



AP4580 Full-bridge of MOSFET

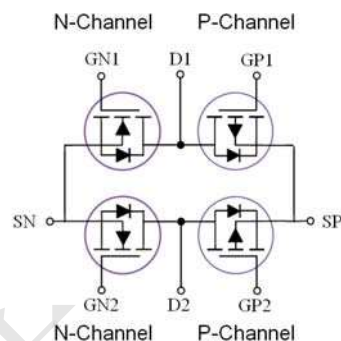
Features

N-Channel

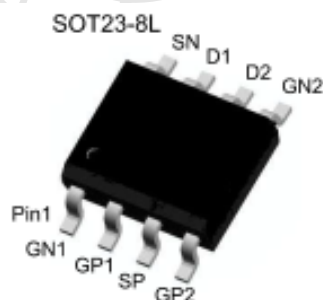
- $BV_{DSS} = 20V$
- $R_{DS(on)} (@V_{GS} = 4.5V) < 72m\Omega$
- $R_{DS(on)} (@V_{GS} = 2.5V) < 90m\Omega$
- Advanced Trench Technology
- Excellent $R_{DS(on)}$ and Low Gate Charge
- Lead free product is acquired

P-Channel

- $BV_{DSS} = -20V$
- $R_{DS(on)} (@V_{GS} = -4.5V) < 146m\Omega$
- $R_{DS(on)} (@V_{GS} = -2.5V) < 220m\Omega$



Package



Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Maximum		Units
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 10	± 10	V
Drain Current ($T_A=25^\circ C, t<10s, V_{GS}=10V$)	I_D	2.0	-1.8	A
Drain Current ($T_A=75^\circ C, t<10s, V_{GS}=10V$)		1.5	-1.3	A
Pulsed Drain Current ^a	I_{DM}	12	-10	A
Power Dissipation ^b ($T_A=25^\circ C$)	P_D	1.4	1.4	W
Power Dissipation ^b ($T_A=75^\circ C$)		1.0	0.9	W
Junction and Storage Temperature Range	T_J, T_{STG}	-55 ~ +150	-55 ~ +150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Maximum		Units
		P-Channel	N-Channel	
Junction-to-Ambient ^a ($t \leq 10s$)	$R_{\theta JA}$	100	100	$^\circ C/W$
Junction-to-Ambient ^{a,d} (Steady-State)		130	130	$^\circ C/W$
Junction-to-Lead (Steady-State)	$R_{\theta JL}$	90	90	$^\circ C/W$



N-Channel Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V , I _D = 250uA	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 20V , V _{GS} = 0V			1	uA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±10V, V _{DS} = 0V			±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250uA	0.45	0.7	1.0	V
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} = 2.5V , I _D = 1.0A		70	90	mΩ
		V _{GS} = 4.5V , I _D = 2.0A		60	72	mΩ
g _{FS}	Forward Transconductance	V _{DS} = 5V , I _D = 1.5A		20		S
Drain-Source Diode Characteristics						
V _{SD}	Diode Forward Voltage	V _{GS} = 0V , I _S = 1.0A			1.2	V
I _S	Maximum Body-Diode Continuous Current				2.0	A
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 10V , V _{GS} = 0V f = 1.0MHz		240		pF
C _{oss}	Output Capacitance			45		pF
C _{rss}	Reverse Transfer Capacitance			23		pF
Switching Characteristics						
Q _g	Total Gate Charge	V _{DS} = 10V , I _D = 2.0A V _{GS} = 6V		2.7		nC
Q _{gs}	Gate-Source Charge			0.5		nC
Q _{gd}	Gate-Drain Charge			0.4		nC
t _{D(on)}	Turn-On Delay Time	V _{DD} = 10V , ID = 1A V _{GS} = 6 V R _{GEN} = 6 ohm		2.3		ns
t _r	Turn-On Rise Time			3.2		ns
t _{D(off)}	Turn-Off Delay Time			20		ns
t _f	Turn-Off Fall Time			3		ns

