



AOD603

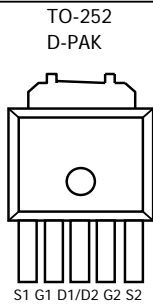
Complementary Enhancement Mode Field Effect Transistor

General Description

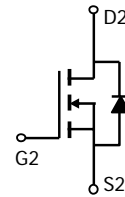
The AOD603 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications. *Standard Product AOD603 is Pb-free (meets ROHS & Sony 259 specifications). AOD603L is a Green Product ordering option. AOD603 and AOD603L are electrically identical.*

Features

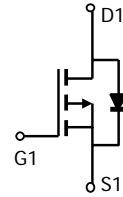
n-channel	p-channel
$V_{DS} (V) = 60V$	-60V
$I_D = 12A (V_{GS}=10V)$	-12A ($V_{GS}=-10V$)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 60mΩ ($V_{GS}=10V$)	< 115mΩ ($V_{GS} = -10V$)
< 85mΩ ($V_{GS}=4.5V$)	< 150mΩ ($V_{GS} = -4.5V$)



Top View
Drain Connected to
Tab



n-channel



p-channel

Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Max n-channel	Max p-channel	Units	
Drain-Source Voltage	V_{DS}	60	-60	V	
Gate-Source Voltage	V_{GS}	± 20	± 20	V	
Continuous Drain Current ^G	I_D	$T_C=25^\circ C$	12	-12	A
		$T_C=100^\circ C$	12	-10	
Pulsed Drain Current ^C	I_{DM}	30	-30		
Avalanche Current ^C	I_{AR}	12	-12	A	
Repetitive avalanche energy $L=0.1mH$ ^C	E_{AR}	23	23	mJ	
Power Dissipation ^B	P_D	$T_C=25^\circ C$	20	37.5	W
		$T_C=100^\circ C$	10	18.8	
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ C$	2	2.5	W
		$T_A=70^\circ C$	1.3	1.6	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	-55 to 175	$^\circ C$	

Thermal Characteristics: n-channel and p-channel

Parameter	Symbol	Device	Typ	Max	
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	n-ch	17.4	30	$^\circ C/W$
		p-ch	50	60	$^\circ C/W$
Maximum Junction-to-Case ^B	$R_{\theta JC}$	n-ch	4	7.5	$^\circ C/W$
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	p-ch	16.7	25	$^\circ C/W$
		p-ch	40	50	$^\circ C/W$
Maximum Junction-to-Case ^B	$R_{\theta JC}$	p-ch	2.5	4	$^\circ C/W$

N-Channel MOSFET Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=10\text{mA}$, $V_{GS}=0\text{V}$	60			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=48\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1	2.4	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=12\text{A}$		47	60	m Ω
		$T_J=125^\circ\text{C}$		85		
		$V_{GS}=4.5\text{V}$, $I_D=6\text{A}$		67	85	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=12\text{A}$		14		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.74	1	V
I_S	Maximum Body-Diode Continuous Current				12	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=30\text{V}$, $f=1\text{MHz}$		450	540	pF
C_{oss}	Output Capacitance			61		pF
C_{rss}	Reverse Transfer Capacitance			27		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.35	2	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=30\text{V}$, $I_D=12\text{A}$		7.5	10	nC
$Q_g(4.5\text{V})$	Total Gate Charge			3.8	5	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			1.9		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$, $V_{DS}=30\text{V}$, $R_L=2.5\Omega$, $R_{GEN}=3\Omega$		4.2		ns
t_r	Turn-On Rise Time			3.4		ns
$t_{D(off)}$	Turn-Off Delay Time			16		ns
t_f	Turn-Off Fall Time			2		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		27.6	35	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=12\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		30		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°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 $T_{J(MAX)}=175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=175^\circ\text{C}$.

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 $<300 \mu\text{s}$ 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 $T_{J(MAX)}=175^\circ\text{C}$.

G: The maximum current rating is limited by bond-wires.

