

60V Complementary Enhancement Mode Power MOSFET

● **Features**

N-channel

$V_{DS} = 60V,$

$I_D = 4.4A$

$R_{DS(ON)}$

$V_{GS} = 10V, TYP 37 m\Omega$

$V_{GS} = 4.5V, TYP 43 m\Omega$

P-channel

$V_{DS} = -60 V$

$I_D = -4.2A$

$R_{DS(ON)}$

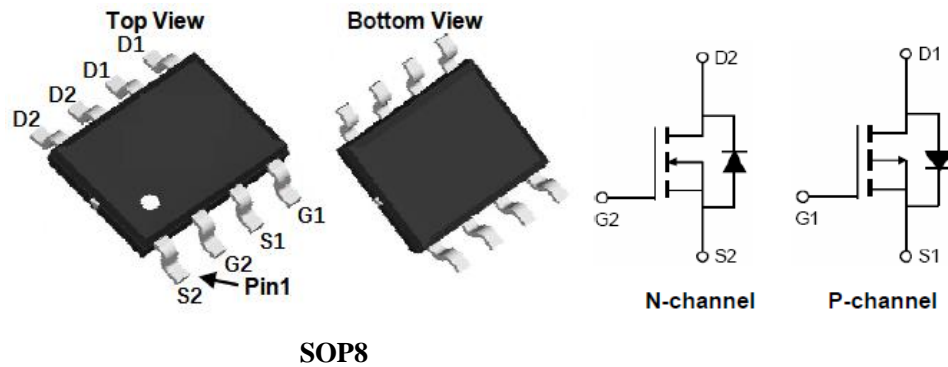
$V_{GS} = -10V, TYP 53 m\Omega$

$V_{GS} = -4.5V, TYP 60 m\Omega$

● **General Description**

- used in inverter
- other applications

● **Pin Configurations**



SOP8

● **Absolute Maximum Ratings @ $T_A=25^\circ C$ 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	$T_A=25^\circ C$	I_D	4.4	-4.2	A
	$T_A=70^\circ C$		3.5	-3.4	
Drain Current (Pulse) *B		I_{DM}	21	-17	A
Power Dissipation	$T_A=25^\circ C$	P_D	2		W
Operating Temperature/ Storage Temperature		T_J/T_{STG}	-55~150	-55~150	$^\circ C$

● **Thermal Resistance Ratings**

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

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

● **N-channel Electrical Characteristics @ $T_A=25^{\circ}\text{C}$ unless otherwise noted**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	60	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 48V, V_{GS} = 0V$	--	--	1	μA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_{DS} = 250\mu A$	1	1.6	3	V
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	--	--	± 100	nA
Drain-Source On-state Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 5.3A$	--	37	48	m Ω
	$R_{DS(on)}$	$V_{GS} = 4.5V, I_D = 4.7A$	--	43	56	m Ω
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	$T_A = 25^{\circ}\text{C}$	--	--	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	$t_{d(on)}$	$V_{GS} = 10V, V_{DS} = 30V, R_L = 4.7\Omega, R_{GEN} = 3\Omega$	--	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}	$V_{GS} = 0V, V_{DS} = 30V, f = 1\text{MHz}$	--	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 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.

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

C: The current rating is based on the $t_s \leq 10s$ junction to ambient thermal resistance rating.

● P-channel Electrical Characteristics @T_A=25°C 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_{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.

