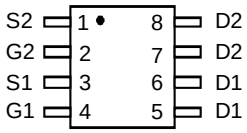
General Description

The 4606 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.

SOP-8L

Top View

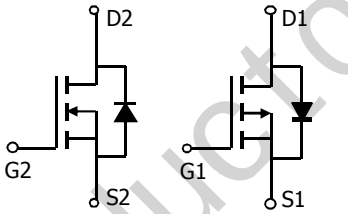


Features

n-channel
V_{DS} (V) = 30V
I_D = 7.2A (V_{GS}=10V)
$R_{DS(ON)}$
= 20mΩ (V_{GS}=10V)
= 30mΩ (V_{GS}=4.5V)

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

100% UIS tested
100% Rg tested



n-channel **p-channel**

Absolute Maximum Ratings T_A=25℃ 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℃	I_D	7.2	-6.8	A
	T_A=70℃		6.2	-5.5	
Pulsed Drain Current [B]		I_{DM}	64	-40	
Power Dissipation [F]	T_A=25℃	P_D	2	2	W
	T_A=70℃		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	℃

Thermal Characteristics: n-channel and p-channel						
Parameter		**Symbol**	**Device**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	n-ch	50	62.5	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		n-ch	80	100	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	n-ch	32	40	℃/W
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	p-ch	50	62.5	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		p-ch	80	100	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	p-ch	32	40	℃/W

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

N-CHANNEL Electrical Characteristics (T_J=25℃ 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			1	μA
		T_J=55℃			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	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		18.7	28	mΩ
		T_J=125℃		25	32	
		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 $R_{\theta JA}$ is measured with the device mounted on 1in^2 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ 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 in^2 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. Rg detail test condition: VGS=0V, VDS=0V, Vosc=0.5V, f=1MHZ, CS is 0.001nF to 1000nF(CS limit is only for checking test contact)
Setup the test condition on Rg tester, then get the Rg value.

