freescale
飞思卡尔(深圳)功率半导体有限公司

AO4600

Complementary Enhancement Mode
Field Effect Transistor

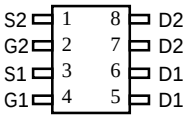
General Description

The AO4600 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications.

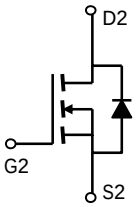
Standard Product AO4600 is Pb-free (meets ROHS & Sony 259 specifications). AO4600L is a Green Product ordering option. AO4600 and AO4600L are electrically identical.

Features

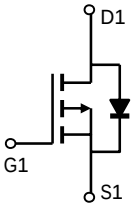
n-channel	p-channel
V_{DS} (V) = 30V	-30V
I_D = 6.9A (V_{GS} = 10V)	-5A (V_{GS} = -10V)
$R_{DS(ON)}$	
< 27mΩ	< 49mΩ (V_{GS} =- 10V)
< 32mΩ	< 64mΩ (V_{GS} =- 4.5V)
< 50mΩ	< 120mΩ (V_{GS} = -2.5V)



SOIC-8



n-channel



p-channel

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}	±12	±12	V
Continuous Drain Current [A]	T_A=25°C	I_D	6.9	-5	A
	T_A=70°C		5.8	-4.2	
Pulsed Drain Current [B]		I_{DM}	40	-30	
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.44	1.44	
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]	t ≤ 10s	$R_{\theta JA}$	48	62.5	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		74	110	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	35	40	°C/W

n-channel MOSFET 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}=24V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.7	1	1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=6.9A		22.6	27	mΩ
		T_J=125°C		33	40	
		V_{GS}=4.5V, I_D=6.0A		27	32	mΩ
		V_{GS}=2.5V, I_D=5A		42	50	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=5A	12	16		S
V_{SD}	Diode Forward Voltage	I_S=1A		0.71	1	V
I_S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		858	1050	pF
C_{oss}	Output Capacitance			110		pF
C_{rss}	Reverse Transfer Capacitance			80		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.4	2	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=6.9A		9.6	12	nC
Q_{gs}	Gate Source Charge			1.65		nC
Q_{gd}	Gate Drain Charge			3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=2.2Ω, R_{GEN}=6Ω		5.7		ns
t_r	Turn-On Rise Time			13		ns
$t_{D(off)}$	Turn-Off DelayTime			37		ns
t_f	Turn-Off Fall Time			4.2		ns
t_{rr}	Body Diode Reverse Recovery time	I_F=5A, dI/dt=100A/µs		15.5	20	ns
Q_{rr}	Body Diode Reverse Recovery charge	I_F=5A, dI/dt=100A/µs		7.9		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 80µs 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.

TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

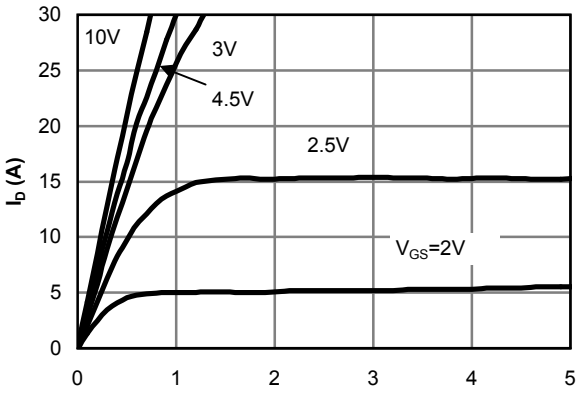


Fig 1: On-Region Characteristics

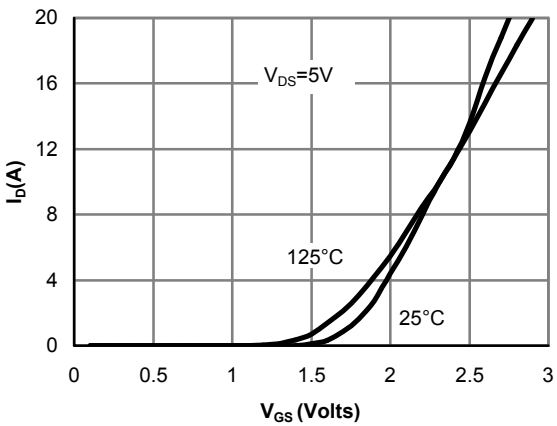


Figure 2: Transfer Characteristics

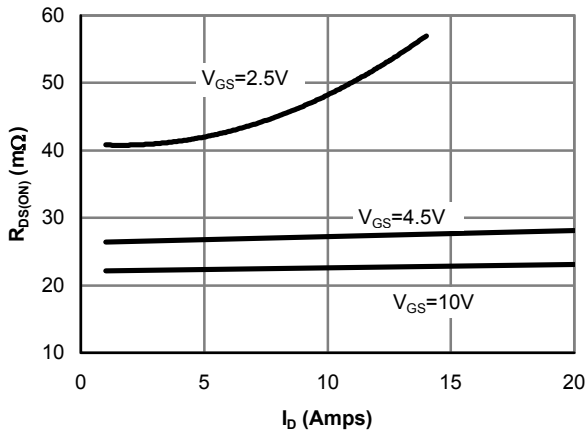


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

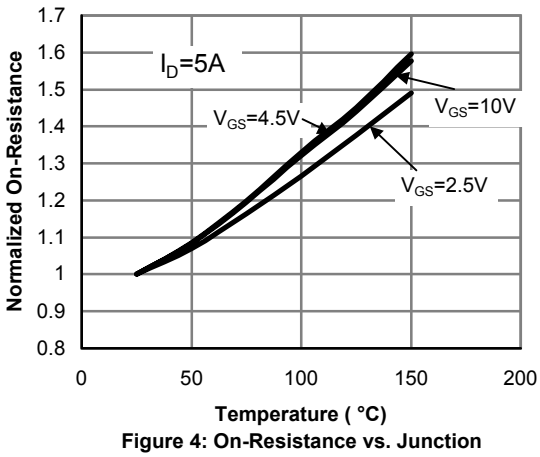


Figure 4: On-Resistance vs. Junction Temperature

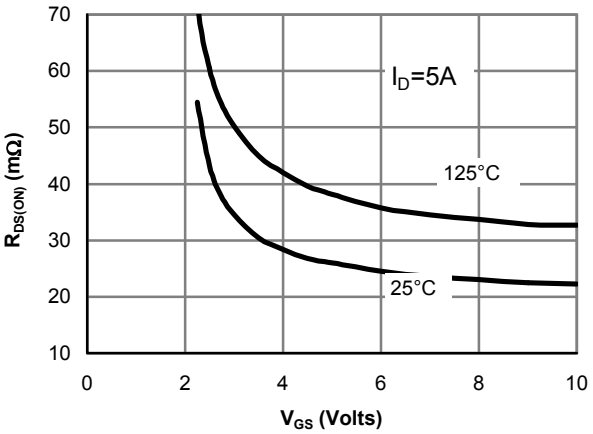


Figure 5: On-Resistance vs. Gate-Source Voltage

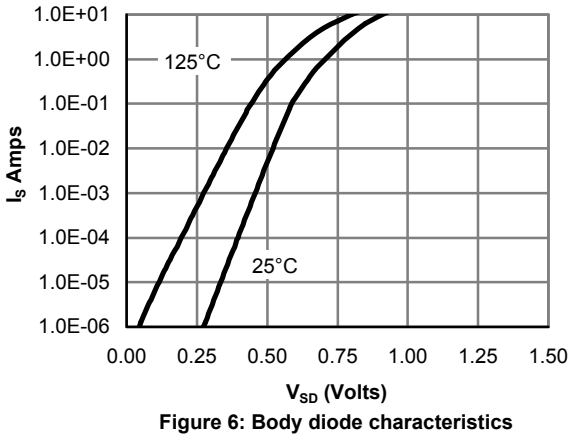


Figure 6: Body diode characteristics

TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

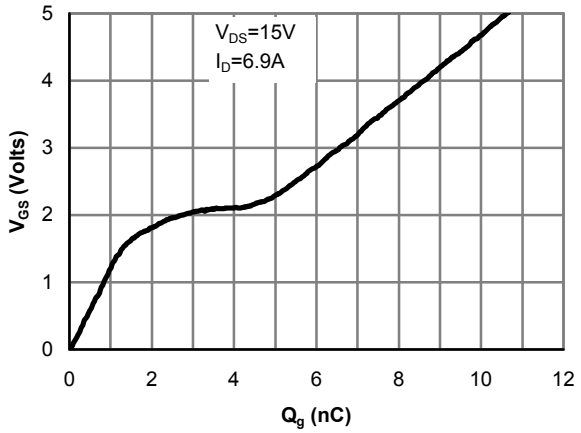


Figure 7: Gate-Charge characteristics

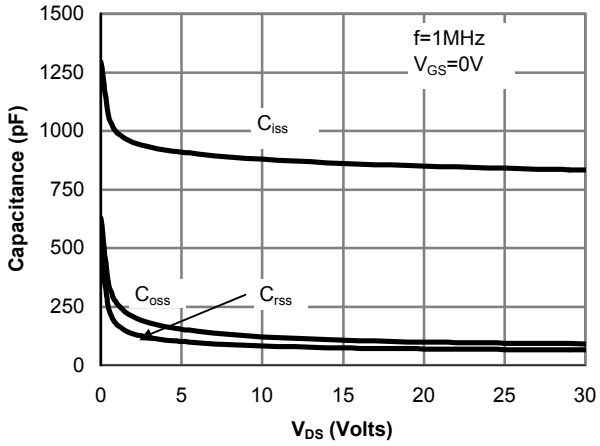


Figure 8: Capacitance Characteristics

