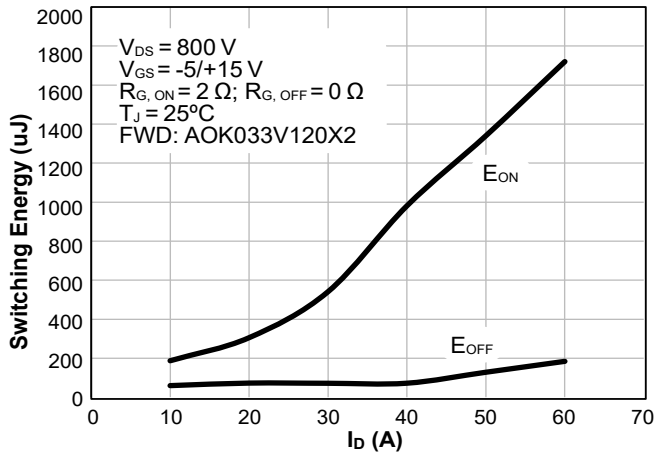


Figure 13. Switching Energy vs. Drain Current

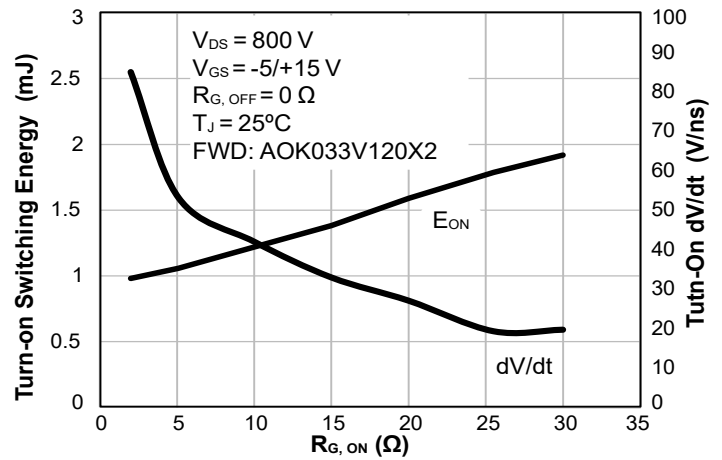


Figure 14. Turn-On Energy and dV/dt vs. External Gate Resistance

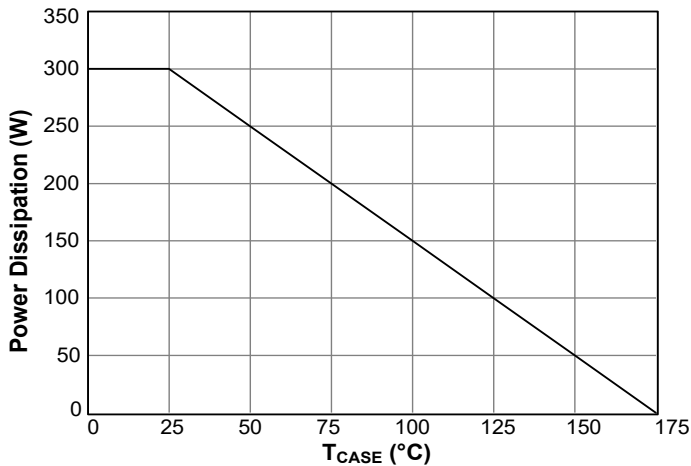


Figure 15. Power Derating vs. Case Temperature (Note I)

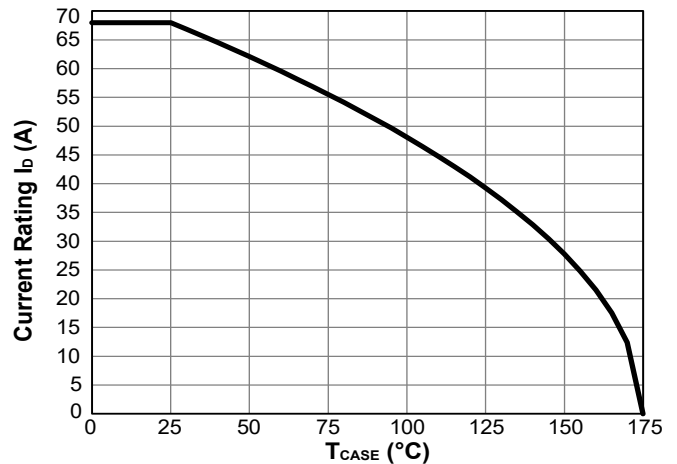


Figure 16. Current Derating vs. Case Temperature (Note I)

