

General Description

The IRF7309 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in inverter and other applications.

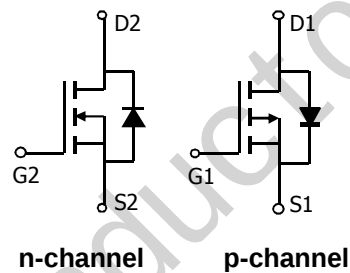
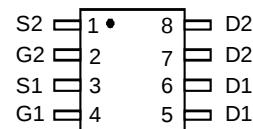
Features

n-channel	p-channel-
V_{DS} (V) = 30V	30V
I_D = 7.2A (V_{GS} =10V)	-6.8A (V_{GS} = -10V)
$R_{DS(ON)}$	$R_{DS(ON)}$
= 20m Ω (V_{GS} =10V)	=36m Ω (V_{GS} = -10V)
= 30m Ω (V_{GS} =4.5V)	= 48m Ω (V_{GS} = -4.5V)

100% UIS tested
100% Rg tested

SOP-8L

Top View



Absolute Maximum Ratings T _A =25°C unless otherwise noted						
Parameter		Symbol	Max n-channel	Max p-channel	Units	
Drain-Source Voltage		V _{DS}	30	-30	V	
Gate-Source Voltage		V _{GS}	±20	±20	V	
Continuous Drain Current ^F	T _A =25°C	I _D	7.2	-6.8	A	
	T _A =70°C		6.2	-5.5		
Pulsed Drain Current ^B		I _{DM}	64	-40		
Power Dissipation ^F	T _A =25°C	P _D	2	2	W	
	T _A =70°C		1.44	1.44		
Avalanche Current ^B		I _{AR}	9	17	A	
Repetitive avalanche energy 0.3mH ^B		E _{AR}	12	43	mJ	
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	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	n-ch	50	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		n-ch	80	100	°C/W
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	n-ch	32	40	°C/W
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	p-ch	50	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		p-ch	80	100	°C/W
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	p-ch	32	40	°C/W

Notes: ESD rating--HBM1b, MSL Rating--MSL Level2

N-CHANNEL 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	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =30V, V _{GS} =0V T _J =55°C			1 5	μA
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	1.0	1.5	2.6	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	64			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =7.2A T _J =125°C		18.7 25	28 32	mΩ
		V _{GS} =4.5V, I _D =5A		24.8	36	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =7.2A		20		S
V _{SD}	Diode Forward Voltage	I _S =2.5A, V _{GS} =0V		0.74	1	V
I _S	Maximum Body-Diode Continuous Current				2.5	A
I _{SM}	Pulsed Body-Diode Current ^B				64	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		373	448	pF
C _{oss}	Output Capacitance			67		pF
C _{rss}	Reverse Transfer Capacitance			41		pF
R _g (Note.H)	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		1.8	2.8	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =7.2A		7.2	11	nC
Q _g (4.5V)	Total Gate Charge			3.5		nC
Q _{gs}	Gate Source Charge			1.3		nC
Q _{gd}	Gate Drain Charge			1.7		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =2.1Ω, R _{GEN} =3Ω		4.5		ns
t _r	Turn-On Rise Time			2.7		ns
t _{D(off)}	Turn-Off DelayTime			14.9		ns
t _f	Turn-Off Fall Time			2.9		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =7.2A, dI/dt=100A/μs		10.5	12.6	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =7.2A, dI/dt=100A/μs		4.5		nC

A: The value of R_{θJA} 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. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

E: 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. The SOA curve provides a single pulse rating.

F: The power dissipation and current rating are based on the t ≤ 10s thermal resistance rating.

H: R_g detail test condition: V_{GS}=0V, V_{DS}=0V, V_{osc}=0.5V, f=1MHz, CS is 0.001nF to 1000nF (CS limit is only for checking test contact)

Setup the test condition on R_g tester, then get the R_g value.