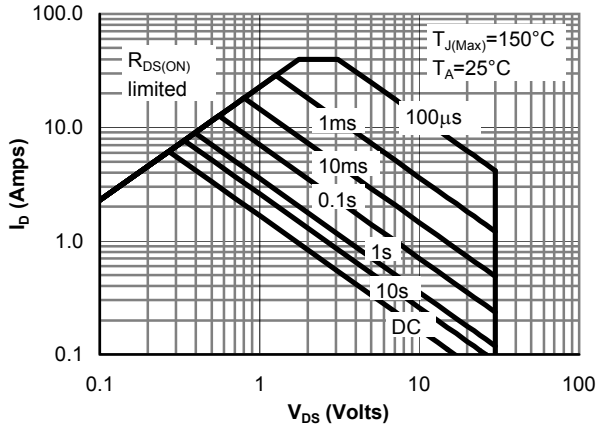


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

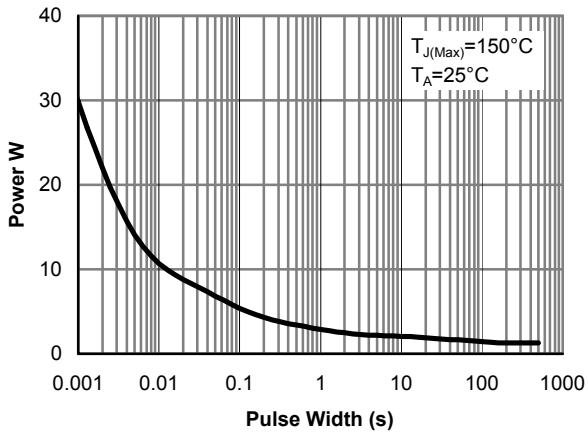


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

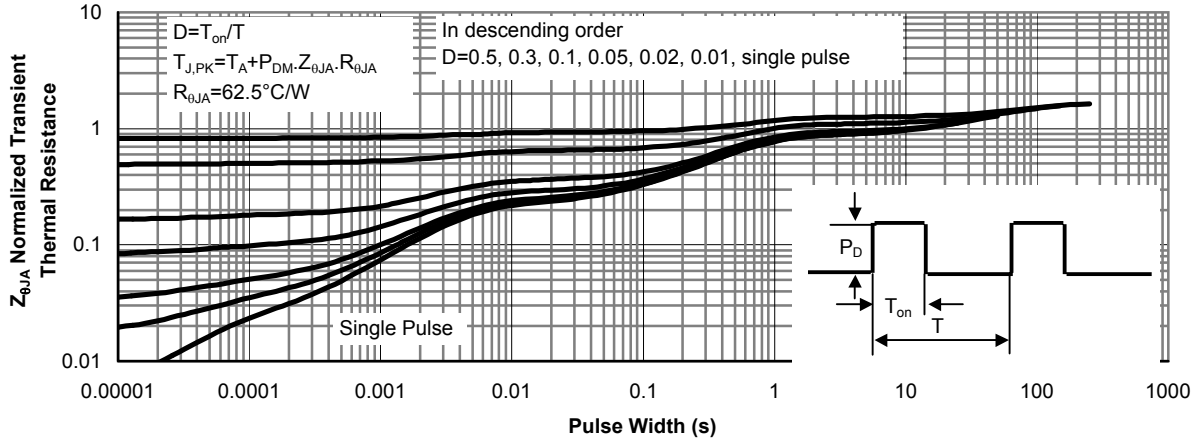


Figure 11: Normalized Maximum Transient Thermal Impedance

p-channel MOSFET 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}=-24V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±12V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.7	-1	-1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-5A		42.5	49	mΩ
		T_J=125°C			74	
		V_{GS}=-4.5V, I_D=-4A		54	64	mΩ
		V_{GS}=-2.5V, I_D=-1A		80	120	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-5A	7	11		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.75	-1	V
I_S	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		952	1200	pF
C_{oss}	Output Capacitance			103		pF
C_{rss}	Reverse Transfer Capacitance			77		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		5.9	30	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-15V, I_D=-5A		9.5	12	nC
Q_{gs}	Gate Source Charge			2		nC
Q_{gd}	Gate Drain Charge			3.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=3Ω, R_{GEN}=6Ω		12		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			37		ns
t_f	Turn-Off Fall Time			12		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-5A, dI/dt=100A/µs		21	26	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-5A, dI/dt=100A/µs		13		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 6,12,14 are obtained using 80µs 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.

