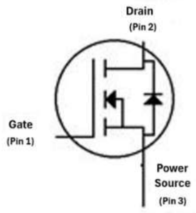
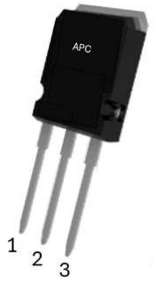
SiC Power MOSFET with Ceramic Isolated Baseplate Tab
AMR1k0V170E1i





Applications:

- **Solar Inverters**
- **Uninterrupted power supplies**
- **Switch mode power supplies**
- **Motor drives**

Features:

- **High blocking voltage with low on-resistance**
- **High switching speed with low capacitance**
- **Very low switching losses**
- **Excellent avalanche ruggedness**
- **Very fast and robust intrinsic body diode with low reverse recovery**
- **0V turn-off V_{gs} for gate driving ease**
- **RoHS compliant**

Absolute Maximum Ratings (T_{amb}=25°C, unless specified otherwise)

Symbol	Parameter	Value	Unit
V_{DSmax}	Drain-source voltage	1700	V
V_{GSmax}	Gate-source voltage, maximum transient voltage	-10/+27	
V_{GSmax}	Gate-source voltage, maximum static voltage	-8/+24	
V_{GSop}	Gate-source voltage	-5/+20	
I_D	Continuous drain current (V_{GS} = 20V)	5.7	A
	Continuous drain current (V_{GS} = 20V), TC = 100°C	4	
$I_{D(pulse)}$	Pulsed drain current (Pulse width limited by T_{jmax})	14	A
P_{tot}	Power dissipation	100	W
T_j	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature	-55 to 175	°C
T_L	Soldering temperature	260	°C
M	Mounting torque	0.7	Nm

Thermal Resistances

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal Resistance	-	TBD	-	°C/W
$R_{\theta JA}$	Junction-to-ambient thermal Resistance	-	-	TBD	°C/W

Static Electrical Characteristics (T_A =25°C, unless specified otherwise)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100µA	1700	/	/	V
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 500µA [a]	2.0	2.6	4.0	
		V_{DS} = V_{GS}, I_D = 500µA, T_j = 175ºC [a]	-	1.8	-	
I_{DSS}	Drain-Source Leakage current	V_{DS} = 1700V, V_{GS} = 0V	-	1	100	µA
I_{GSS}	Gate-Source leakage current	-10V < V_{GS} < 27V	-	1	100	nA
$R_{DS(on)}$	Drain-Source ON Resistance	V_{GS} = 20V, I_D = 2A	-	1.0	1.2	Ω
		V_{GS} = 20V, I_D = 2A, T_j = 175ºC	-	1.5	-	
g_{fs}	Transconductance	V_{DS} = 20V, I_D = 2A	-	1.0	-	S
		V_{DS} = 20V, I_D = 2A, T_j = 175ºC	-	1.2	-	
$R_{g(int)}$	Internal Gate Resistance	f = 1MHz, V_{AC} = 25mV	-	10	-	Ω
E_{AS}	Avalanche Energy	L = 5mH, V_{DD} = 50V	-	150	-	mJ

[a] pre-condition Vth, as per JEDEC standard JEP183A, (Revision of JEP183 January 2021)

Dynamic Characteristics ($T_A = 25$ °C, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
C_{iss}	Input capacitance	V_{GS} = 0V, V_{DS} = 1000V, f = 1MHz, V_{AC} = 25mV	-	227	-	pF
C_{oss}	Output capacitance		-	12.5	-	
C_{rss}	Reverse transfer capacitance		-	2	-	
E_{oss}	C_{OSS} stored energy		-	7.7	-	µJ
Q_{GS}	Gate to source charge	V_{DD} = 1200V, I_D = 2A, V_{GS} = -5/+20V, I_{GS} = 1mA	-	1.67	-	nC
Q_{GD}	Gate to drain charge		-	9.2	-	
Q_G	Total gate charge		-	16.7	-	

Switching Characteristics ($\mathrm{T_A} = 25\ ^\circ\mathrm{C}$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$t_{d(on)}$	Turn-on delay time		-		-	ns
t_r	Rise time		-		-	
$t_{d(off)}$	Turn-off delay time		-		-	
t_f	Fall time		-		-	
E_{on}	Turn-on switching energy		-		-	µJ
E_{off}	Turn-off switching energy		-		-	
$t_{d(on)}$	Turn-on delay time		-		-	ns
t_r	Rise time		-		-	
$t_{d(off)}$	Turn-off delay time		-		-	
t_f	Fall time		-		-	
E_{on}	Turn-on switching energy		-		-	µJ
E_{off}	Turn-off switching energy		-		-	

[b] This SIC MOSFET can switch with driver pulses 0V to 20V with optimized PCB layouts and gate drive circuits.

Reverse SiC Diode Characteristics ($\mathrm{T_A} = 25\ ^\circ\mathrm{C}$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_{SD}	Diode forward voltage					V
I_S	Continuous diode forward current					A
$I_{S,\ pulse}$	Diode pulse current					A
t_{rr}	Reverse recovery time					ns
Q_{rr}	Reverse recovery charge					µC
I_{rrm}	Peak reverse recovery current					A
t_{rr}	Reverse recovery time					ns
Q_{rr}	Reverse recovery charge					µC
I_{rrm}	Peak reverse recovery current					A

