60V Complementary Enhancement Mode Power MOSFET

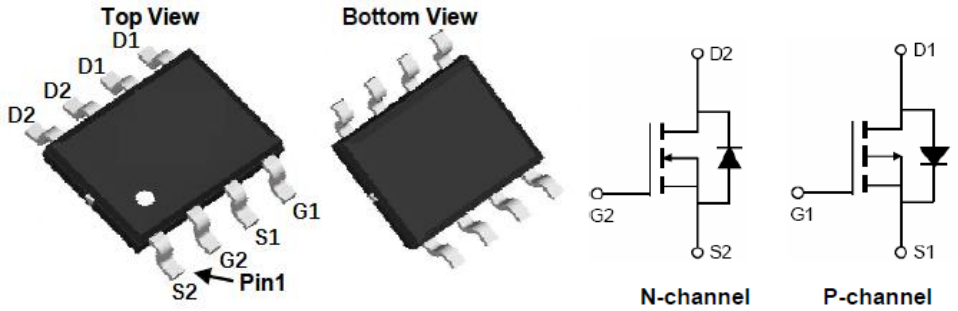
● Features

N-channel	P-channel
V_{DS} = 60V,	V_{DS} = -60 V
I_D = 4.4A	I_D = -4.2A
$R_{DS(ON)}$	$R_{DS(ON)}$
V_{GS}= 10V, TYP 37 mΩ	V_{GS}= -10V, TYP 53 mΩ
V_{GS}= 4.5V, TYP 43 mΩ	V_{GS}= -4.5V, TYP 60 mΩ

● General Description

- used in inverter
- other applications

● Pin Configurations



SOP8

● Absolute Maximum Ratings @T_A=25℃ unless otherwise noted

Parameter		Symbol	N-Ratings	P-Ratings	Unit
Drain-Source Voltage		V_{DSS}	60	-60	V
Gate-Source Voltage		V_{GSS}	±20	±20	V
Drain Current (Continuous) *AC	T_A=25°C	I_D	4.4	-4.2	A
	T_A=70°C		3.5	-3.4	
Drain Current (Pulse) *B		I_{DM}	21	-17	A
Power Dissipation	T_A=25°C	P_D	2		W
Operating Temperature/ Storage Temperature		T_J/T_{STG}	-55~150	-55~150	℃

● Thermal Resistance Ratings

	Parameter		Symbol	Typ	Maximum	Unit
N-channel	Maximum Junction-to-Ambient	t ≤ 10s	R_{thJA}	48	62.5	°C/W
	Maximum Junction-to Lead	Steady State	R_{thJL}	35	60	

	Parameter		Symbol	Typ	Maximum	Unit
P-channel	Maximum Junction-to-Ambient	t ≤ 10s	R_{thJA}	48	62.5	°C/W
	Maximum Junction-to Lead	Steady State	R_{thJL}	35	40	

- **N-channel Electrical Characteristics** @T_A=25℃ unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D= 250μA	60	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 48V, V_{GS} = 0V	--	--	1	μA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_{DS}= 250μA	1	1.6	3	V
Gate Leakage Current	I_{GSS}	V_{GS}= ±20V, V_{DS}=0V	--	--	±100	nA
Drain-Source On-state Resistance	$R_{DS(on)}$	V_{GS} = 10V, I_D = 5.3A	--	37	48	mΩ
	$R_{DS(on)}$	V_{GS} = 4.5V, I_D = 4.7A	--	43	56	mΩ
Forward Transconductance	g_{FS}	V_{DS}= 5V, I_D= 6.3A	--	27	--	S
Diode Forward Voltage	V_{SD}	I_{SD}= 1A , V_{GS}=0V	--	--	1.2	V
Diode Forward Current	I_S	T_A =25°C	--	--	4.4	A
Switching						
Total Gate Charge	Q_g	V_{GS}=10V, V_{DS}=30V, I_D=6.3A	--	24.2	--	nC
Gate-Source Charge	Q_{gs}		--	6	--	nC
Gate-Drain Charge	Q_{gd}		--	14.4	--	nC
Turn-on Delay Time	$t_{d(on)}$	V_{GS}=10V, V_{DS}=30V, R_L=4.7Ω, R_{GEN}=3Ω	--	7.6	--	ns
Turn-on Rise Time	t_r		--	5	--	ns
Turn-off Delay Time	$t_{d(off)}$		--	28.9	--	ns
Turn-Off Fall Time	t_f		--	5.5	--	ns
Dynamic						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=30V, f=1MHz	--	1920	--	pF
Output Capacitance	C_{oss}		--	155	--	pF
Reverse Transfer Capacitance	C_{rss}		--	116	--	pF

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.

