ALPHA & OMEGA SEMICONDUCTOR

AOPL66801

80V N-Channel MOSFET Symmetric Half-Bridge

General Description

- Trench Power AlphaSGT™ Technology
- 1/2 Bridge Configuration
- MSL1 up to 260°C Peak Reflow
- RoHS 2.0 and Halogen-Free Compliant

Applications

- AI Power 48V
- Datacenter Power 48V

Product Summary

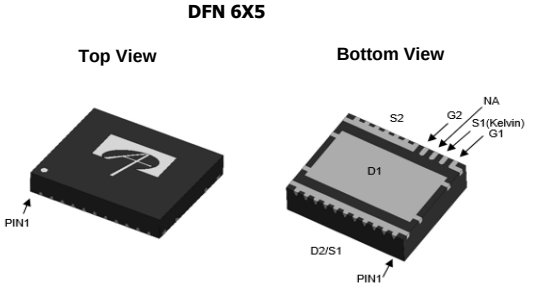
	Q1	Q2
V_{DS}	80V	80V
I_D (at V_{GS}=10V)	304A	215A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 2.2mΩ	< 2.2mΩ
$R_{DS(ON)}$ (at V_{GS}=7V)	< 3mΩ	< 3mΩ

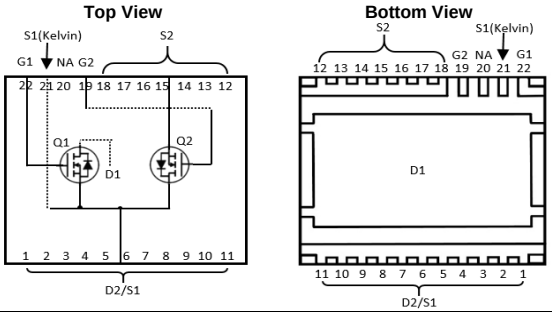
100% UIS Tested
100% Rg Tested

Max Tj=175°C

GREEN Product

DFN 6X5





Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOPL66801	DFN 6x5	Tape & Reel	3000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage		V_{DS}	80	80	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current	T_C=25°C	I_D	304	215	A
	T_C=100°C		215	152	
Pulsed Drain Current [C]		I_{DM}	1216	860	
Avalanche Current [C]		I_{AS}	50	50	A
Avalanche energy	L=0.3mH [C]	E_{AS}	375	375	mJ
Power Dissipation [B]	T_C=25°C	P_D	428	214	W
	T_C=100°C		214	107	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175		°C

Thermal Characteristics

Parameter		Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	16	16	20	20	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		40	40	50	50	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.25	0.5	0.35	0.7	°C/W

Q1 Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V	80			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=80V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA	2.7	3.4	4.1	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		1.8	2.2	mΩ
		T_J=125°C		3	3.6	
		V_{GS}=7V, I_D=20A		2.3	3	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		76		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				200	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=40V, f=200KHz		4900		pF
C_{oss}	Output Capacitance			1400		pF
C_{rss}	Reverse Transfer Capacitance			34		pF
R_g	Gate resistance	f=1MHz	0.8	1.65	2.5	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=40V, I_D=20A		70	100	nC
Q_{gs}	Gate Source Charge			28		nC
Q_{gd}	Gate Drain Charge			15		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=40V, R_L=2Ω, R_{GEN}=3Ω		24		ns
t_r	Turn-On Rise Time			17		ns
$t_{D(off)}$	Turn-Off DelayTime			40		ns
t_f	Turn-Off Fall Time			13		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, di/dt=100A/µs		43		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, di/dt=100A/µs		45		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
B. 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.
C. Single pulse width limited by junction temperature $T_{J(MAX)}$=175° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedance 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.
G. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

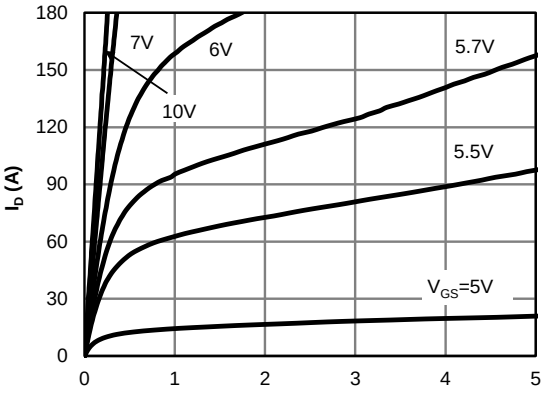


Figure 1: On-Region Characteristics (Note E)