Electrical Characteristic Diagrams

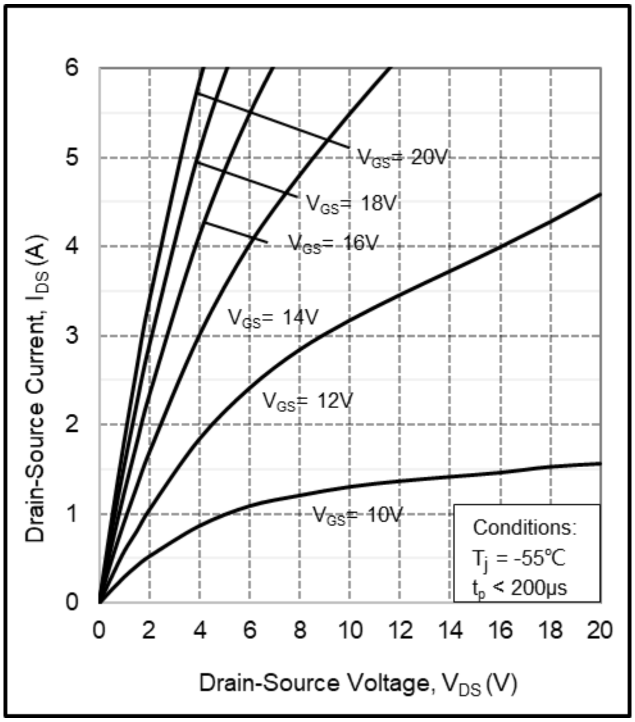


Figure 1. Output characteristics at T_j = -55℃

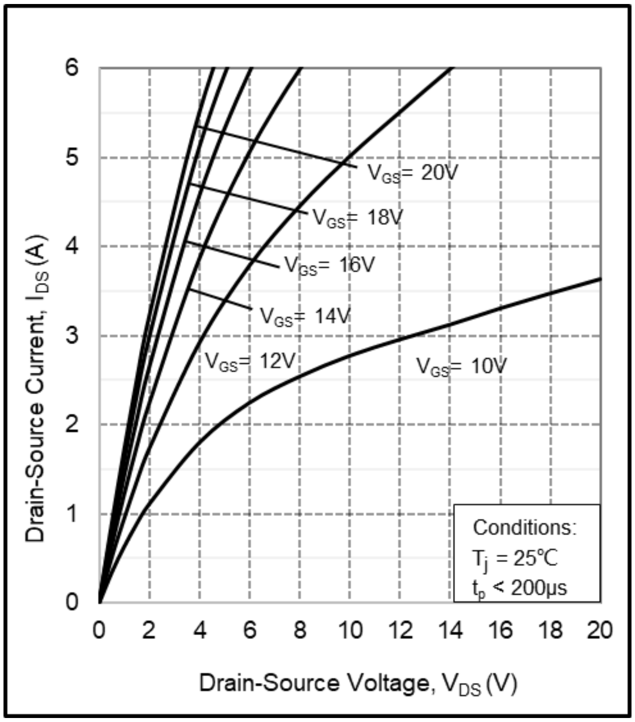


Figure 2. Output characteristics at T_j = 25℃

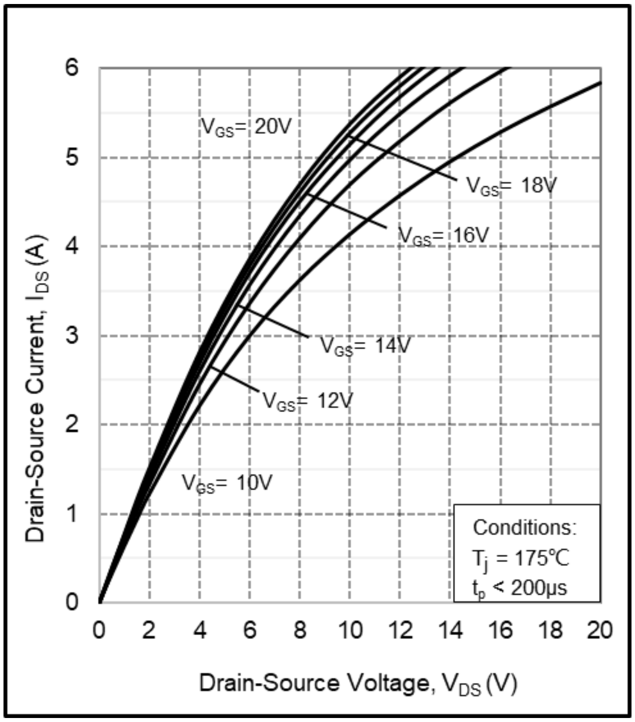


Figure 3. Output characteristics at T_j = 175℃

Figure 4. Normalized on-resistance vs. temperature

Figure 5. On-resistance vs. drain current
for various temperatures

Figure 6. On-resistance vs. temperature
for various gate voltages