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

C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

- **P-channel Electrical Characteristics** @T_A=25℃ unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D= -250μA	-60	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -48V, V_{GS} = 0V	--	--	-1	μA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_{DS}= -250μA	-1	-1.6	-3	V
Gate Leakage Current	I_{GSS}	V_{GS}= ±20V, V_{DS}=0V	--	--	±100	nA
Drain-Source On-state Resistance	$R_{DS(on)}$	V_{GS} = -10V, I_D = -5A	--	-53	-65	mΩ
	$R_{DS(on)}$	V_{GS} = -4.5V, I_D = -3A	--	-60	-80	mΩ
Forward Transconductance	g_{FS}	V_{DS}= -5V, I_D= -4.9A	--	18	--	S
Diode Forward Voltage	V_{SD}	I_{SD}= -1A , V_{GS}=0V	--	--	-1.2	V
Diode Forward Current	I_S	T_A =25°C	--	--	-4.2	A
Switching						
Total Gate Charge	Q_g	V_{GS}=-10V, V_{DS}=-30V, I_D=-4.9A	--	22.8	--	nC
Gate-Source Charge	Q_{gs}		--	5.8	--	nC
Gate-Drain Charge	Q_{gd}		--	9.6	--	nC
Turn-on Delay Time	$t_{d(on)}$	V_{GS}=-10V, V_{DS}=-30V, R_L=6.2Ω,R_{GEN}=3Ω	--	9.8	--	ns
Turn-on Rise Time	t_r		--	6.1	--	ns
Turn-off Delay Time	$t_{d(off)}$		--	44	--	ns
Turn-Off Fall Time	t_f		--	12.7	--	ns
Dynamic						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-30V, f=1MHz	--	2417	--	pF
Output Capacitance	C_{oss}		--	179	--	pF
Reverse Transfer Capacitance	C_{rss}		--	120	--	pF

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.

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

C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

- **N-channel Typical Performance Characteristics（(TJ = 25 °C, unless otherwise noted)）**

