

General Description

AO4612 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.

Features

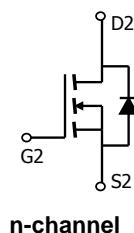
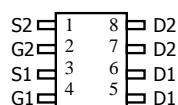
n-channel
 V_{DS} (V) = 60V
 I_D = 4.5A (V_{GS} =10V)

p-channel
-60V
-3.2A (V_{GS} = -10V)

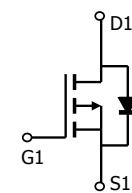
$R_{DS(ON)}$
< 56mΩ (V_{GS} =10V)
< 77mΩ (V_{GS} =4.5V)

$R_{DS(ON)}$
< 105mΩ (V_{GS} = -10V)
< 135mΩ (V_{GS} = -4.5V)

100% R_g tested



n-channel



p-channel

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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 ^A	I_D	4.5	-3.2	A
$T_A=70^\circ\text{C}$		3.6	-2.6	
Pulsed Drain Current ^B	I_{DM}	20	-20	
Power Dissipation	P_D	2	2	W
$T_A=70^\circ\text{C}$		1.28	1.28	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	°C

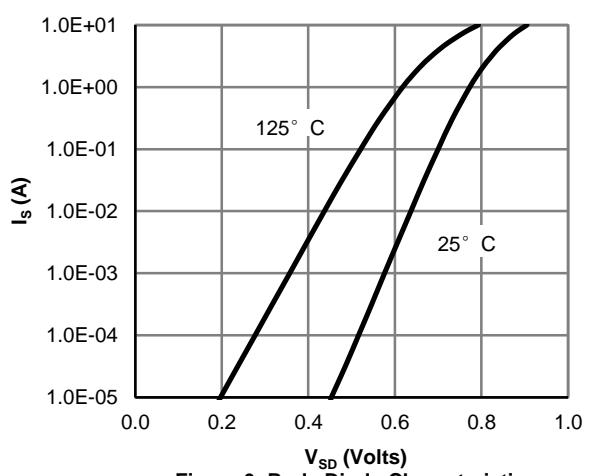
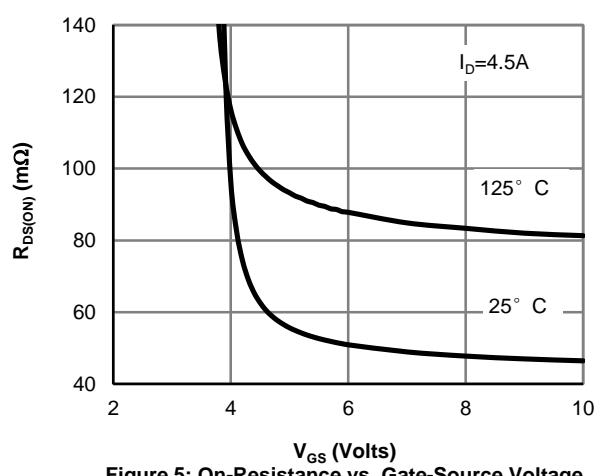
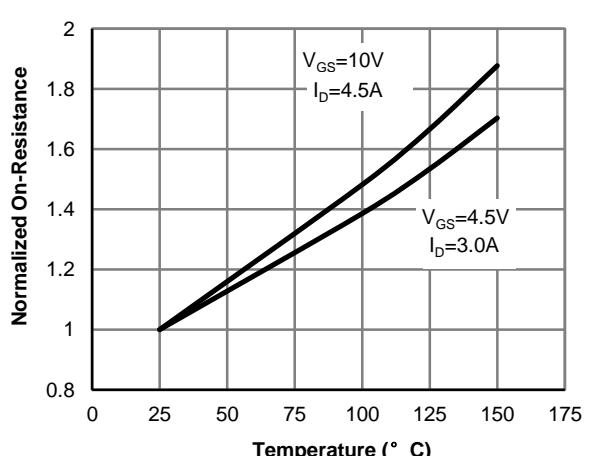
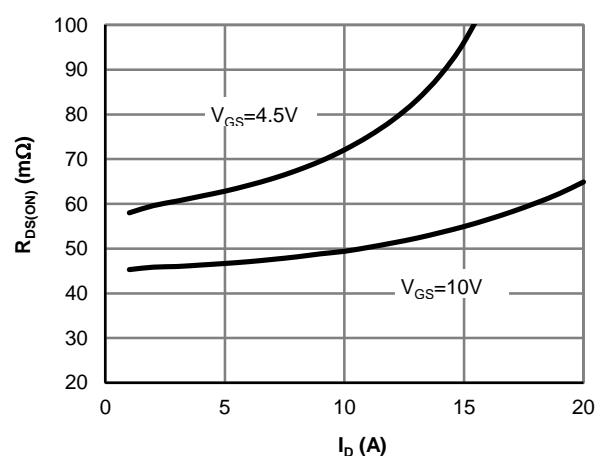
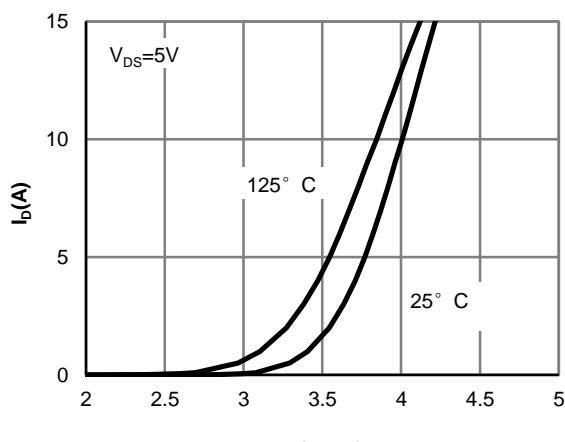
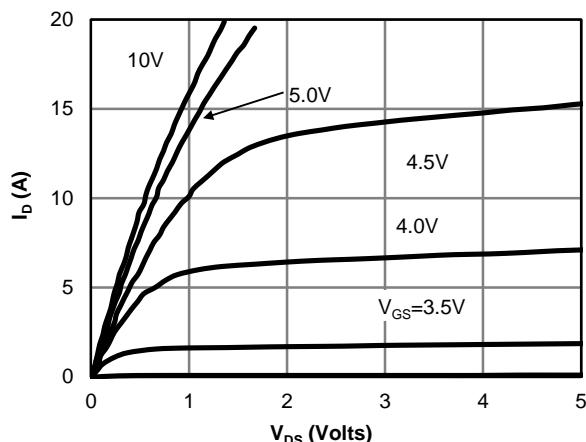
Thermal Characteristics: n-channel and p-channel