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

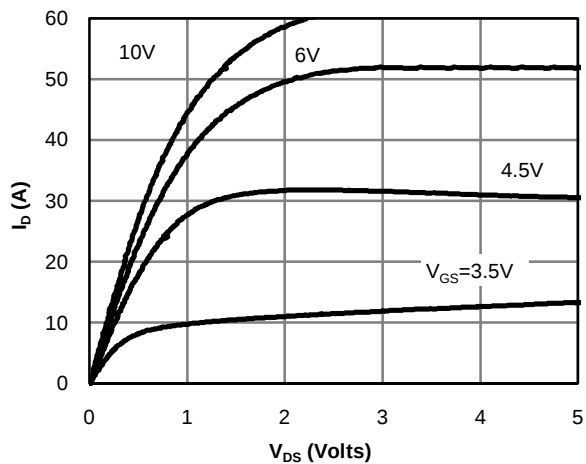


Fig 1: On-Region Characteristics

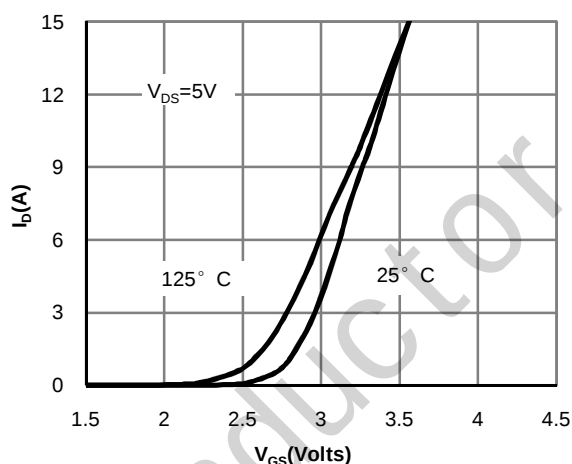


Figure 2: Transfer Characteristics

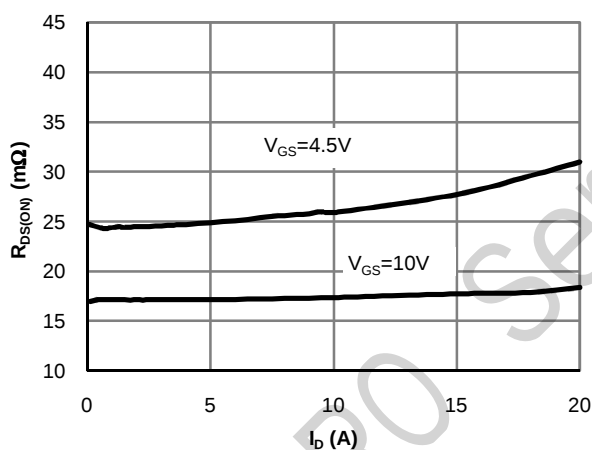


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

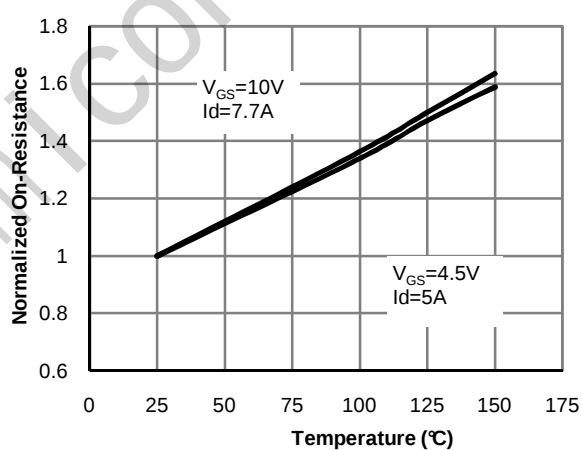