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

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

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

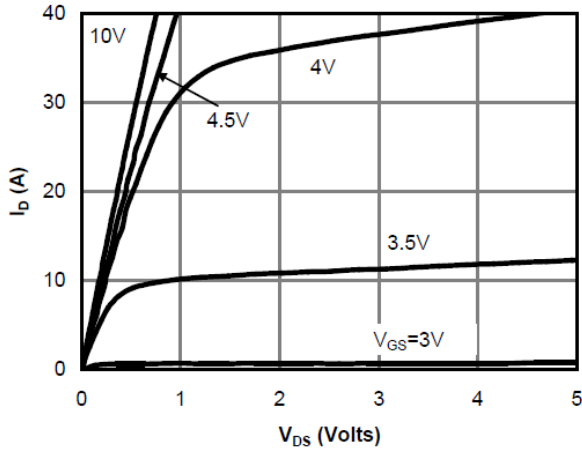


Fig 1: On-Region Characteristics

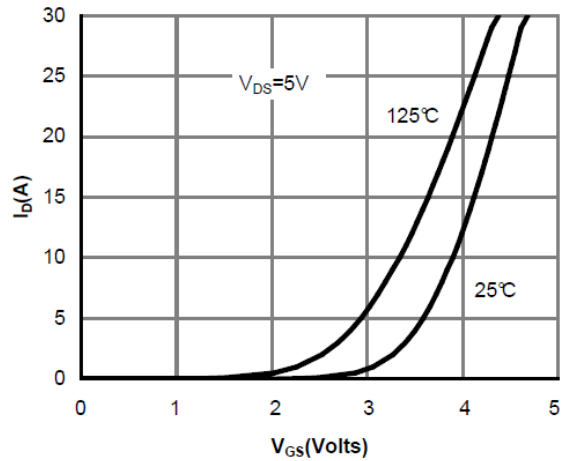


Figure 2: Transfer Characteristics

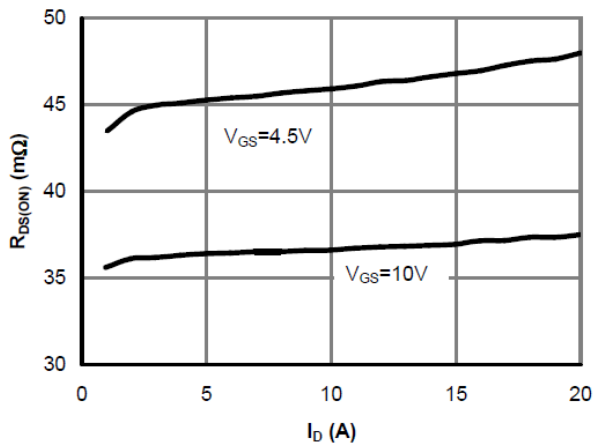


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

