

Product Summary

Part #	V_{DS}	$R_{DS(on).typ}$ (@ $V_{GS}=10V$)	$R_{DS(on).typ}$ (@ $V_{GS}=4.5V$)	I_D
EFM3409A	-30V	77m Ω	85m Ω	-2.6A

Features

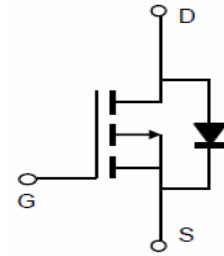
- Low $R_{DS(on)}$ @ $V_{GS}=-10V$
- - 4.5V Logic Level Control
- P Channel SOT23-3L Package
- Pb-Free, RoHS Compliant

Application

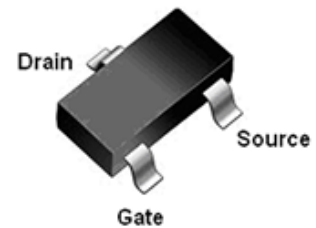
- Notebook
- Load Switch
- Battery Protection
- Hand-Held Instruments

Ordering Information:

Part NO.	EFM3409A
Marking	A9****
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}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-2.6	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	-20	A
Maximum Power Dissipation	P_D	1.4	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)	$R_{\theta JA}$	100	$^{\circ}C/W$
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• 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 =-250uA	-30	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V V _{GS} =0V	--	--	-1	uA
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	-1.0	-1.6	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V I _D =-2.6A	--	77	87	mΩ
		V _{GS} =-4.5V I _D =-2A	--	85	100	mΩ
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =-15V V _{GS} =0V F=1.0MHz	--	197	--	PF
Output Capacitance	C _{OSS}		--	42	--	PF
Reverse Transfer Capacitance	C _{RSS}		--	26	--	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-15V I _D =-2.6A V _{GS} =-10V R _G =3Ω,	--	7.5	--	nS
Turn-on Rise Time	t _r		--	4.1	--	nS
Turn-Off Delay Time	t _{d(off)}		--	11.8	--	nS
Turn-Off Fall Time	t _f		--	3.8	--	nS
Total Gate Charge	Q _g	V _{DS} =-15V I _D =-2.6A V _{GS} =-10V	--	4.3	--	nC
Gate-Source Charge	Q _{gs}		--	0.7	--	nC
Gate-Drain Charge	Q _{gd}		--	1.1	--	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V I _S =-2.6A	--	-0.84	-1.2	V
Diode Forward Current (Note 2)	I _S		--	--	-2.6	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

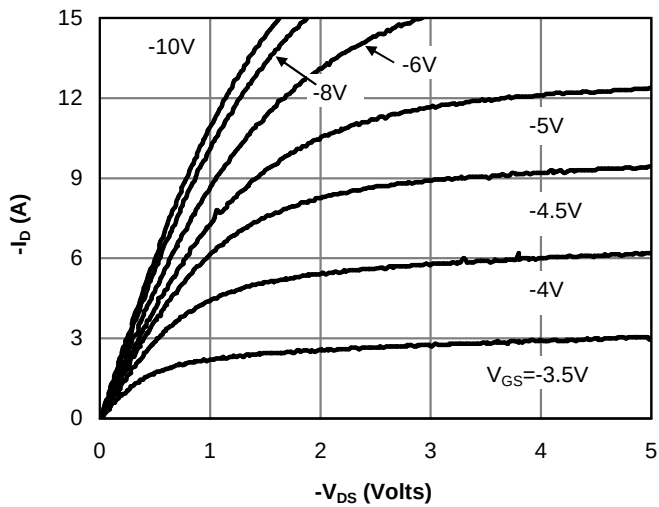


Fig 1: On-Region Characteristics (Note E)