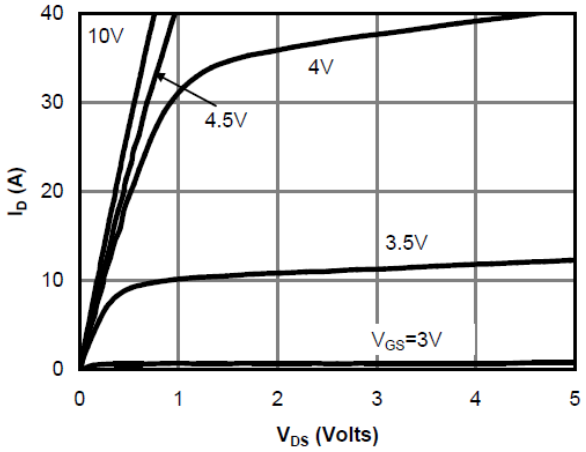


Fig 1: On-Region Characteristics

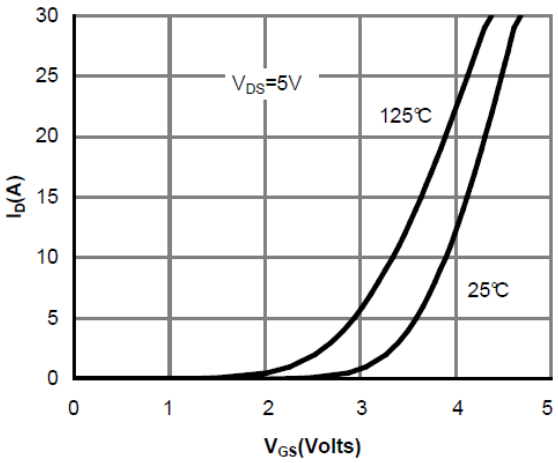


Figure 2: Transfer Characteristics

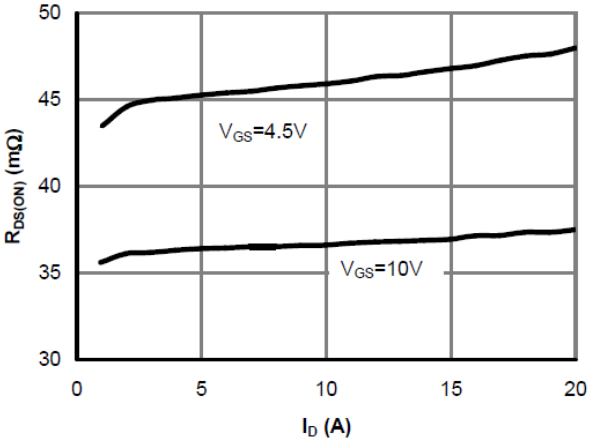


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

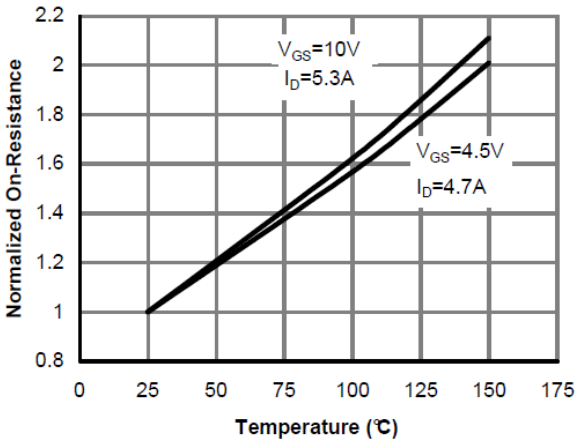


Figure 4: On-Resistance vs. Junction Temperature

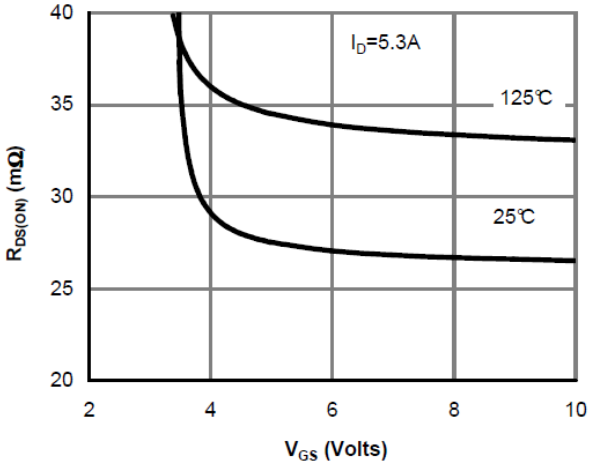