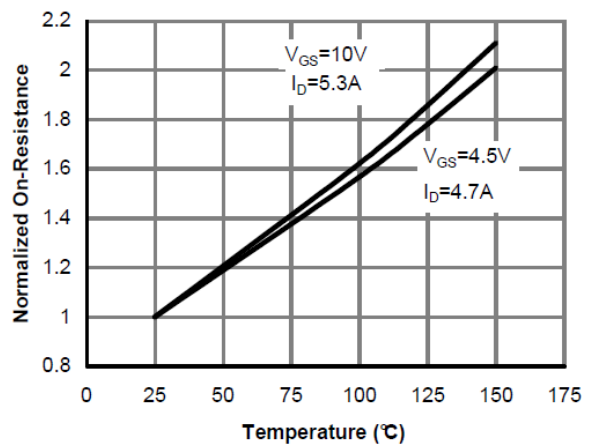


Figure 4: On-Resistance vs. Junction Temperature

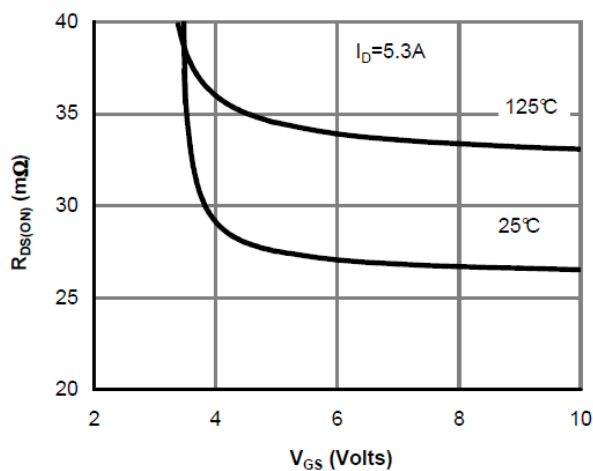


Figure 5: On-Resistance vs. Gate-Source Voltage

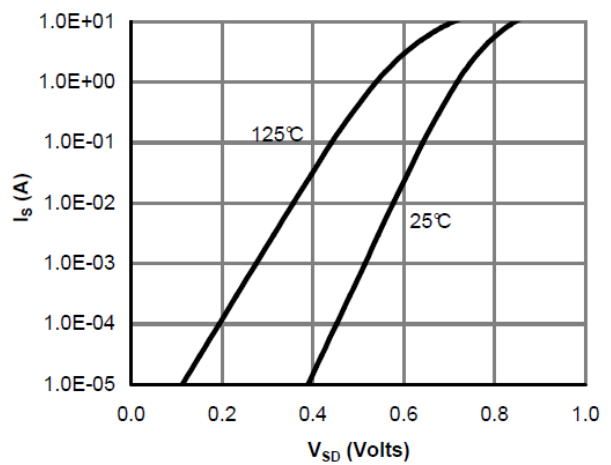


Figure 6: Body-Diode Characteristics

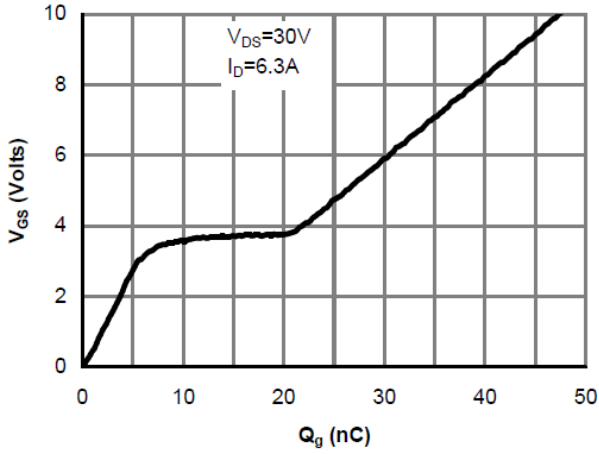


Figure 7: Gate-Charge Characteristics

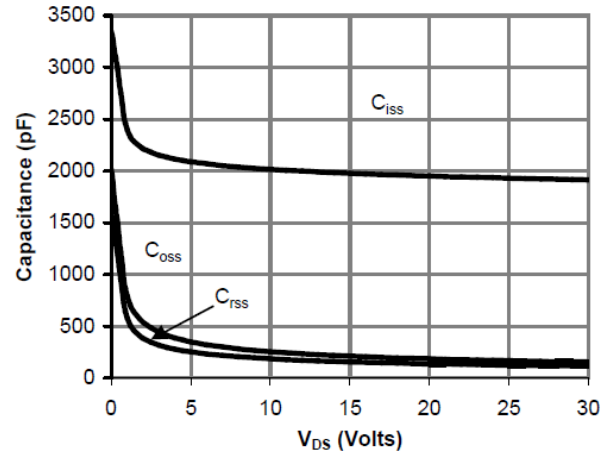


Figure 8: Capacitance Characteristics