Rev 4 : Sept 2005

TYPICAL P-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

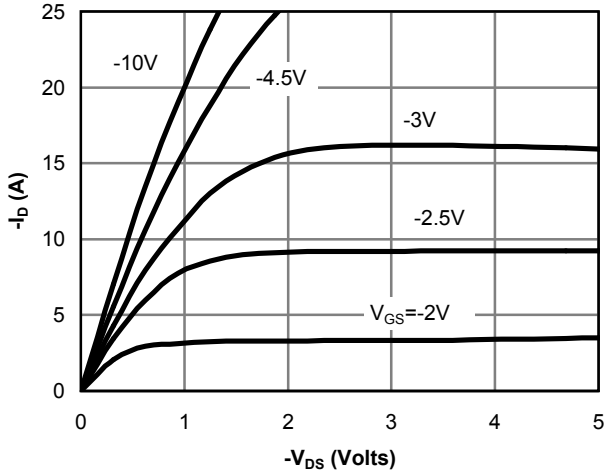


Fig 1: On-Region Characteristics

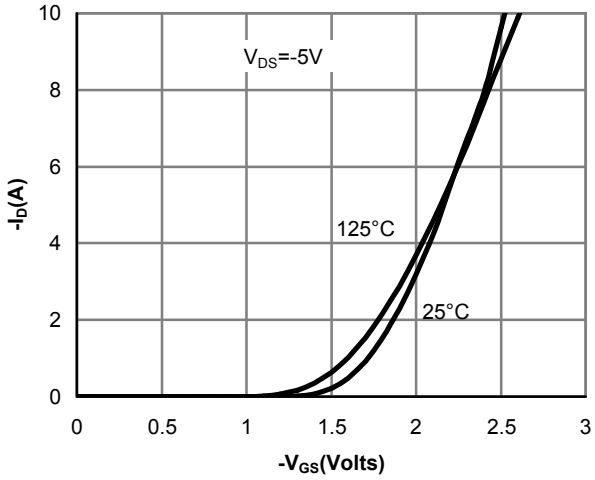


Figure 2: Transfer Characteristics

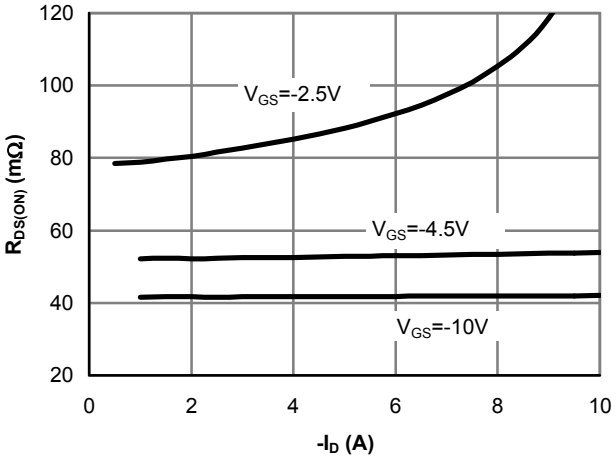


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

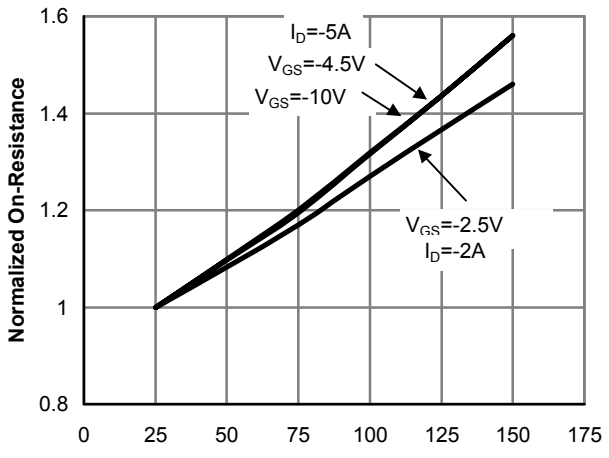


Figure 4: On-Resistance vs. Junction Temperature

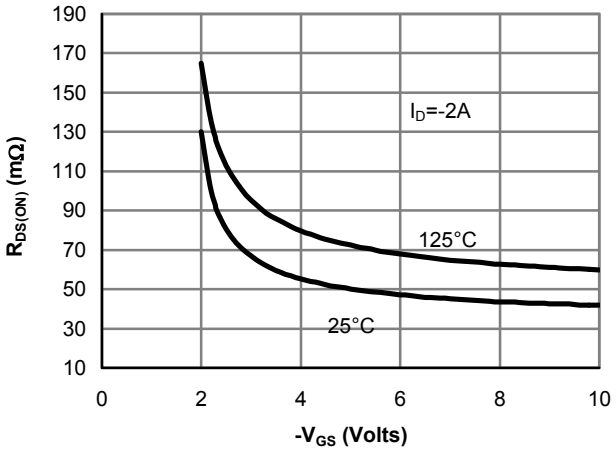


Figure 5: On-Resistance vs. Gate-Source Voltage