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production



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Typical Electrical and Thermal Characteristics

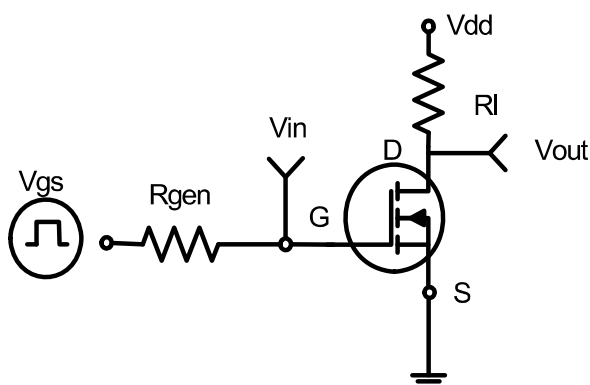


Figure 1: Switching Test Circuit

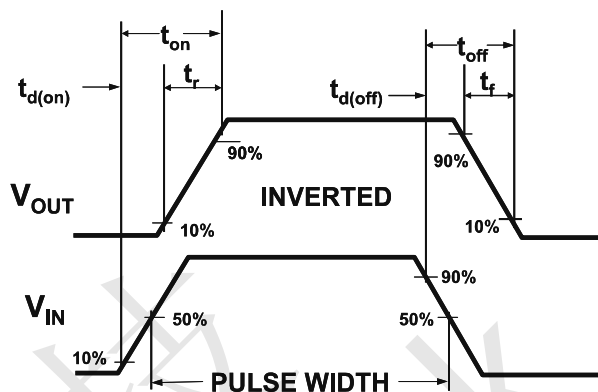


Figure 2: Switching Waveforms

P_D Power(W)

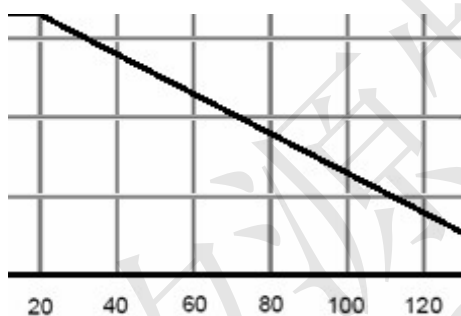


Figure 3 Power Dissipation

I_D - Drain Current (A)

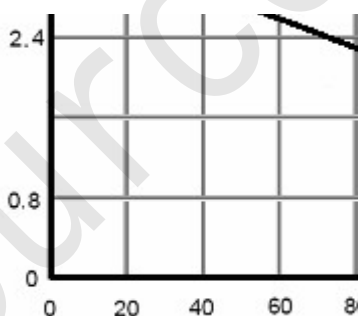


Figure 4 Drain Current

I_D - Drain Current (A)

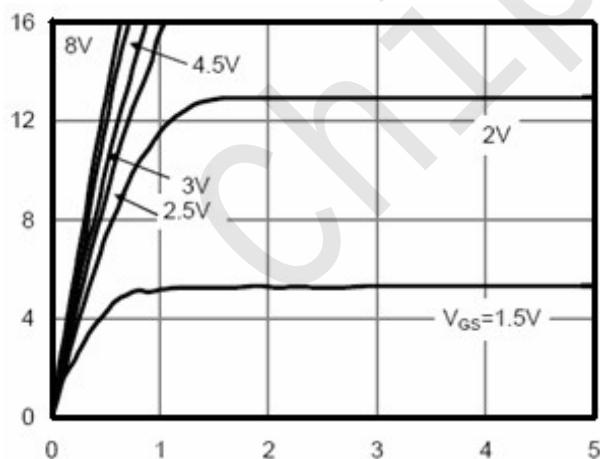


Figure 5 Output Characteristics

$R_{ds(on)}$ On-Resistance(m Ω)