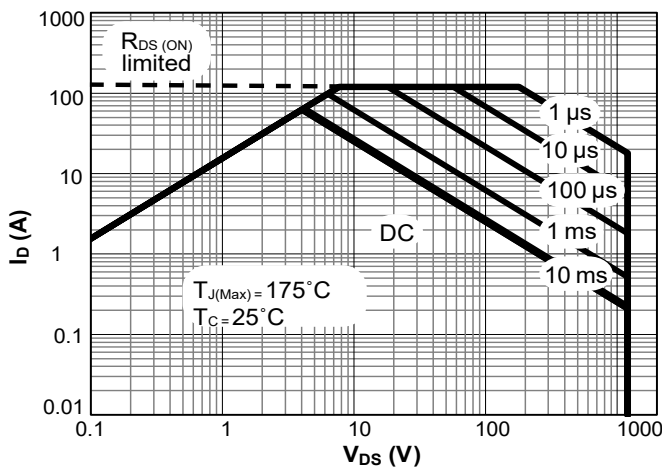


Figure 17. Maximum Forward Biased Safe Operating (Note I)

Typical Electrical and Thermal Characteristics (Continued)

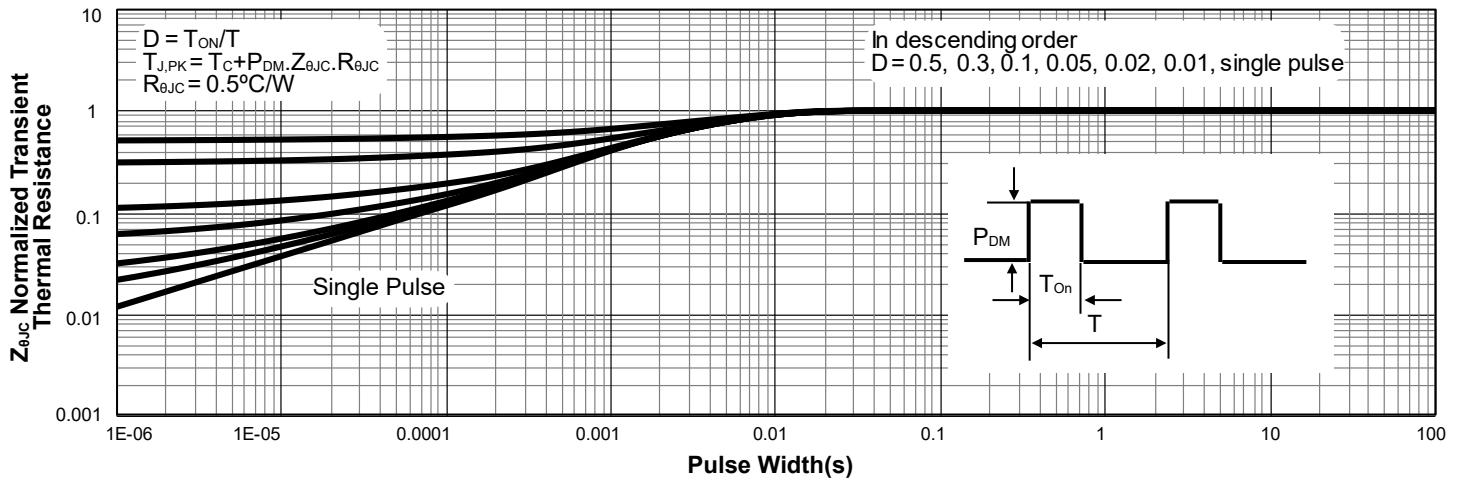


Figure 18. Normalized Maximum Transient Thermal Impedance for AOK033V120X2 (Note I)