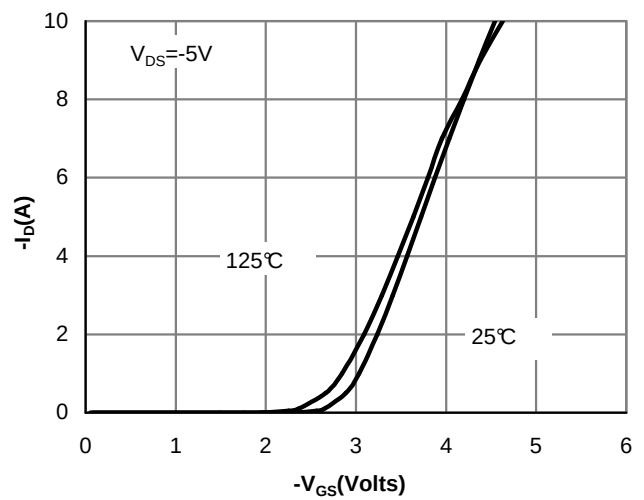


Figure 2: Transfer Characteristics (Note E)

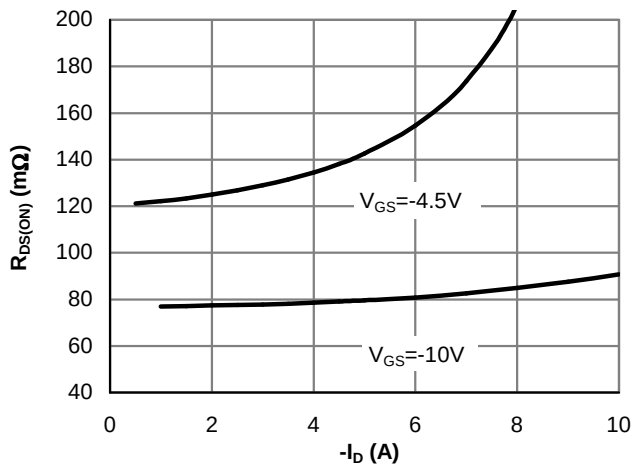


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

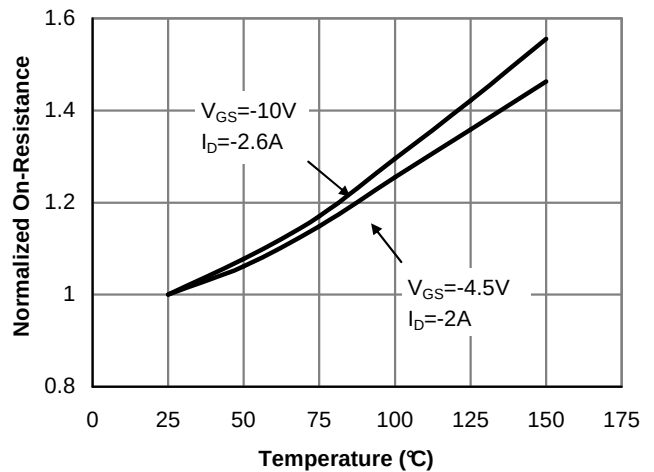


Figure 4: On-Resistance vs. Junction Temperature (Note E)