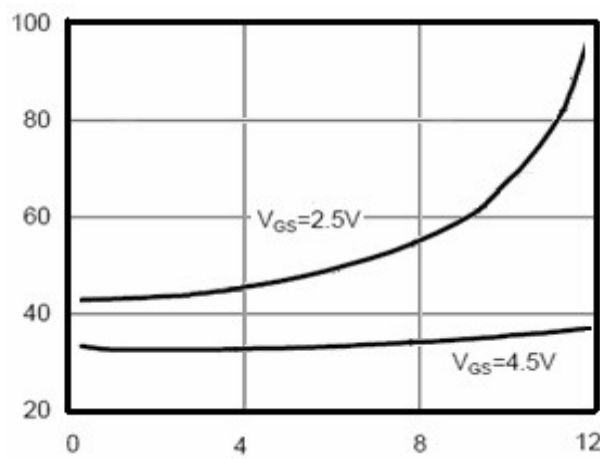
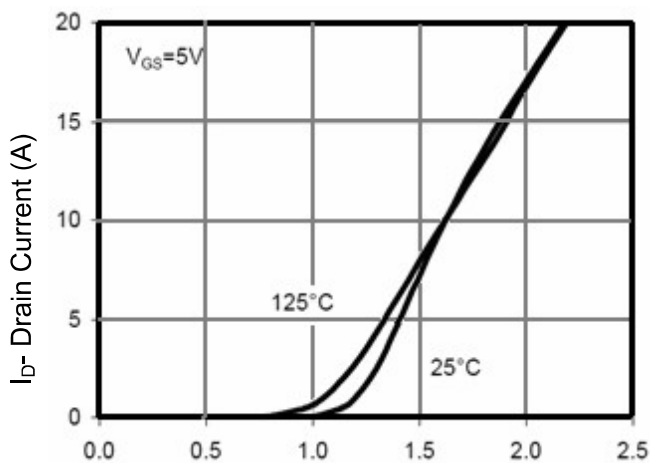