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	R_{0JA}	48	62.5	°C/W
Steady-State		74	90	°C/W
Maximum Junction-to-Lead ^C	R_{0JL}	35	40	°C/W

N Channel 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	$V_{DS}=48\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			100	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1	2.1	3	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	20			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=4.5\text{A}$ $T_J=125^\circ\text{C}$		46 79	56	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=3\text{A}$		64	77	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=4.5\text{A}$		11		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				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=30\text{V}, f=1\text{MHz}$		450		pF
C_{oss}	Output Capacitance			60		pF
C_{rss}	Reverse Transfer Capacitance			25		pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		1.65	2	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=30\text{V}, I_D=4.5\text{A}$		8.5	12	nC
$Q_g(4.5\text{V})$	Total Gate Charge			4.3	7	nC
Q_{gs}	Gate Source Charge			1.6		nC
Q_{gd}	Gate Drain Charge			2.2		nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=30\text{V}, R_L=6.7\Omega, R_{\text{GEN}}=3\Omega$		4.7		ns
t_r	Turn-On Rise Time			2.3		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			15.7		ns
t_f	Turn-Off Fall Time			1.9		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=4.5\text{A}, dI/dt=100\text{A}/\mu\text{s}$		27.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=4.5\text{A}, dI/dt=100\text{A}/\mu\text{s}$		32		nC