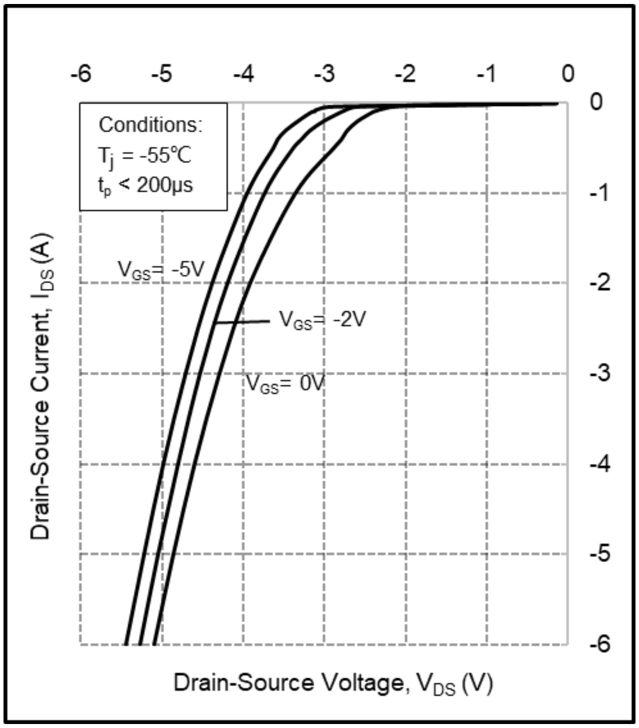


Figure 7. Transfer characteristic
for various junction temperatures

Figure 8. Body diode characteristic at T_j = -55℃

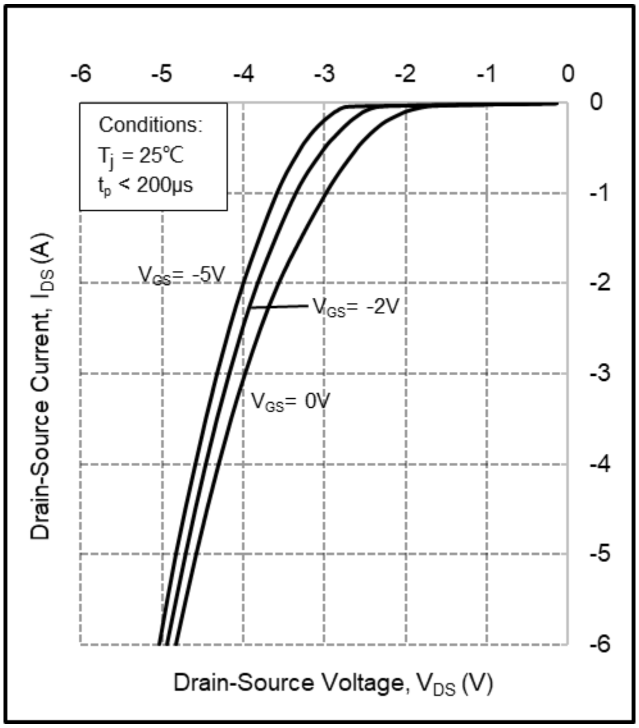


Figure 9. Body diode characteristic at T_j = 25℃

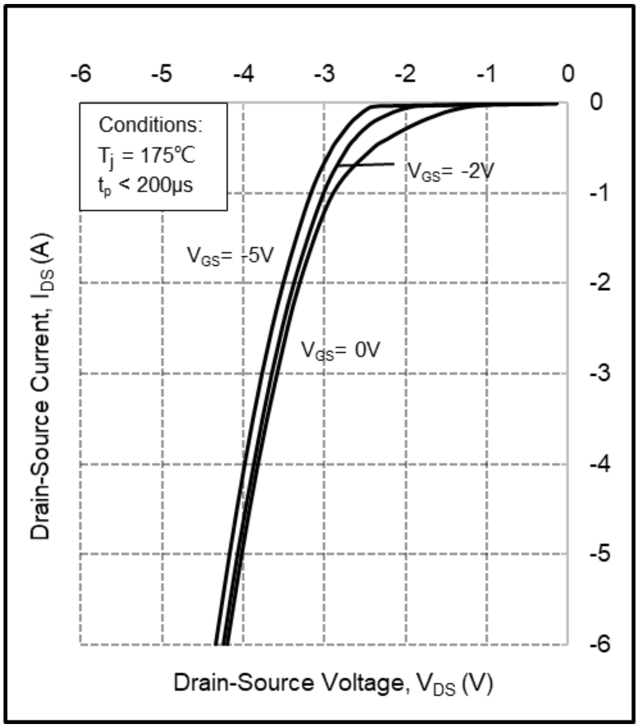


Figure 10. Body diode characteristic at T_j = 175℃

Figure 11. Threshold voltage vs. temperature

Figure 12. Gate charge characteristics

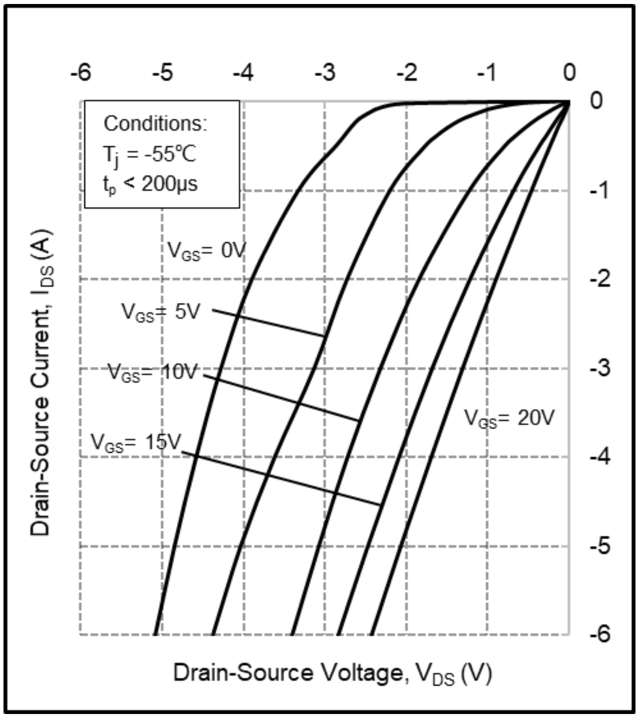


Figure 13. 3rd quadrant characteristic