Figure 4: On-Resistance vs. Junction Temperature

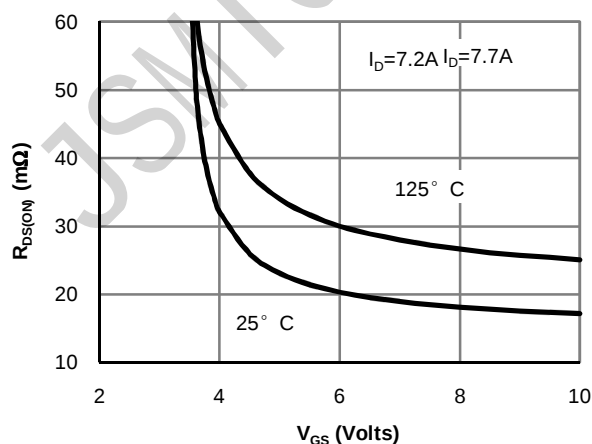


Figure 5: On-Resistance vs. Gate-Source Voltage

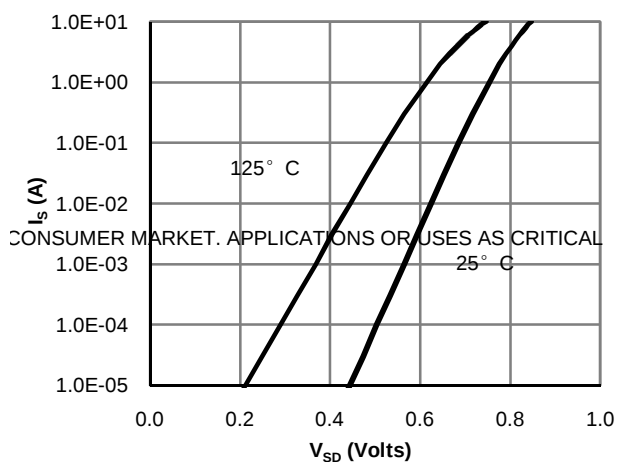
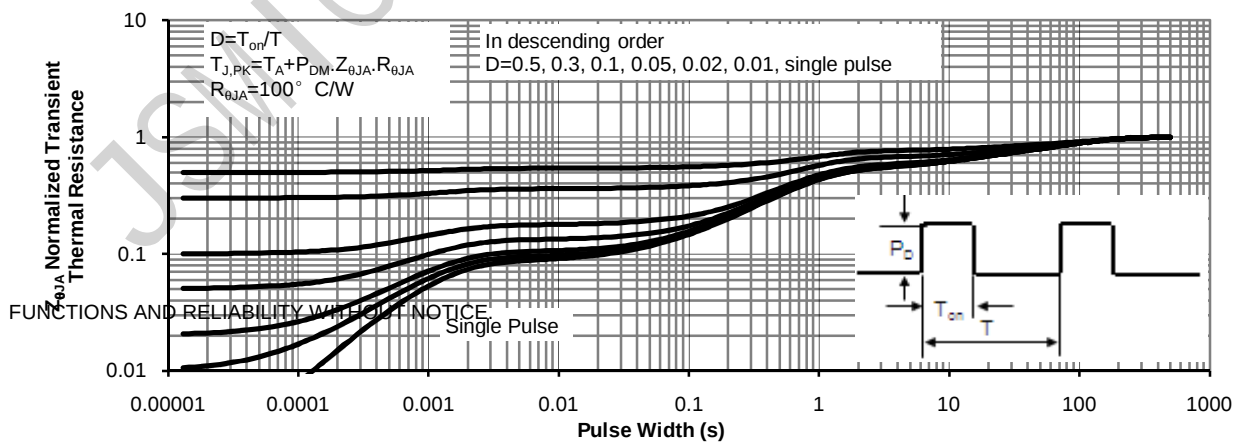
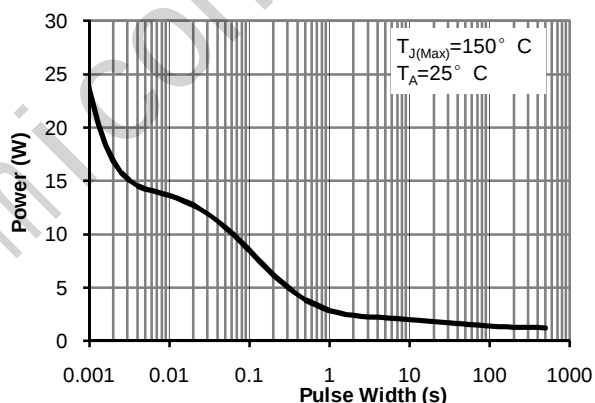
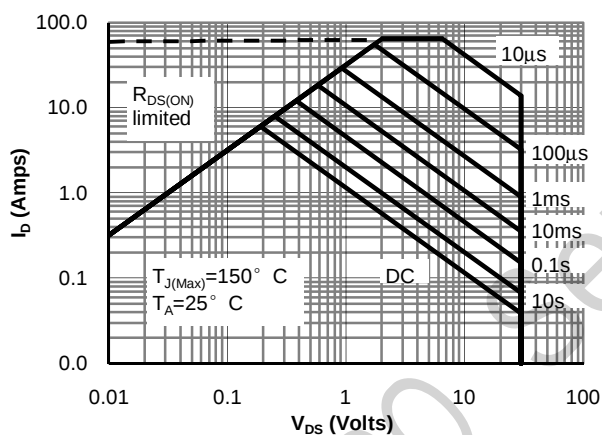
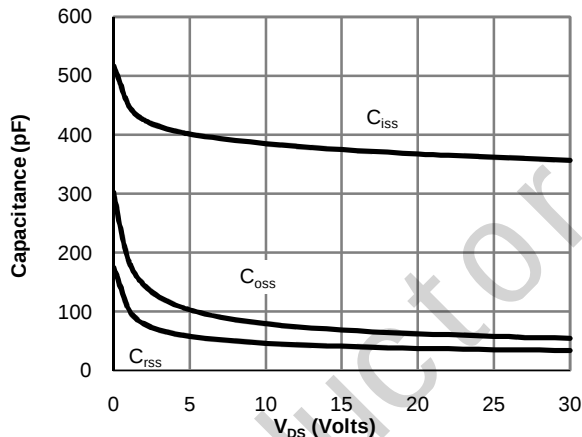
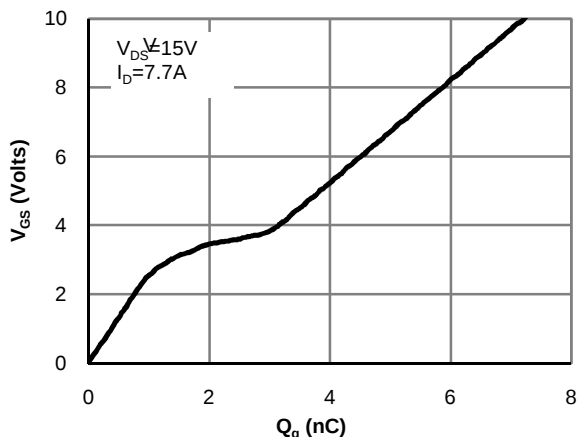