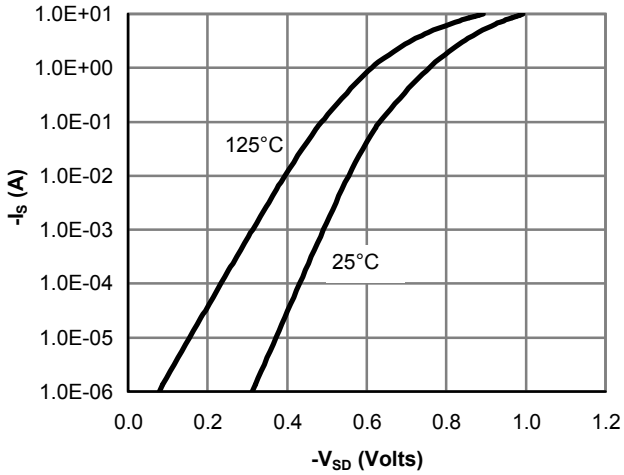


Figure 6: Body-Diode Characteristics

TYPICAL P-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

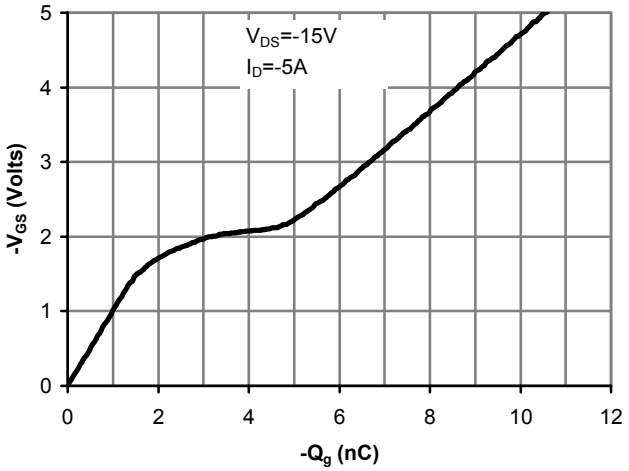


Figure 7: Gate-Charge Characteristics

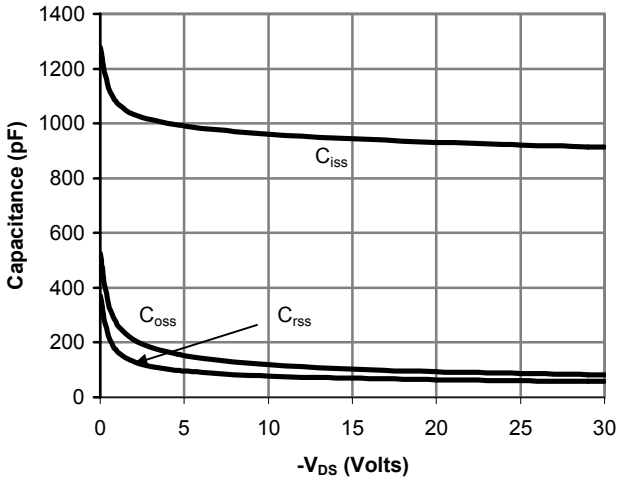


Figure 8: Capacitance Characteristics

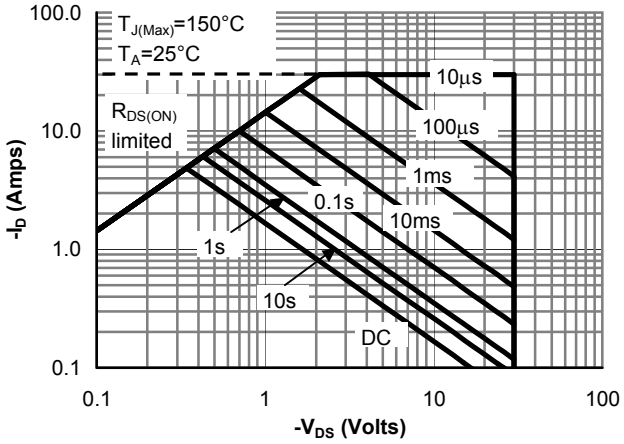


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

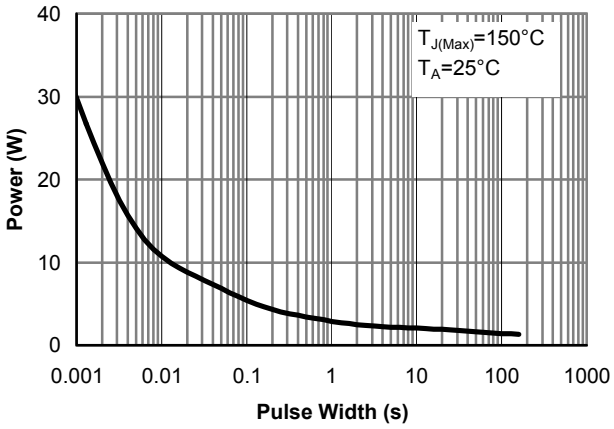


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

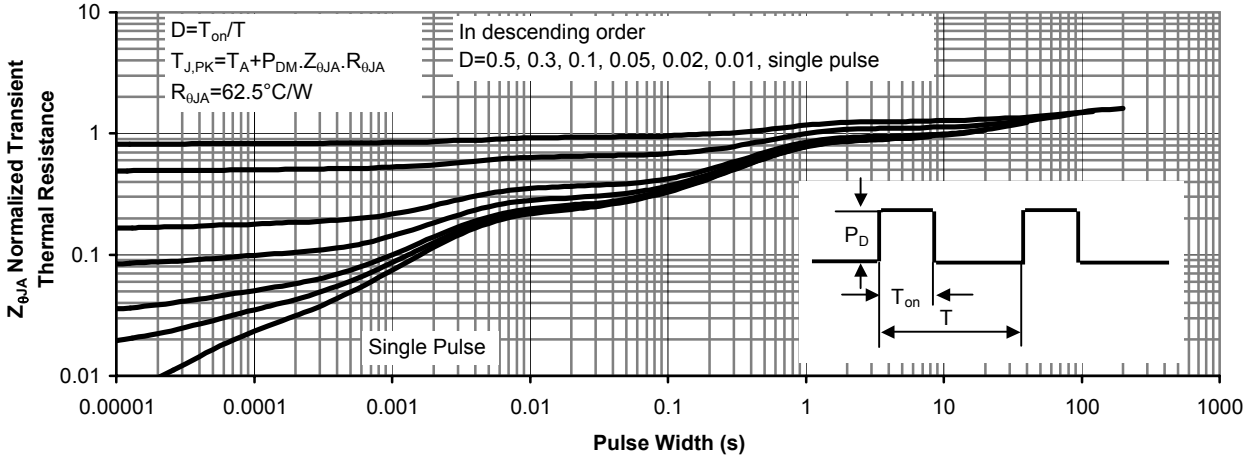