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

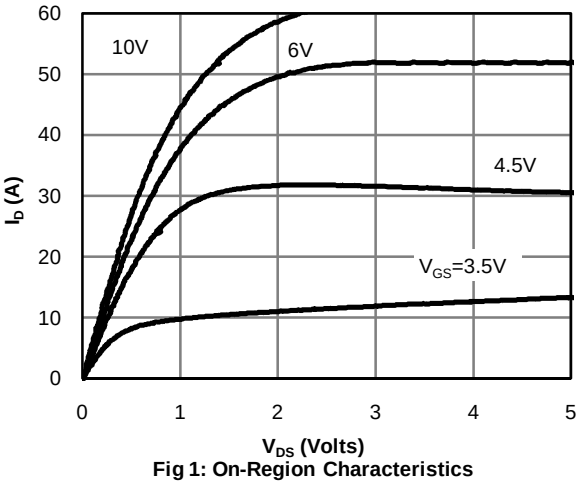


Fig 1: On-Region Characteristics

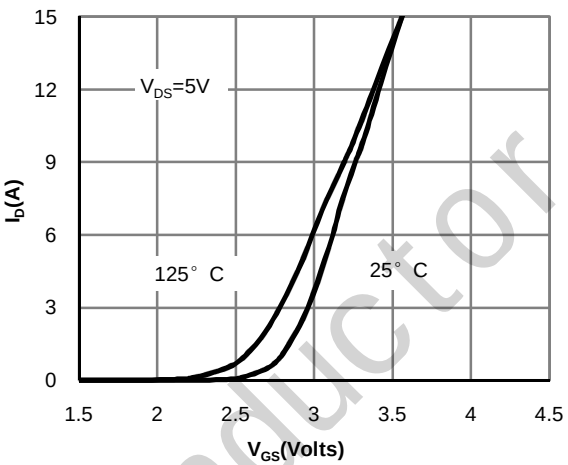


Figure 2: Transfer Characteristics

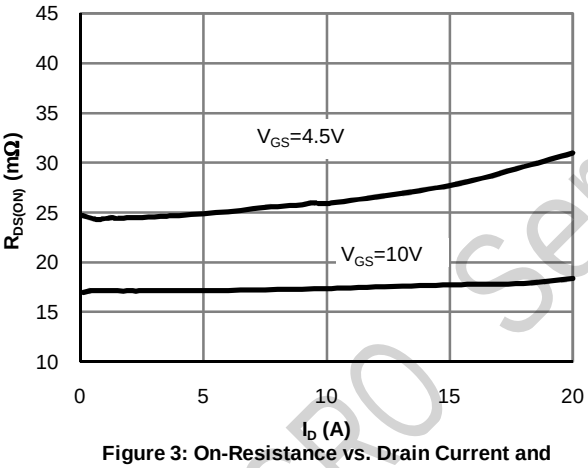


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

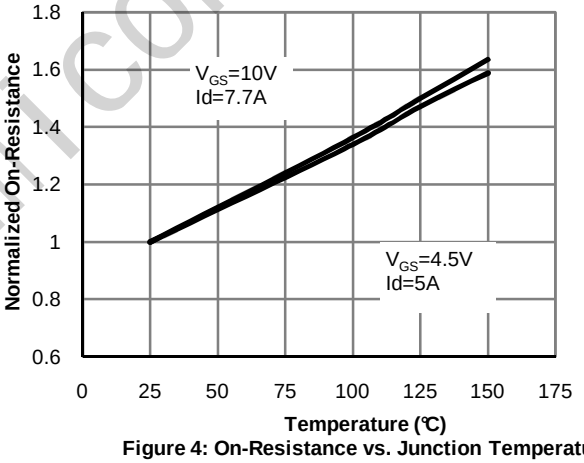


Figure 4: On-Resistance vs. Junction Temperature

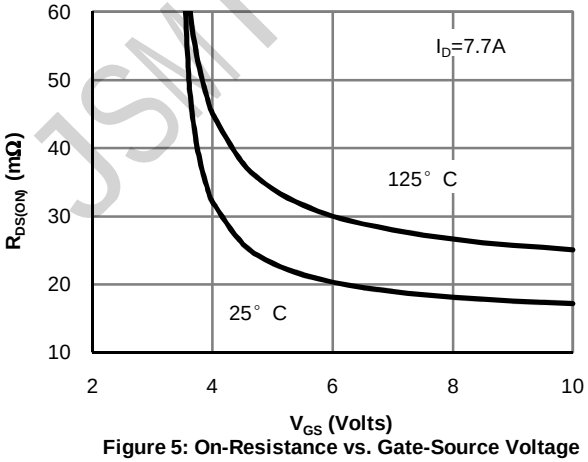


Figure 5: On-Resistance vs. Gate-Source Voltage

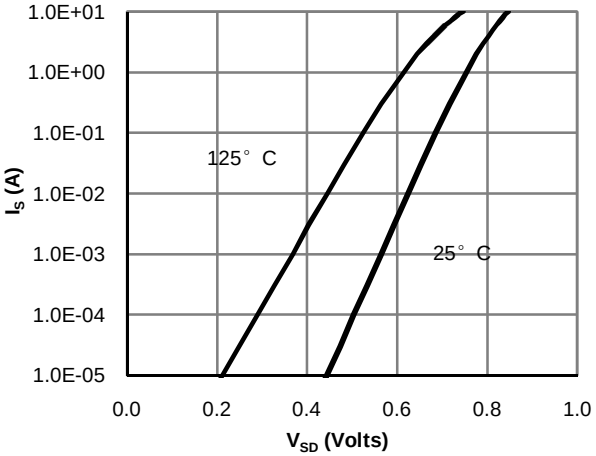


Figure 6: Body-Diode Characteristics

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

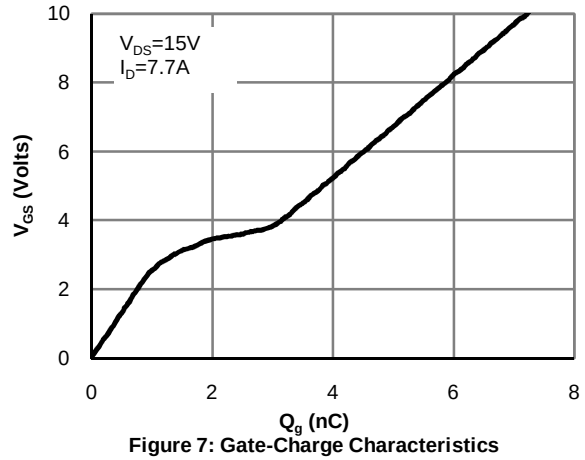


Figure 7: Gate-Charge Characteristics

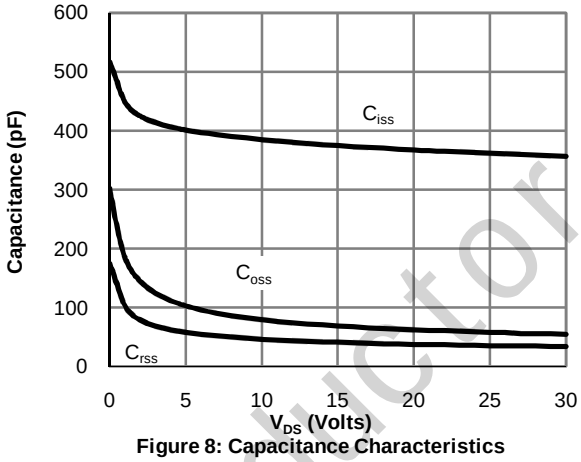


Figure 8: Capacitance Characteristics

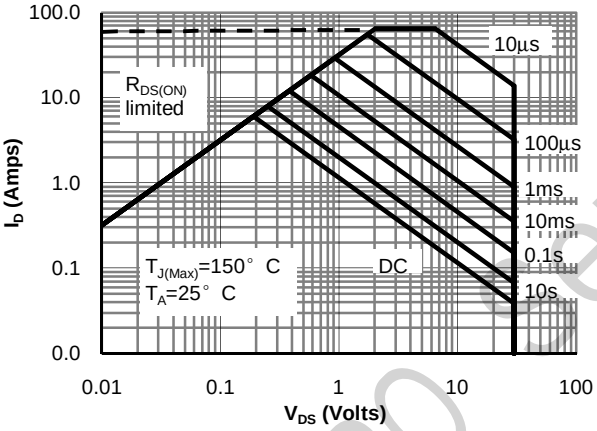


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