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

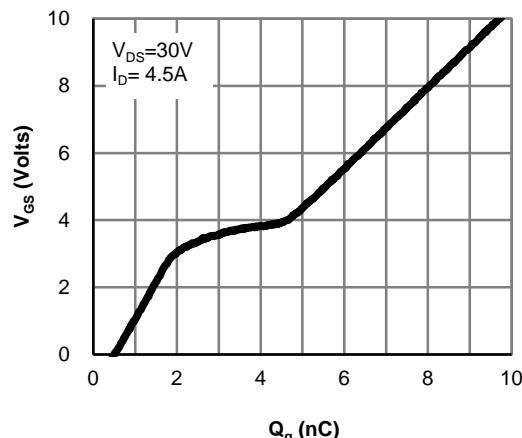


Figure 7: Gate-Charge Characteristics

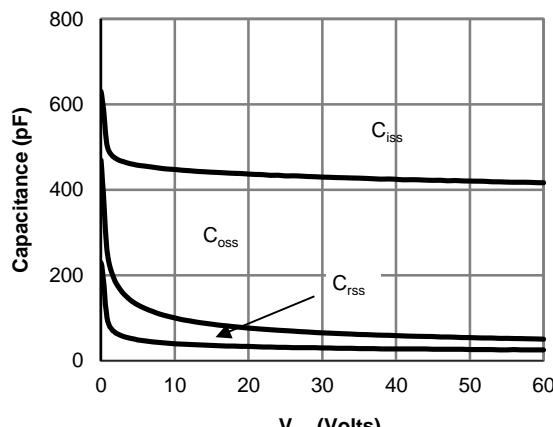


Figure 8: Capacitance Characteristics

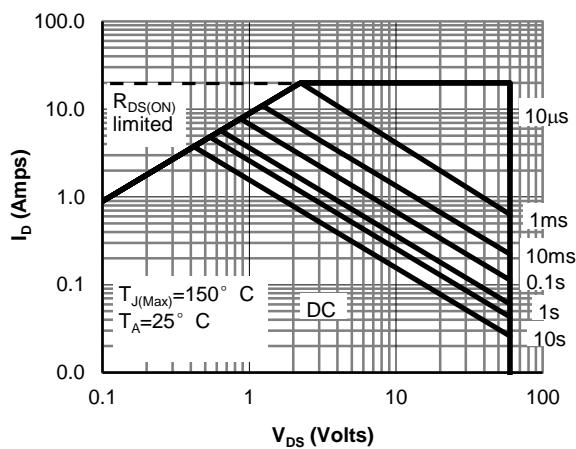


