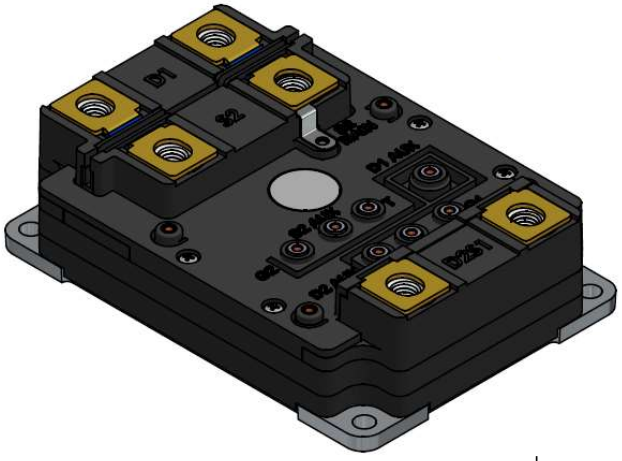
PRELIMINARY

1700V Half-Bridge Silicon Carbide
Power Module

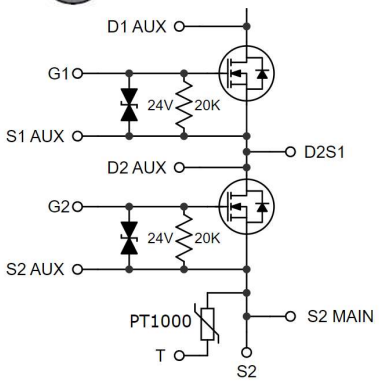
GE17080CDA3
V_{DS}: 1700 V I_{DS}: 765 A

Superior performance for high power, high frequency applications needing best-in-class power density



Features

- Highly reliable GE SiC MOSFET devices
- Low $R_{DS(ON)}$ (1.85 mΩ) (device only)
- Low stray inductance (10 nH)
- Ultra-low switching losses over entire operating range
- Partial discharge free at high altitudes
- Body diode with minimal reverse recovery
- Integrated temperature sensing
- Dedicated DESAT Pin and Source-Kelvin Pin
- AlSiC Baseplate and Si_3N_4 AMB Substrate



MOSFET DC Characteristics @ T_J = 25˚C (unless otherwise specified)

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
I_{DS}	Continuous Drain Current			765	A	V_{GS} = 20 V, T_c = 25˚C	Per Switch
				540		V_{GS} = 20 V, T_c = 100˚C	
				440		V_{GS} = 20 V, T_c = 125˚C	
$I_{DS,pulse}$	Pulsed Drain Current			1600	A	T_c = 25˚C, t_p = 1 ms	
V_{DSmax}	Drain - Source Breakdown Voltage	1700			V	V_{GS} = 0 V, I_{DS} = 100 µA	
V_{GSmax}	Maximum Gate - Source Voltage			-15/+23	V	V_{DS} = 0 V	
V_{GSop}	Recommended Gate - Source Voltage		-5/+20		V		
T_{Jmax}	Junction Temperature			175	˚C		
T_C	Case Temperature Range	-55		150	˚C		
T_{STG}	Storage Temperature Range	-55		150	˚C		
P_D	Power Dissipation			2350	W	T_c = 25˚C	

(Continued) **MOSFET DC Characteristics @ T_J = 25˚C** (unless otherwise specified)

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
I_{DS}	Continuous Drain Current			765	A	V_{GS} = 20 V, T_c = 25˚C	Per Switch
$V_{GS(th)}$	Gate Threshold Voltage	2.5	2.9	4.5	V	V_{GS} = V_{DS}, I_{DS} = 160 mA	
I_{DSS}	Drain Leakage Current			0.20	mA	V_{DS} = 1700 V, V_{GS} = 0 V, T_J = 25˚C	
				3.2		T_J = 175˚C	
I_{GSS}	Gate-Source Leakage Current			320	nA	V_{GS} = -15/+23 V	
$R_{DS(on)}$	On State Resistance (Device Only)		1.85	2.23	mΩ	V_{GS} = 20 V, I_{DS} = 425 A, T_J = 25˚C	Per Switch
			3.35	4.13		T_J = 175˚C	
$R_{G(int)}$	Gate-Source Series Resistance		1.2		Ω	V_{GS} = 0 V, f = 100 kHz, T_c = 25˚C	

MOSFET Dynamic Characteristics per switch @ T_J = 25˚C (unless otherwise specified)

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
C_{iss}	Input Capacitance		58.0		nF	V_{GS} = 0 V V_{DS} = 1000 V f = 100 kHz	
C_{oss}	Output Capacitance		2.05		nF		
C_{rss}	Reverse Transfer Capacitance		0.14		nF		
E_{on}	Turn-On Switching Energy		67		mJ	V_{GS} = -5 V to +20 V V_{DS} = 1200 V I_{DS} = 600 A R_{Gon} = 2.35 Ω R_{Goff} = 2.35 Ω	
E_{off}	Turn-Off Switching Energy		57		mJ		
t_r	Rise Time		56		ns		
t_f	Fall Time		57		ns		
Q_G	Total Gate Charge		2414		nC	V_{GS} = 0 to 18 V V_{DS} = 900 V I_{DS} = 480 A	
Q_{GD}	Gate-Drain Charge		1050		nC		
Q_{GS}	Gate-Source Charge		372		nC		