Figure 6: Body-Diode Characteristics

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-30\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-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	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.0	-1.50	-2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-6.3\text{A}$ $T_J=125^\circ\text{C}$		36 31.5	48	m Ω
		$V_{GS}=-4.5\text{V}$, $I_D=-3.5\text{A}$		48	58	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-5.3\text{A}$		19		S
V_{SD}	Diode Forward Voltage	$I_S=-3.5\text{A}$, $V_{GS}=0\text{V}$		-0.8	-1	V
I_S	Maximum Body-Diode Continuous Current				-3.5	A
I_{SM}	Pulsed Body-Diode Current ^B				-40	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		760		pF
C_{oss}	Output Capacitance			140		pF
C_{rss}	Reverse Transfer Capacitance			95		pF
R_g (Note.H)	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3.2	5	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-5.3\text{A}$		13.6	16	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			6.7		nC
Q_{gs}	Gate Source Charge			2.5		nC
Q_{gd}	Gate Drain Charge			3.2		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=2.8\Omega$, $R_{GEN}=3\Omega$		8		ns
t_r	Turn-On Rise Time			6		ns
$t_{D(off)}$	Turn-Off DelayTime			17		ns
t_f	Turn-Off Fall Time			5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-5.3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		15		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-5.3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		9.7		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 $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

E: 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.