H: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

Rev2: August 2005

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N-Channel MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

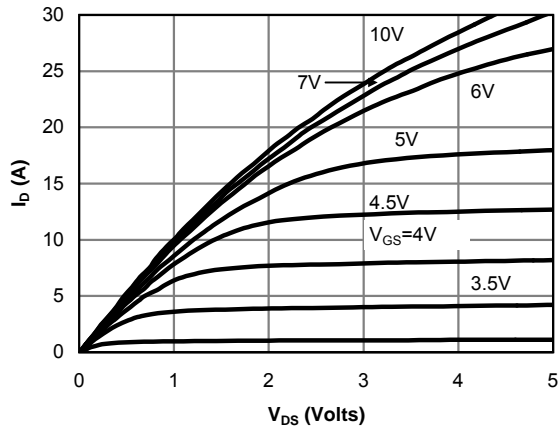


Fig 1: On-Region Characteristics

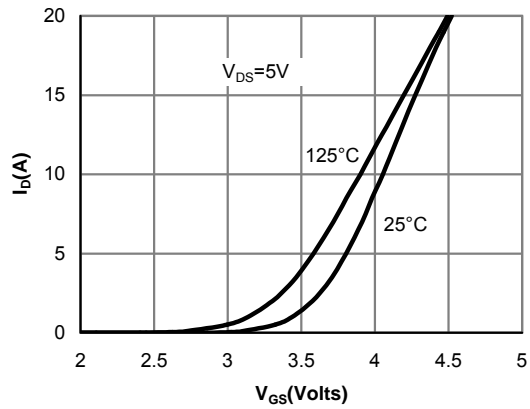


Figure 2: Transfer Characteristics

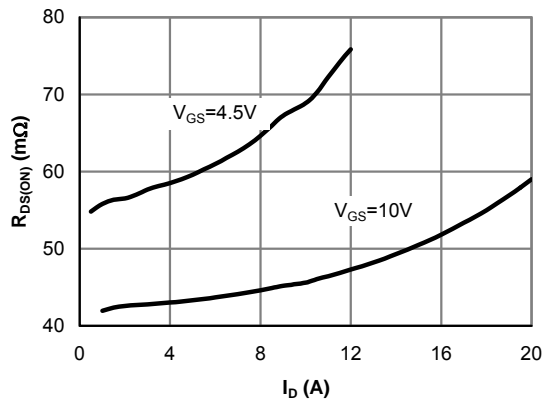


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

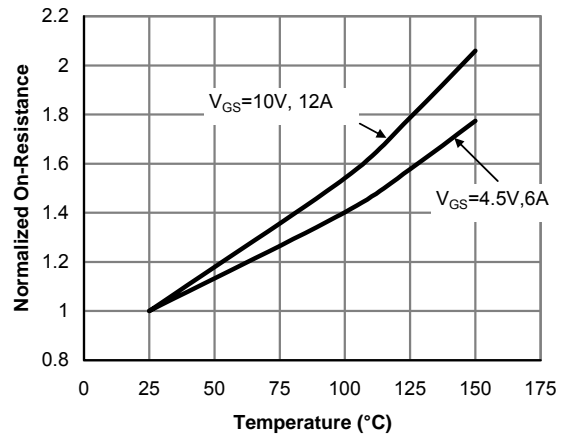


Figure 4: On-Resistance vs. Junction Temperature