Figure 5: On-Resistance vs. Gate-Source Voltage

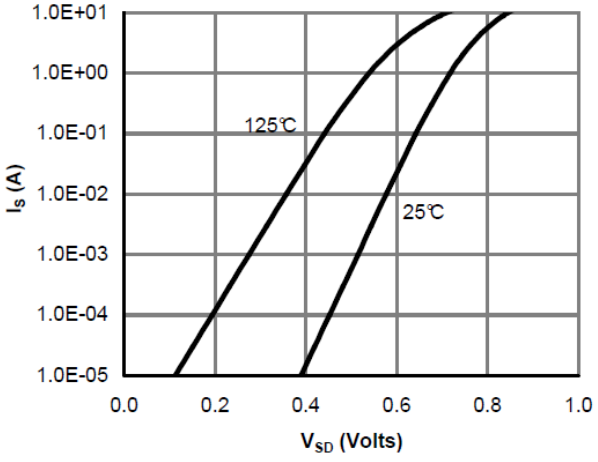


Figure 6: Body-Diode Characteristics

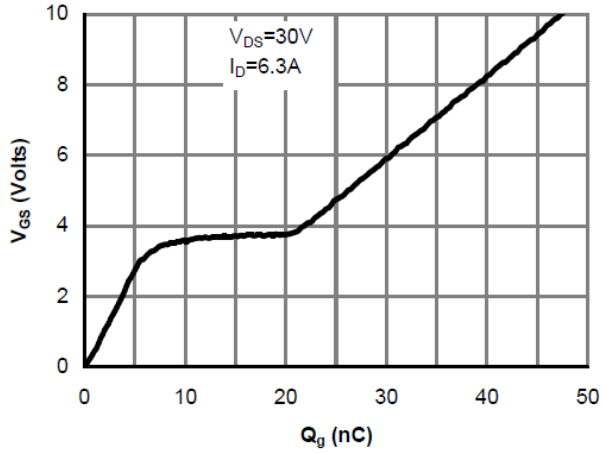


Figure 7: Gate-Charge Characteristics

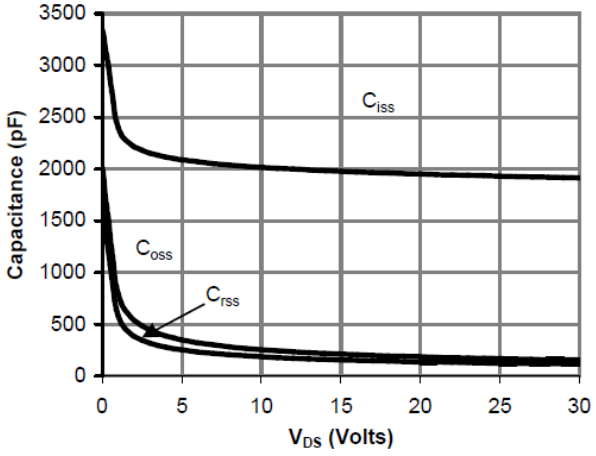


Figure 8: Capacitance Characteristics

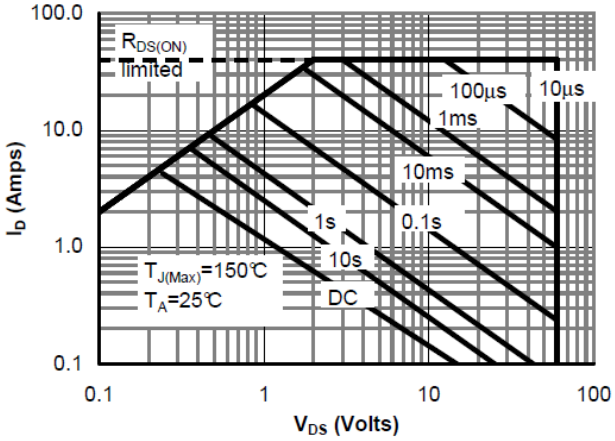


Figure 9: Maximum Forward Biased Safe Operating Area

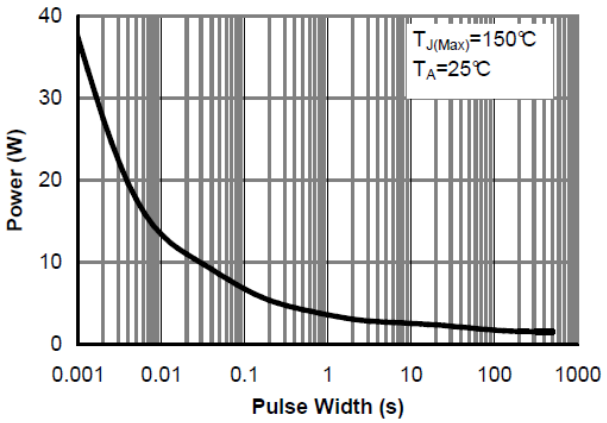