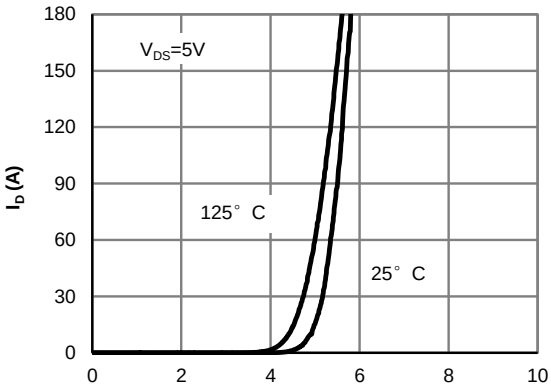


Figure 2: Transfer Characteristics (Note E)

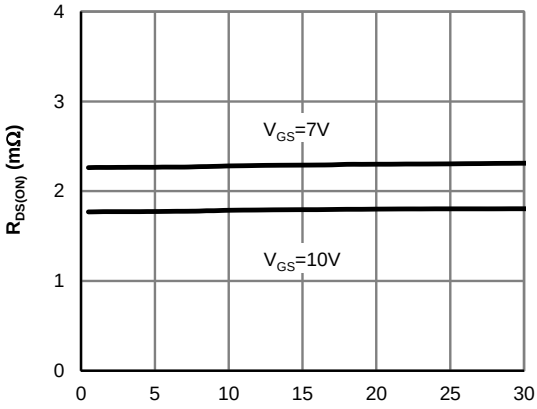


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

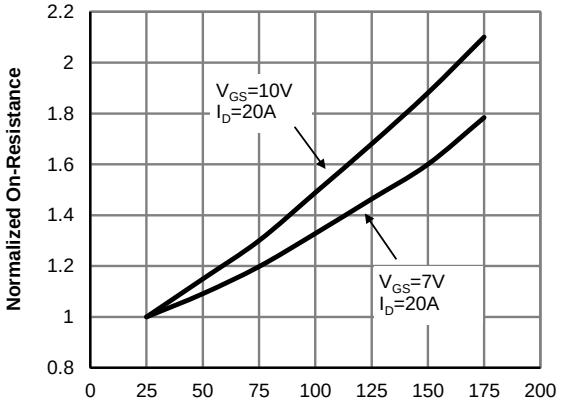


Figure 4: On-Resistance vs. Junction Temperature (Note E)