at T_j = -55℃

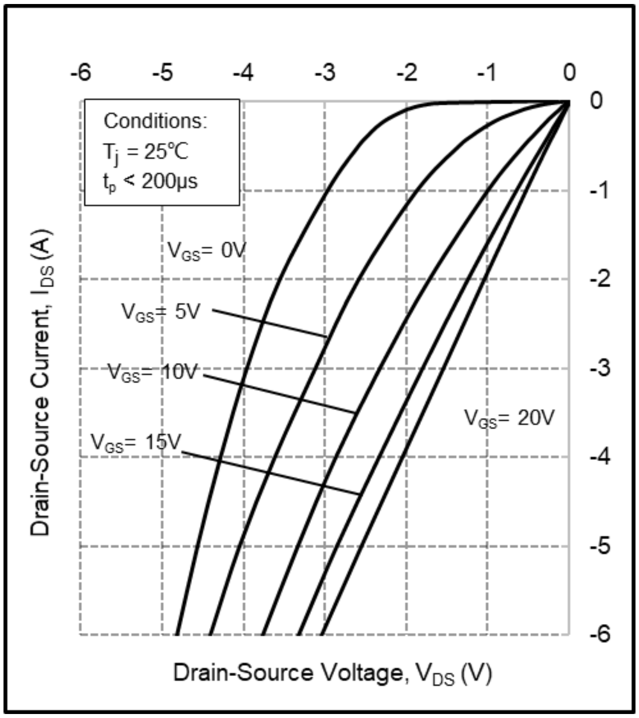


Figure 14. 3rd quadrant characteristic
at Tj = 25℃

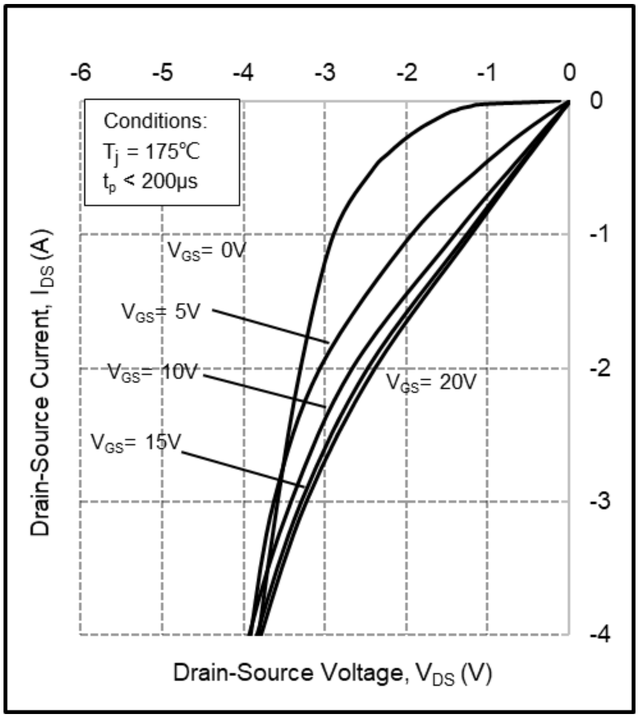


Figure 15. 3rd quadrant characteristic
at Tj = 175℃

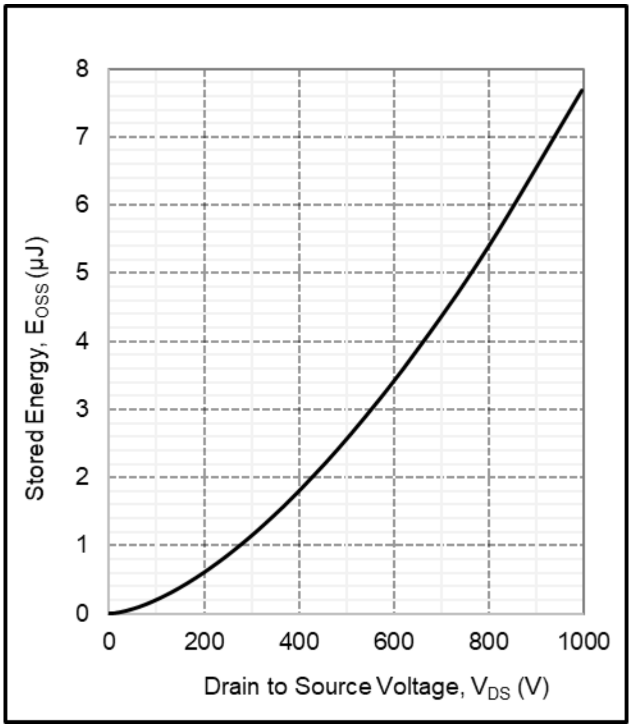


Figure 16. Output capacitor stored energy

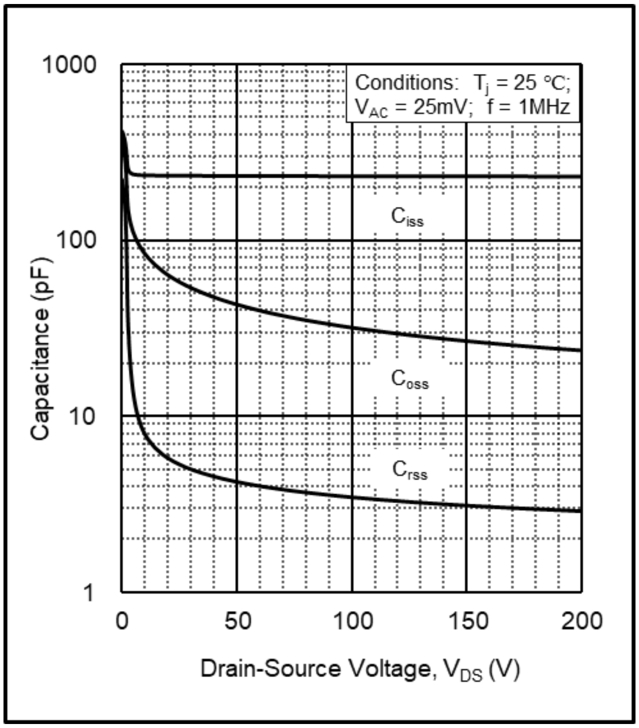


Figure 17. Capacitance vs. drain-source voltage
(0 - 200V)

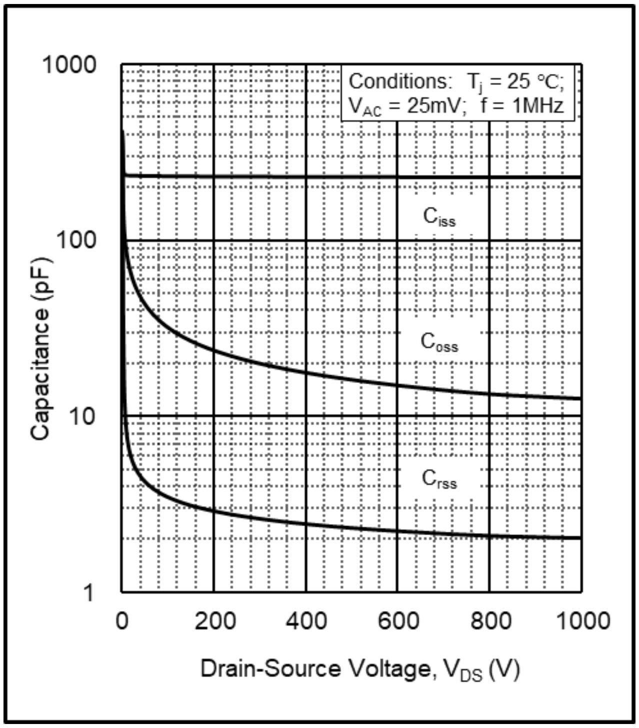


Figure 18. Capacitance vs. drain-source voltage
(0 - 1000V)