Body Diode Characteristics per switch @ T_J = 25˚C (unless otherwise specified)

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
I_{SD}	Pulsed body diode current			1440	A	V_{GS} = 0 V	1.
V_{SD}	Diode Forward Voltage		5.0		V	V_{GS} = 0 V, I_{SD} = 900 A, T_J = 25˚C	

1. Use of body diode is recommended in pulse mode only

Thermal Characteristics

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
R_{th}	Thermal Resistance Junction-to-Case		.060	.064	˚C/W	JESD51-14	Per Switch

Temperature Sensor Characteristics

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
R_{RTD}	Rated Resistance of RTD		1k		ohm		2.
	Tolerance of Resistance		0.12		%		
	Accuracy		0.3		°C		
	Measuring Current	100		300	µA		
TCR	Temperature Coefficient		3850		ppm/K		
	Operating Temperature	-70		+500	°C		
	Insulation Resistance		100		MOhm	20°C	

2. RTD is mounted directly over center-most die allowing direct reading of T_J

Module packaging data

Symbols	Parameters	Min.	Typ.	Max.	Unit	Test Conditions	Notes
V_{Iso}	Case Isolation Voltage	4			kV	AC 50 Hz, 1 min, 25˚C	
CTI	Comparative Tracking Index		600				
M_s	Mounting Torque			10.0	N-m	Power Terminals	
				6.0		Baseplate	
				1.0		Auxiliary	
L_{D1S2}	Loop Inductance		10		nH		
	Module Mass		0.76		Kg		
	Clearance Distance		8		mm	D1 to S2	
			68		mm	S2 to D2S1	
			33		mm	D1 to Baseplate	
			47		mm	S2 to Baseplate	
			33		mm	D2S1 to Baseplate	
	Creepage Distance		89		mm	D1 to S2	
			96		mm	S2 to D2S1	
			33		mm	D1 to Baseplate	
			55		mm	S2 to Baseplate	
			33		mm	D2S1 to Baseplate	
M_{BP}	Base Plate Material		AlSiC				

Typical performance: **GE17080CDA3**

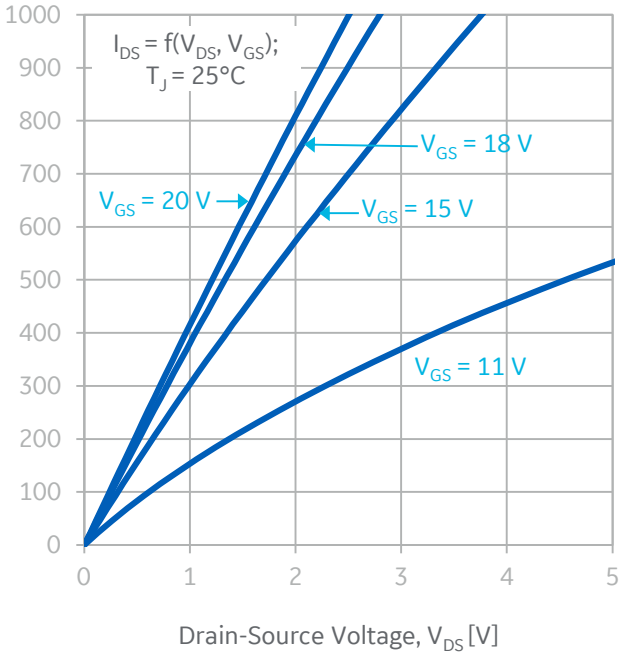


Figure 1: Output Characteristics (25°C)

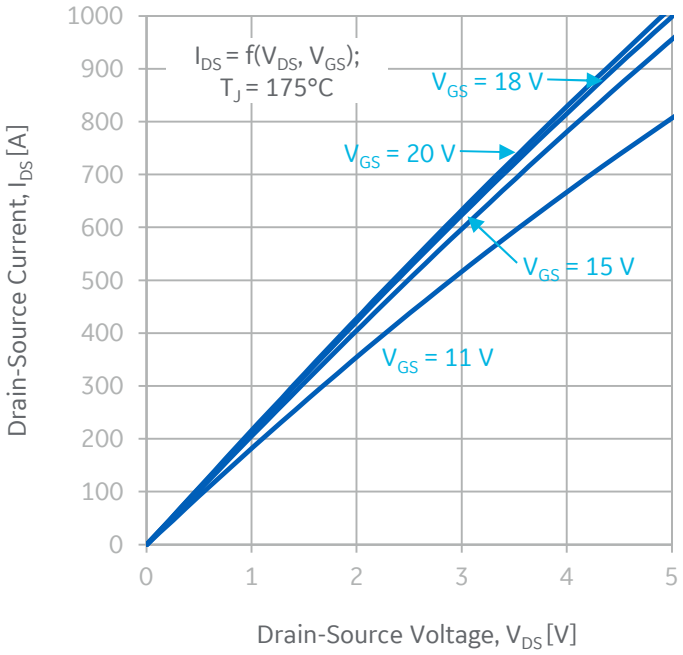


Figure 2: Output Characteristics (175°C)

