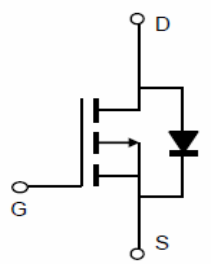
EFM4409A

P-Channel Advanced MOSFET

• Product Summary

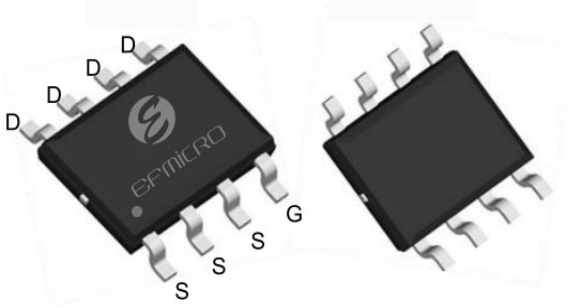
Part #	V_{DS}	$R_{DS(on).typ}$ ($@V_{GS}$=10V)	$R_{DS(on).typ}$ ($@V_{GS}$=4.5V)	I_D
EFM4409A	-30V	6.2mΩ	9.5mΩ	-15A



P-Channel MOSFET

• Description

- The EFM4409A is the high cell density trenched
- N-ch MOSFETs which provide excellent
- RDSON and gate cherge for most of the
- synchronous buck converter applications.
- The EFM4409A meet the RoHS and Green
- Prod uct requirement, 100 % EAS guaranteed
- with full function reliability approved.



SOP-8

•Application

- Super Low Gate Charge 100% EAS Guaranteed
- Green Device Available Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

•Ordering Information:

Part NO.	EFM4409A
Marking	4409 ******
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	-15	A
Drain Current-Pulsed (Note 1)	I_{DM}	-80	A
Maximum Power Dissipation	P_D	3	W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

•Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{\theta JA}$	40	℃/W

● Static Electrical Characteristics @ T_J = 25°C (unless otherwise stated)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250uA	-30	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-30V V_{GS}=0V	--	--	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V V_{DS}=0V	--	--	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} I_D=250uA	-1.4	-1.9	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V I_D=-15A	--	6.2	7.5	mΩ
		V_{GS}=-4.5V I_D=-10A	--	9.5	12	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V I_D=-15A	--	50	--	S
Gate Resistance	Rg	F=1.0MHz	--	2	--	Ω
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=-15V V_{GS}=0V F=1.0MHz	--	5270	--	PF
Output Capacitance	C_{oss}		--	945	--	PF
Reverse Transfer Capacitance	C_{rss}		--	745	--	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-15V I_D=-15A V_{GS}=-10V R_G=3Ω,	--	14	--	nS
Turn-on Rise Time	t_r		--	16.5	--	nS
Turn-Off Delay Time	$t_{d(off)}$		--	76.5	--	nS
Turn-Off Fall Time	t_f		--	37.5	--	nS
Total Gate Charge	Q_g	V_{DS}=-15V I_D=-15A V_{GS}=-10V	--	100	--	nC
Gate-Source Charge	Q_{gs}		--	14.5	--	nC
Gate-Drain Charge	Q_{gd}		--	23	--	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V I_S=-15A	--	-0.8	-1.2	V
Diode Forward Current (Note 2)	I_S		--	--	-15	A

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 a 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.