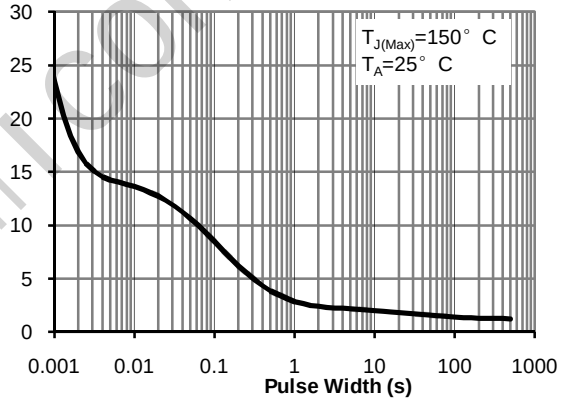


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

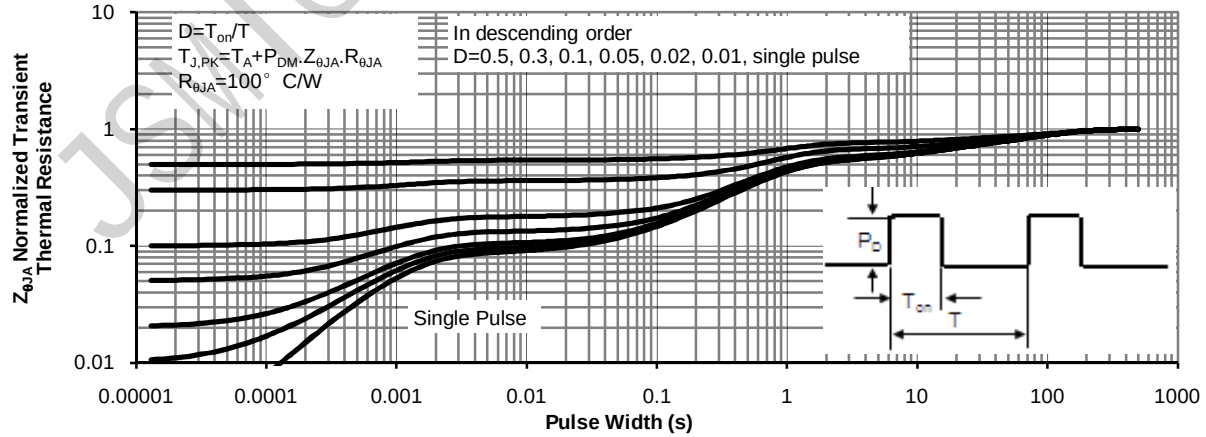


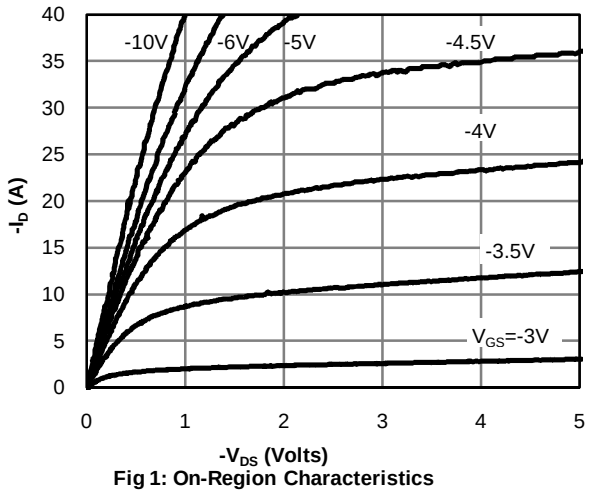
Figure 11: Normalized Maximum Transient Thermal Impedance

P-CHANNEL Electrical Characteristics (T_J=25℃ 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			-1	μA
		T_J=55℃			-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	-1.0	-1.50	-2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	-40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-6.3A		36	48	mΩ
		T_J=125℃		31.5		
		V_{GS}=-4.5V, I_D=-3.5A		48	58	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-5.3A		19		S
V_{SD}	Diode Forward Voltage	I_S=-3.5A,V_{GS}=0V		-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}=0V, V_{DS}=-15V, f=1MHz		760		pF
C_{oss}	Output Capacitance			140		pF
C_{rss}	Reverse Transfer Capacitance			95		pF
R_g (Note.H)	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		3.2	5	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge (10V)	V_{GS}=-10V, V_{DS}=-15V, I_D=-5.3A		13.6	16	nC
Q_g(4.5V)	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}=-10V, V_{DS}=-15V, R_L=2.8Ω, R_{GEN}=3Ω		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=-5.3A, dI/dt=100A/μs		15		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-5.3A, dI/dt=100A/μs		9.7		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ 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 in^2 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 current rating is based on the t ≤ 10s thermal resistance rating.
H. Rg detail test condition: VGS=0V, VDS=0V, Vosc=0.5V, f=1MHZ, CS is 0.001nF to 1000nF(CS limit is only for checking test contact)
Setup the test condition on Rg tester, then get the Rg value.