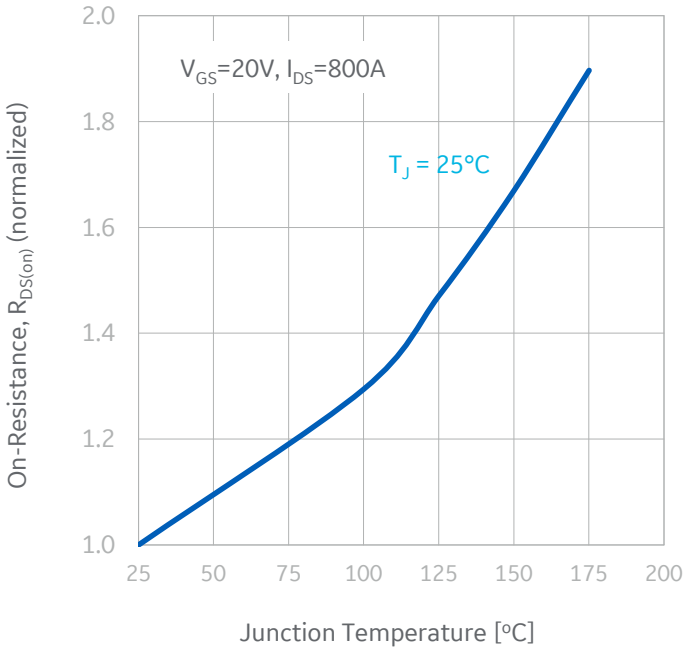


Figure 3: Normalized On-state Resistance vs. Temperature

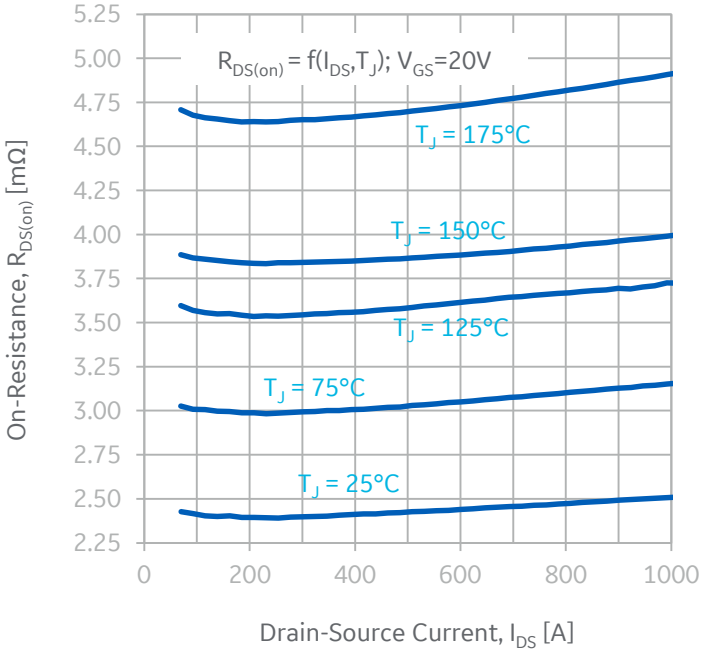


Figure 4: Module Drain-Source On-state Resistance

Typical performance: **GE17080CDA3**

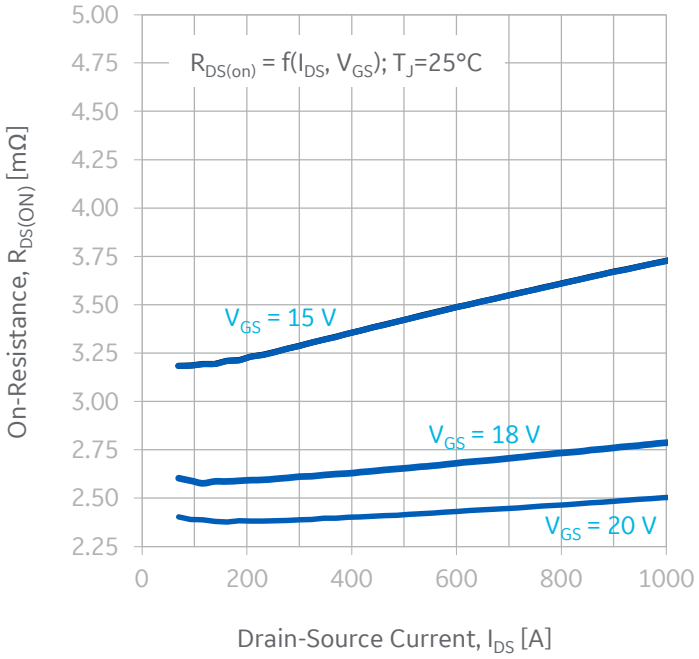