• Typical Characteristics

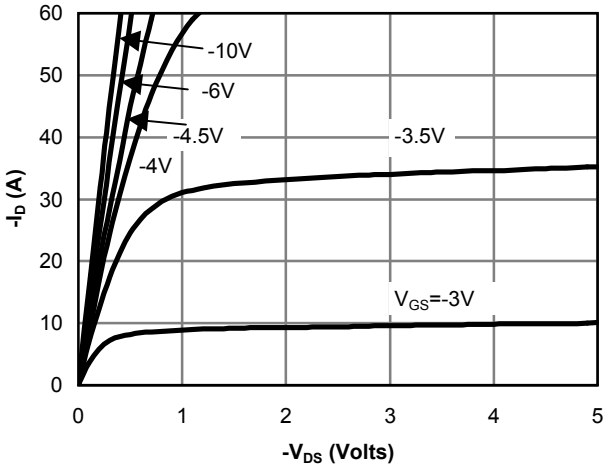


Fig 1: On-Region Characteristics

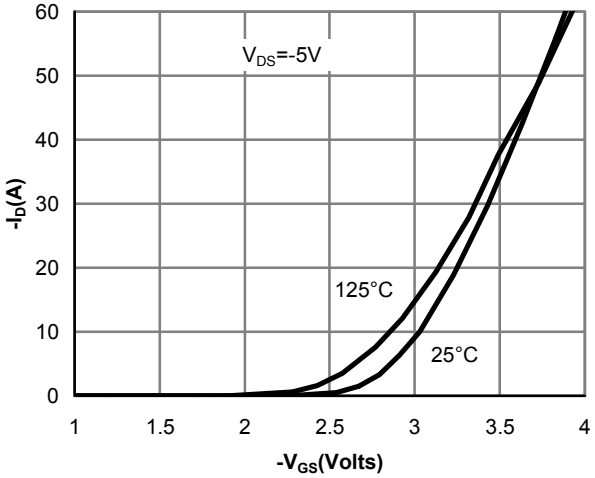


Figure 2: Transfer Characteristics

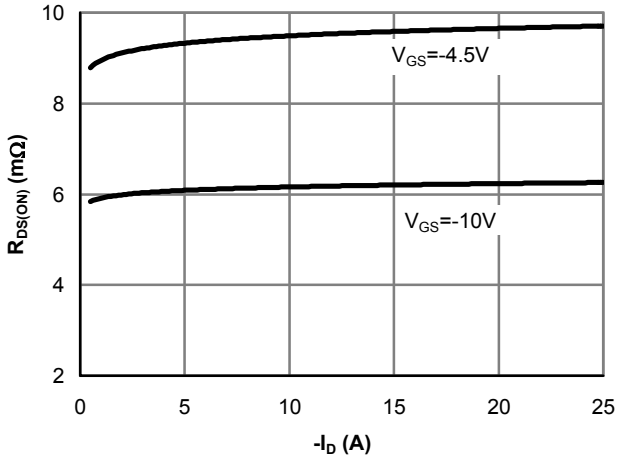


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

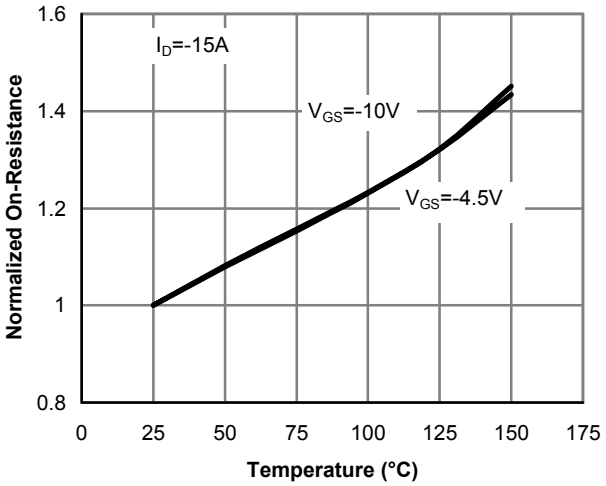


Figure 4: On-Resistance vs. Junction Temperature

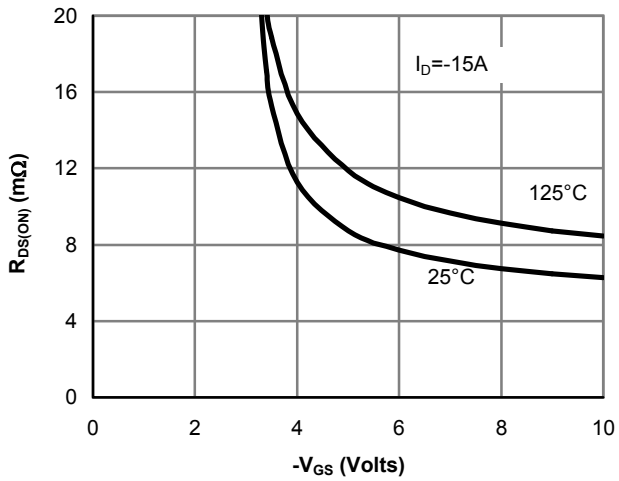


Figure 5: On-Resistance vs. Gate-Source Voltage

