

Product Summary

Part #	V_{DS}	$R_{DS(on).typ}$ (@ $V_{GS}=10V$)	$R_{DS(on).typ}$ (@ $V_{GS}=4.5V$)	I_D
EFM2309A	-60V	140m Ω	190m Ω	-2A

Features

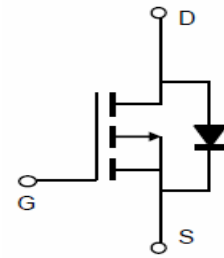
- Low $R_{DS(on)}$ @ $V_{GS}=-10V$
- -5V Logic Level Control
- P Channel SOT23 Package
- Pb-Free, RoHS Compliant

Application

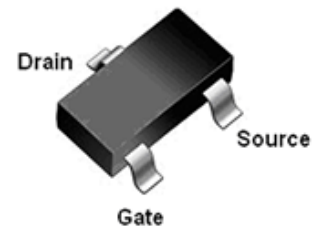
- High-side Load Switch
- Switching Circuits
- High Speed line Driver

Ordering Information:

Part NO.	EFM2309A
Marking	*****
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000



P-Channel MOSFET



SOT23-3L



Absolute Maximum Ratings ($T_C=25^{\circ}C$)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-2	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	-8	A
Maximum Power Dissipation	P_D	1	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	125	$^{\circ}C/W$
---	-----------------	-----	---------------

• Static Electrical Characteristics @ $T_J = 25^{\circ}\text{C}$ (unless otherwise stated)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$ $I_D=250\mu A$	-60	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-60V$ $V_{GS}=0V$	--	--	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$ $V_{DS}=0V$	--	--	± 100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ $I_D=250\mu A$	-1.4	-2.0	-2.6	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V$ $I_D=-2A$	--	140	190	m Ω
		$V_{GS}=-4.5V$ $I_D=-1.5A$	--	190	240	m Ω
Dynamic Characteristics ^(Note4)						
Input Capacitance	C_{ISS}	$V_{DS}=-30V$ $V_{GS}=0V$ $F=1.0MHz$	--	310	--	PF
Output Capacitance	C_{OSS}		--	22	--	PF
Reverse Transfer Capacitance	C_{RSS}		--	15	--	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-30V$ $I_D=-2A$ $V_{GS}=-10V$ $R_G=3.3\Omega$,	--	41	--	nS
Turn-on Rise Time	t_r		--	22	--	nS
Turn-Off Delay Time	$t_{d(off)}$		--	25	--	nS
Turn-Off Fall Time	t_f		--	32	--	nS
Total Gate Charge	Q_g	$V_{DS}=-30V$ $I_D=-2A$ $V_{GS}=-10V$	--	5.4	--	nC
Gate-Source Charge	Q_{gs}		--	1.1	--	nC
Gate-Drain Charge	Q_{gd}		--	1.6	--	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V$ $I_S=-2A$	--	-0.84	-1.2	V
Diode Forward Current ^(Note 2)	I_S		--	--	-1.4	A

Notes:

- ① Pulse width limited by maximum allowable junction temperature
 ② Pulse test ; Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