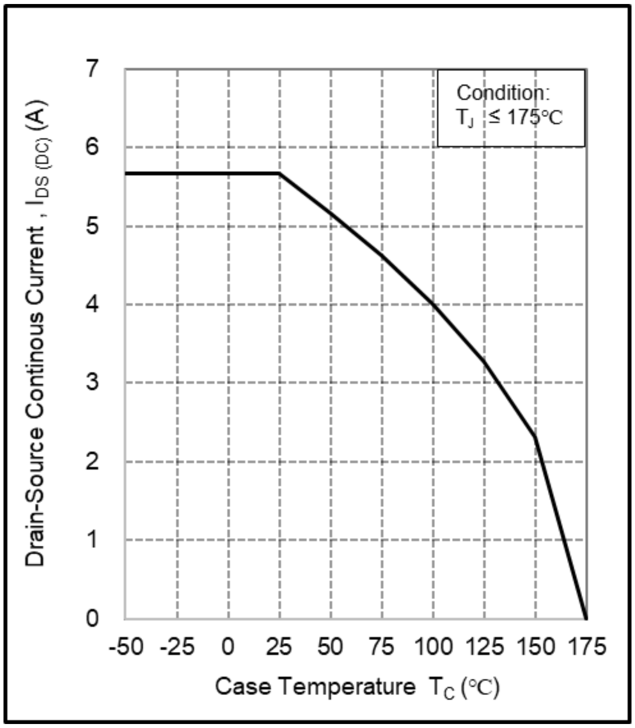


Figure 19. Continuous drain current derating
vs. temperature

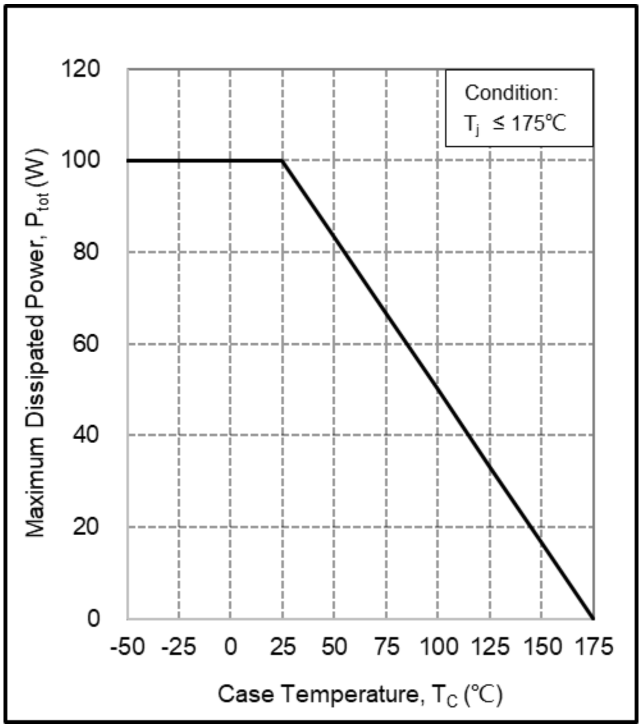


Figure 20. Maximum power dissipation derating
vs. temperature

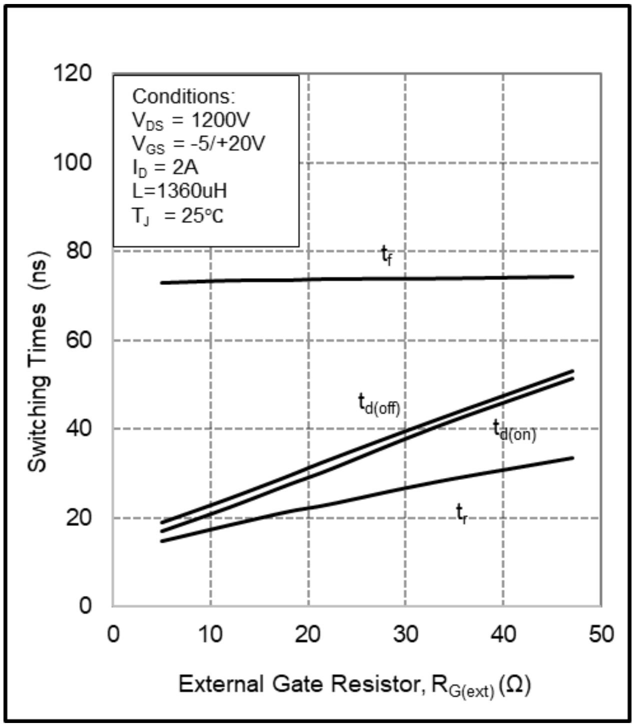


Figure 21. Switching Times vs. $R_{G(ext)}$

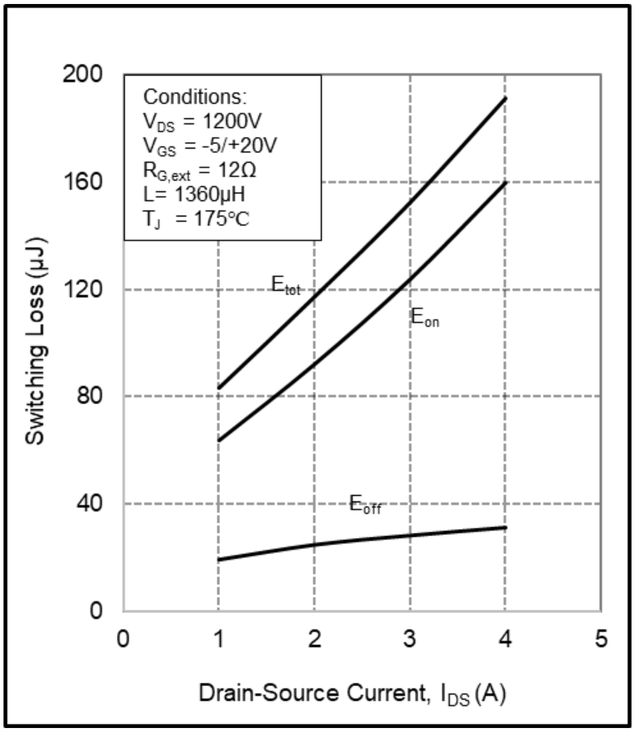