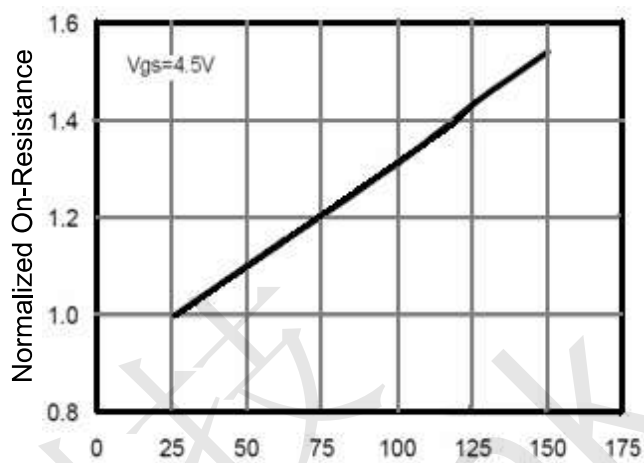
Figure 6 Drain-Source On-Resistance



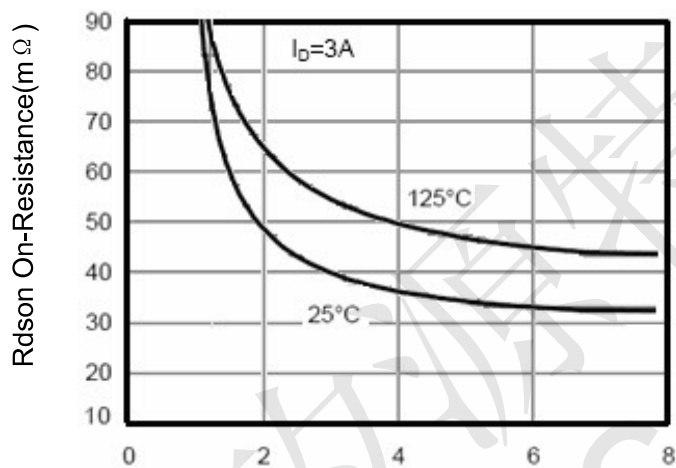
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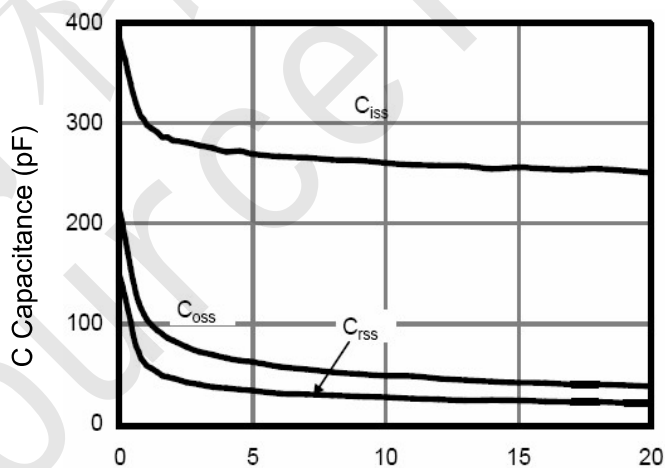
Vgs Gate-Source Voltage (V)
Figure 7 Transfer Characteristics



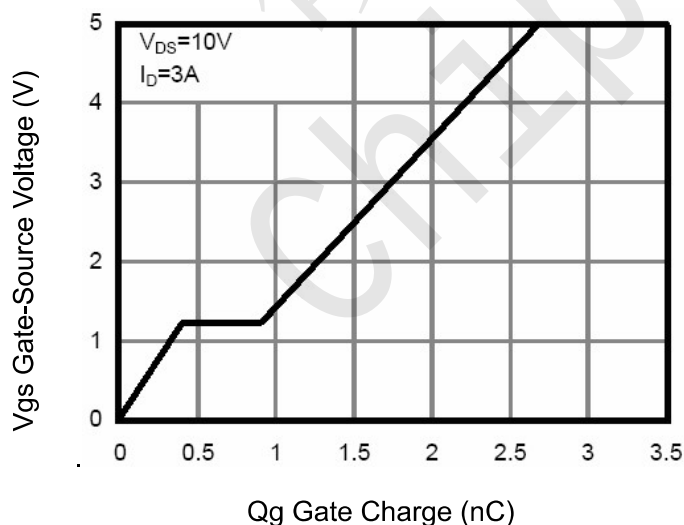
Tj-Junction Temperature(°C)
Figure 8 Drain-Source On-Resistance



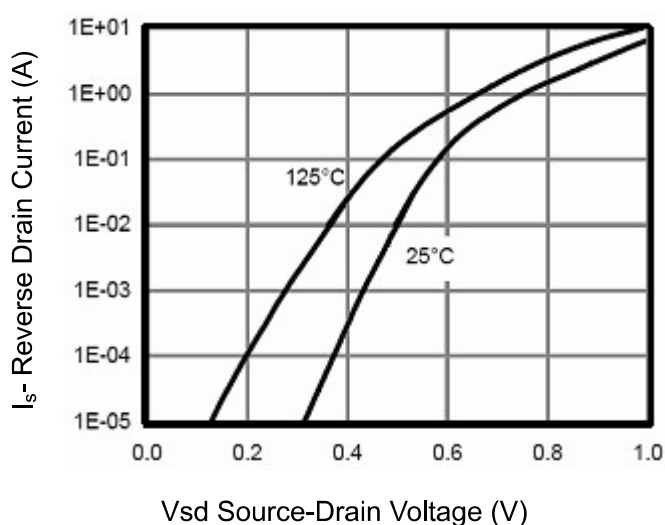
Vgs Gate-Source Voltage (V)
Figure 9 Rdson vs Vgs