• Typical Characteristics

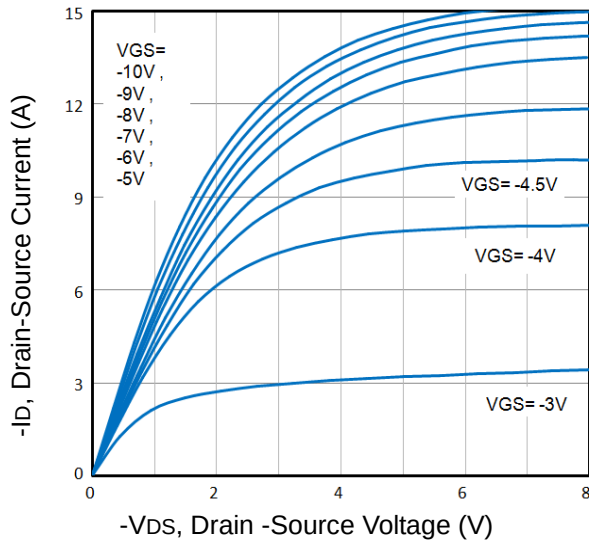


Fig1. Typical Output Characteristics

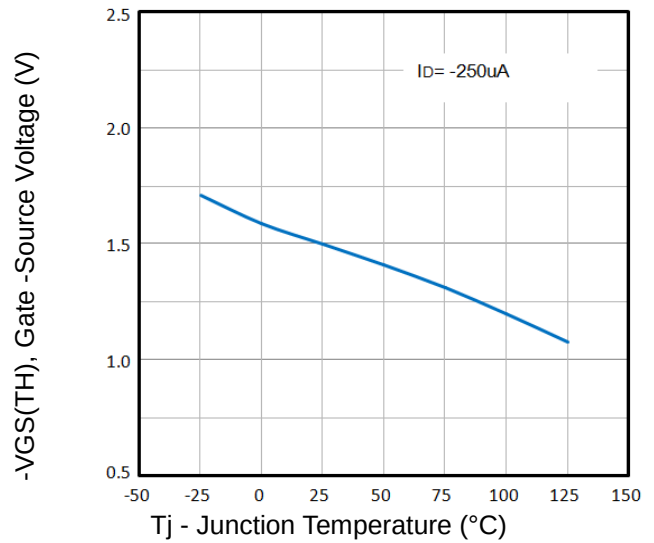


Fig2. Normalized Threshold Voltage Vs. Temperature

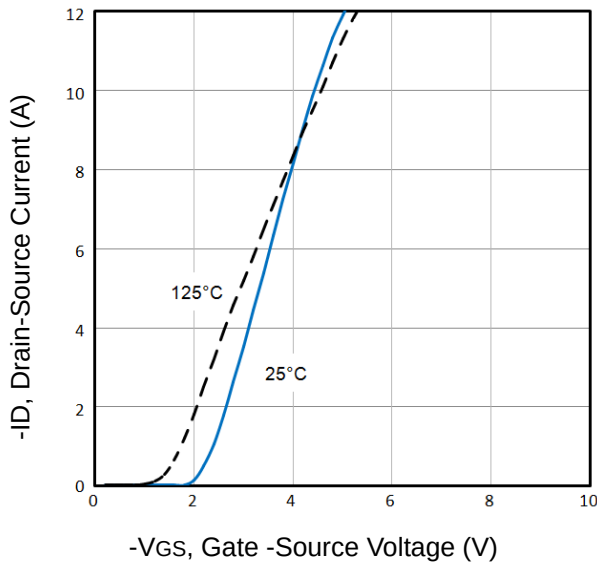


Fig3. Typical Transfer Characteristics

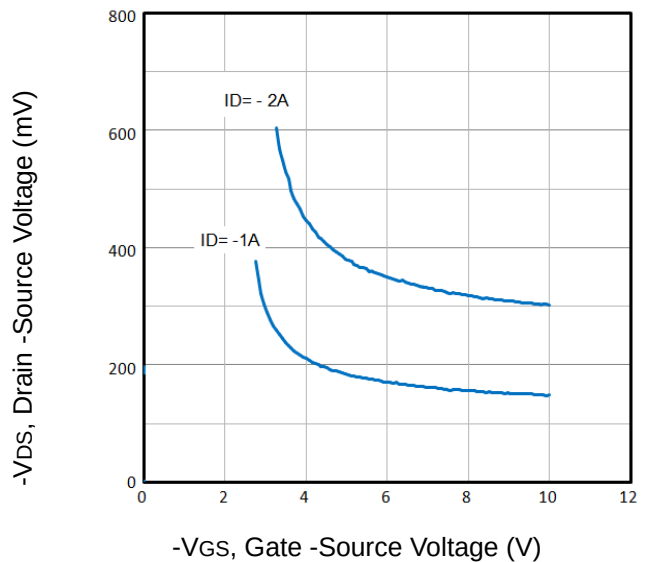