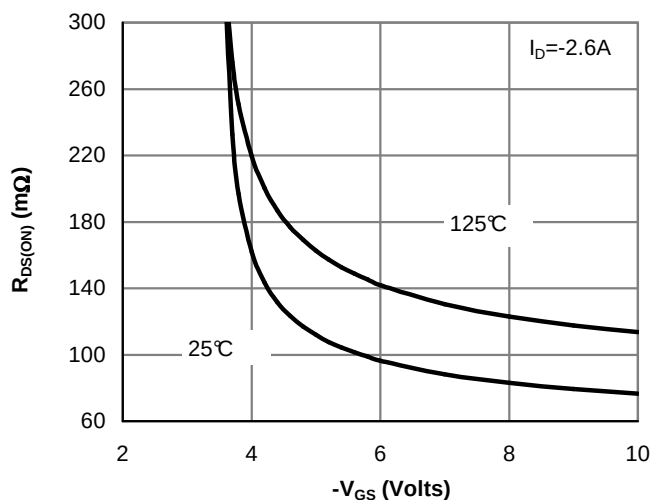


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

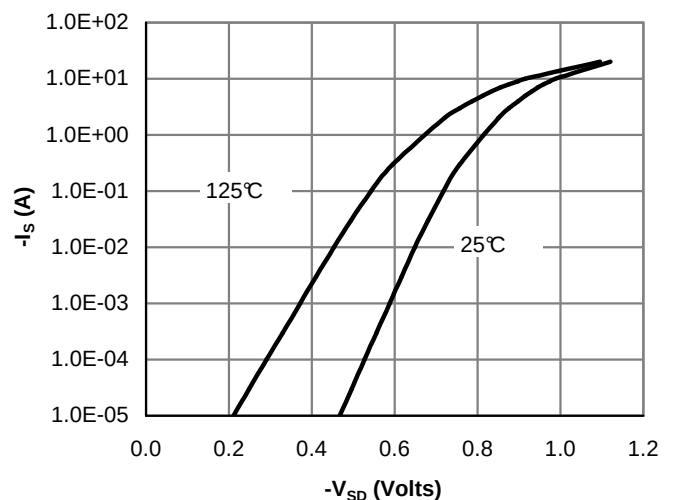
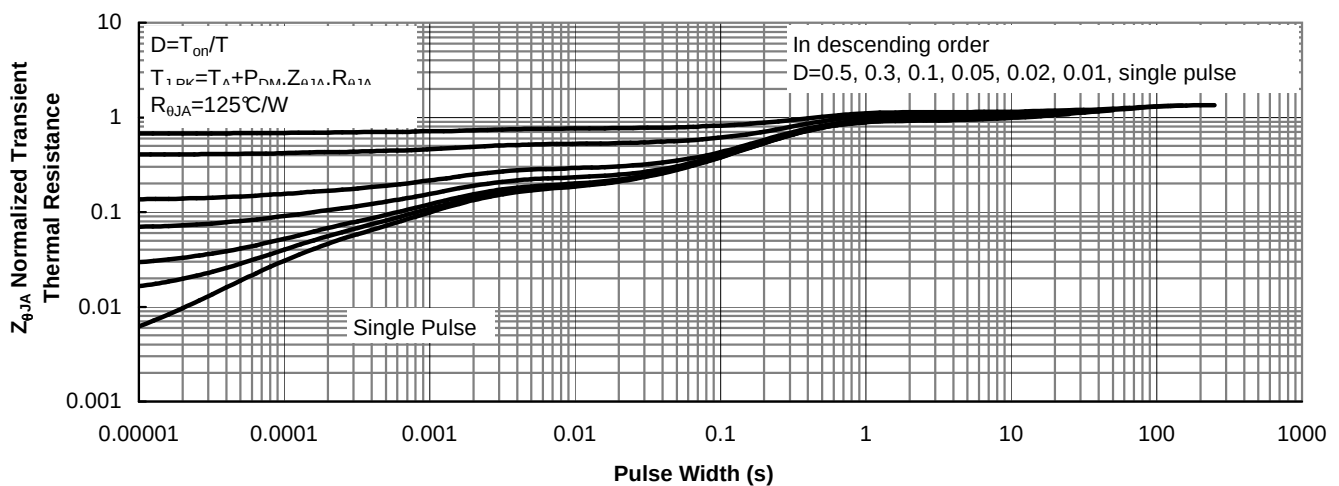
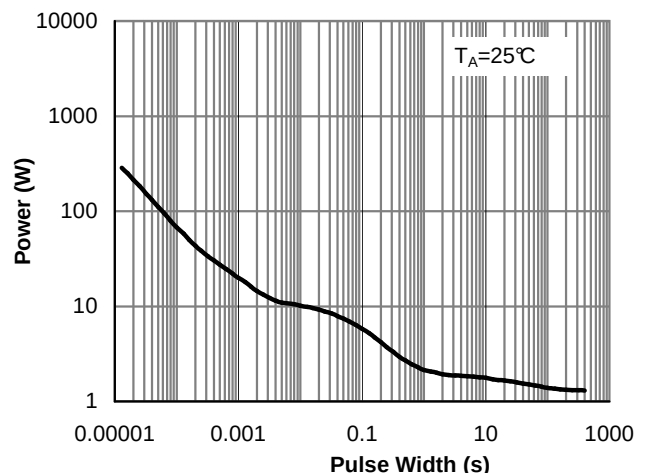