Figure 10: Single Pulse Power Rating Junction-to-Ambient

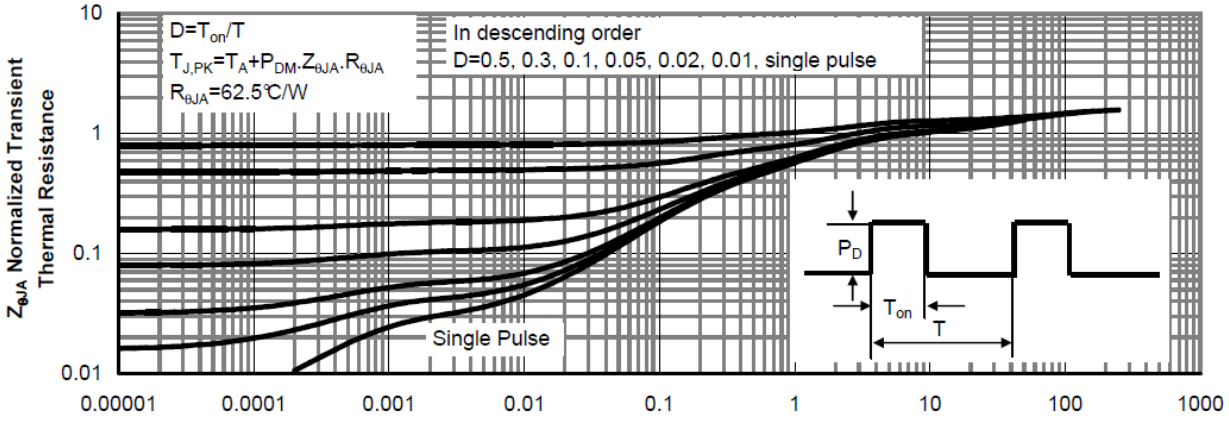


Figure 11: Normalized Maximum Transient Thermal Impedance

- **P-channel Typical Performance Characteristics（(TJ = 25 °C, unless otherwise noted)）**

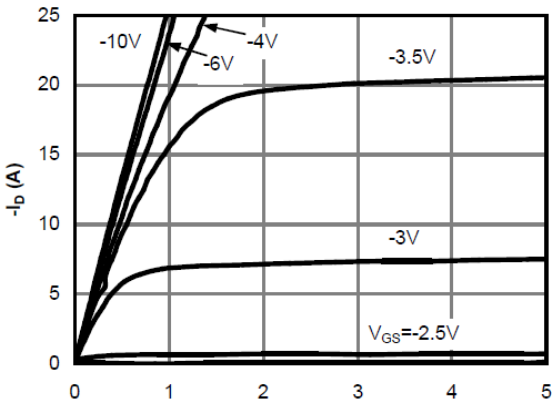


Fig 1: On-Region Characteristics

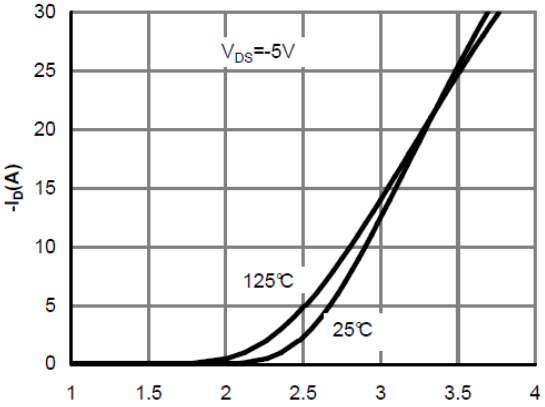
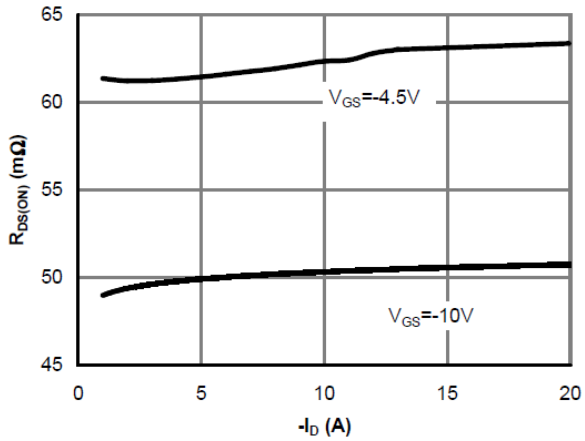