Vds Drain-Source Voltage (V)
Figure 10 Capacitance vs Vds



Qg Gate Charge (nC)
Figure 11 Gate Charge



Vsd Source-Drain Voltage (V)
Figure 12 Source- Drain Diode Forward



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P-Channel Electrical Characteristics (T _A = 25°C unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V , I _D = -250uA	-20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -20V , V _{GS} = 0V			-1	uA
I _{GSS}	Gate-Body Leakage Current	V _{GS} = ±10V, V _{DS} = 0V			±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250uA	-0.45	0.7	-1.0	V
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} = -2.5V , I _D = -1.0A		190	220	mΩ
		V _{GS} = -4.5V , I _D = -1.8A		128	146	mΩ
g _{FS}	Forward Transconductance	V _{DS} = -5V , I _D = -1.0A		15		S
Drain-Source Diode Characteristics						
V _{SD}	Diode Forward Voltage	V _{GS} = 0V , I _S = -1.0A			-1.2	V
I _S	Maximum Body-Diode Continuous Current				-1.8	A
Dynamic Characteristics						
C _{iSS}	Input Capacitance	V _{DS} = -10V , V _{GS} = 0V f = 1.0MHz		290		pF
C _{oSS}	Output Capacitance			100		pF
C _{rSS}	Reverse Transfer Capacitance			34		pF
Switching Characteristics						
Q _g	Total Gate Charge	V _{DS} = -10V , I _D = -1.8A V _{GS} = -6V		3.0		nC
Q _{gs}	Gate-Source Charge			0.5		nC
Q _{gd}	Gate-Drain Charge			0.8		nC
t _{D(ON)}	Turn-On Delay Time	V _{DD} = -10V , I _D = -1A V _{GS} = -6 V R _{GEN} = 6 ohm		9.5		ns
t _r	Turn-On Rise Time			4.9		ns
t _{D(OFF)}	Turn-Off Delay Time			21.5		ns
t _f	Turn-Off Fall Time			10		ns

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production



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Typical Electrical and Thermal Characteristics