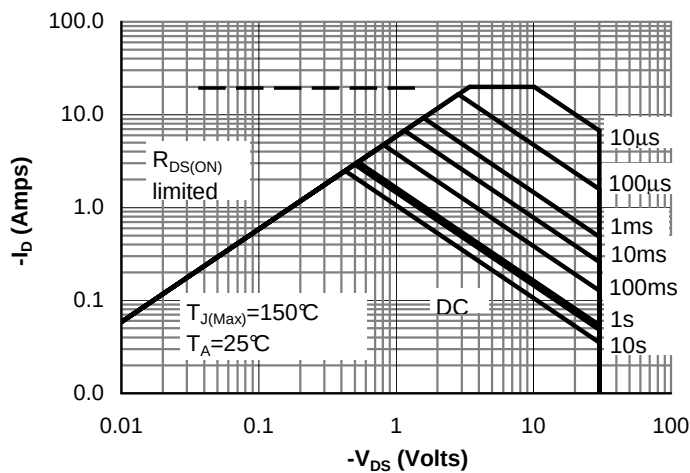
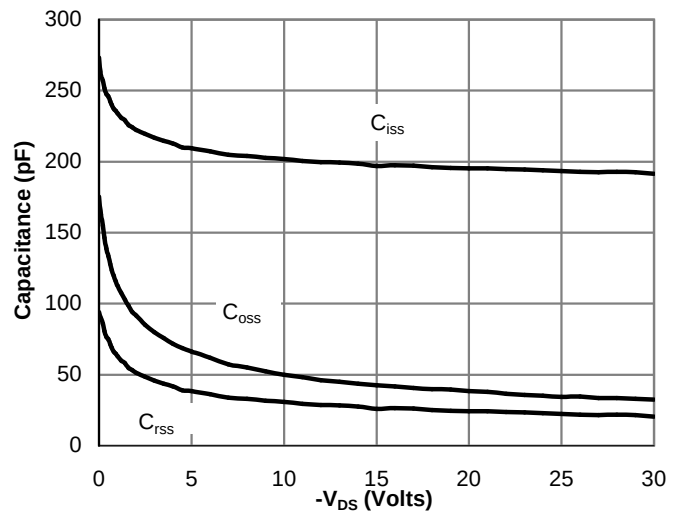
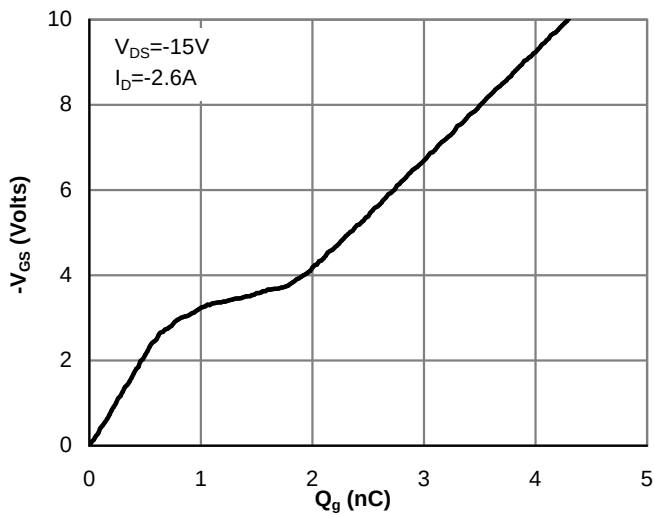
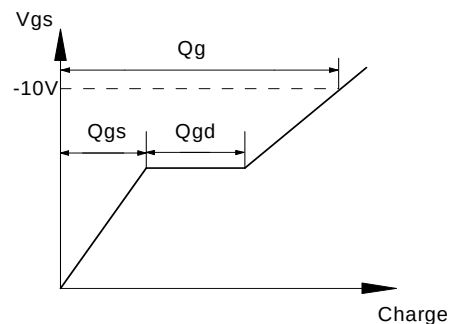
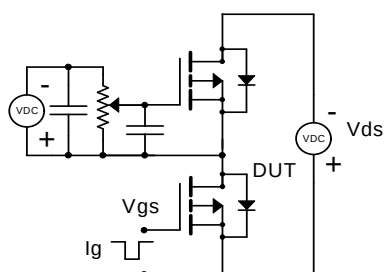