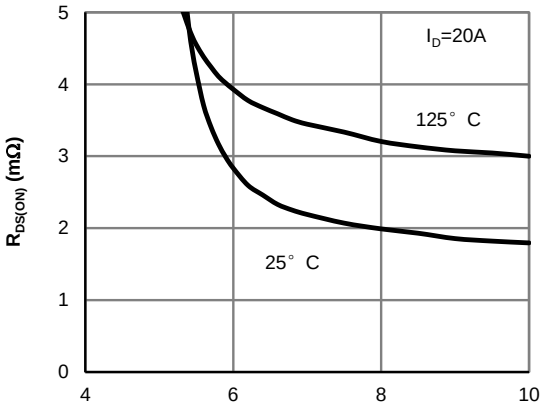


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

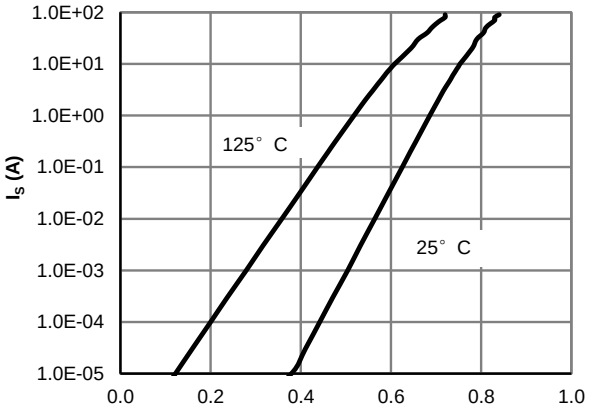


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

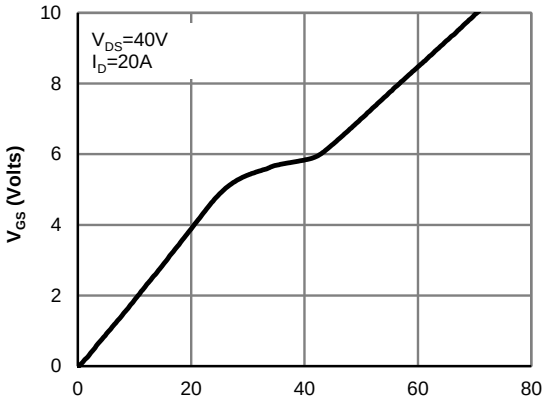


Figure 7: Gate-Charge Characteristics

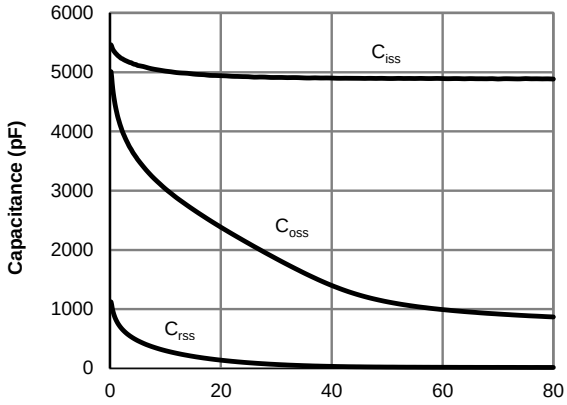


Figure 8: Capacitance Characteristics

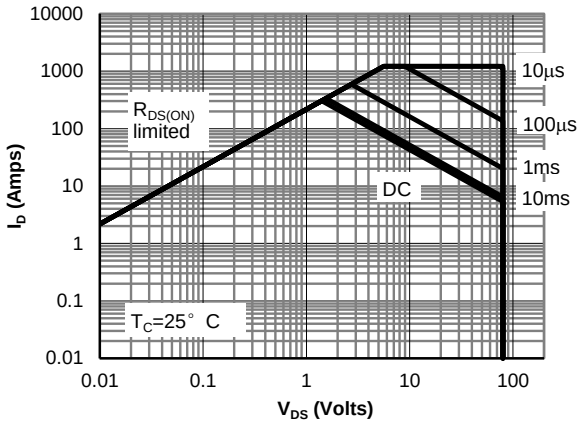


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

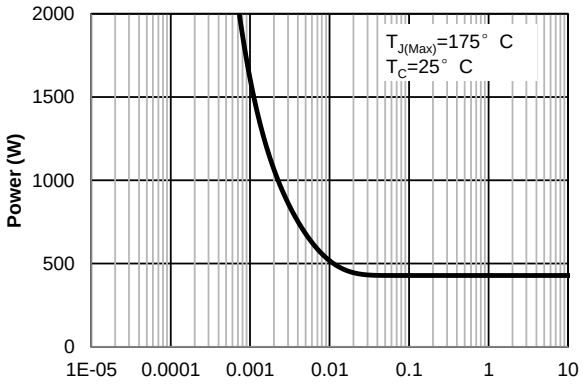


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

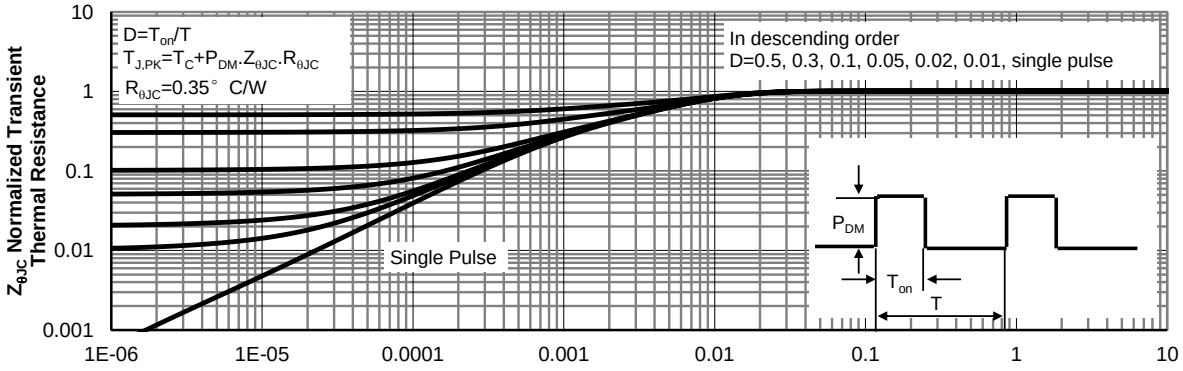


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

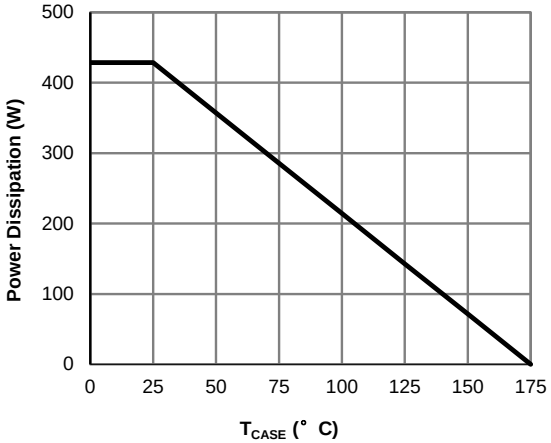


Figure 12: Power De-rating (Note F)