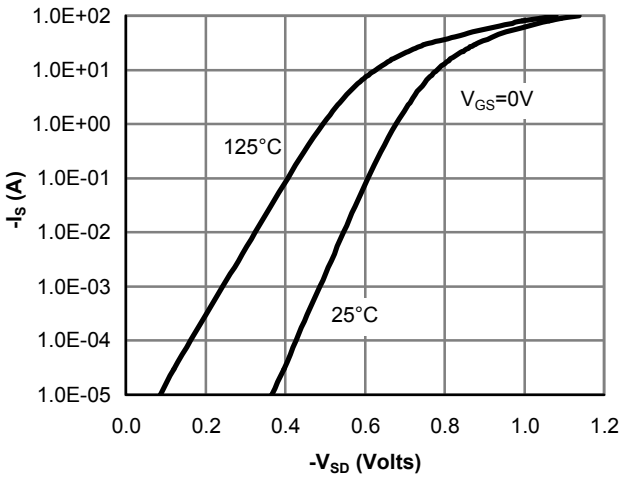


Figure 6: Body-Diode Characteristics

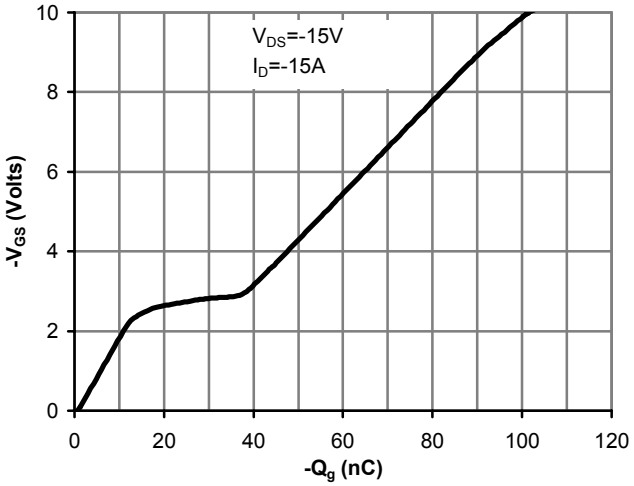


Figure 7: Gate-Charge Characteristics

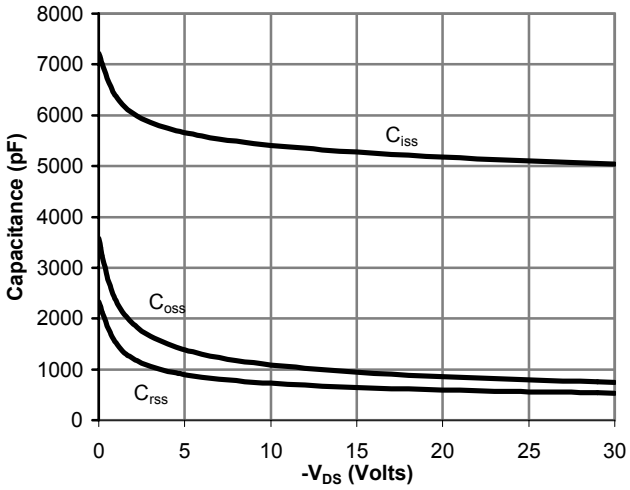


Figure 8: Capacitance Characteristics

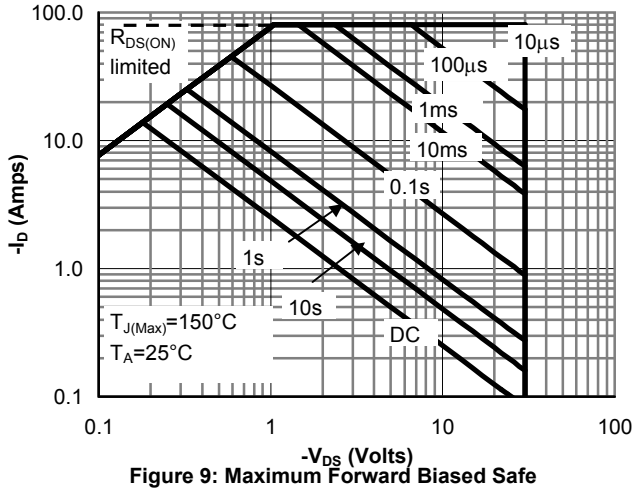


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

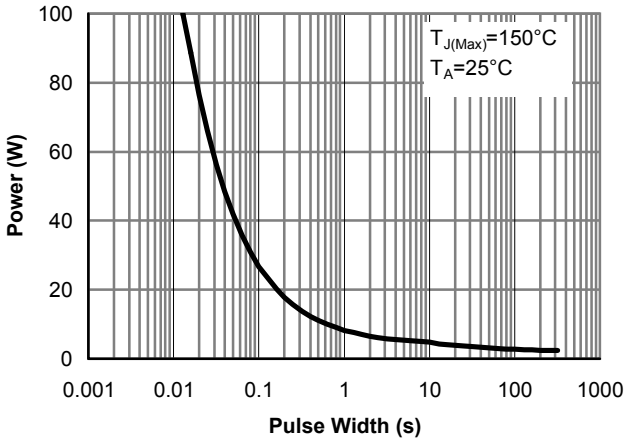


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

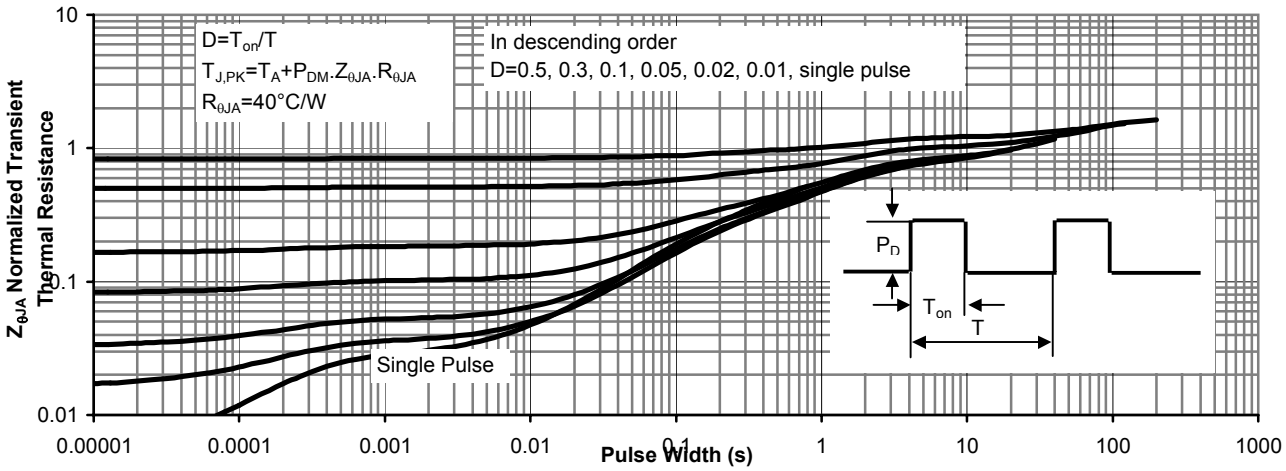