Figure 6: Body-Diode Characteristics (Note E)

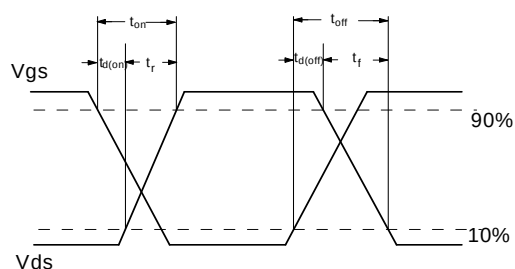
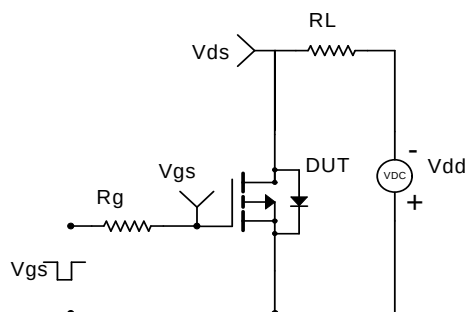


• Test circuit

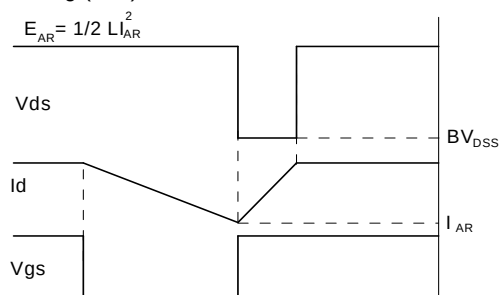
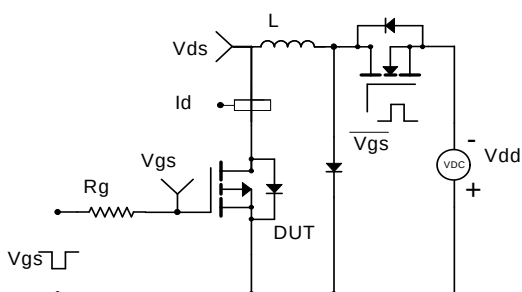
Gate Charge Test Circuit & Waveform



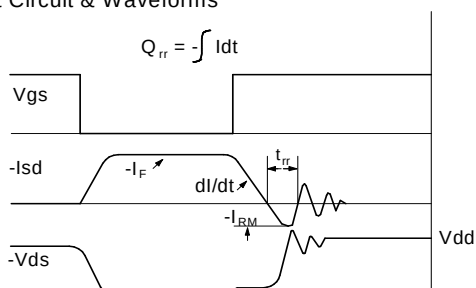
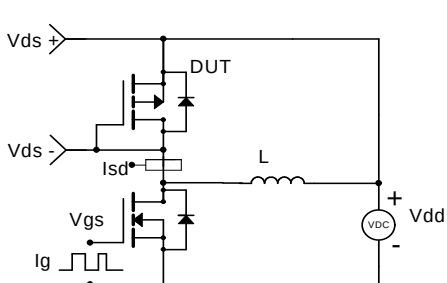
Resistive Switching Test Circuit & Waveforms