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

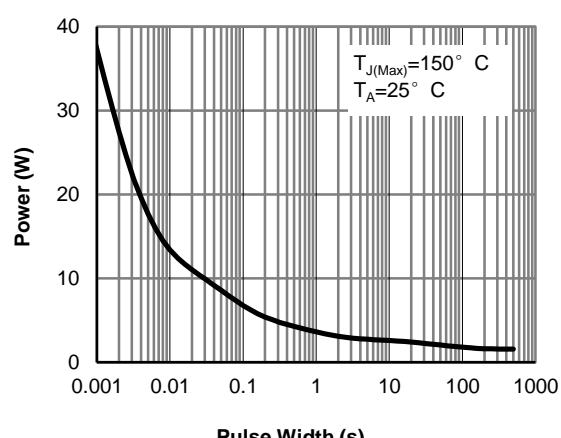


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

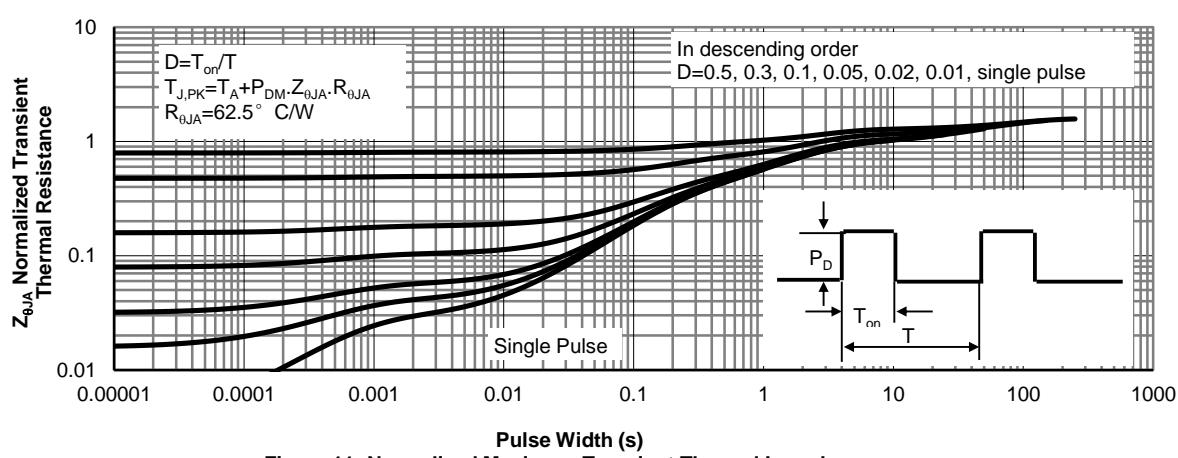
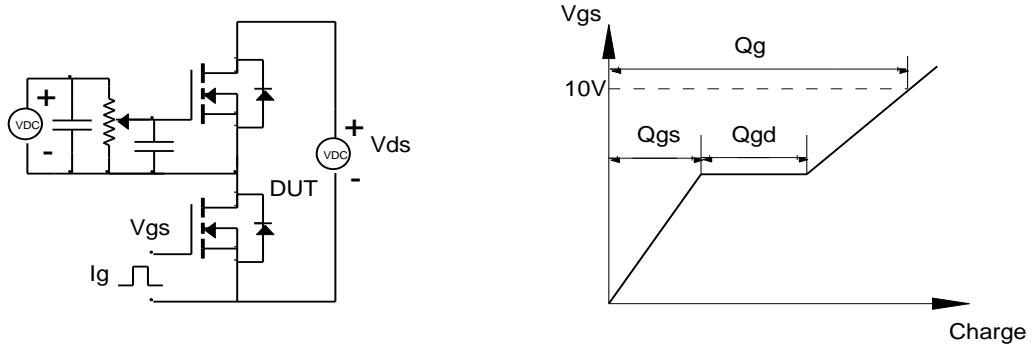
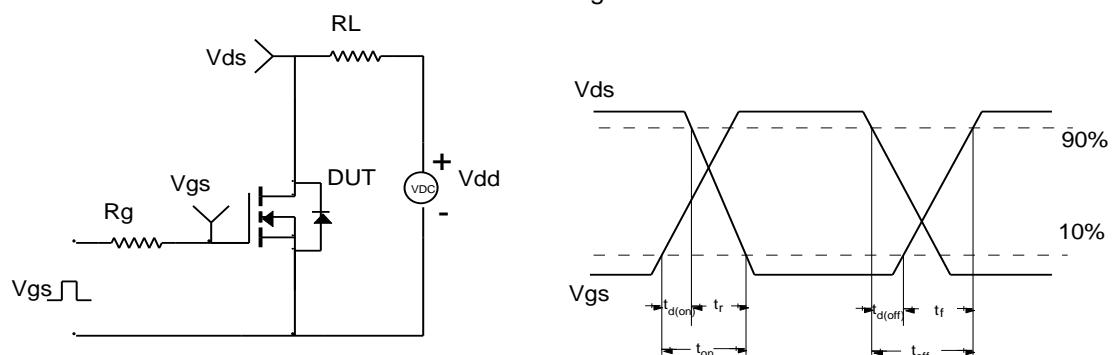