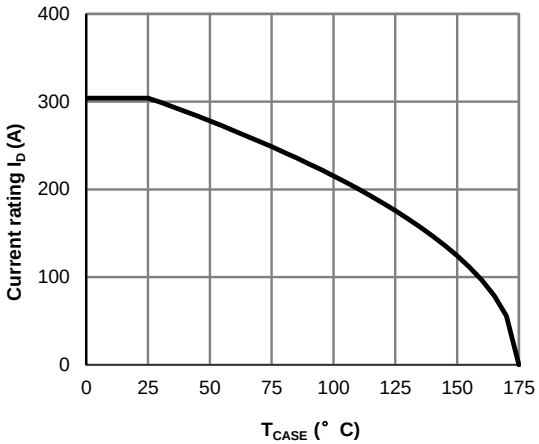


Figure 13: Current De-rating (Note F)

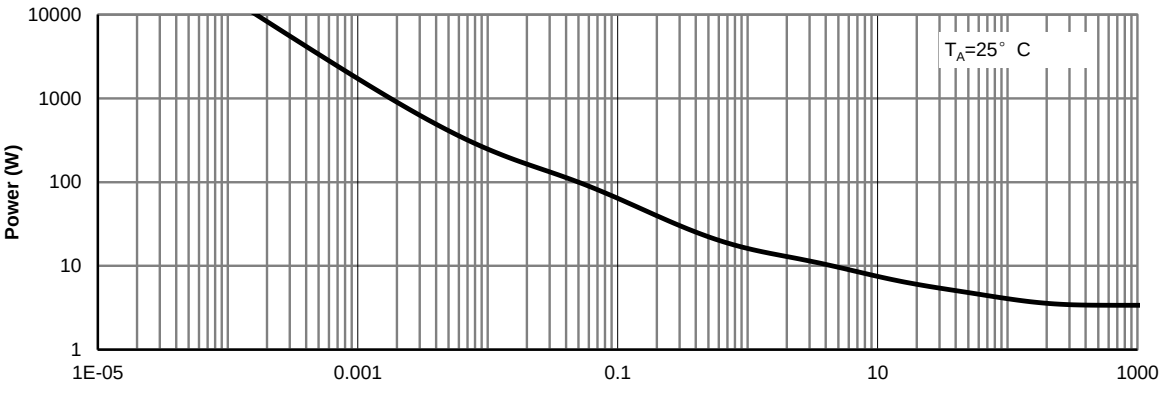


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

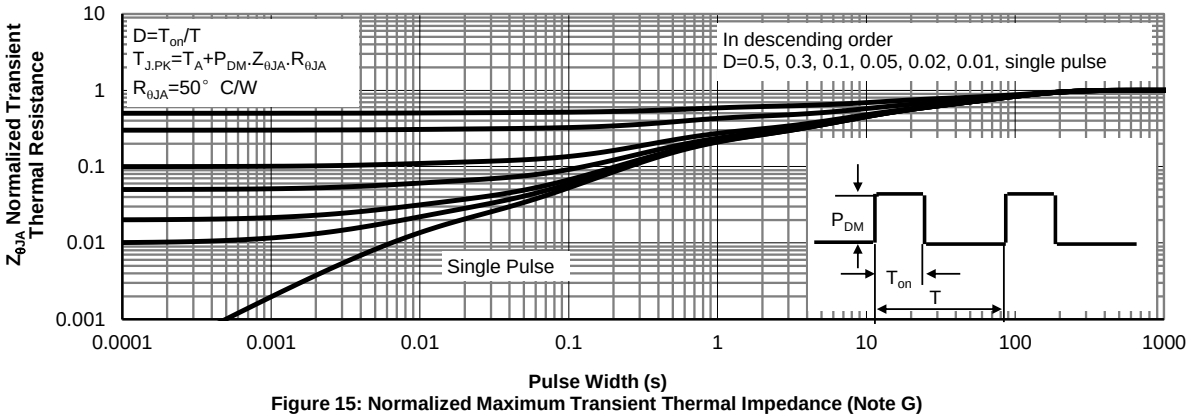


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

Q2 Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V	80			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=80V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA	2.7	3.4	4.1	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		1.8	2.2	mΩ
		T_J=125°C		3	3.6	
		V_{GS}=7V, I_D=20A		2.3	3	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		76		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				200	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=40V, f=200KHz		4900		pF
C_{oss}	Output Capacitance			1400		pF
C_{rss}	Reverse Transfer Capacitance			34		pF
R_g	Gate resistance	f=1MHz	0.8	1.65	2.5	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=40V, I_D=20A		70	100	nC
Q_{gs}	Gate Source Charge			28		nC
Q_{gd}	Gate Drain Charge			15		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=40V, R_L=2Ω, R_{GEN}=3Ω		24		ns
t_r	Turn-On Rise Time			17		ns
$t_{D(off)}$	Turn-Off DelayTime			40		ns
t_f	Turn-Off Fall Time			13		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, di/dt=100A/µs		43		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, di/dt=100A/µs		45		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
B. 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.
C. Single pulse width limited by junction temperature $T_{J(MAX)}$=175° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedance 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.
G. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