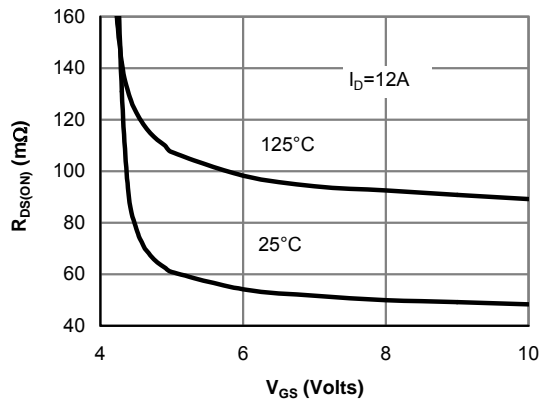


Figure 5: On-Resistance vs. Gate-Source Voltage

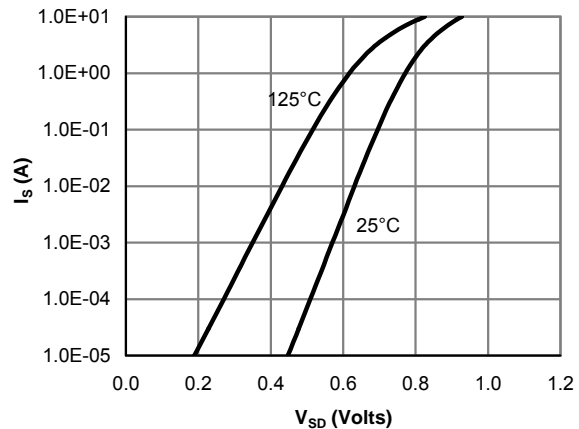


Figure 6: Body-Diode Characteristics

N-Channel MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

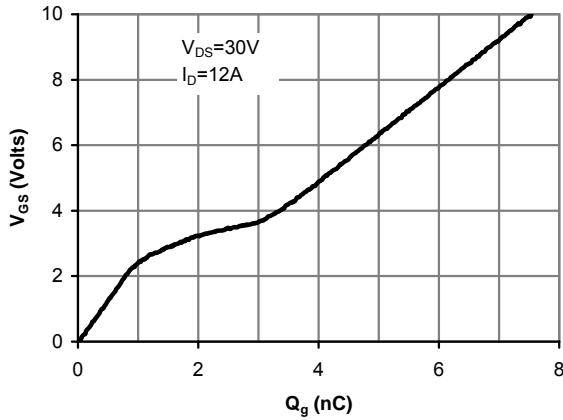


Figure 7: Gate-Charge Characteristics

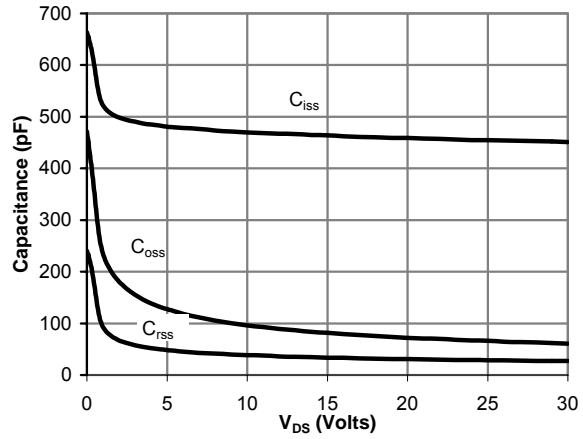


Figure 8: Capacitance Characteristics

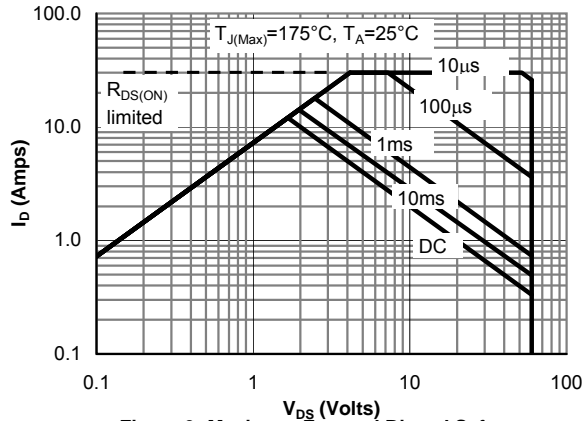


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