Figure 5: Module Drain-Source On-state Resistance

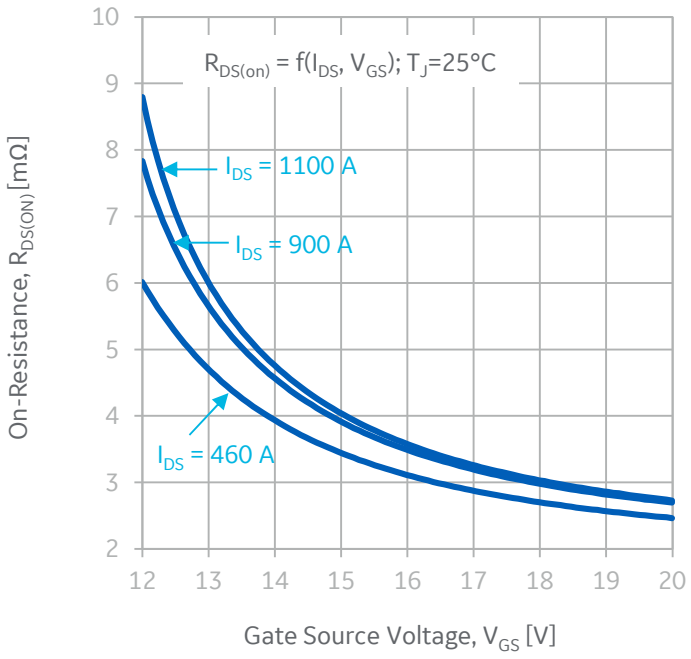


Figure 6: Drain-Source On-state Resistance vs. Gate Voltage

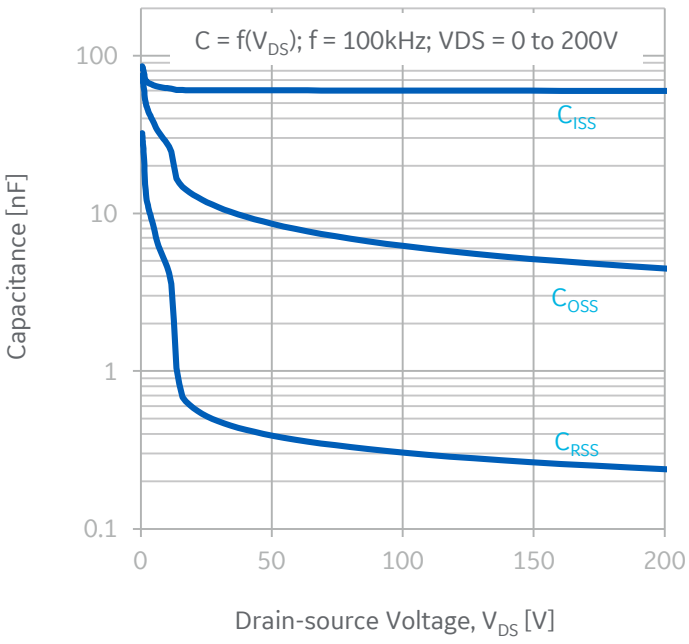


Figure 7: Junction Capacitances to 200 V

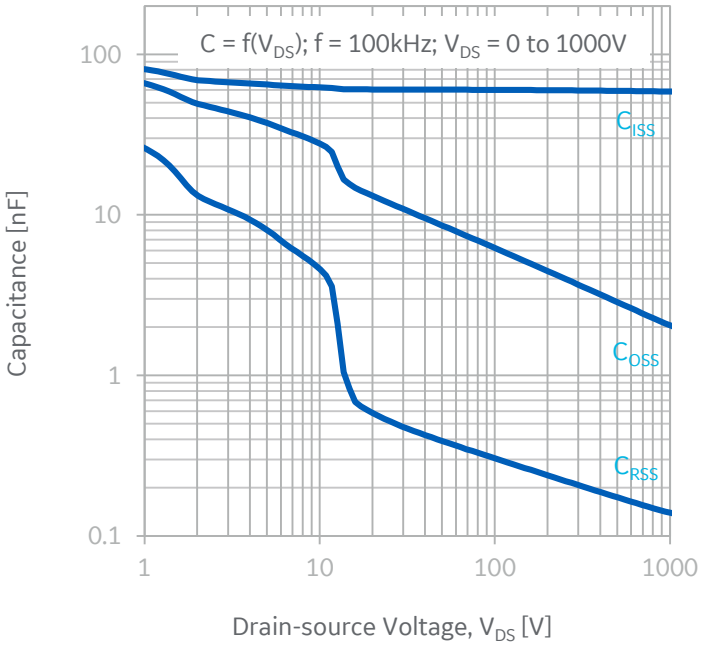