F: The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

H: R_g detail test condition: $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $V_{osc}=0.5\text{V}$, $f=1\text{MHz}$, CS is 0.001nF to 1000nF (CS limit is only for checking test contact)

Setup the test condition on R_g tester, then get the R_g value.

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

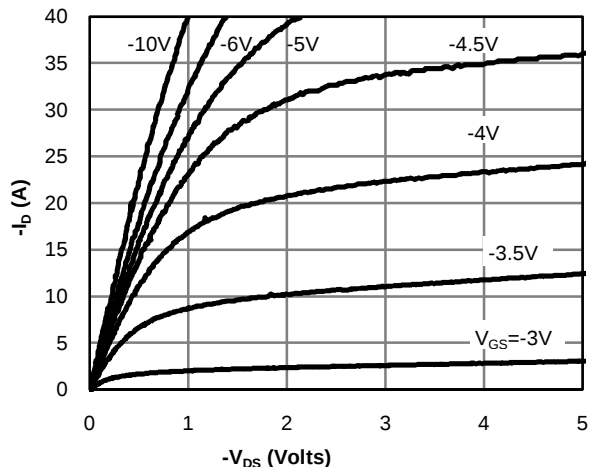


Fig 1: On-Region Characteristics

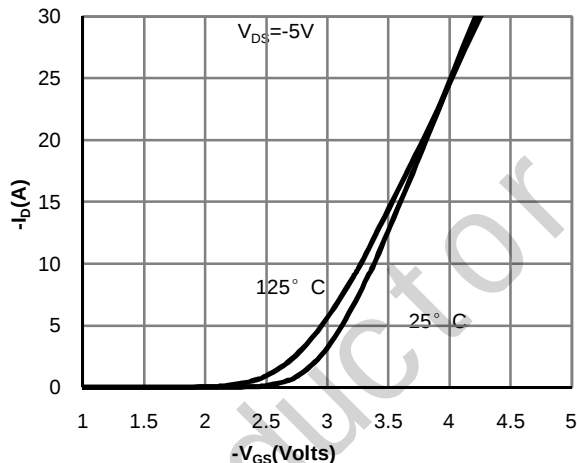


Figure 2: Transfer Characteristics