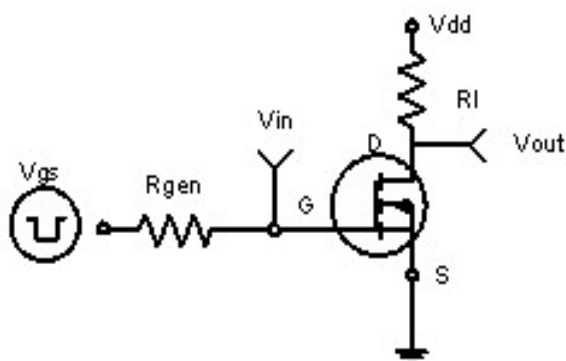


Figure 1: Switching Test Circuit

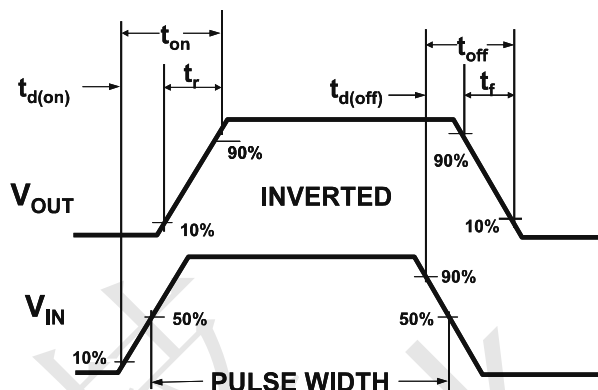


Figure 2: Switching Waveforms

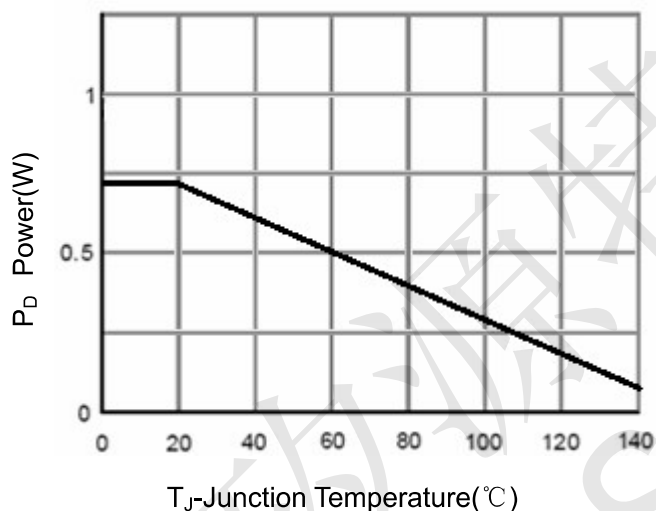


Figure 3 Power Dissipation

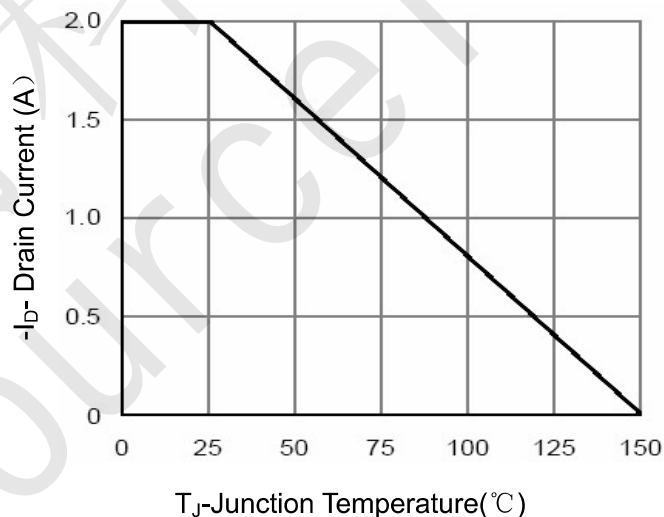