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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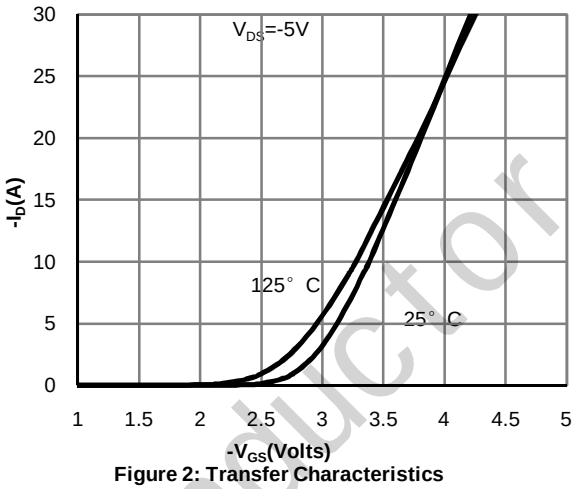
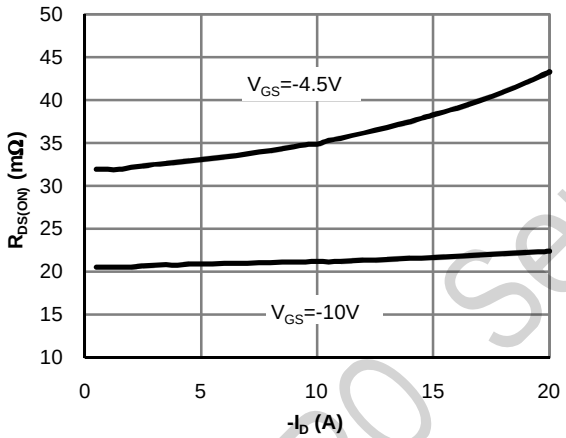


Figure 2: Transfer Characteristics



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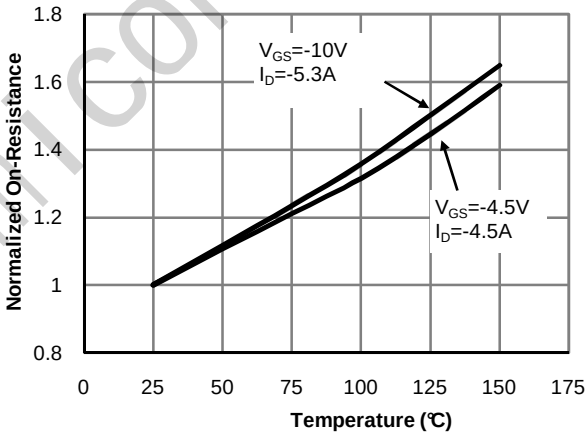


Figure 4: On-Resistance vs. Junction Temperature

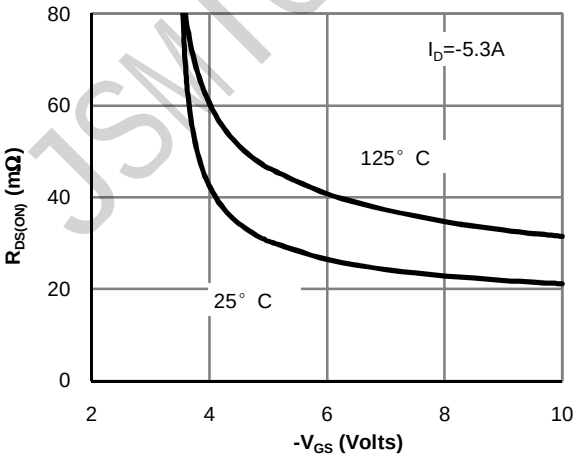


Figure 5: On-Resistance vs. Gate-Source Voltage

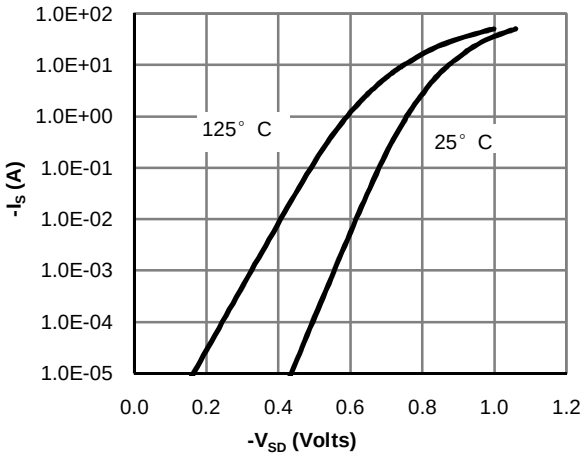
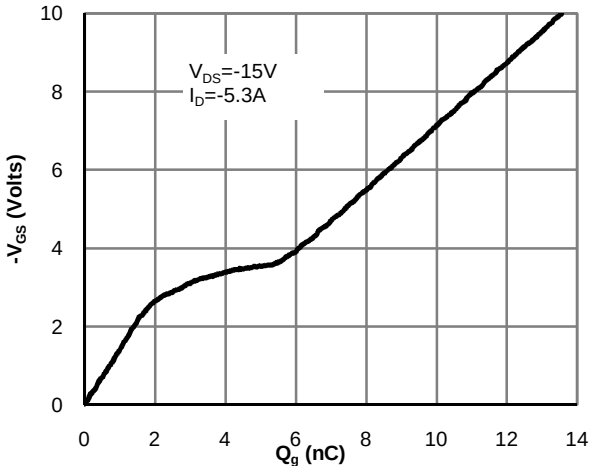