Figure 2: Transfer Characteristics



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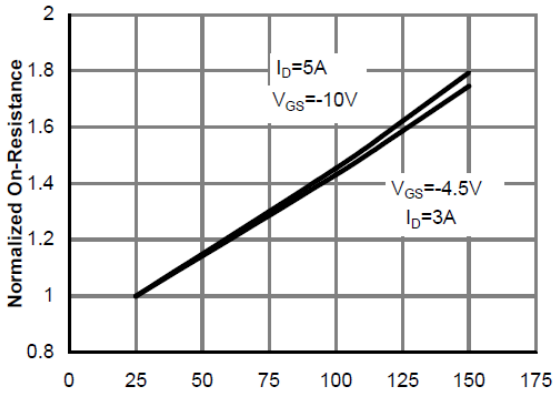


Figure 4: On-Resistance vs. Junction Temperature

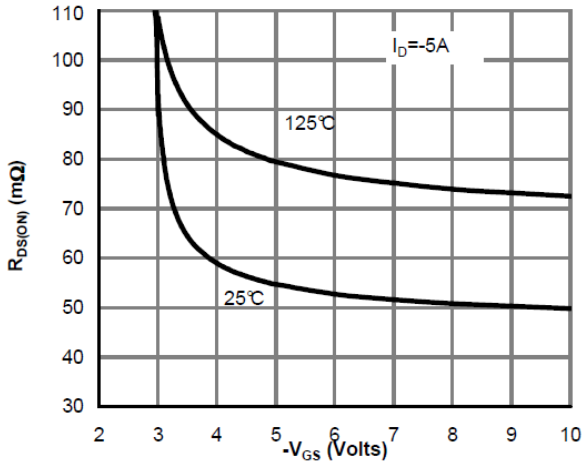


Figure 5: On-Resistance vs. Gate-Source Voltage

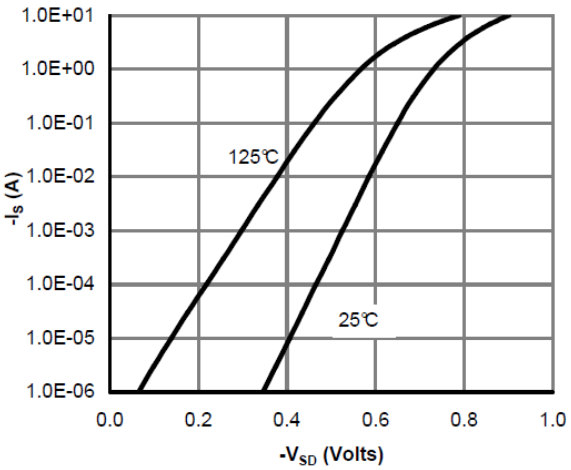