Figure 11: Normalized Maximum Transient Thermal Impedance

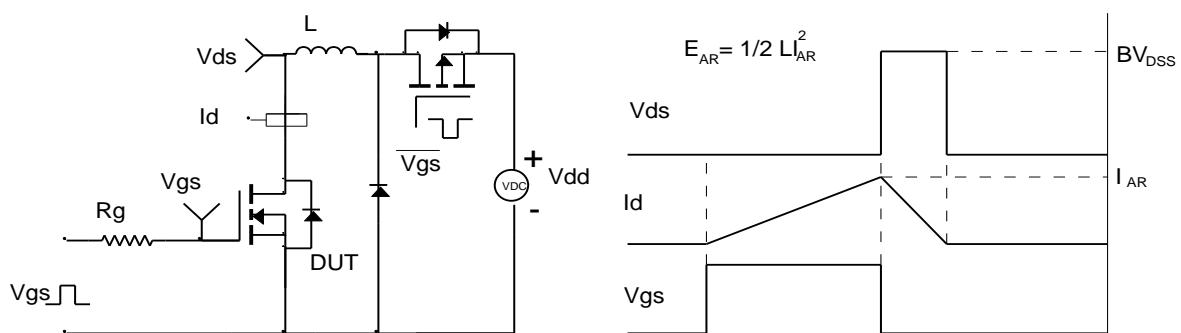
Gate Charge Test Circuit & Waveform



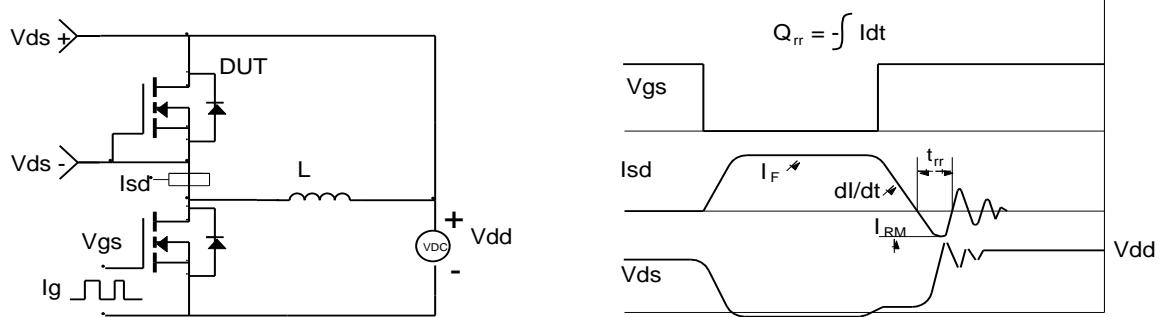
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



P-Channel 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	$V_{DS}=-48\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm20\text{V}$			±100	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-1	-2.1	-3	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=-10\text{V}, V_{DS}=-5\text{V}$	-20			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}, I_D=-3.2\text{A}$ $T_J=125^\circ\text{C}$	84	105		$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}, I_D=-2.8\text{A}$	145		106	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}, I_D=-3.2\text{A}$		9		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}, V_{GS}=0\text{V}$		-0.73	-1	V
I_S	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=-30\text{V}, f=1\text{MHz}$		930		pF
C_{oss}	Output Capacitance			85		pF
C_{rss}	Reverse Transfer Capacitance			35		pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		9.5	15	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}, V_{DS}=-30\text{V}, I_D=-3.2\text{A}$		16	22	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			8	12	nC
Q_{gs}	Gate Source Charge			2.5		nC
Q_{gd}	Gate Drain Charge			3.2		nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=-10\text{V}, V_{DS}=-30\text{V}, R_L=9.4\Omega, R_{\text{GEN}}=3\Omega$		8		ns
t_r	Turn-On Rise Time			3.8		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			31.5		ns
t_f	Turn-Off Fall Time			7.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-3.2\text{A}, dI/dt=100\text{A}/\mu\text{s}$		27		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-3.2\text{A}, dI/dt=100\text{A}/\mu\text{s}$		32		nC