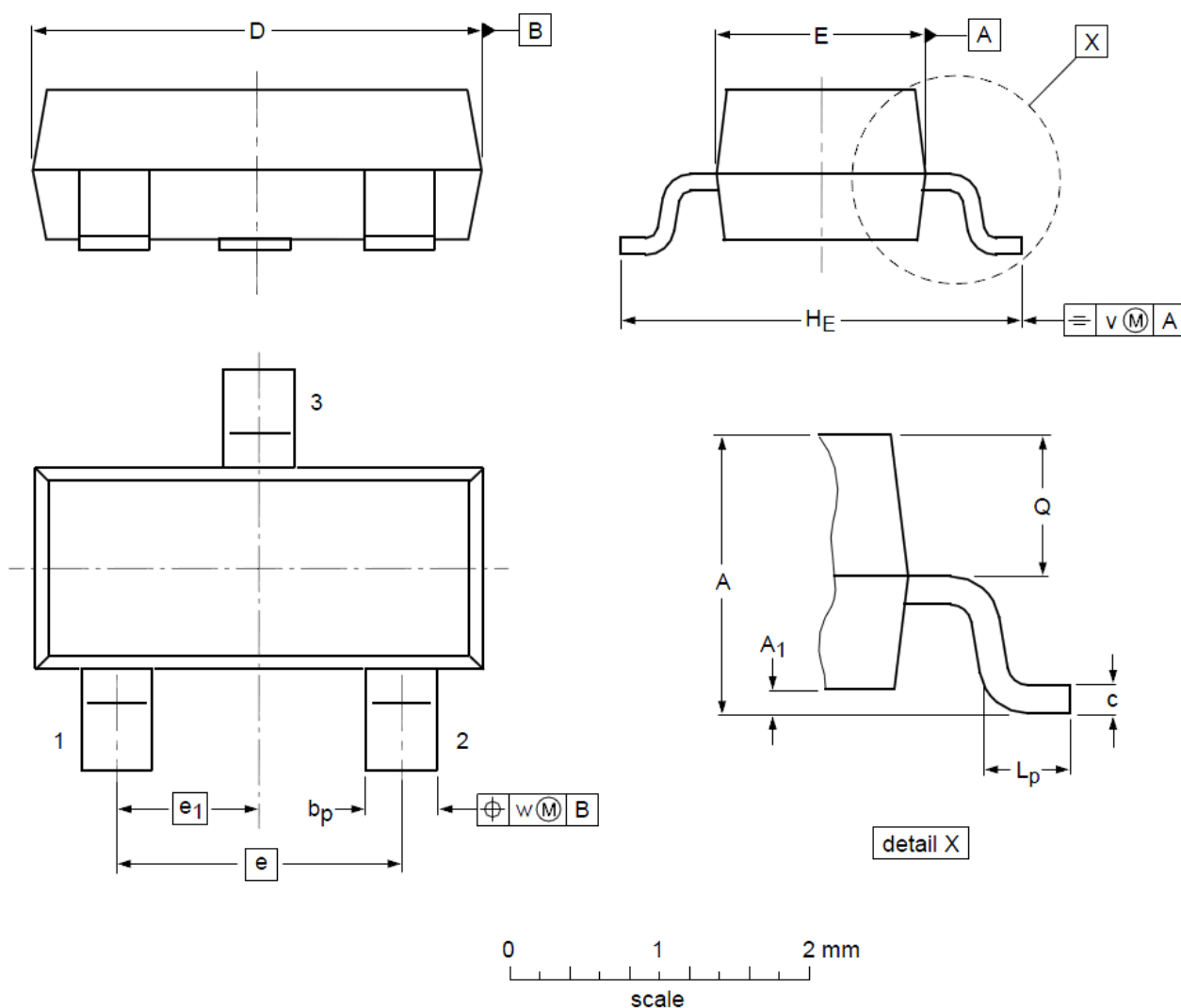
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & 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	--				