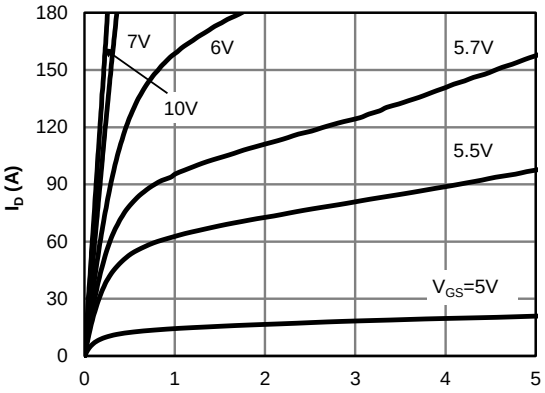


Figure 1: On-Region Characteristics (Note E)

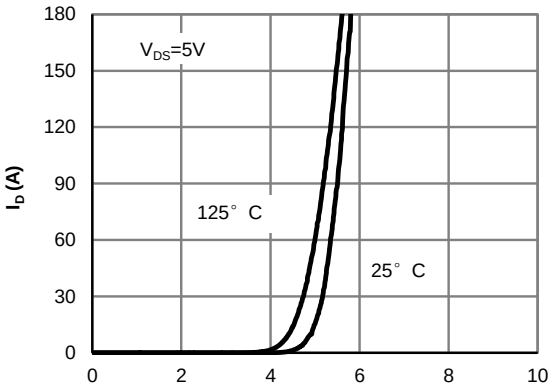


Figure 2: Transfer Characteristics (Note E)

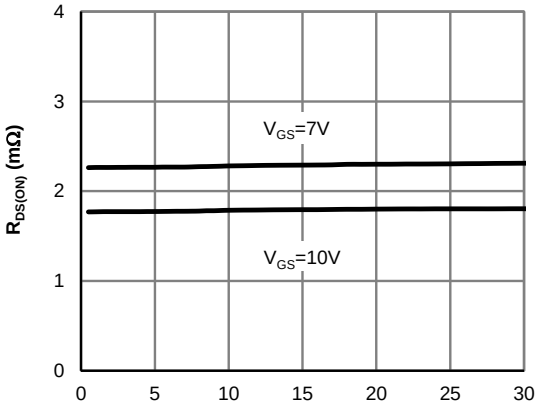


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

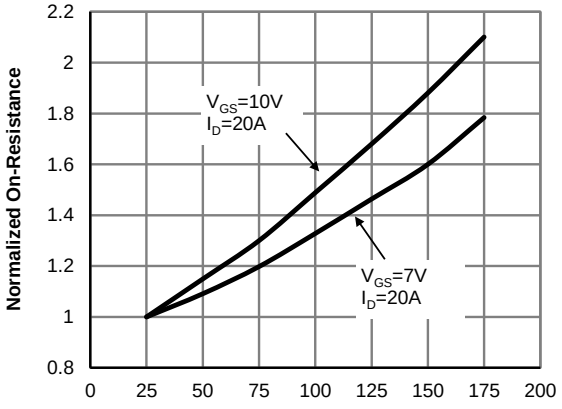


Figure 4: On-Resistance vs. Junction Temperature (Note E)