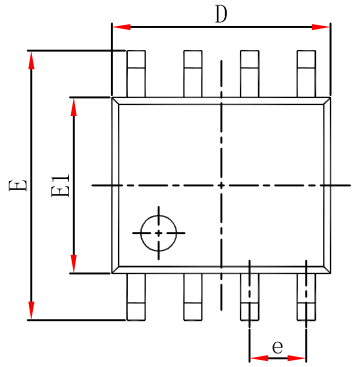
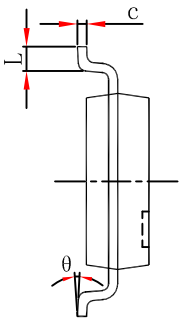
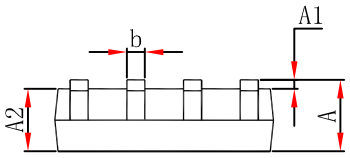


Figure 11: Normalized Maximum Transient Thermal Impedance

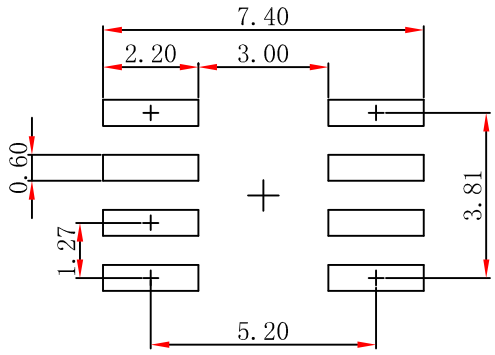
SOP8 Package Outline Dimensions







Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.450	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
e	1.270（BSC）		0.050（BSC）	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.