Figure 4 Drain Current

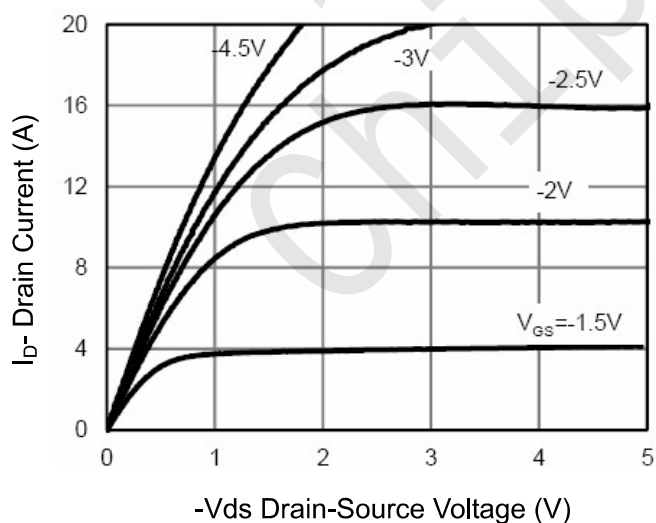


Figure 5 Output Characteristics

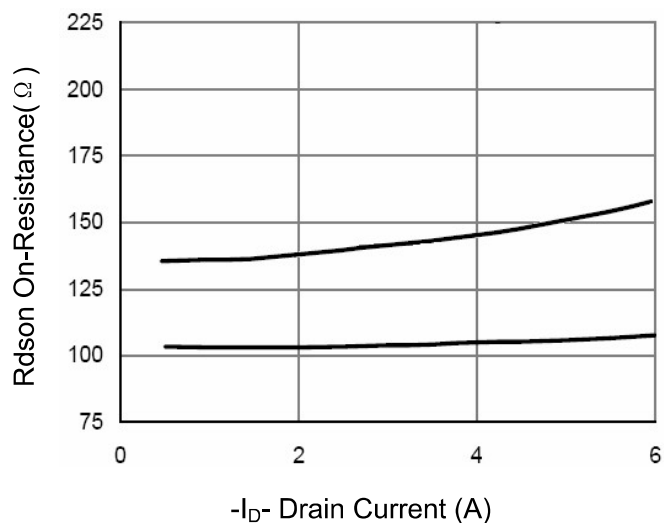


Figure 6 Drain-Source On-Resistance



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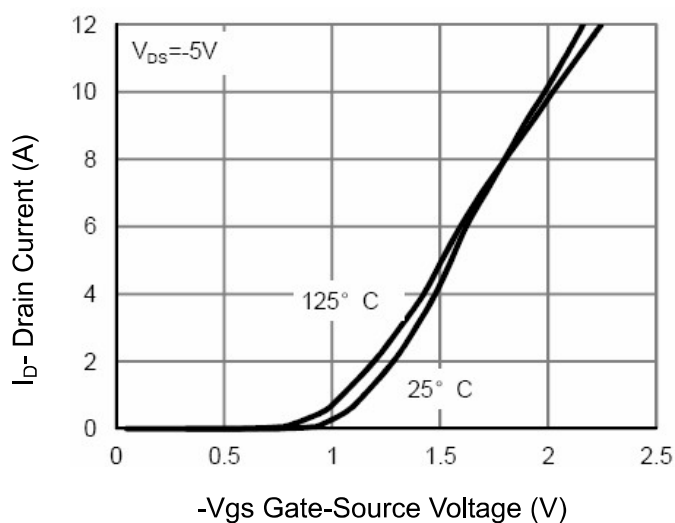