Fig4. Drain -Source Voltage vs Gate -Source Voltage

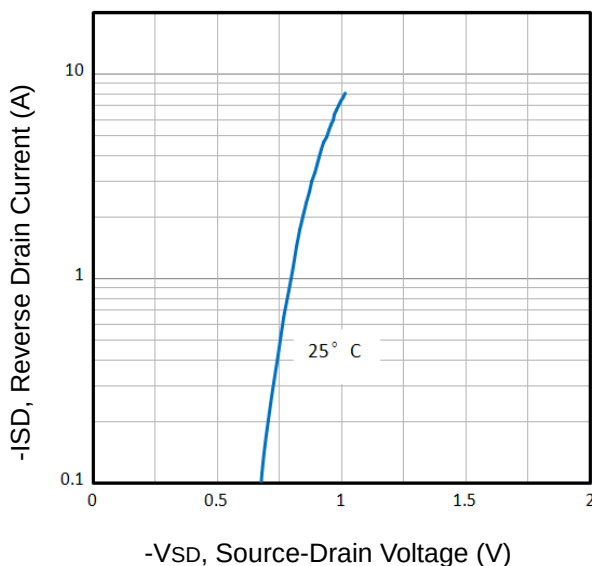


Fig5. Typical Source-Drain Diode Forward Voltage

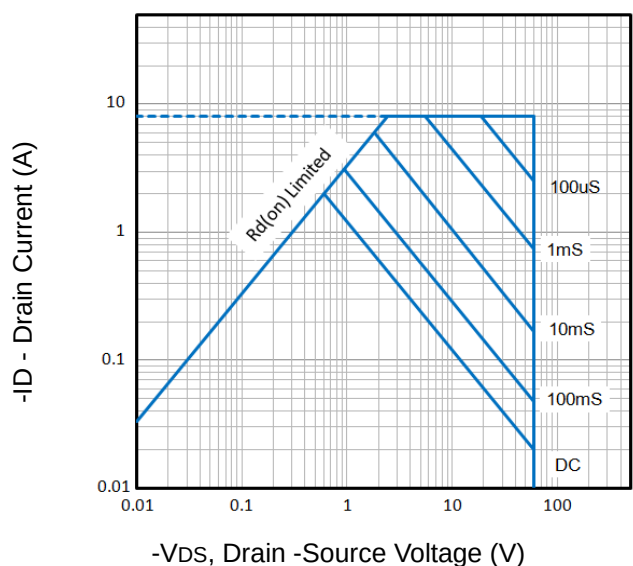


Fig6. Maximum Safe Operating Area

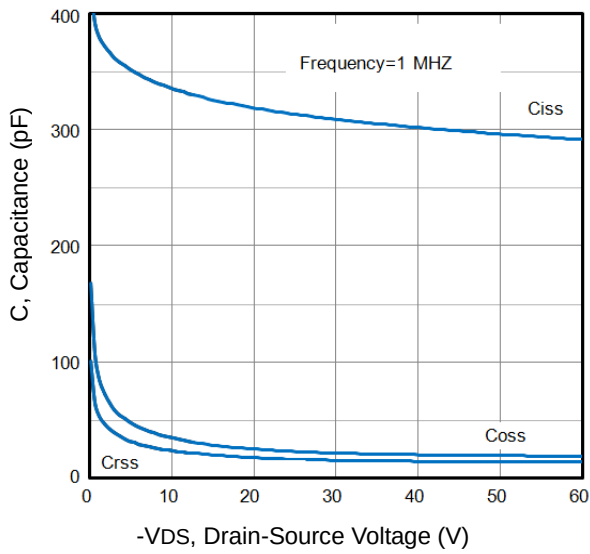


Fig7. Typical Capacitance Vs. Drain-Source Voltage