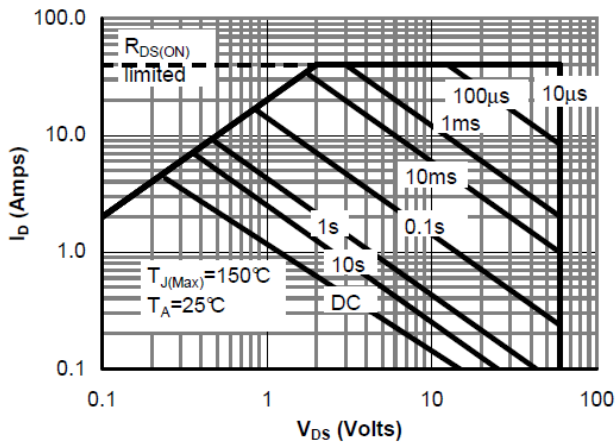


Figure 9: Maximum Forward Biased Safe Operating Area

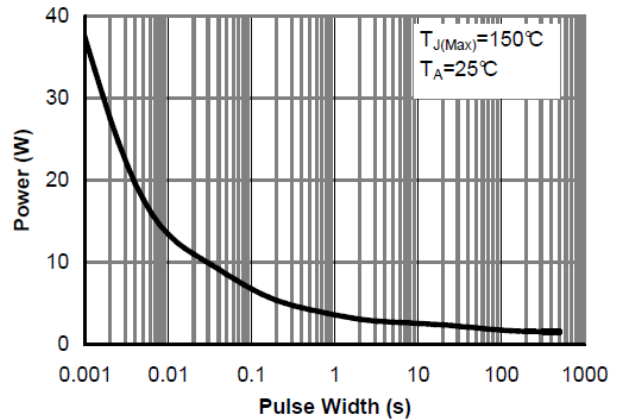


Figure 10: Single Pulse Power Rating Junction-to-Ambient

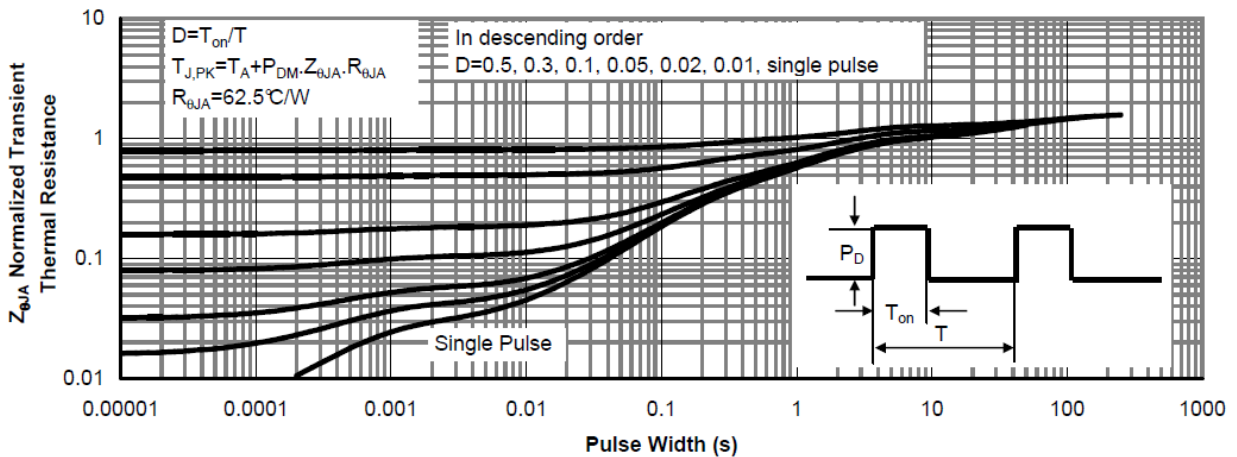


Figure 11: Normalized Maximum Transient Thermal Impedance

● P-channel Typical Performance Characteristics (($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted))