Figure 8: Junction Capacitances to 1000 V

Typical performance: **GE17080CDA3**

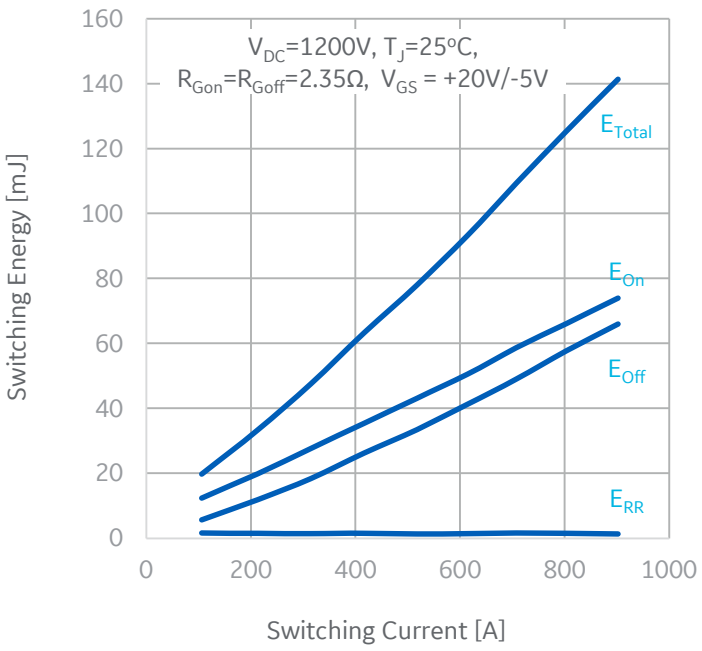


Figure 9: Switching Energy vs. Drain Current (1200 V, 25 °C)

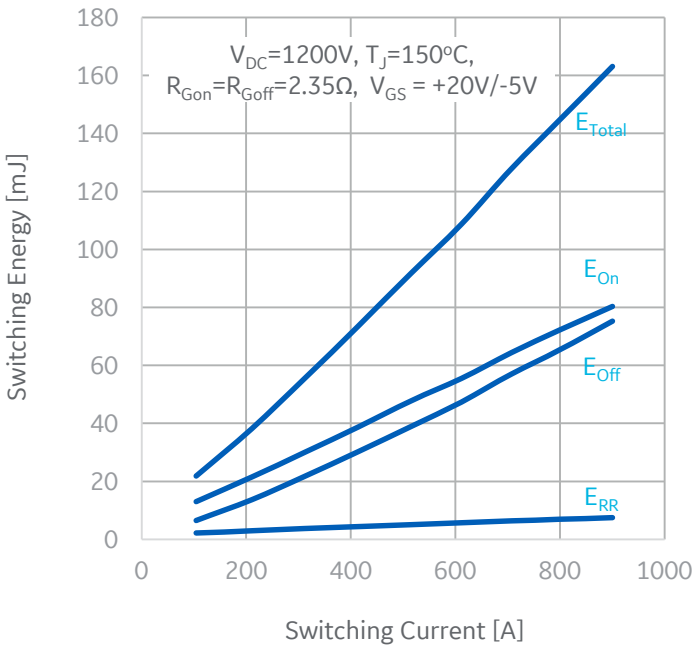


Figure 10: Switching Energy vs. Drain Current (1200 V, 150°C)