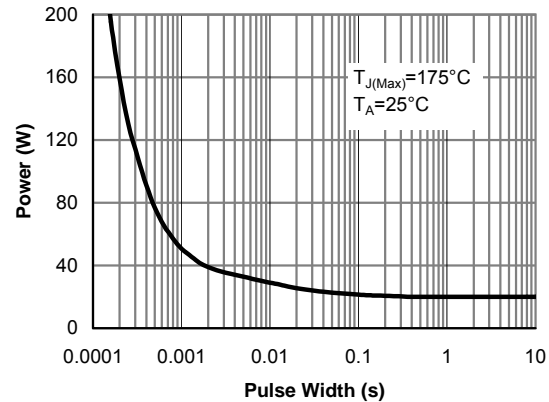


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

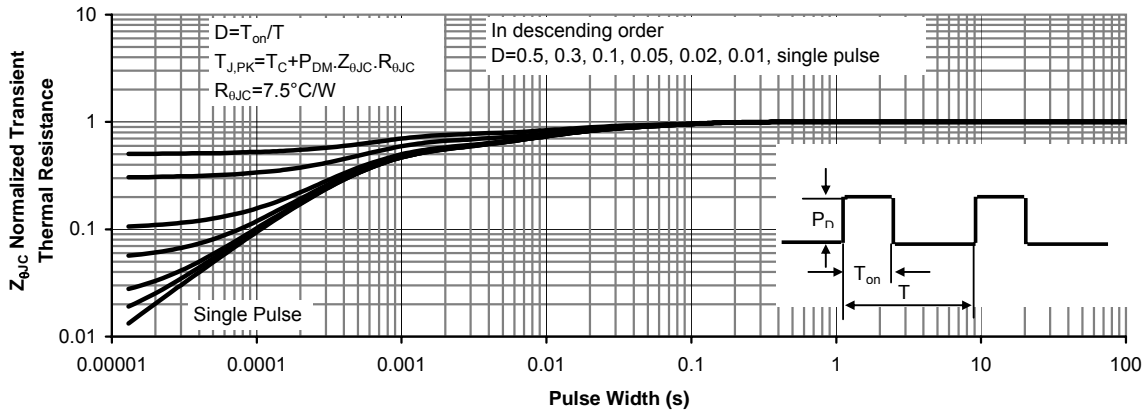


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

N-Channel MOSFET TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

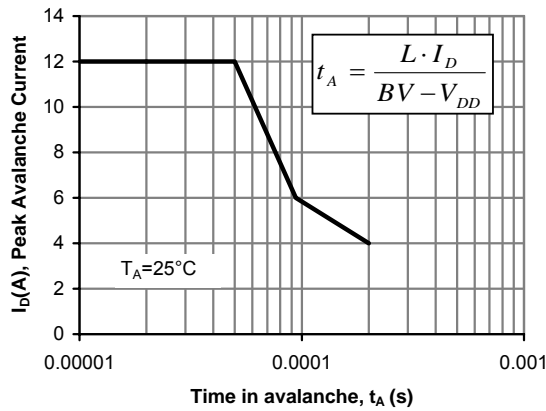


Figure 12: Single Pulse Avalanche capability

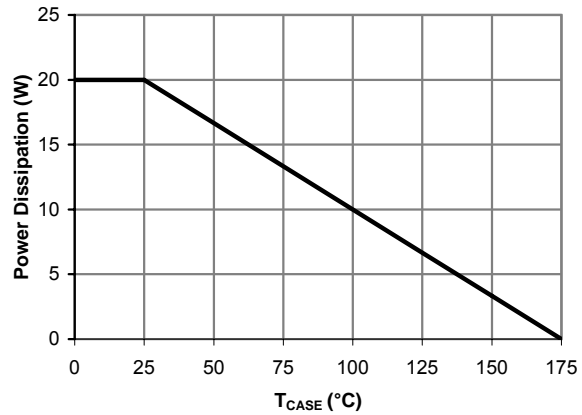


Figure 13: Power De-rating (Note B)

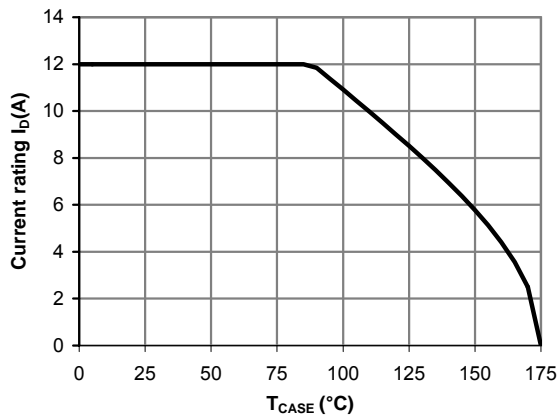


Figure 14: Current De-rating (Note B)