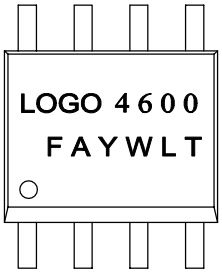
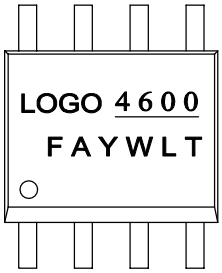


Figure 11: Normalized Maximum Transient Thermal Impedance

SO-8 PACKAGE MARKING DESCRIPTION



Standard product



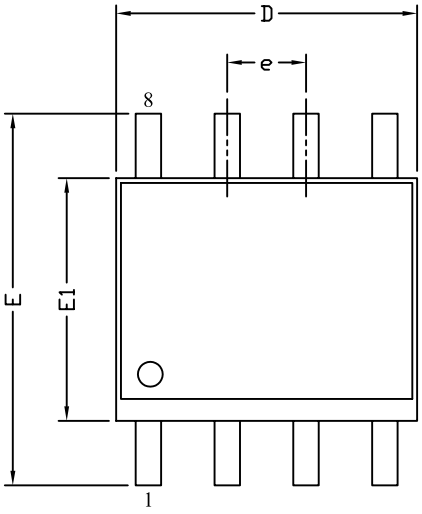
Green product

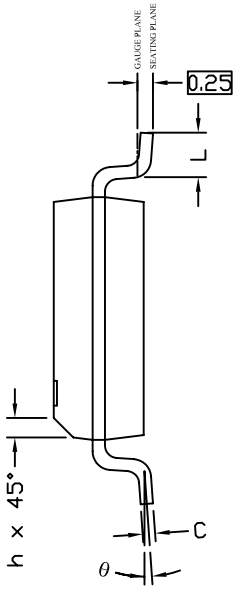
NOTE:
LOGO - AOS LOGO
4600 - PART NUMBER CODE.
F&A - FOUNDRY AND ASSEMBLY LOCATION
Y - YEAR CODE
W - WEEK CODE.
L T - ASSEMBLY LOT CODE

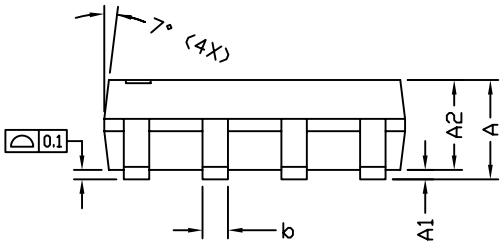
PART NO.	DESCRIPTION	CODE
AO4600	Standard product	4600
AO4600L	Green product	4600