Figure 22. Clamped inductive Switching energy vs. drain current

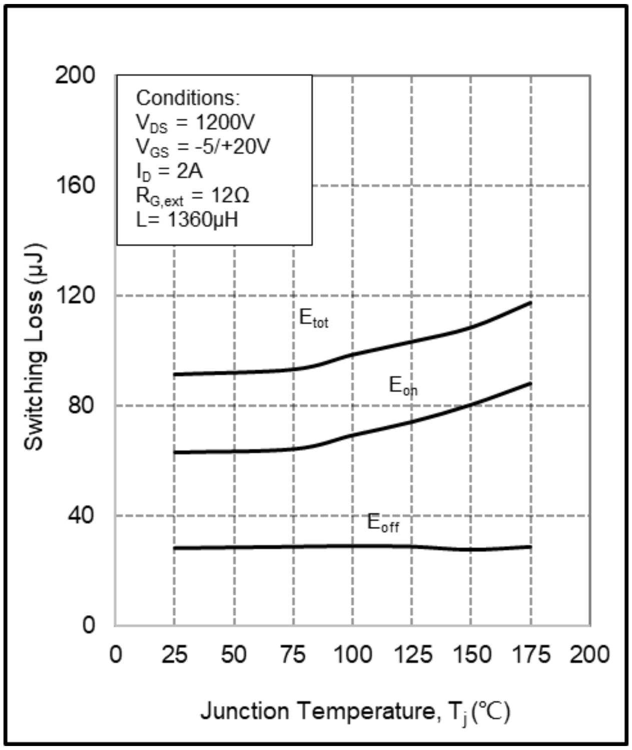


Figure 23. Clamped inductive Switching energy vs. temperature

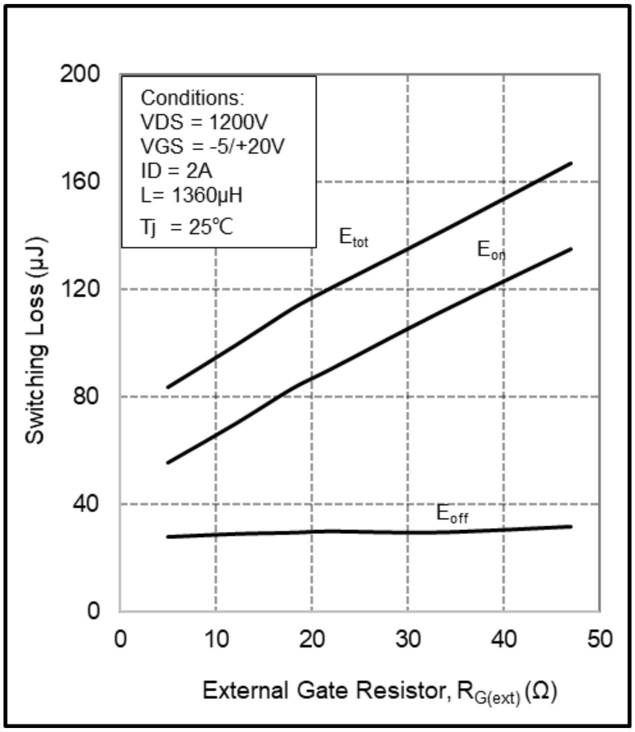
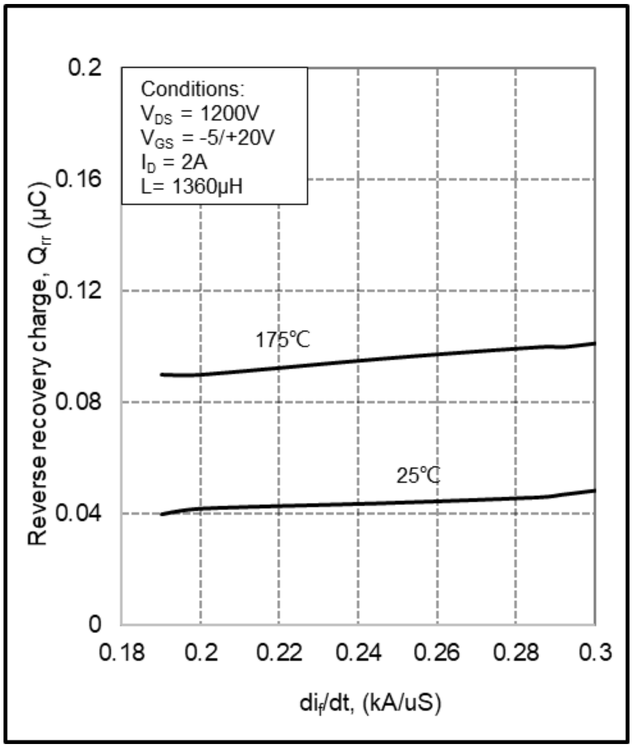


Figure 24. Clamped inductive Switching energy vs. $R_{G(ext)}$



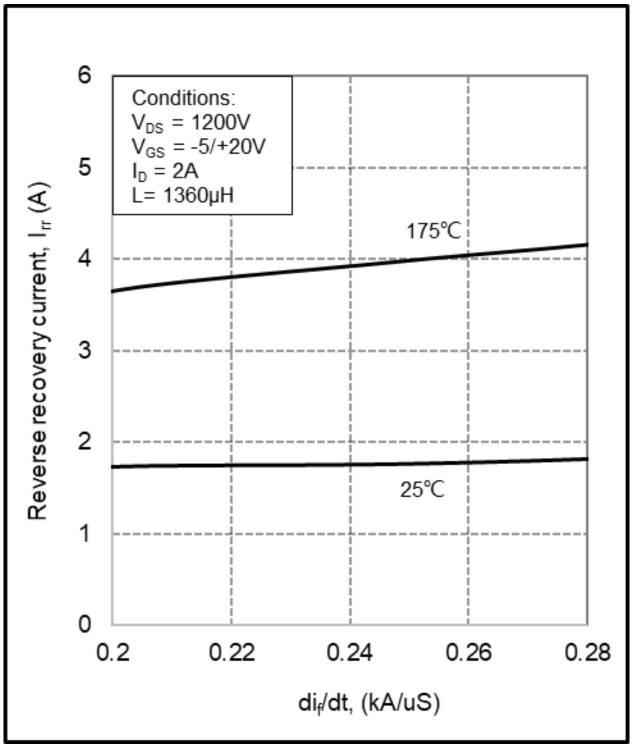
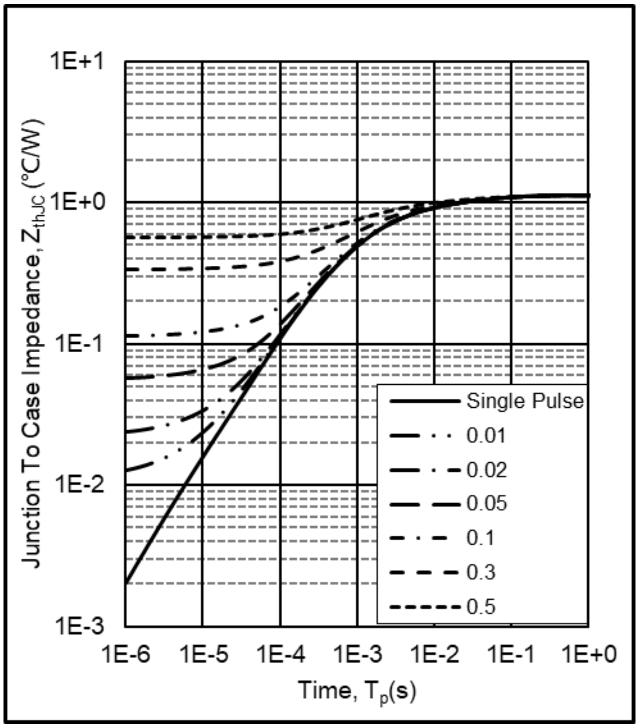