Figure 6: Body-Diode Characteristics

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



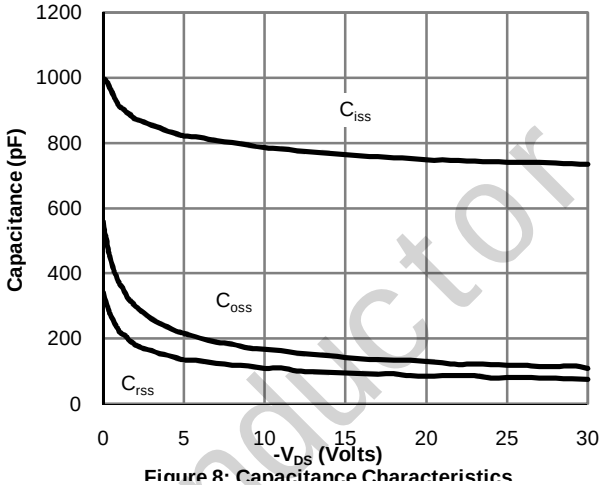


Figure 8: Capacitance Characteristics

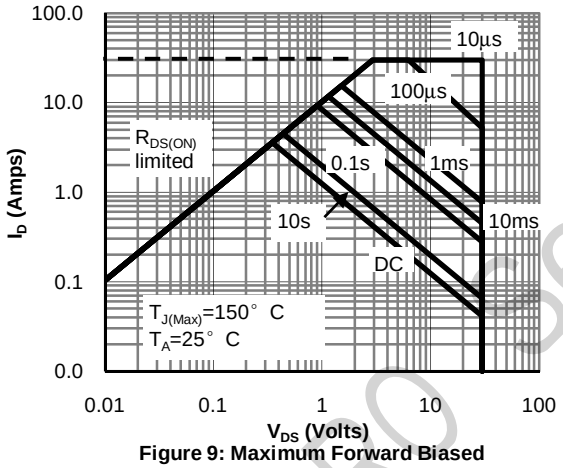


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

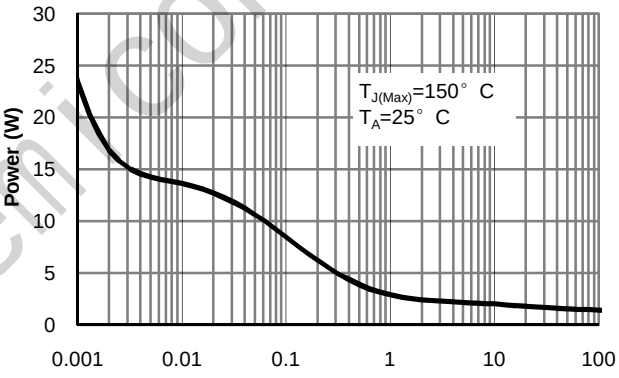


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

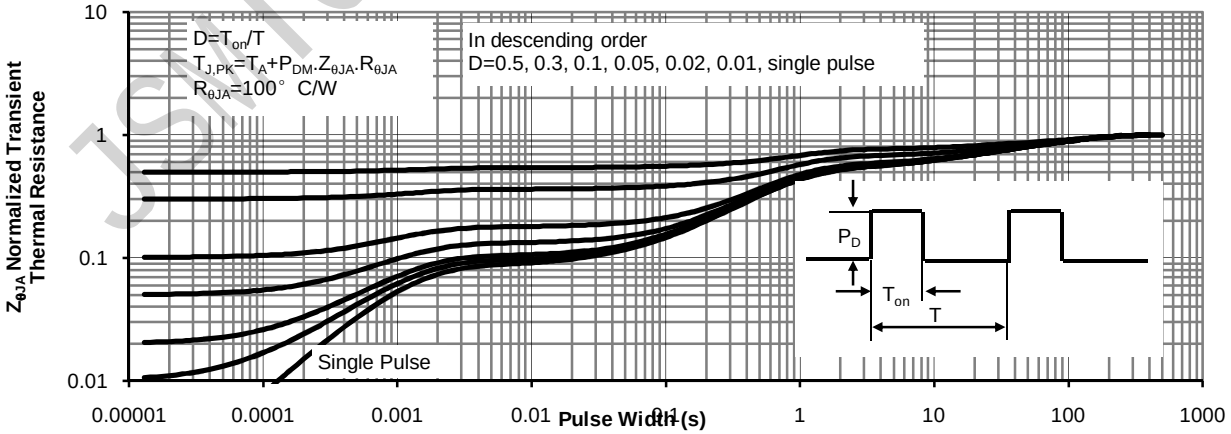