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

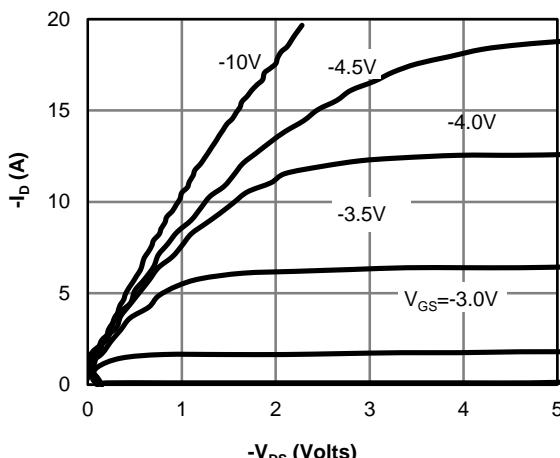


Fig 1: On-Region Characteristics

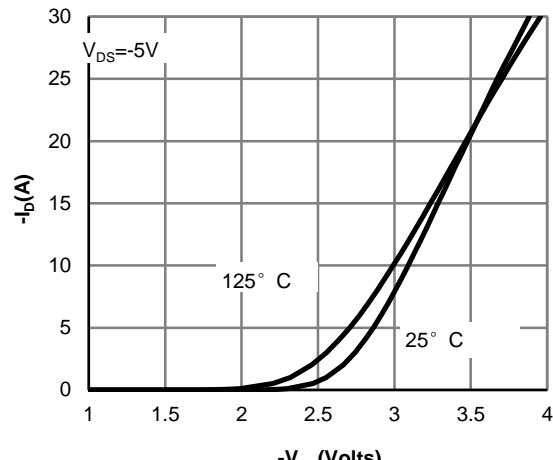


Figure 2: Transfer Characteristics

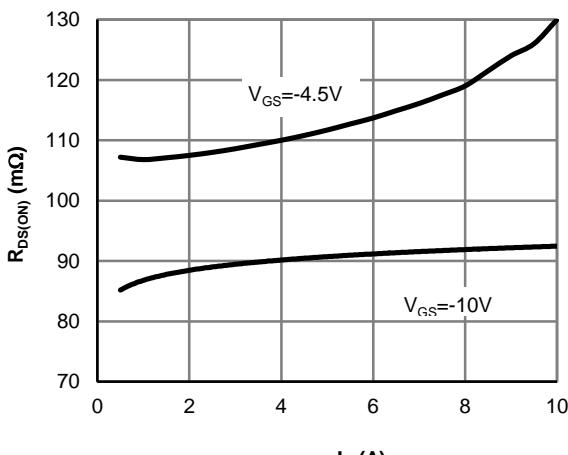


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

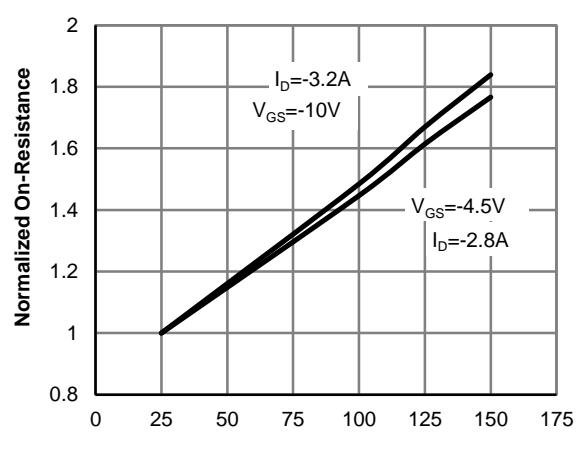


Figure 4: On-Resistance vs. Junction Temperature

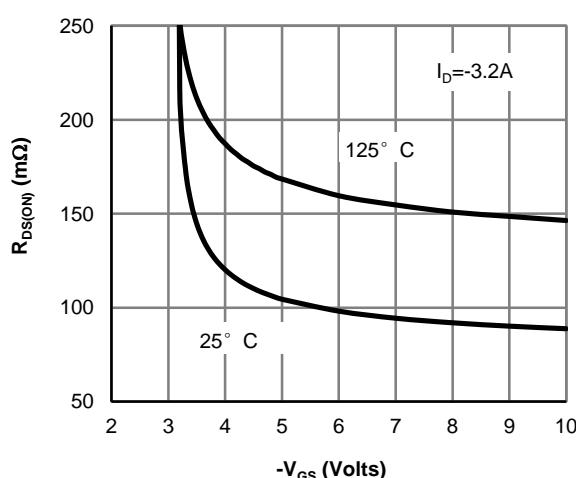