Figure 25. Reverse recovery charge vs. di_f/dt

Figure 26. Reverse recovery current vs. di_f/dt



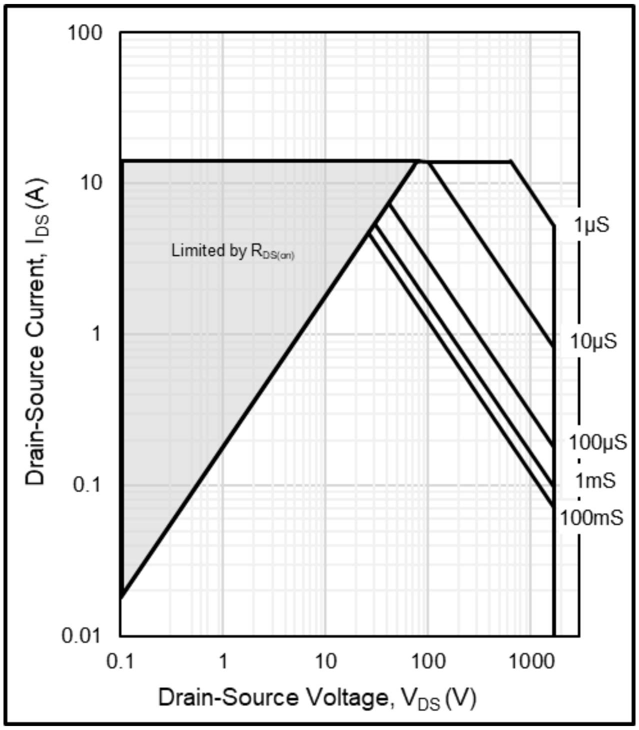


Figure 27. Transient Thermal Impedance
(Junction - Case)