Test Circuits and Waveforms

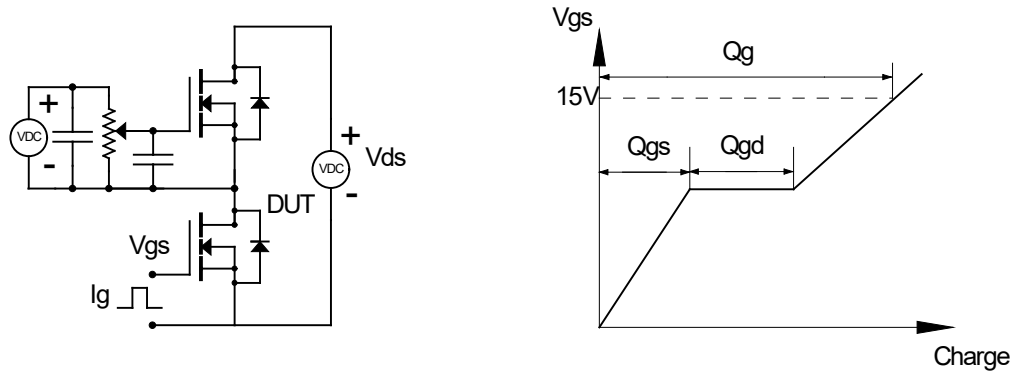


Figure 19. Gate Charge Test Circuits and Waveforms

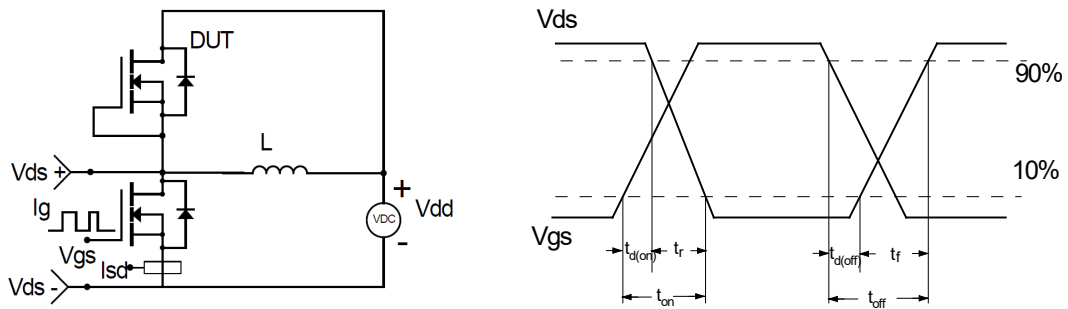


Figure 20. Inductive Switching Test Circuit and Waveforms

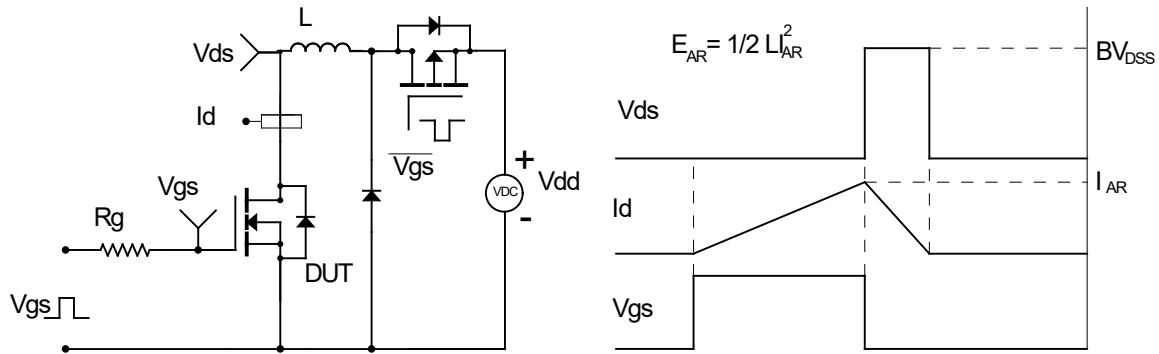


Figure 21. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

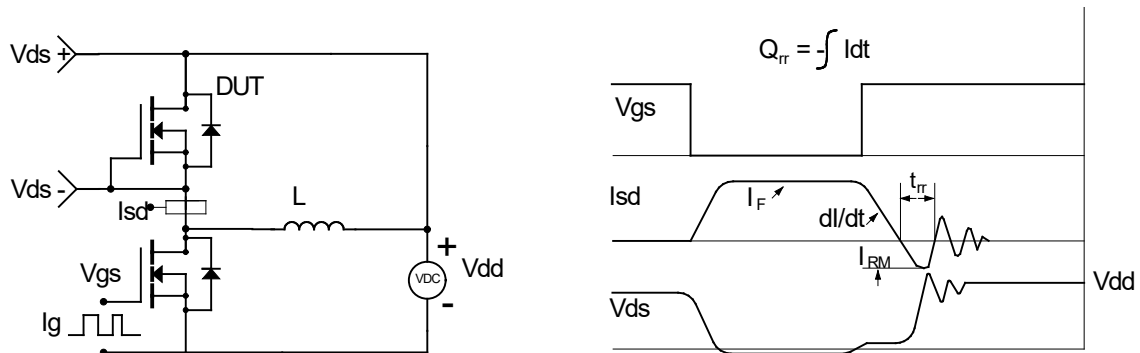
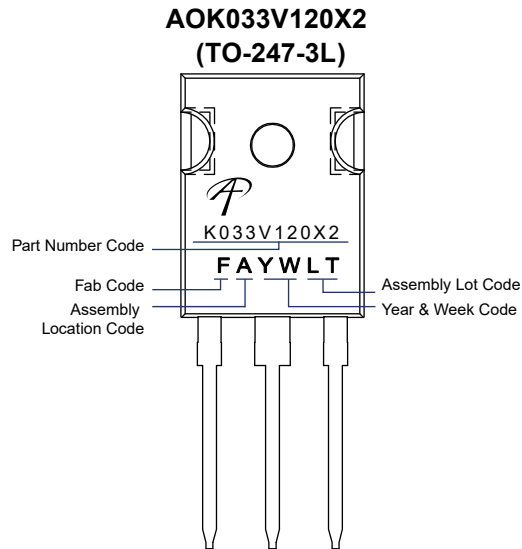


Figure 22. Diode Recovery Test Circuits and Waveforms

Part Marking



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