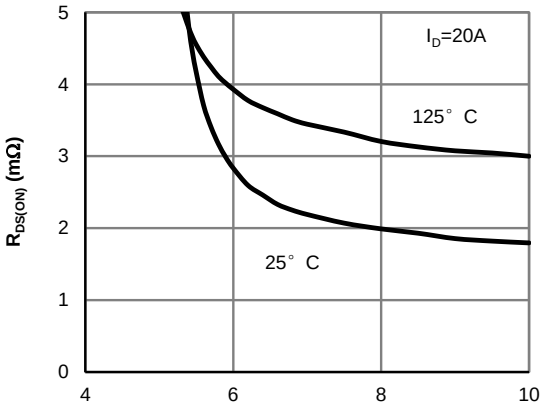


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

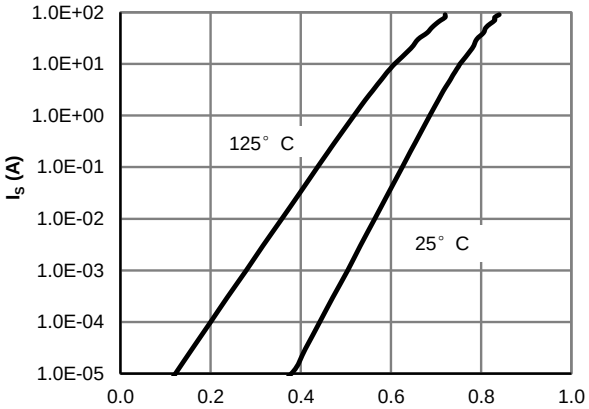


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

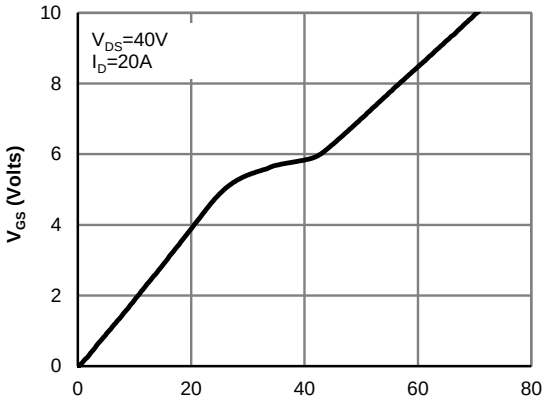


Figure 7: Gate-Charge Characteristics

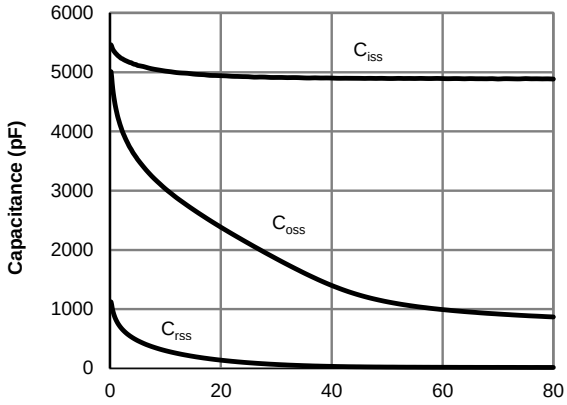


Figure 8: Capacitance Characteristics

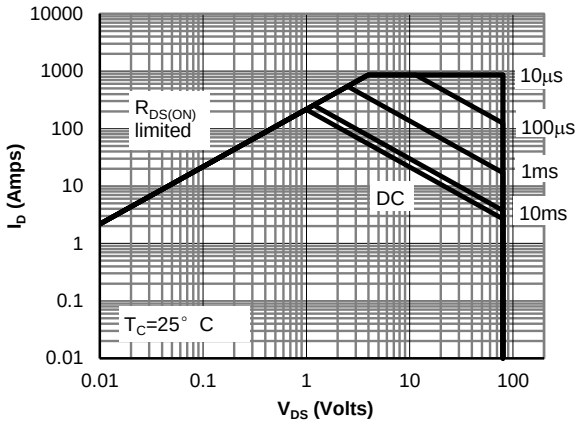