Figure 28. Safe Operating Area

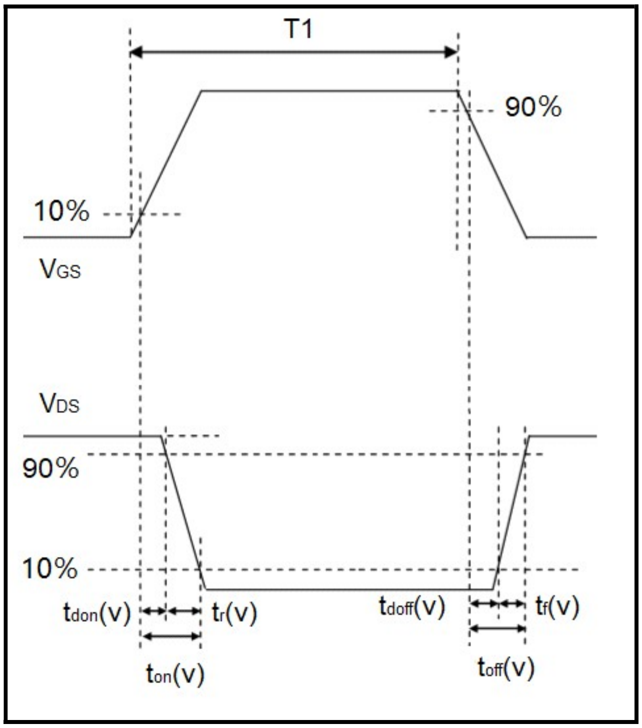


Figure 29. Switching times definition

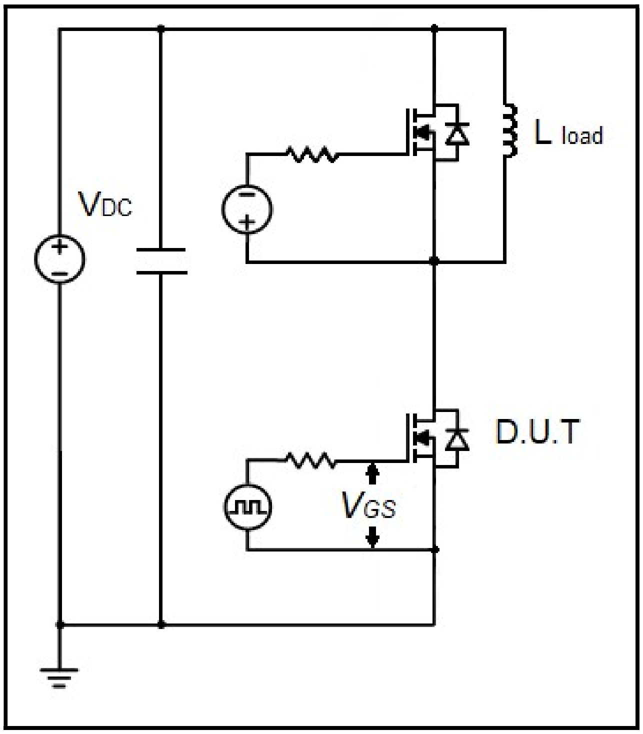


Figure 30. Clamped inductive switching waveform test circuit

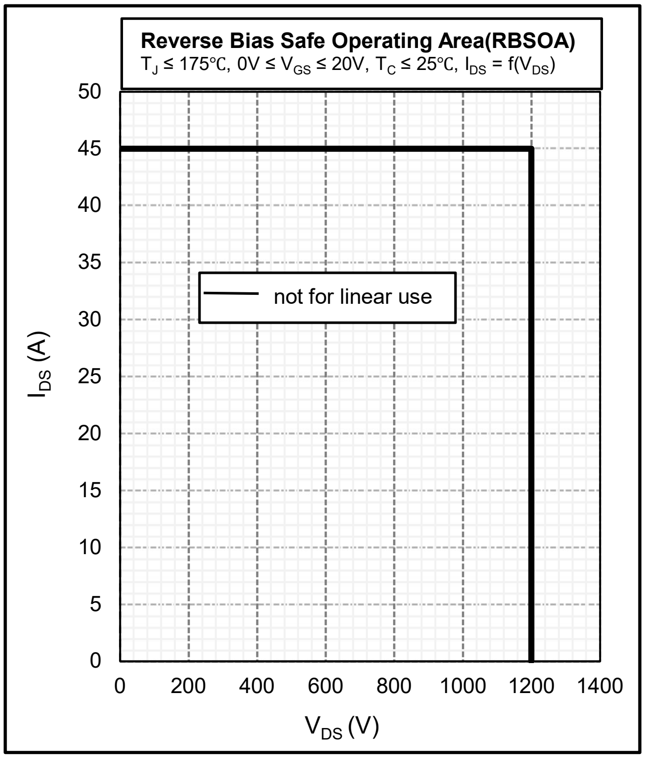
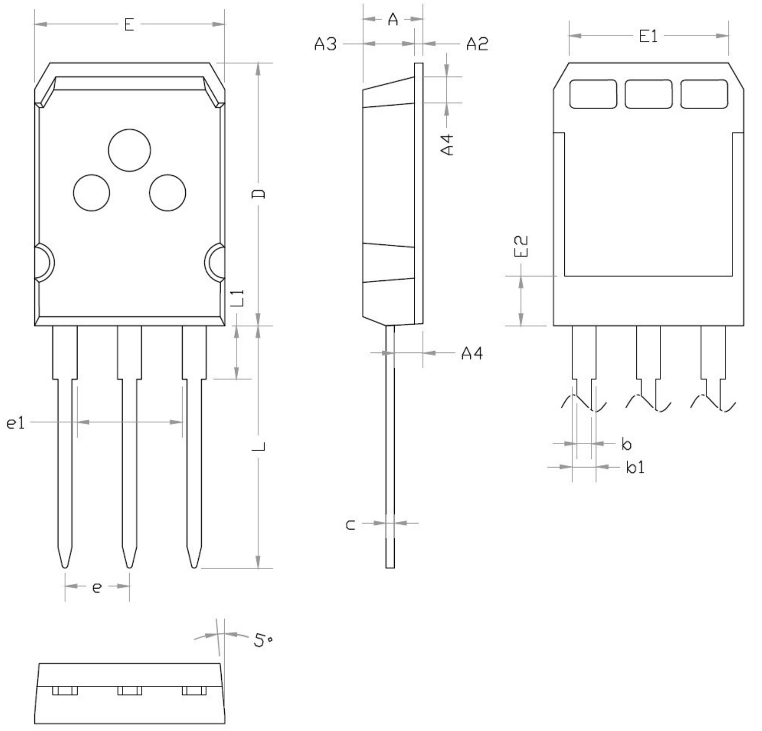


Figure 31. Reverse Bias Safe Operating Area

Package Information:



SYMBOL	mm
A	5.03 mm
A1	2.39 mm
A2	0.7 mm
A3	4.33 mm
A4	2.2 mm
b	1.19 mm
b1	2.01 mm
c	0.7 mm
D	21.94 mm
E	15.9 mm
E1	13.35 mm
E2	4.17 mm
e	5.4 mm
e1	8.79 mm
L	20.27 mm
L1	4.51 mm

Ordering Information

Part number	AMR1k0V170E1i
Package	TO-247i-3L
Unit quantity	300 EA
Packing type	Tube

For more information, visit https://www.apowerc2.com

IMPORTANT NOTICE AND DISCLAIMER

The information provided in this document is for reference purposes only and is subject to change without notice. The manufacturer makes no representation or warranty, express or implied, regarding the accuracy, completeness, or reliability of the information contained herein. Please contact your local salesperson for information related to warranties. Any datasheet marked as "preliminary" is subject to change and product samples provided with a preliminary datasheet are not intended for reliability testing, may differ from those provided in mass production, and are subject to change or even discontinuation. APC-E makes reasonable commercial efforts to make all datasheets accurate in all material aspects.

All parameters, including but not limited to electrical characteristics, are provided for informational purposes and do not constitute a guarantee of performance under all operating conditions. Typical values are not tested and are not guaranteed.

Products are not authorized for use and must not be used as critical components in life-support devices or systems, safety-critical applications, or any application in which failure of the product could result in personal injury, death, or severe property or environmental damage.

The user is solely responsible for: the selection, qualification, and validation of the product for the intended application; compliance with all applicable laws, regulations, and safety requirements; implementation of adequate design and operating safeguards. Due to technical requirements, components described in this datasheet may contain dangerous substances.

No license, express, implied or by estoppel to any intellectual property rights is granted under this document.

EXCEPT AS EXPRESSLY SET FORTH IN APC-E/LUMINUS' TERMS AND CONDITIONS OF SALE, THE PRODUCT IS PROVIDED "AS IS" AND "WITH ALL FAULTS." LUMINUS AND APC-E DISCLAIM ALL WARRANTIES, EXPRESS IMPLIED, OR BY ESTOPPEL INCLUDING BUT NOT LIMITED TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT. LUMINUS AND APC-E DO NOT WARRANT THAT THE DEVICE WILL OPERATE ERROR FREE OR IN COMBINATIONS SELECTED BY THE USER.

IN NO EVENT SHALL LUMINUS AND/OR APC-E BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, OR PUNITIVE DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS, LOSS OF DATA, OR BUSINESS INTERRUPTION, ARISING OUT OF OR RELATED TO THE USE OF THE PRODUCT OR THIS DOCUMENT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.