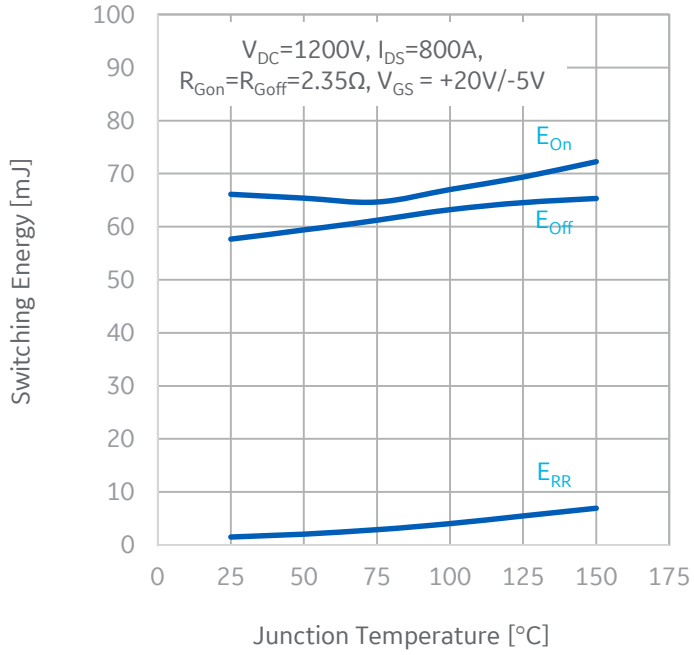


Figure 11: Switching Energy vs. Junction Temperature

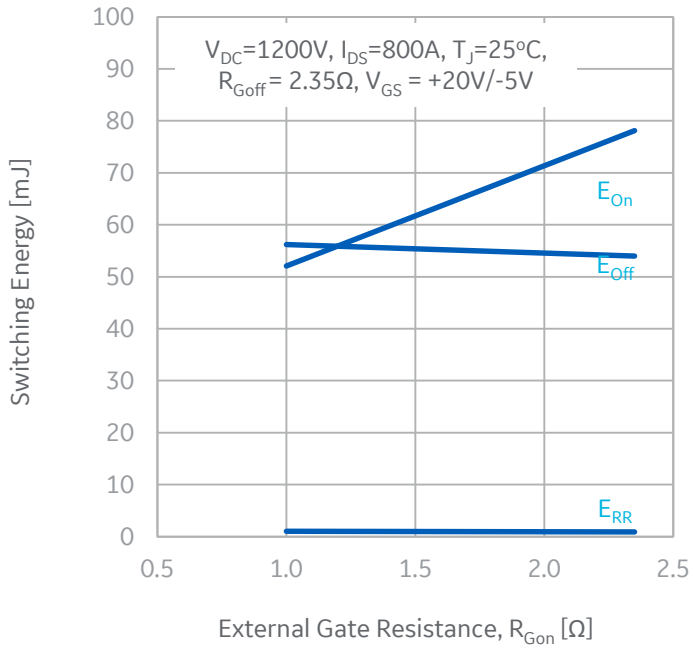


Figure 12: Switching Energy vs. On Gate Resistance

Typical performance: **GE17080CDA3**

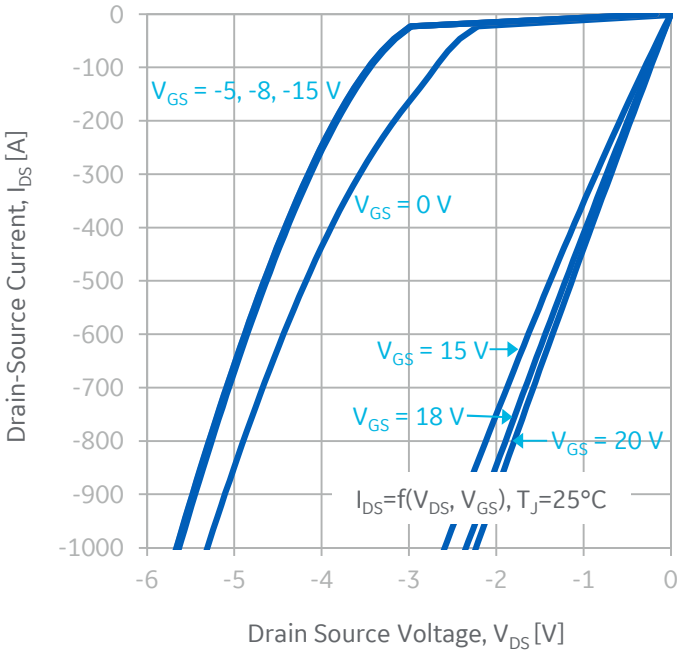


Figure 13: 3rd Quadrant Characteristics (25°C)

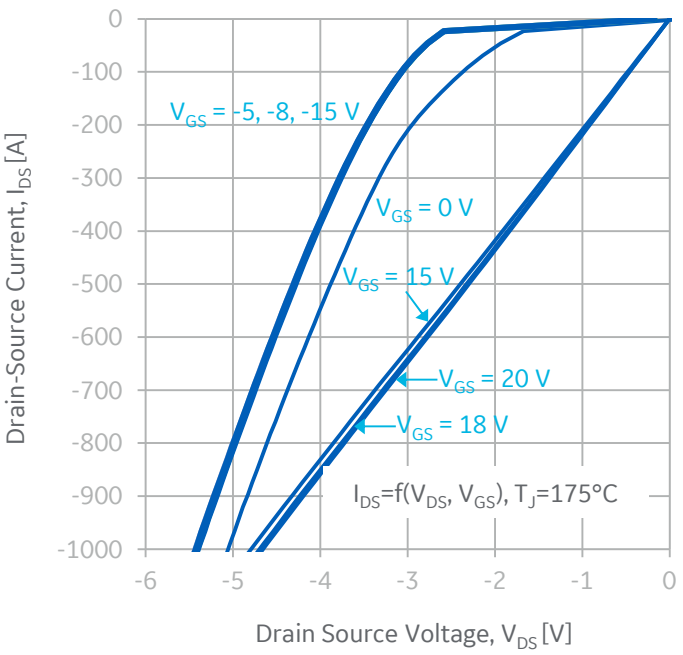


Figure 14: 3rd Quadrant Characteristics (175°C)