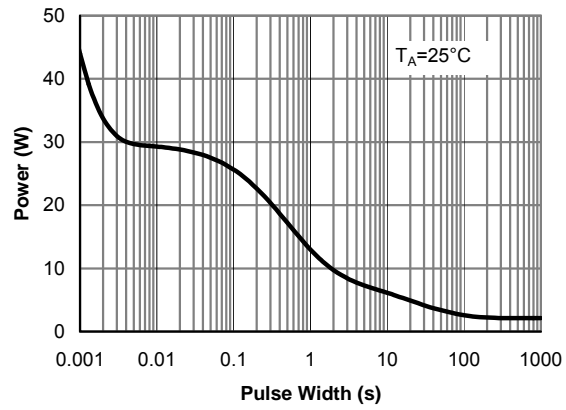


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

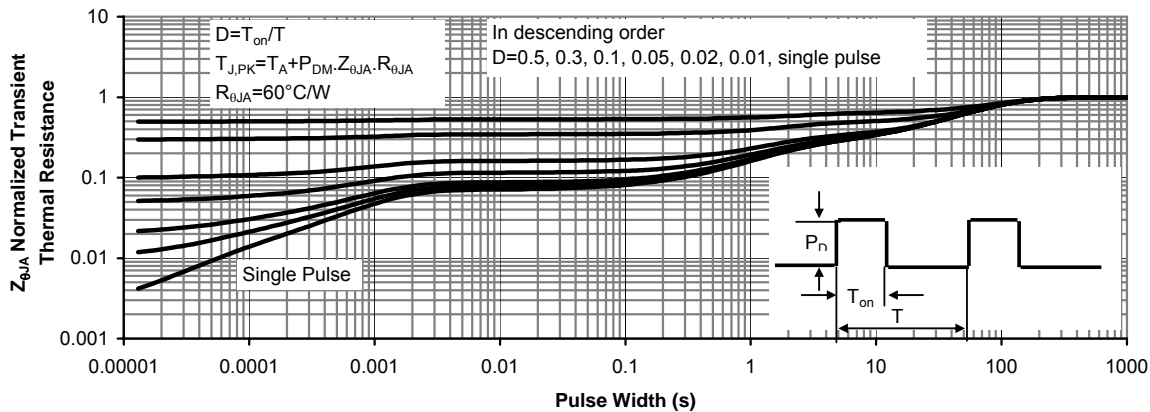


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

P-Channel MOSFET Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-60			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-48\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		-0.003	-1	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.5	-2.1	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-12\text{A}$ $T_J=125^\circ\text{C}$		91	115	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-6\text{A}$		114	150	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-12\text{A}$		12.8		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current				-12	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-30\text{V}$, $f=1\text{MHz}$		987	1185	pF
C_{oss}	Output Capacitance			114		pF
C_{rss}	Reverse Transfer Capacitance			46		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		7	10	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $I_D=-12\text{A}$		15.8	20	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			7.4	9	nC
Q_{gs}	Gate Source Charge			3		nC
Q_{gd}	Gate Drain Charge			3.5		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $R_L=2.5\Omega$, $R_{GEN}=3\Omega$		9		ns
t_r	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off Delay Time			25		ns
t_f	Turn-Off Fall Time			11		ns
t_{rr}	Body Diode Reverse Recovery Time		$I_F=-12\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		27.5	35
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-12\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		30		nC

A: The value of R qJA is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation PDSM is based on R qJA and the maximum allowed junction temperature of 150°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 PD is based on $T_J(\text{MAX})=175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature $T_J(\text{MAX})=175^\circ\text{C}$.

D: The R qJA is the sum of the thermal impedance from junction to case R qJC and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using <300 ms 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 $T_J(\text{MAX})=175^\circ\text{C}$.

G: The maximum current rating is limited by bond-wires.

H: These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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P-Channel MOSFET Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