Figure 5: On-Resistance vs. Gate-Source Voltage

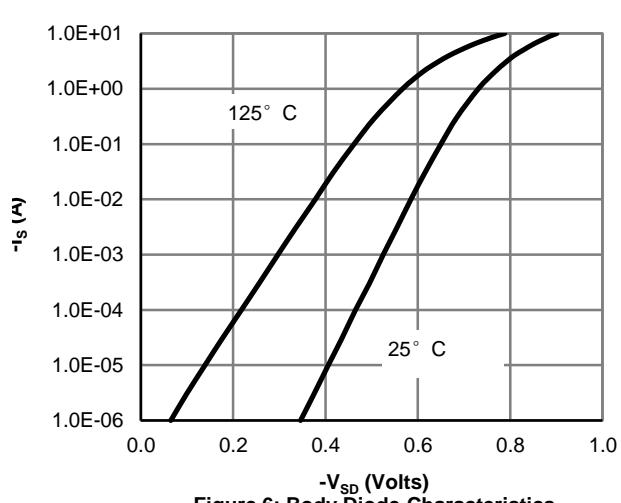


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

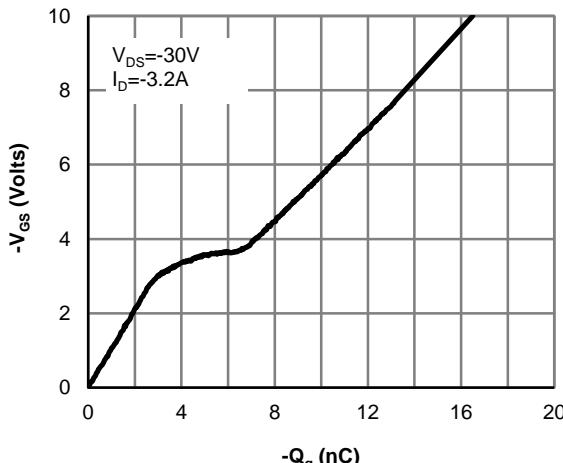


Figure 7: Gate-Charge Characteristics

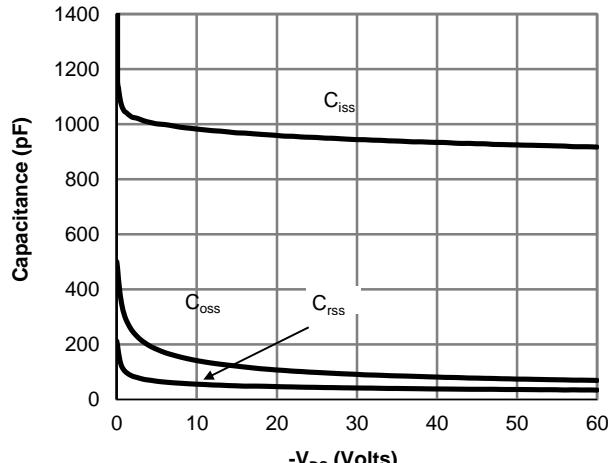


Figure 8: Capacitance Characteristics

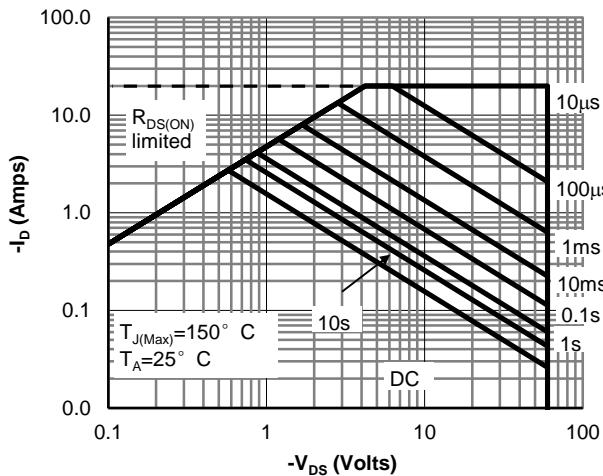


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

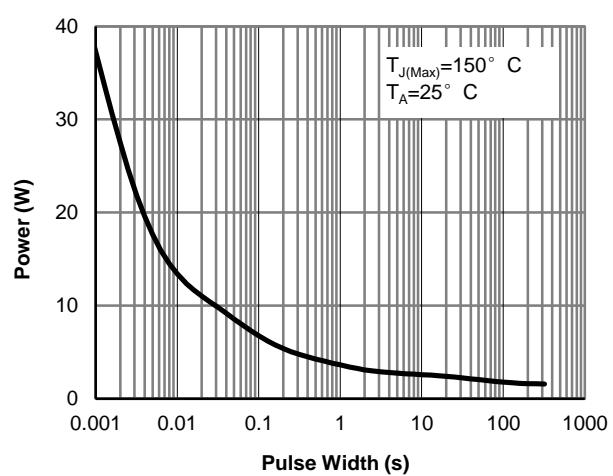