Figure 6: Body-Diode Characteristics

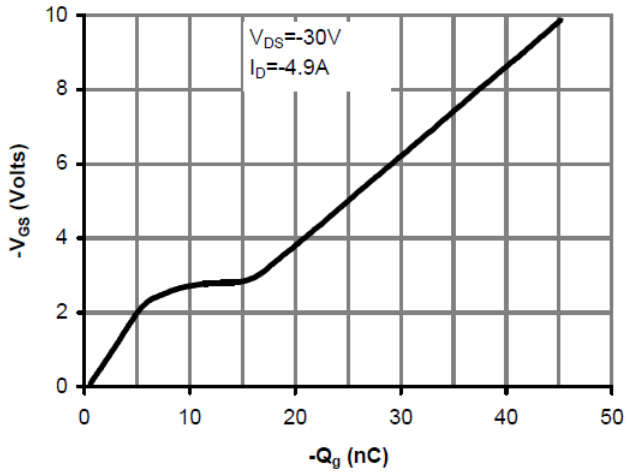


Figure 7: Gate-Charge Characteristics

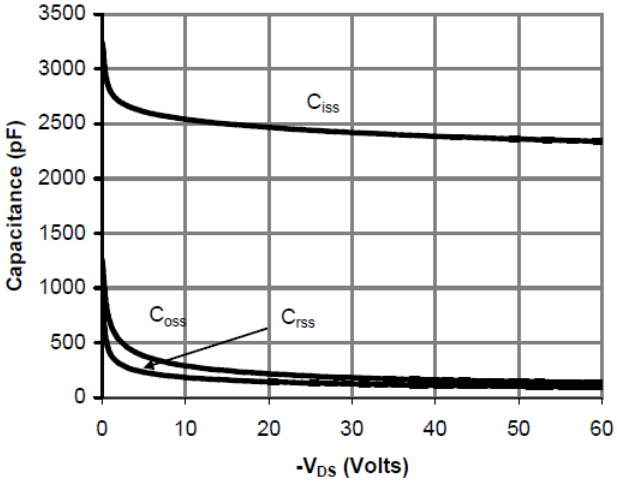
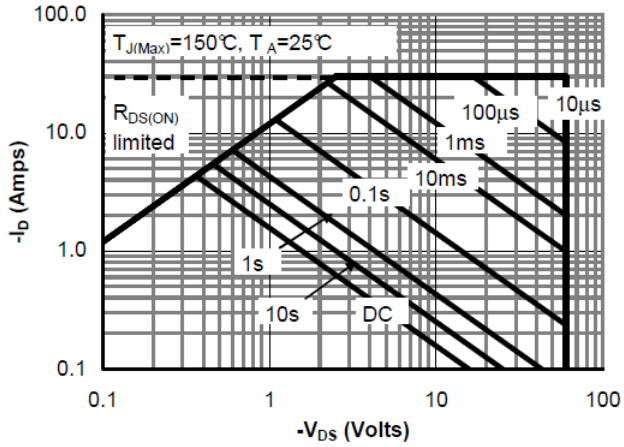


Figure 8: Capacitance Characteristics



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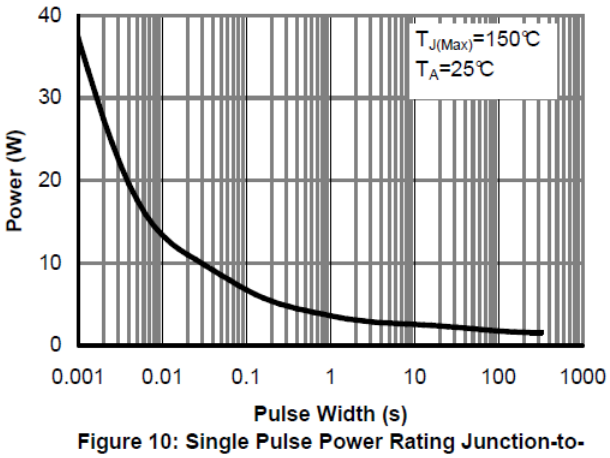