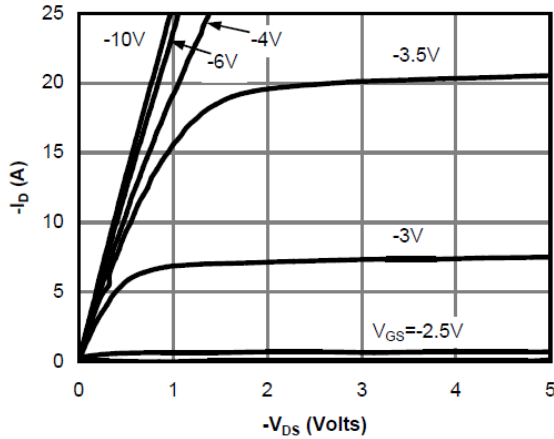


Fig 1: On-Region Characteristics

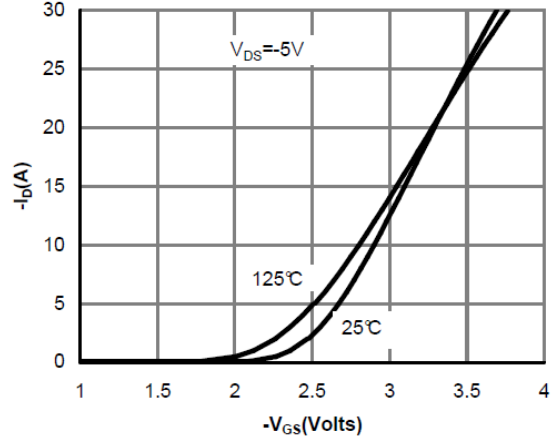


Figure 2: Transfer Characteristics

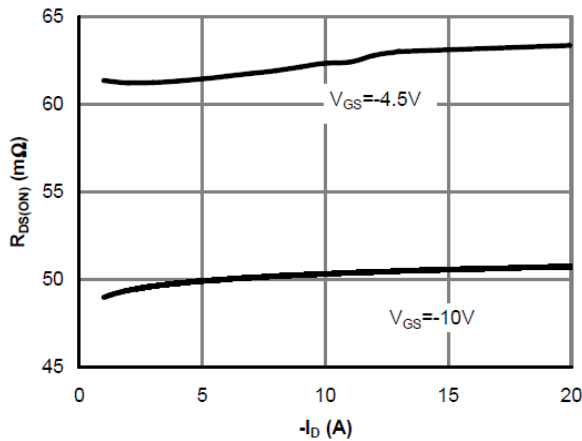


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

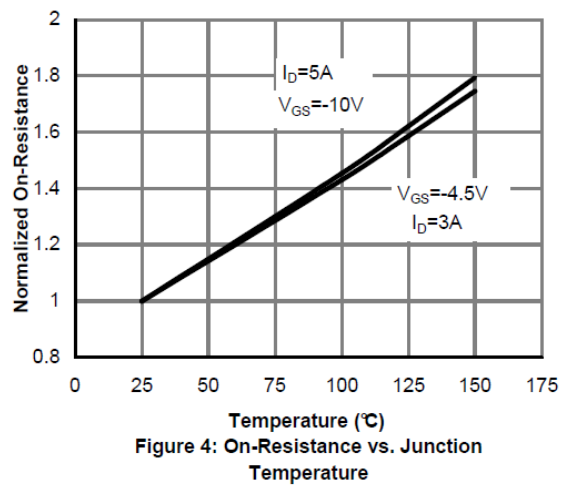


Figure 4: On-Resistance vs. Junction Temperature

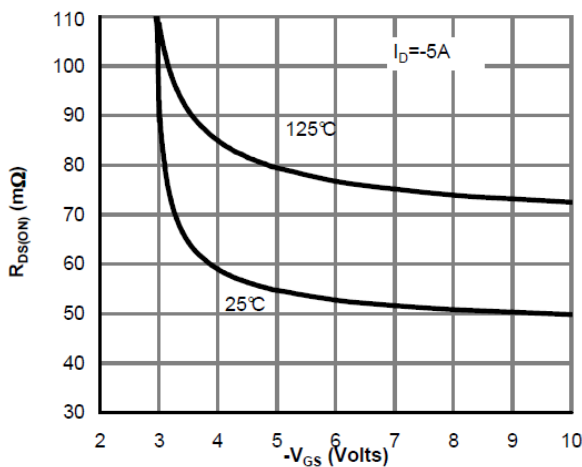