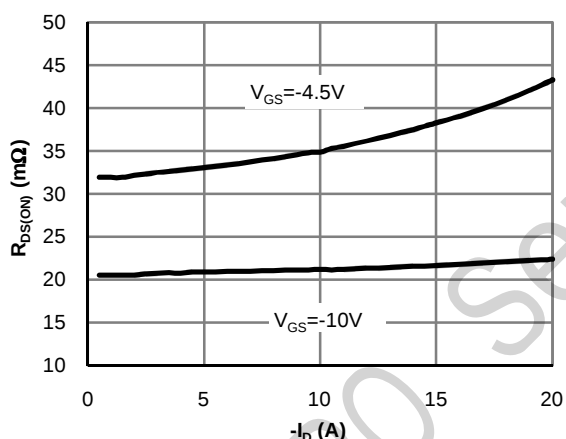


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

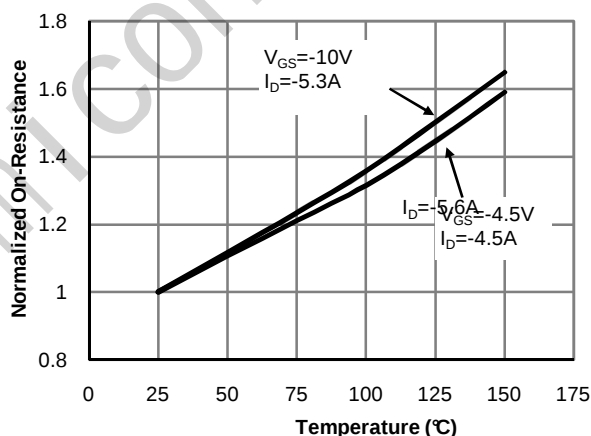


Figure 4: On-Resistance vs. Junction Temperature

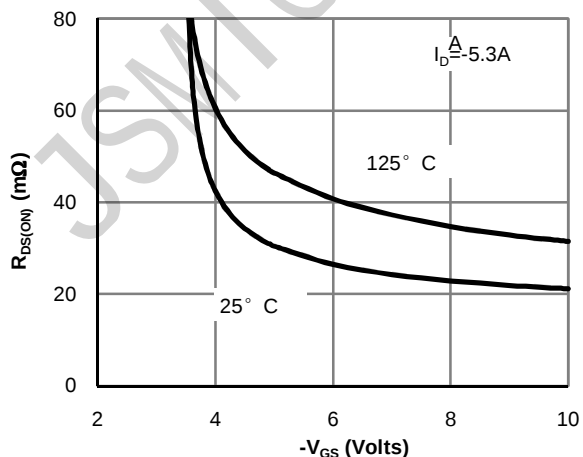


Figure 5: On-Resistance vs. Gate-Source Voltage

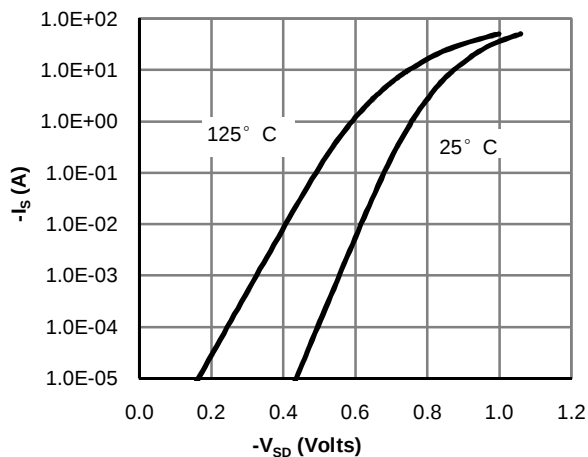


Figure 6: Body-Diode Characteristics

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

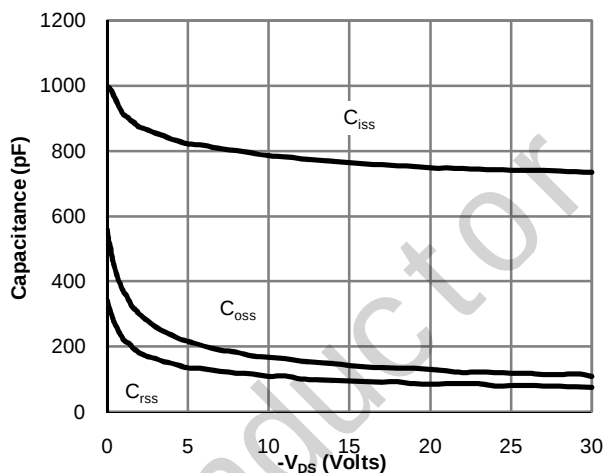
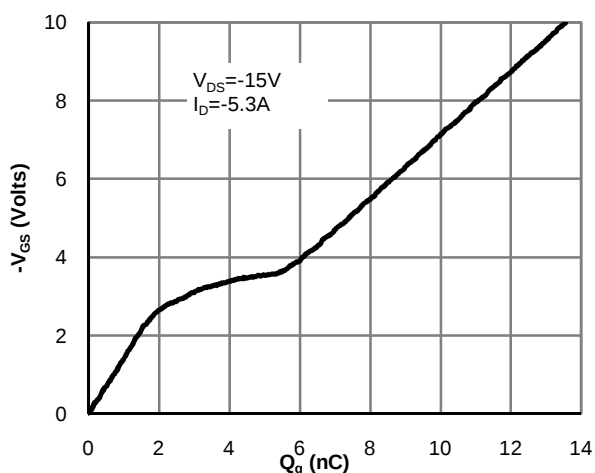