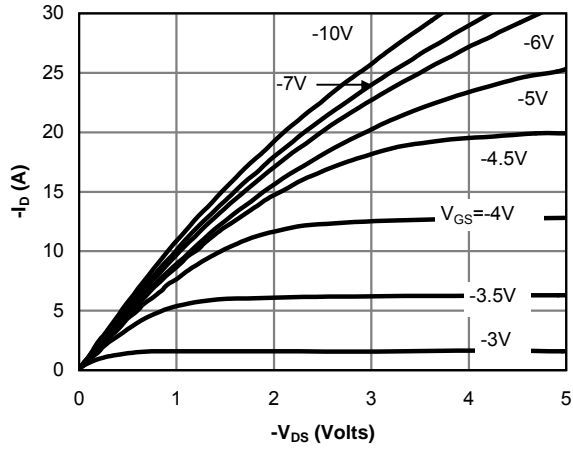


Fig 1: On-Region Characteristics

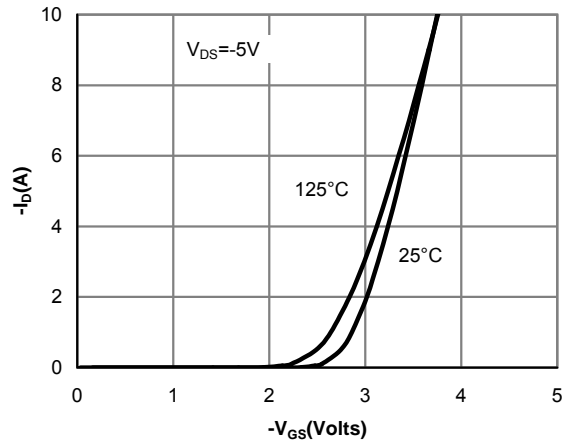


Figure 2: Transfer Characteristics

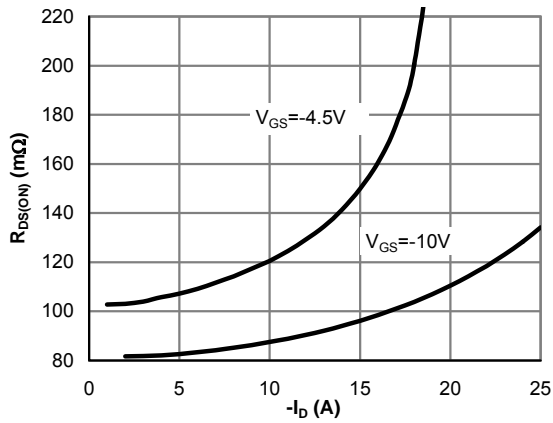


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

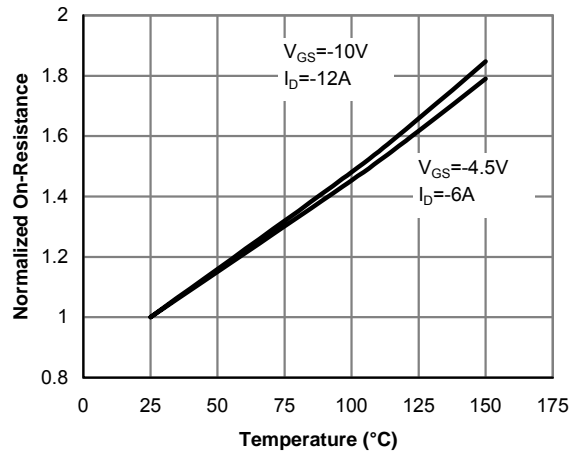


Figure 4: On-Resistance vs. Junction Temperature

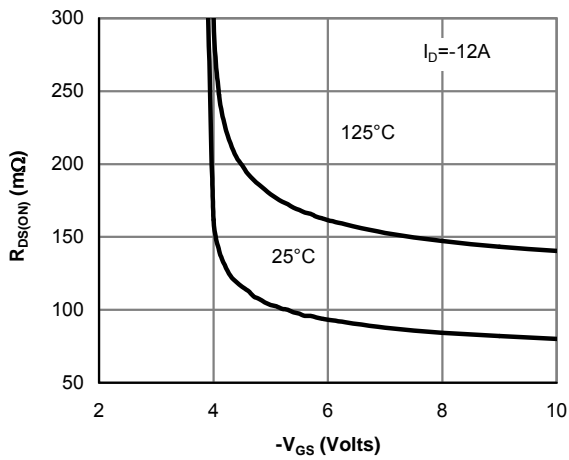


Figure 5: On-Resistance vs. Gate-Source Voltage

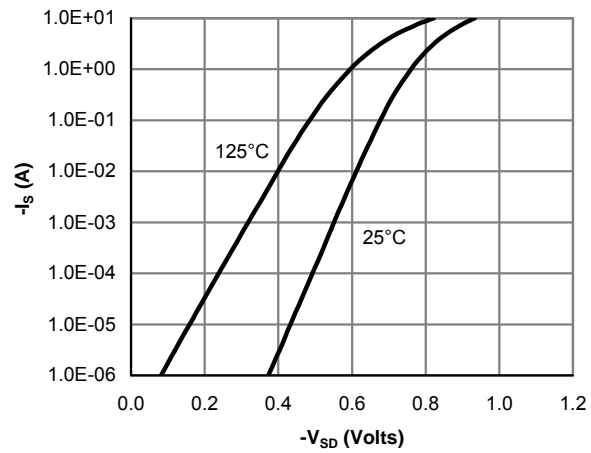


Figure 6: Body-Diode Characteristics

P-Channel MOSFET Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