Figure 10: Single Pulse Power Rating Junction-to-Ambient

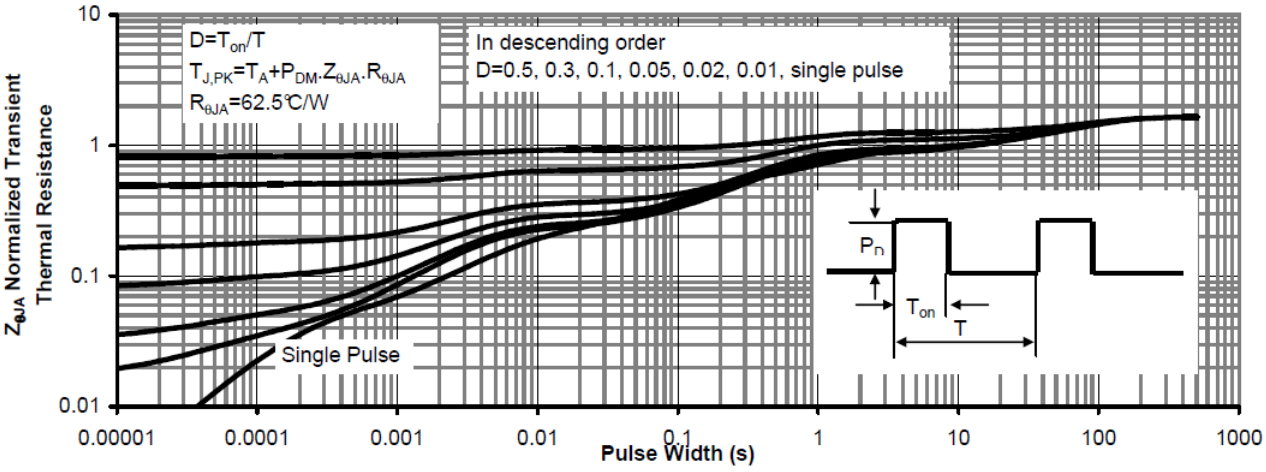
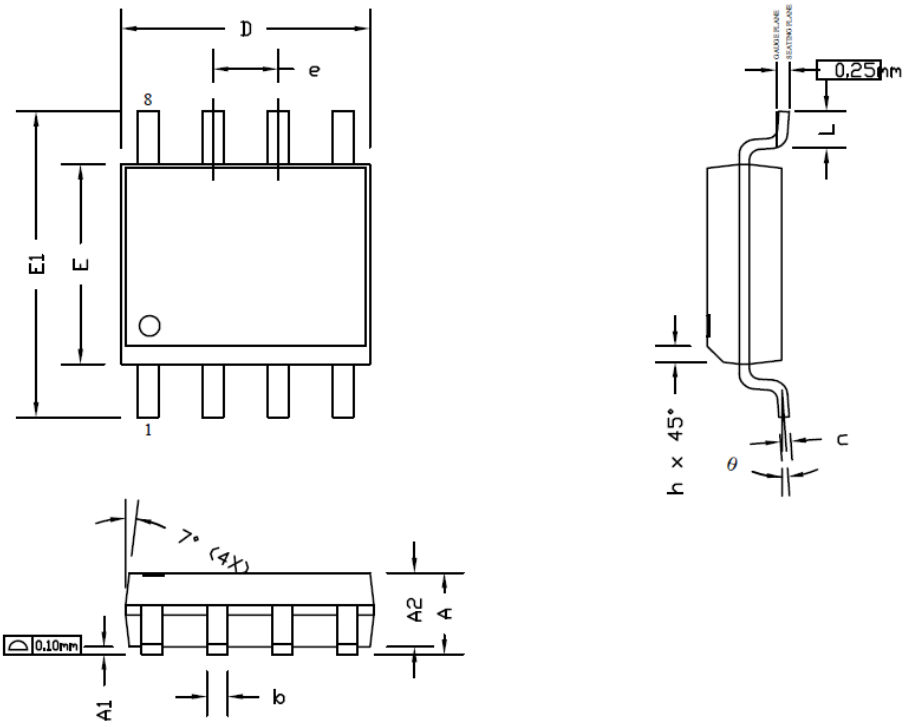
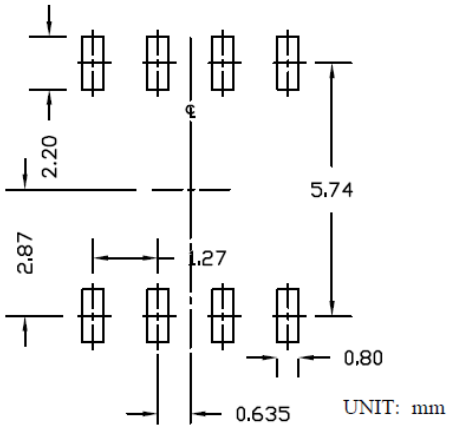


Figure 11: Normalized Maximum Transient Thermal Impedance

- **Package Information**



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	0.15	0.25	0.004	0.006	0.010
A2	1.25	1.50	1.65	0.049	0.059	0.065
b	0.31	0.41	0.51	0.012	0.016	0.020
c	0.17	0.20	0.25	0.007	0.008	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	0.30	0.50	0.010	0.012	0.020
L	0.40	0.69	1.27	0.016	0.027	0.050
θ	0°	4°	8°	0°	4°	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.