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

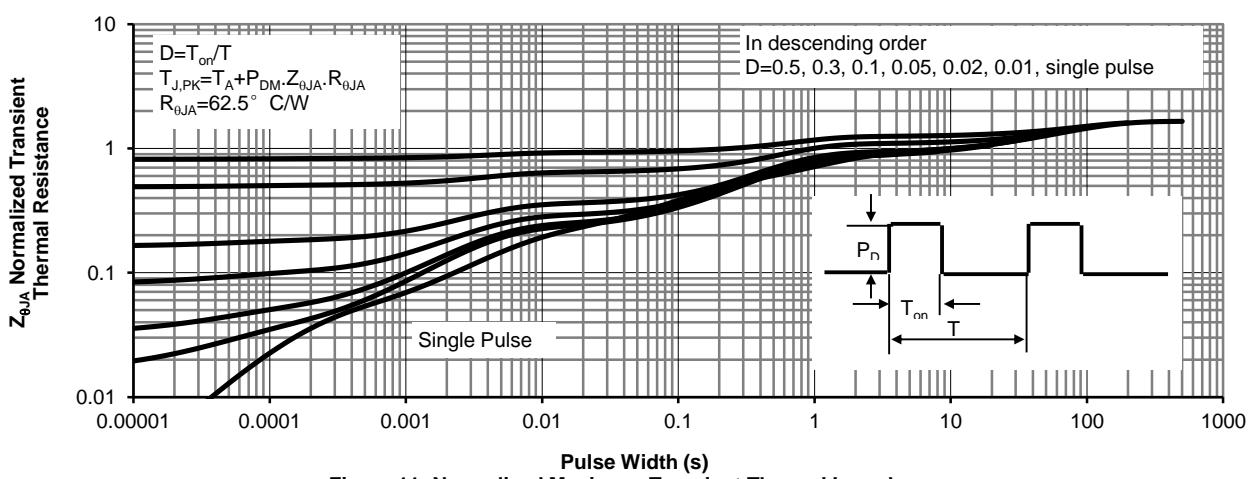
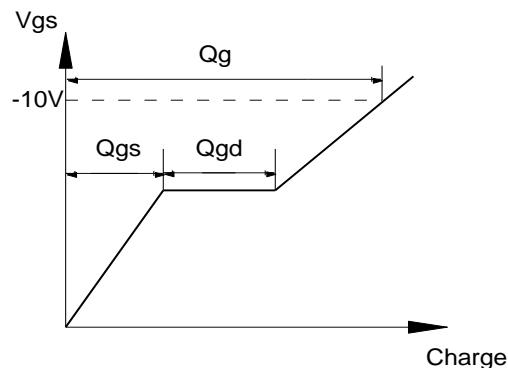
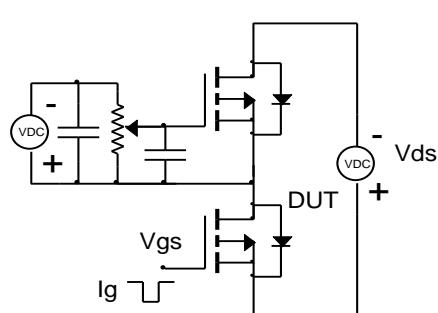
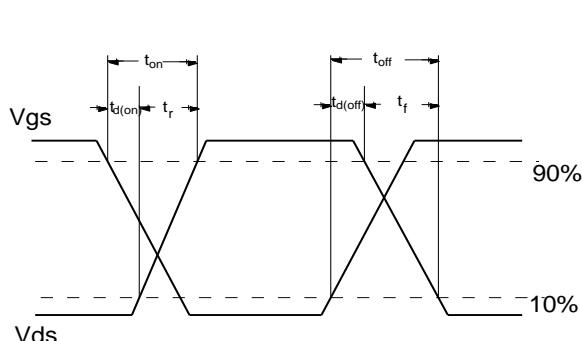
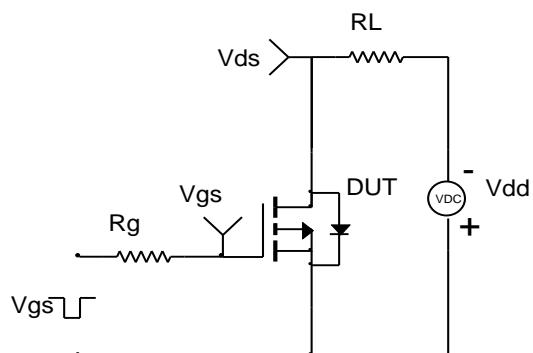


Figure 11: Normalized Maximum Transient Thermal Impedance

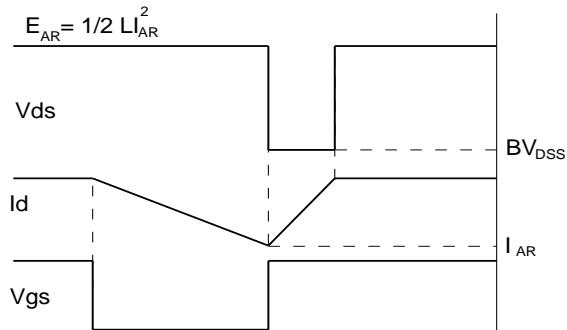
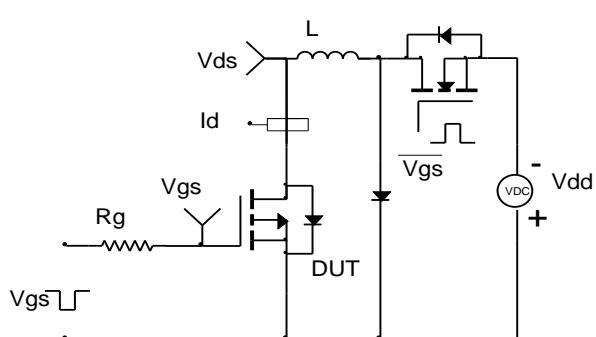
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