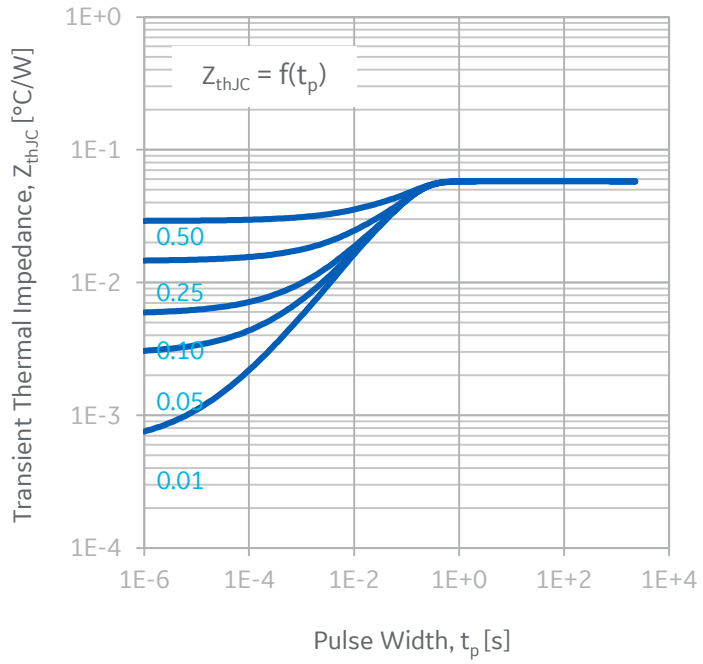


Figure 15: Transient Thermal Impedance

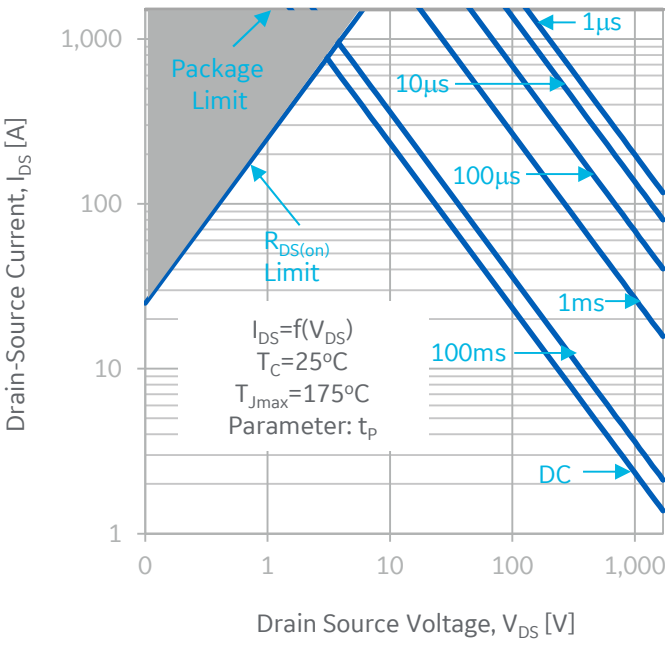


Figure 16: Forward-Bias Safe Operating Area

Typical performance: **GE17080CDA3**

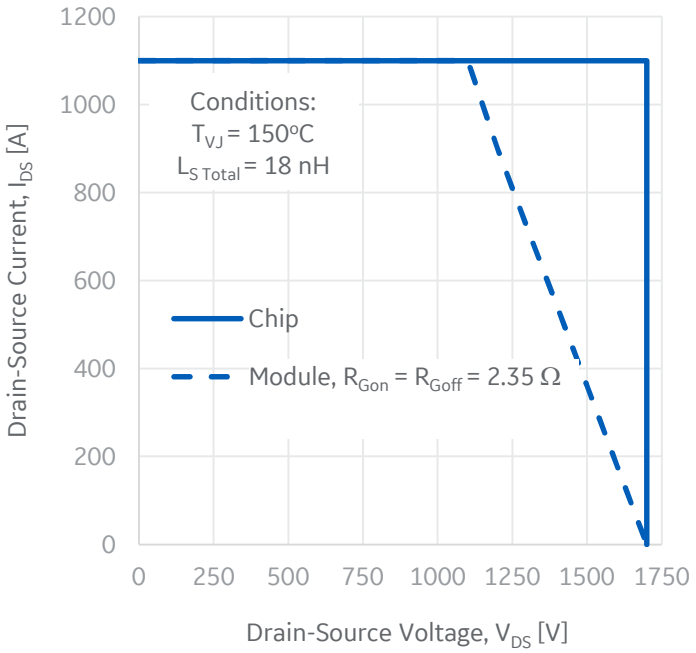


Figure 17: Reverse-Bias Safe Operating Area