Document No.	PO-00004
Version	rev F

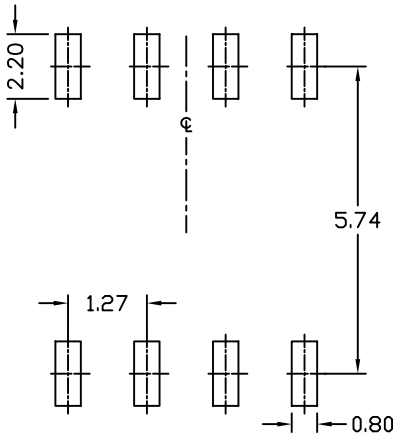
SO-8L PACKAGE OUTLINE







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
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27 BSC			0.050 BSC		
E	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°

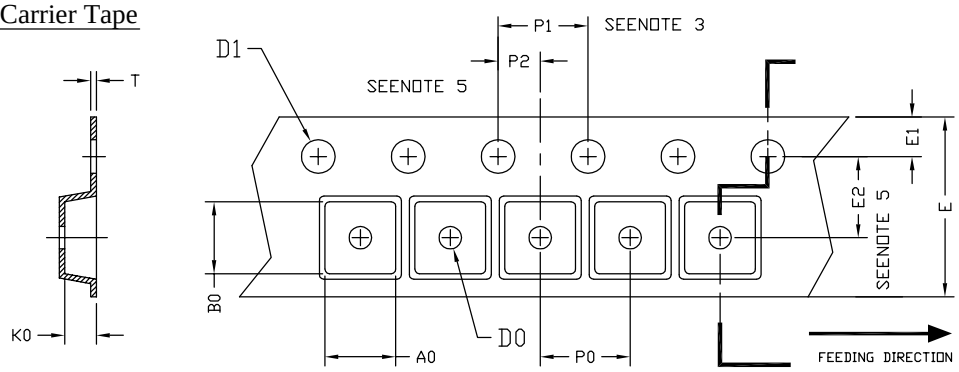
UNIT: mm

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.
4. DIMENSION L IS MEASURED IN GAUGE PLANE.
5. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

freescale
飞思卡尔(深圳)功率半导体有限公司

SO-8 Tape and Reel Data

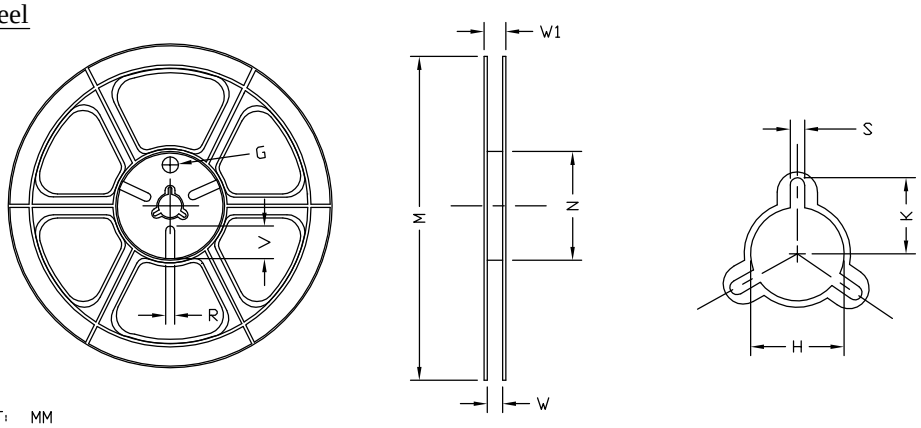
SO-8 Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SO-8 (12 mm)	6.40 ±0.10	5.20 ±0.10	2.10 ±0.10	1.60 ±0.10	1.50 +0.10	12.00 ±0.30	1.75 ±0.10	5.50 ±0.05	8.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

SO-8 Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
12 mm	ø330	ø330.00 ±0.50	ø97.00 ±0.10	13.00 ±0.30	17.40 ±1.00	ø13.00 +0.50 −0.20	10.60	2.00 ±0.50	---	---	---

SO-8 Tape

Leader / Trailer & Orientation