Figure 5: On-Resistance vs. Gate-Source Voltage

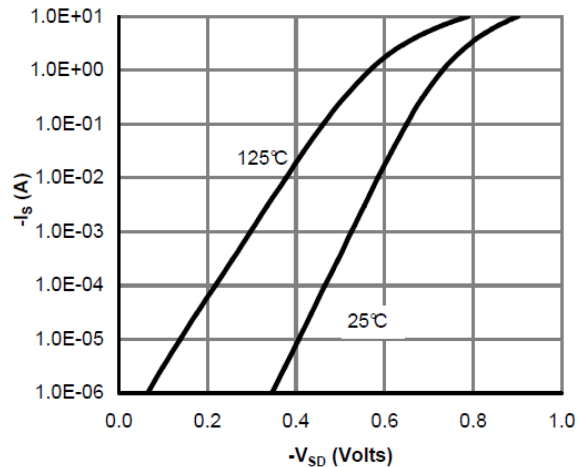


Figure 6: Body-Diode Characteristics

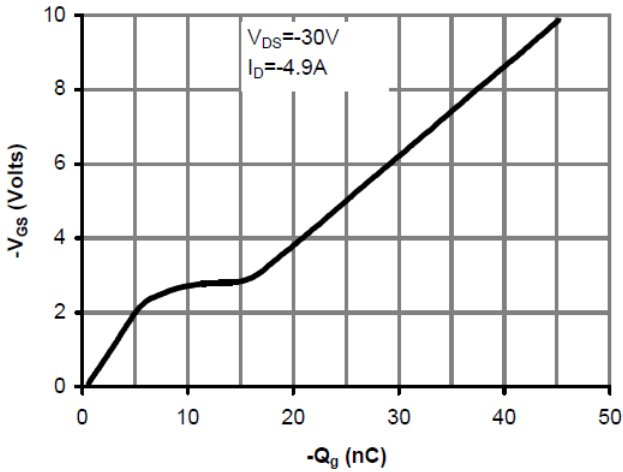


Figure 7: Gate-Charge Characteristics

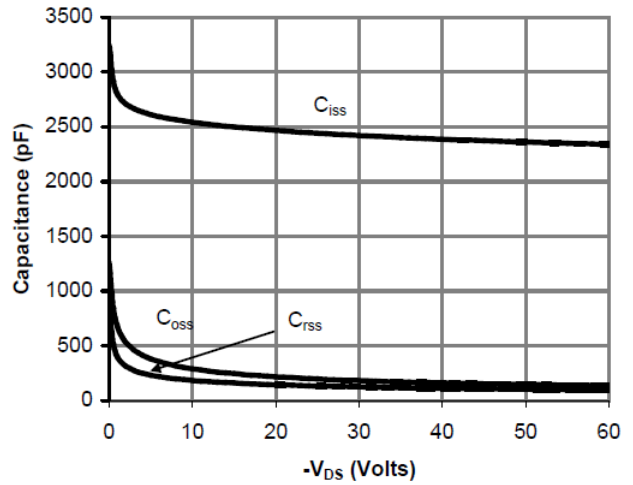


Figure 8: Capacitance Characteristics

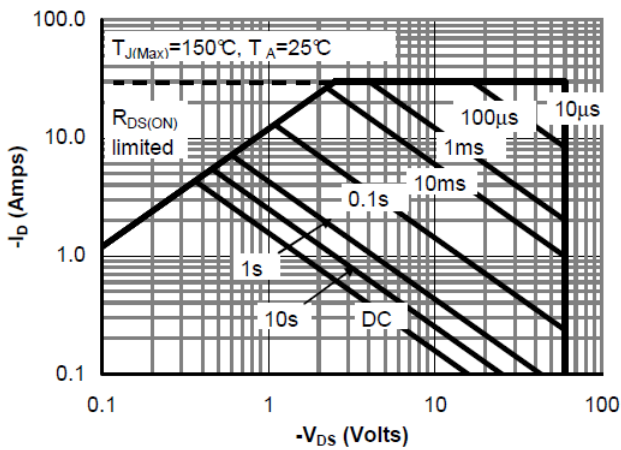


Figure 9: Maximum Forward Biased Safe Operating Area

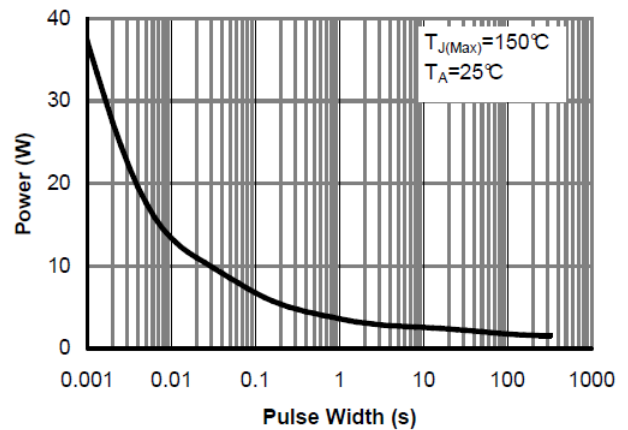