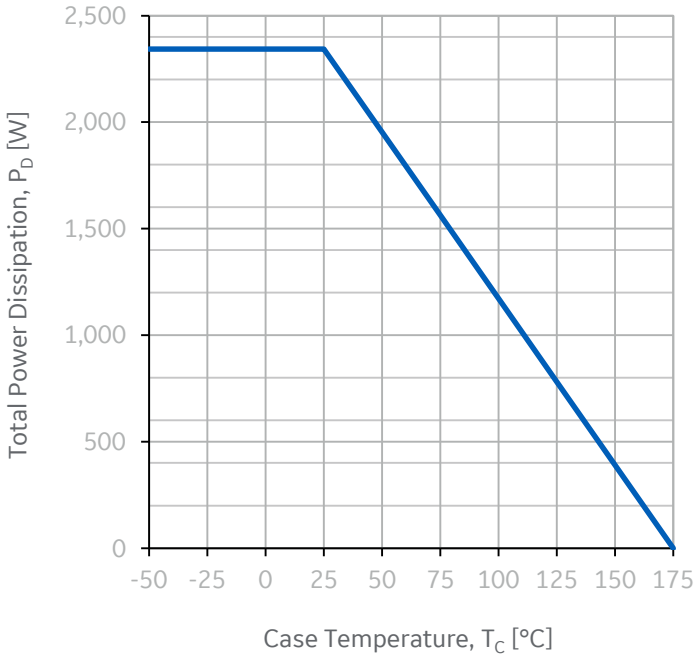
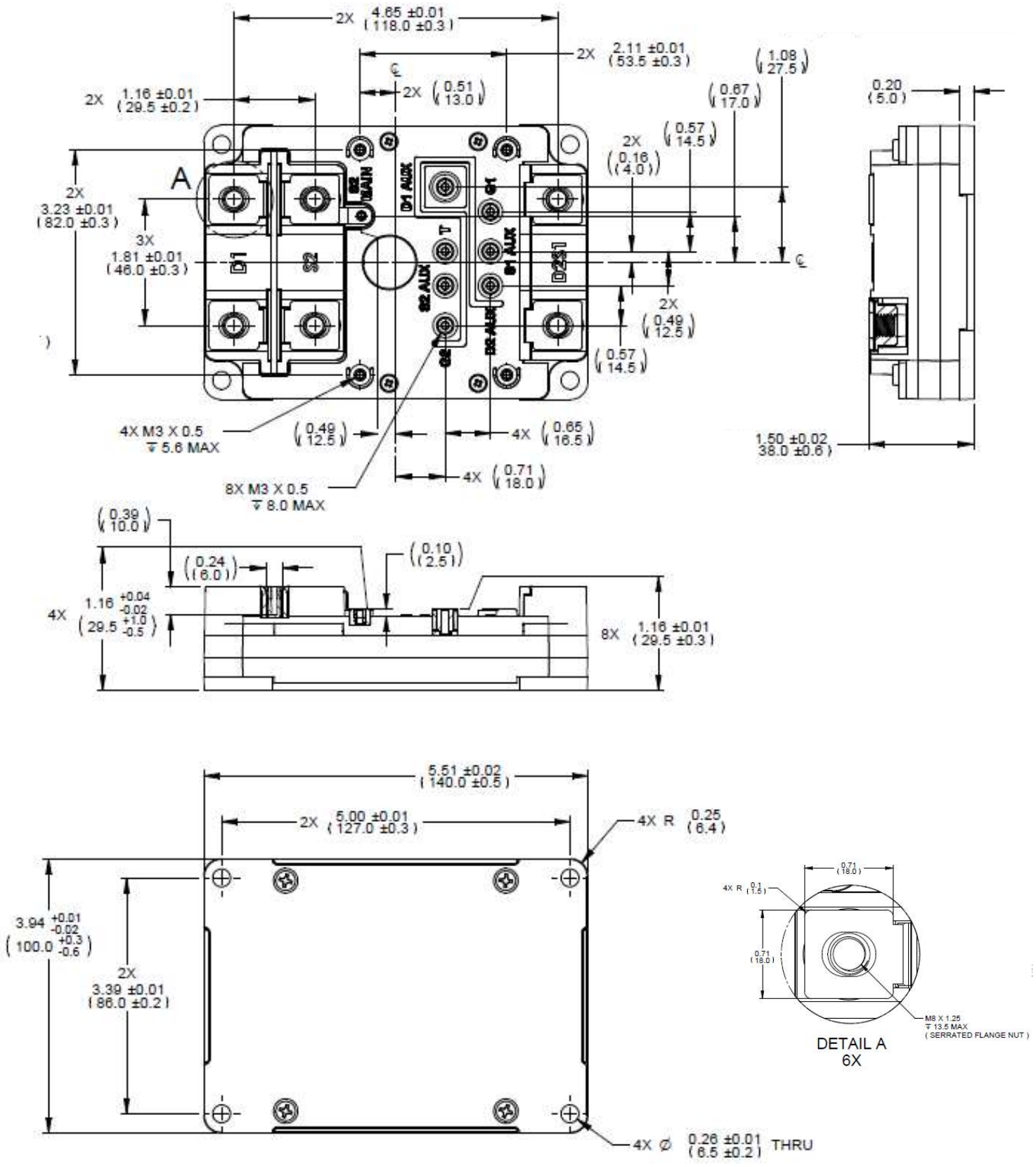


Figure 18: Maximum Power Dissipation vs. Case Temperature

PRELIMINARY

Module dimensions (millimeters)



PRELIMINARY

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Document revisions
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