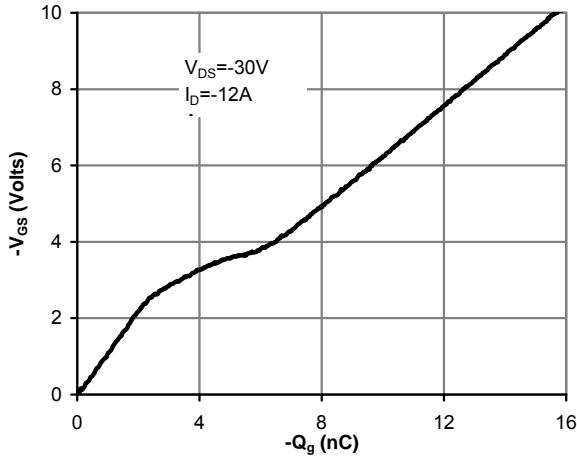


Figure 7: Gate-Charge Characteristics

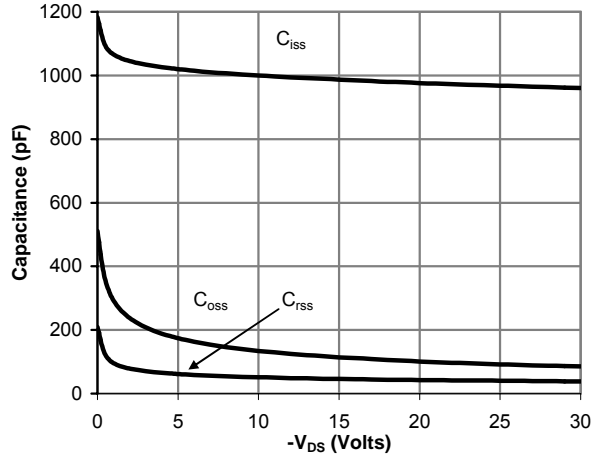


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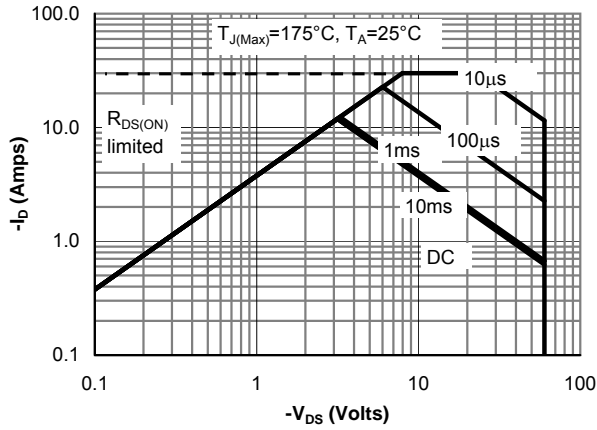


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

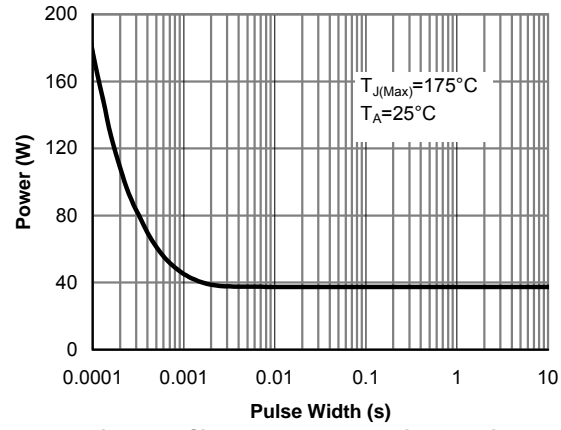


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

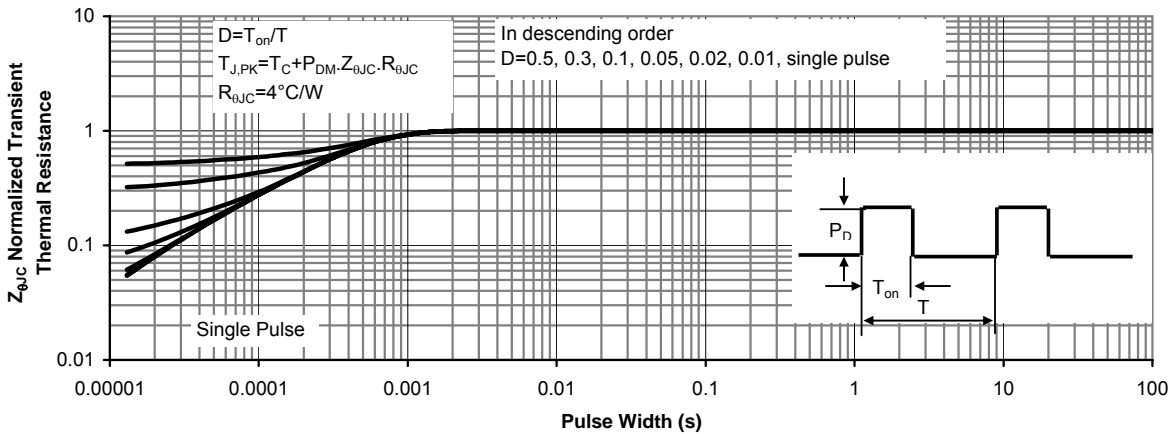


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

P-Channel MOSFET Electrical Characteristics (T_J=25°C unless otherwise noted)