Figure 10: Single Pulse Power Rating Junction-to-Ambient

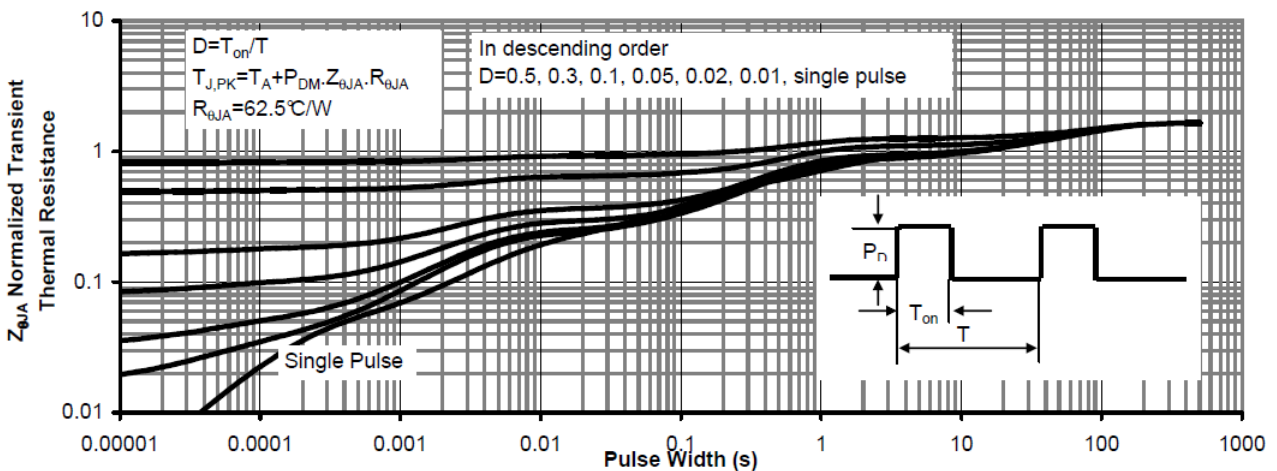
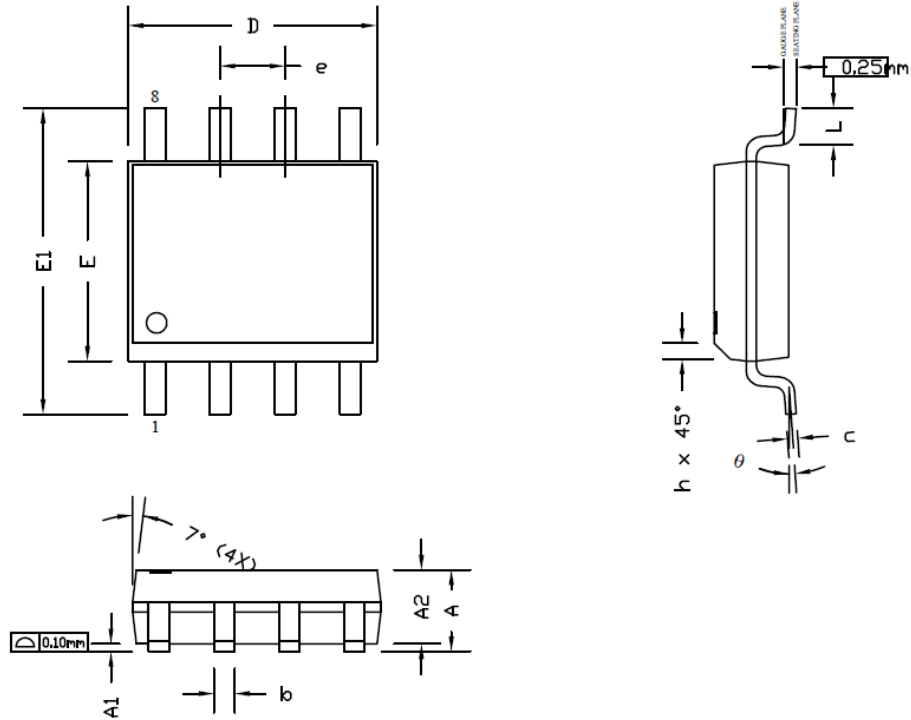
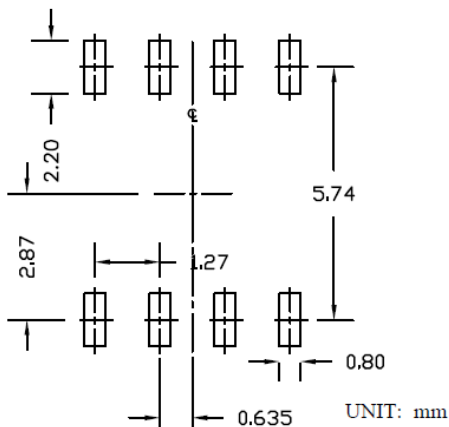


Figure 11: Normalized Maximum Transient Thermal Impedance

● 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 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.

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