Figure 7 Transfer Characteristics

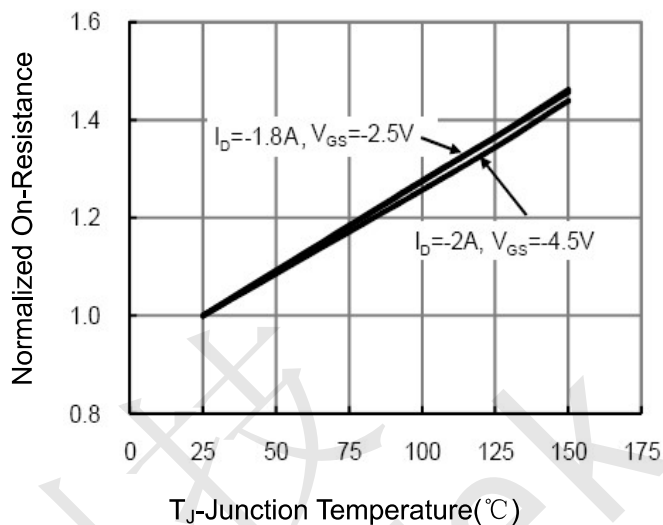


Figure 8 Drain-Source On-Resistance

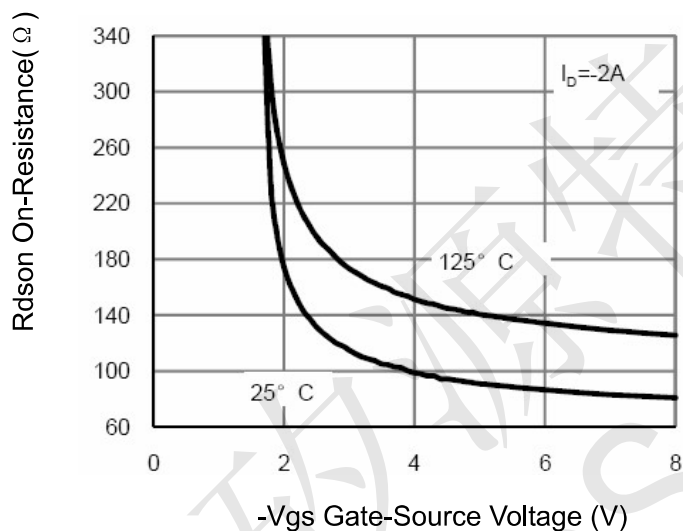


Figure 9 $R_{DS(on)}$ vs V_{GS}

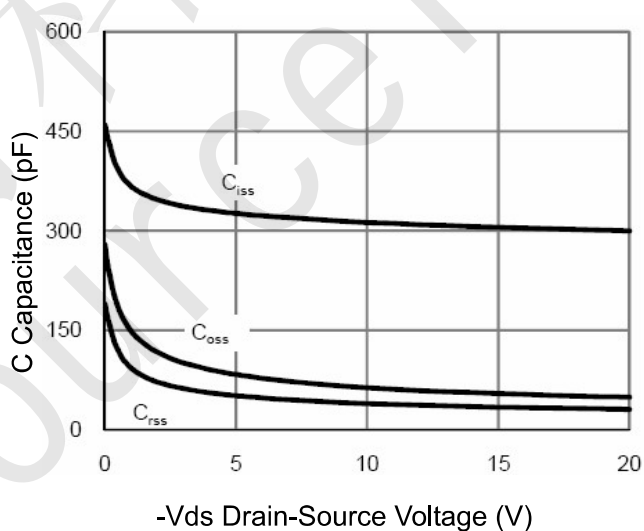


Figure 10 Capacitance vs V_{DS}

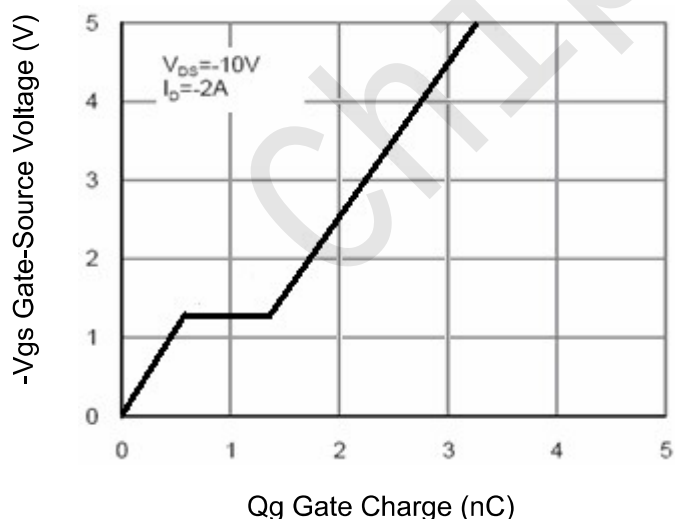


Figure 11 Gate Charge

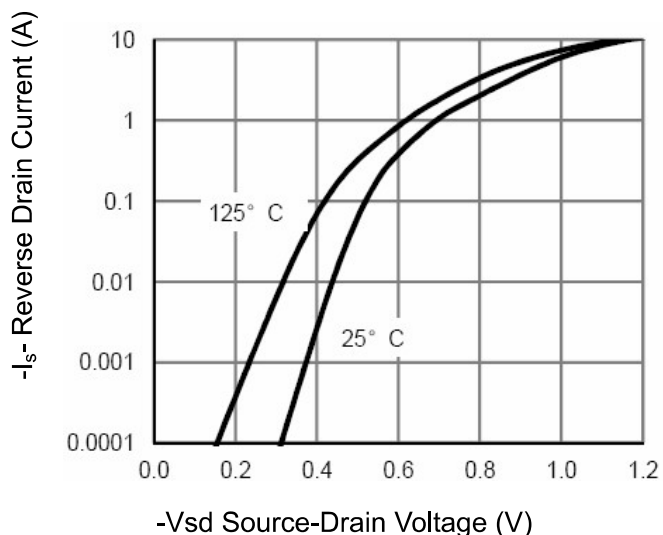


Figure 12 Source- Drain Diode Forward



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SOT23-8L Package Outline