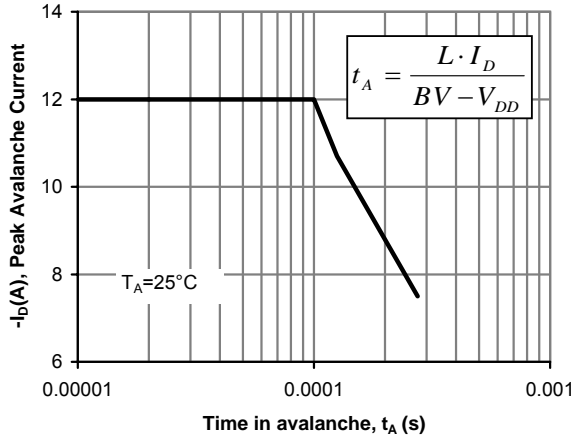


Figure 12: Single Pulse Avalanche capability

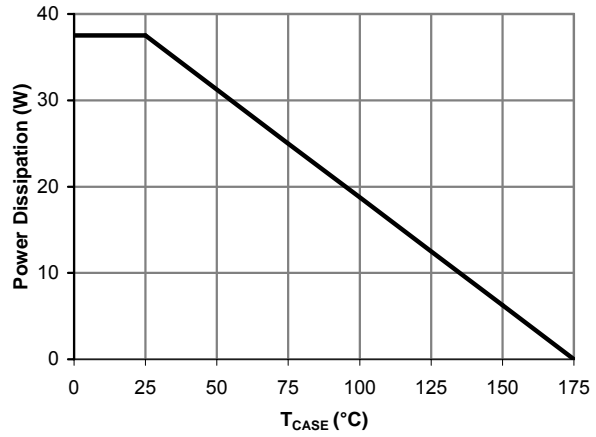


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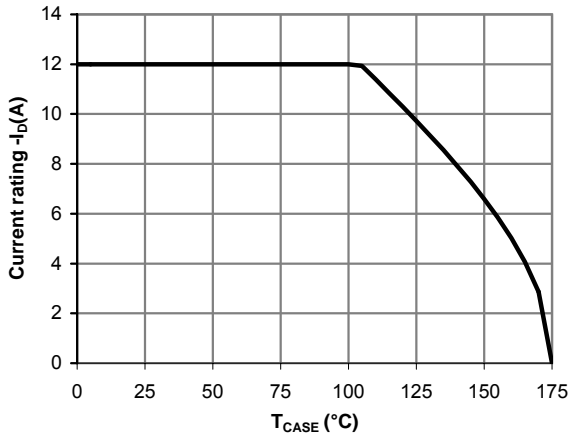


Figure 14: Current De-rating (Note B)

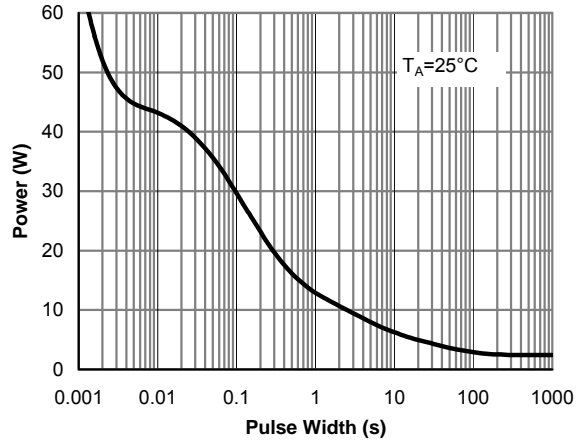


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

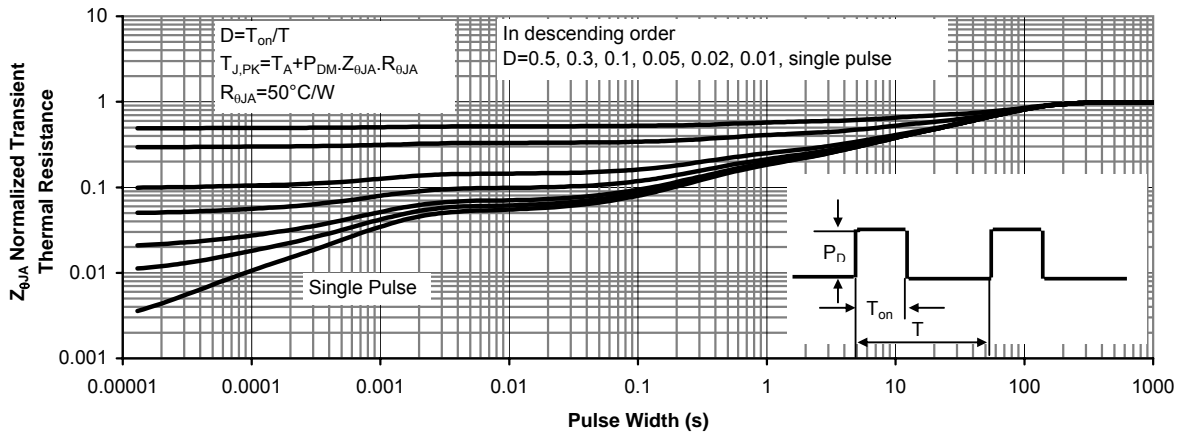


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)