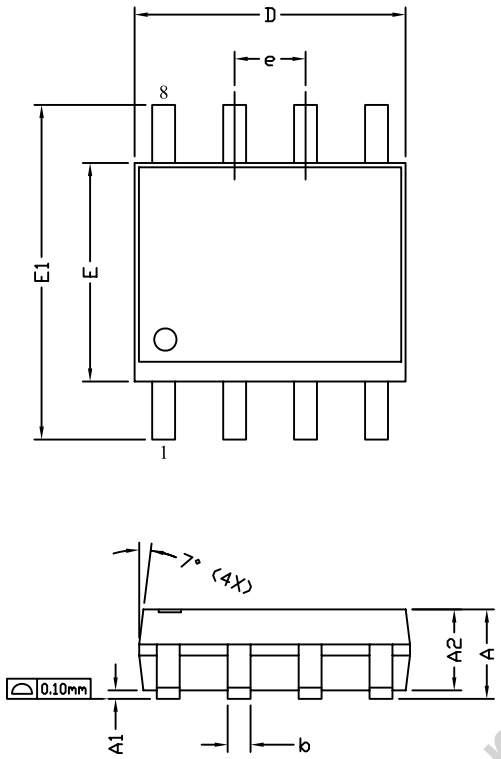
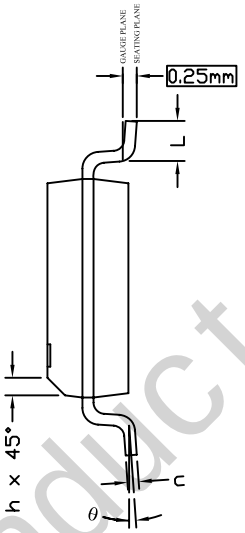


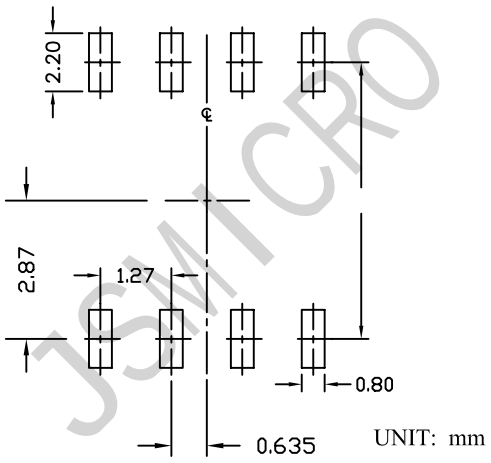
Figure 11: Normalized Maximum Transient Thermal Impedance

■ SOP8 PACKAGE OUTLINE DIMENSIONS





RECOMMENDED LAND PATTERN



UNIT: mm

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 MILLMETERS.
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.