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

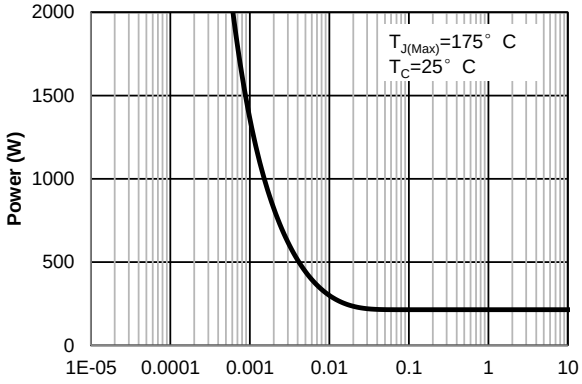


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

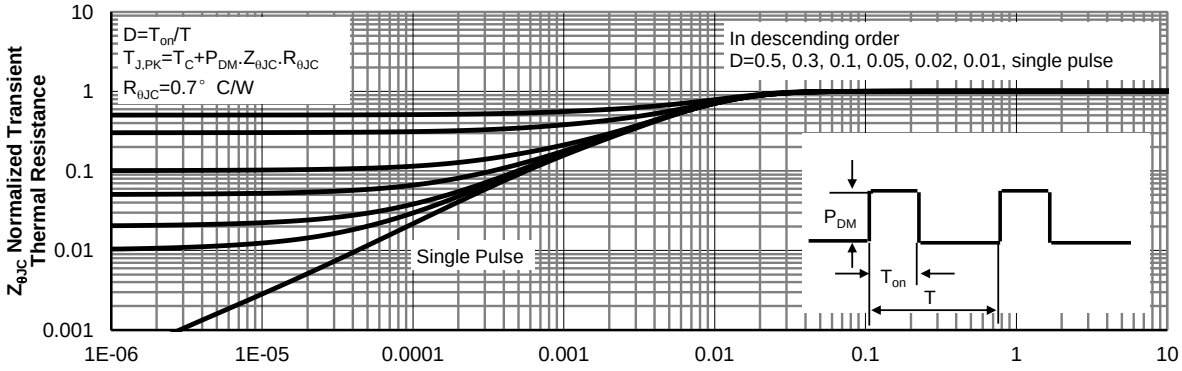


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

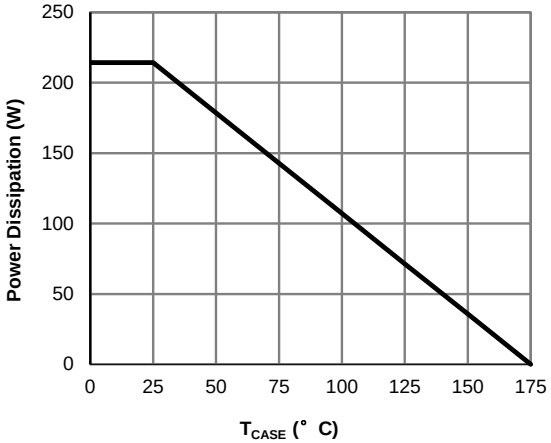


Figure 12: Power De-rating (Note F)

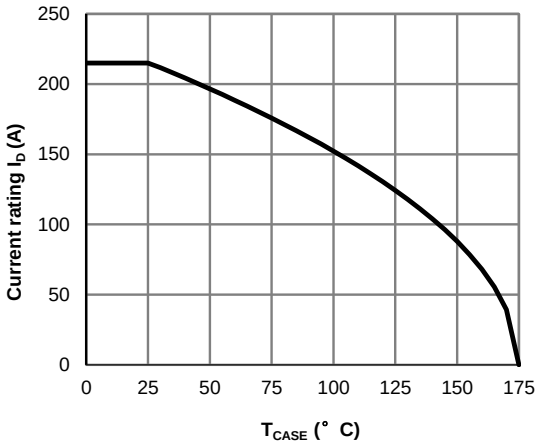


Figure 13: Current De-rating (Note F)