Figure 8: Capacitance Characteristics

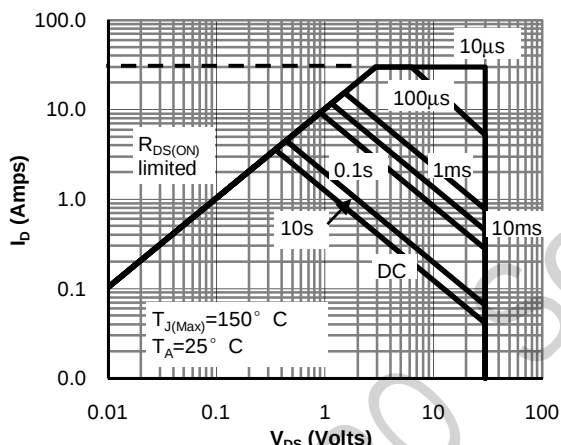


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

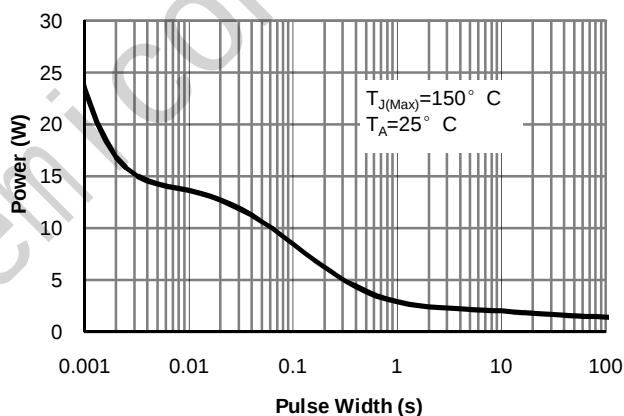


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

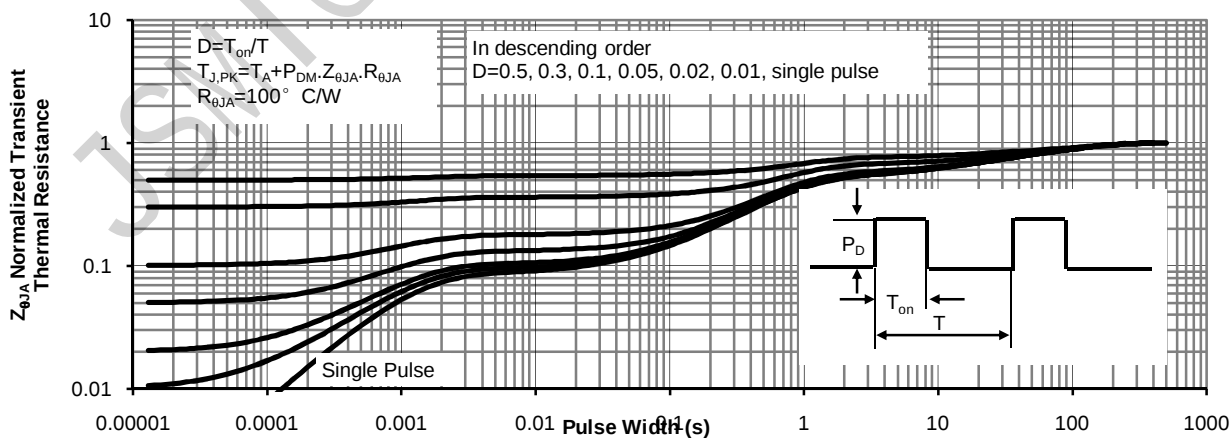
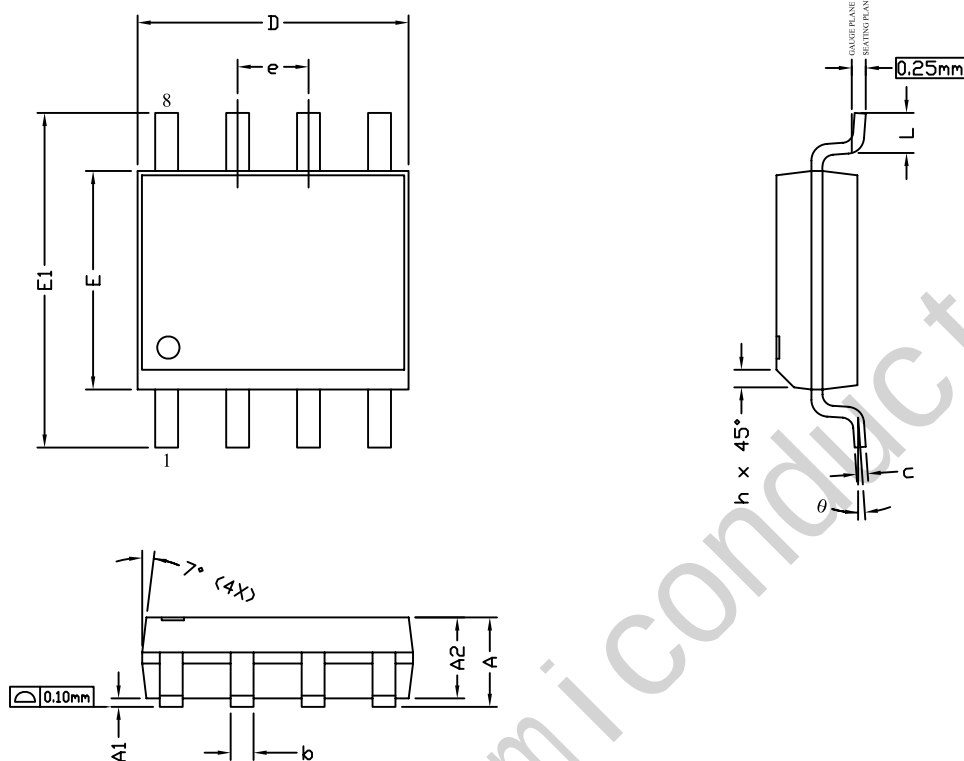
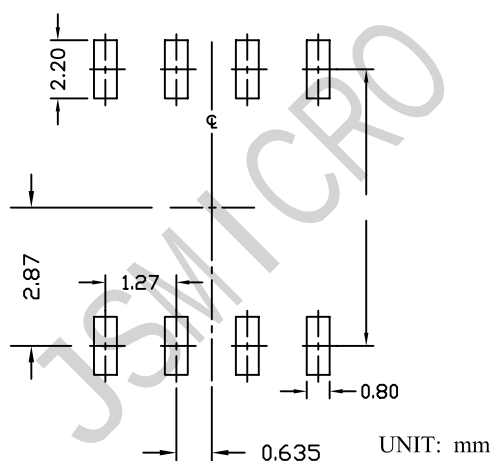


Figure 11: Normalized Maximum Transient Thermal Impedance

■ SOP8 PACKAGE OUTLINE DIMENSIONS



RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	1.65	1.75	0.053	0.065	0.069
A1	0.10	—	0.25	0.004	—	0.010
A2	1.25	1.50	1.65	0.049	0.059	0.065
b	0.31	—	0.51	0.012	—	0.020
c	0.17	—	0.25	0.007	—	0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27 BSC			0.050 BSC		
E1	5.80	6.00	6.20	0.228	0.236	0.244
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
θ	0°	—	8°	0°	—	8°

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
4. DIMENSION L IS MEASURED IN GAUGE PLANE.
5. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.