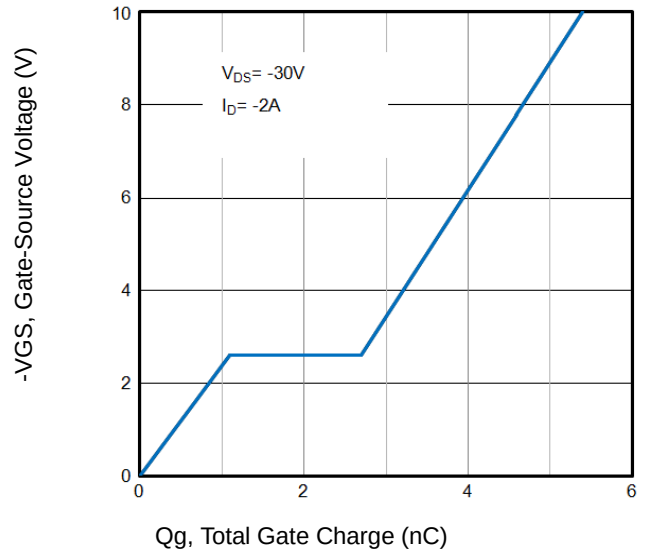


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

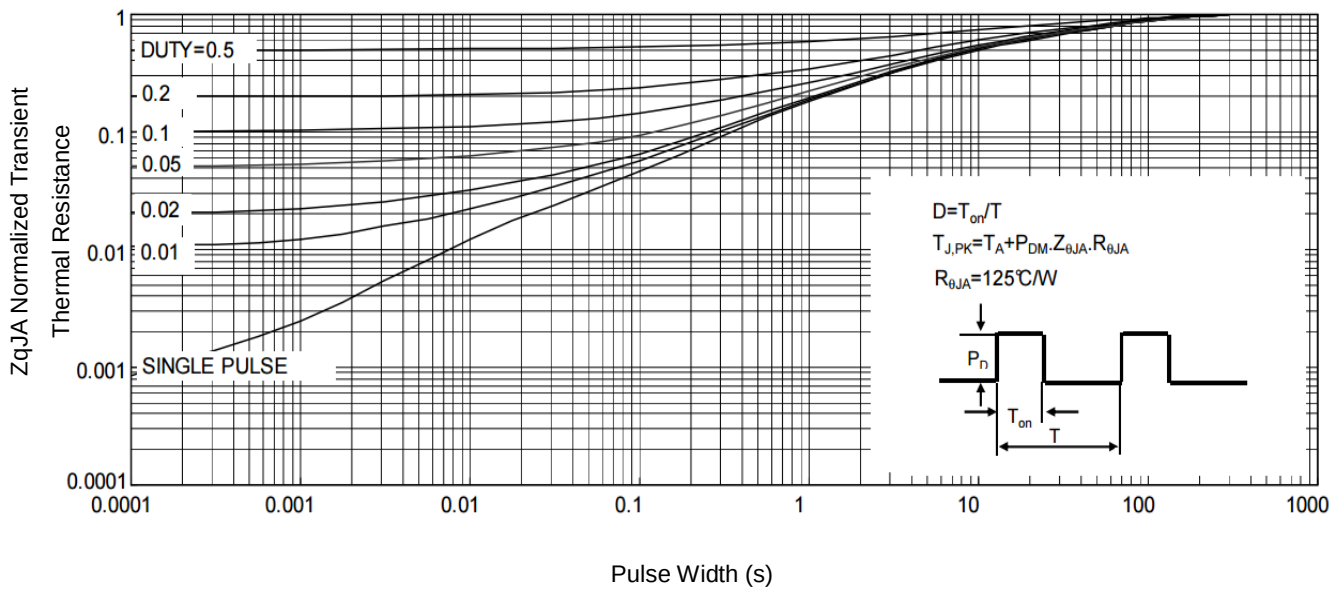


Fig9. Normalized Maximum Transient Thermal Impedance

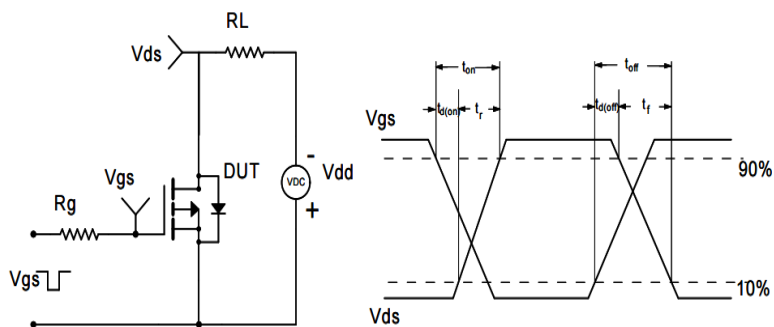
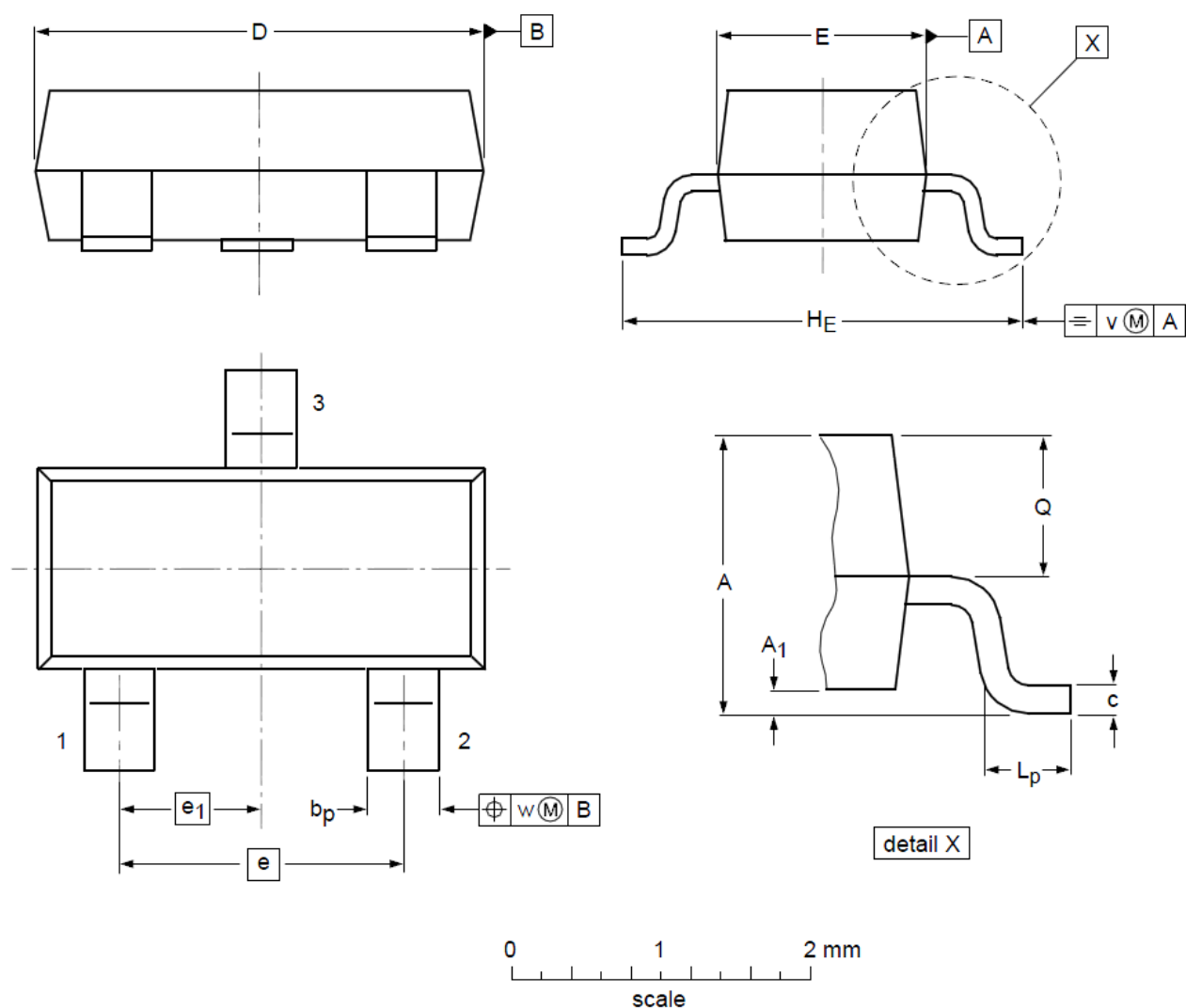


Fig10. Switching Time Test Circuit and waveforms

SOT23-3L Package Outline Dimensions



DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	1.00	1.17	1.30	A₁	0.01	0.05	0.10
b_p	0.35	0.39	0.50	c	0.10	0.20	0.26
D	2.70	2.90	3.10	E	1.30	1.58	1.70
e	--	1.90	--	e₁	--	0.95	--
H_E	2.50	2.78	3.00	L_p	0.20	0.32	0.60
Q	0.23	0.27	0.33	v	--	0.20	--
w	--	0.20	--				