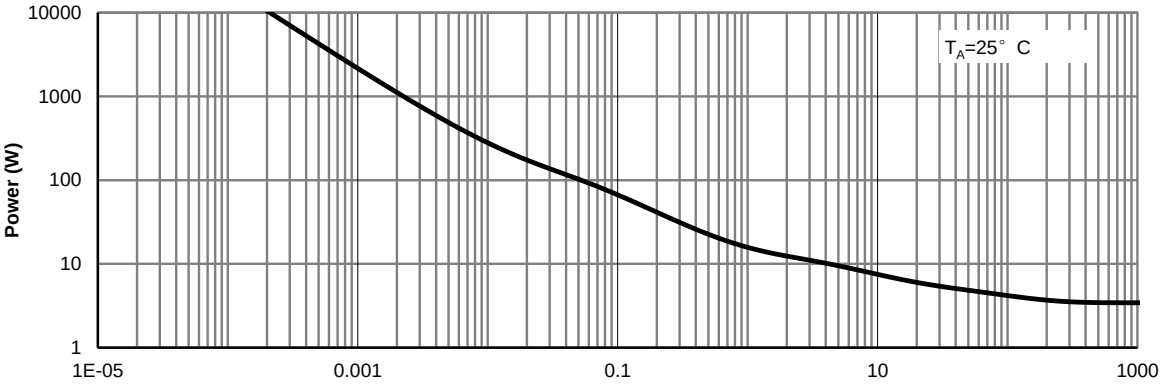


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

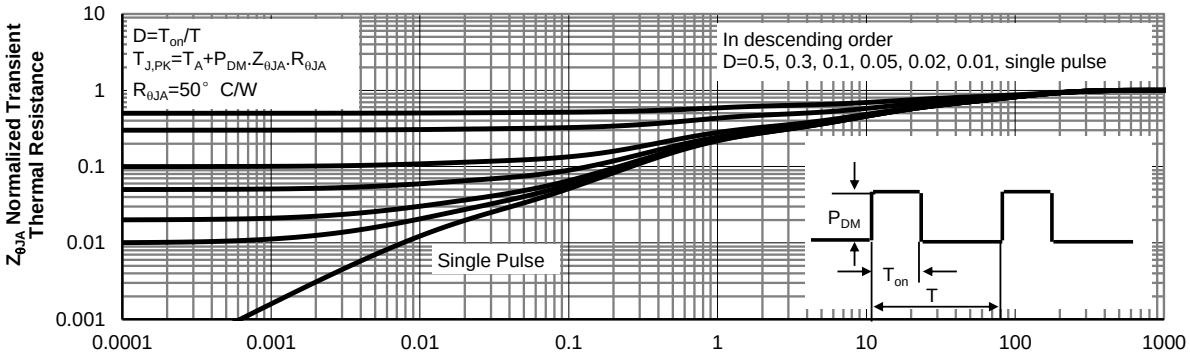


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

Figure A: Gate Charge Test Circuit & Waveforms

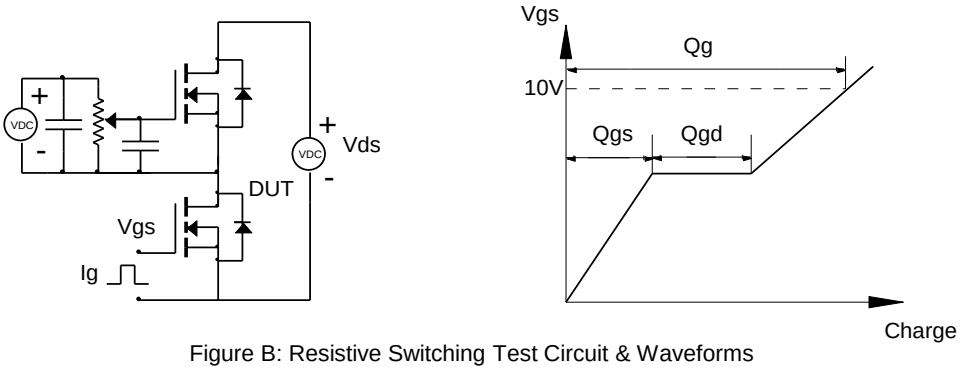


Figure B: Resistive Switching Test Circuit & Waveforms

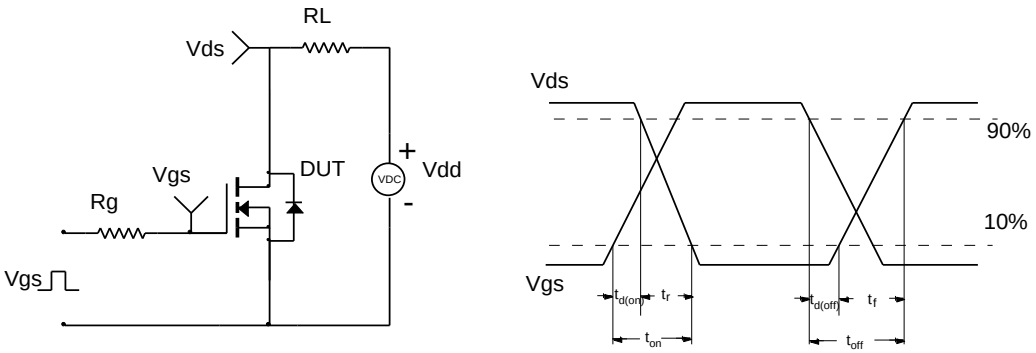


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

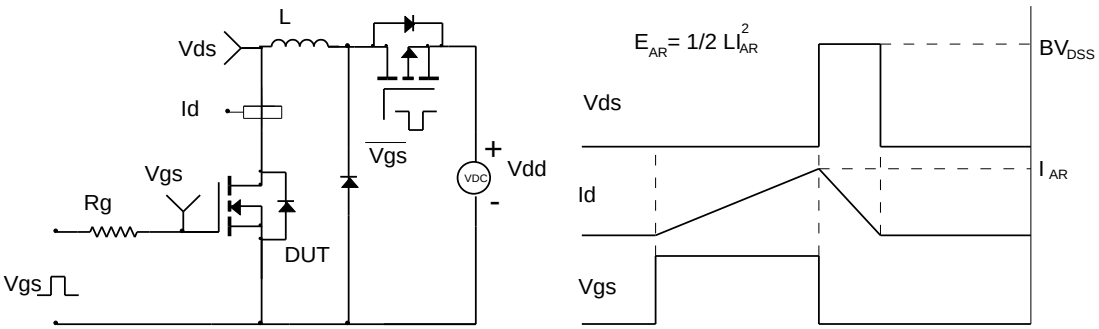


Figure D: Diode Recovery Test Circuit & Waveforms