

DESCRIPTION

SMC4228ENB is the Dual N-Channel MOSFET, fast switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency Li-Battery Protection applications.

PART NUMBER INFORMATION

SMC 4228 E NB - TR G

a b c d e f

- a : Company name.
- b : Product Serial number.
- c : ESD Protection
- d : Package code NB: DFN3.3X3.3B-8
- e : Handling code TR: Tape&Reel
- f : Green produce code G: RoHS Compliant

FEATURES

V_{DS}=20V, I_D=13A

$R_{DS(ON)}=10.2m\Omega(Typ.)@V_{GS}=4.5V$

$R_{DS(ON)}=11.0m\Omega(Typ.)@V_{GS}=3.2V$

$R_{DS(ON)}=11.5m\Omega(Typ.)@V_{GS}=2.5V$

$R_{DS(ON)}=14.0m\Omega(Typ.)@V_{GS}=1.8V$

◆ ESD Protection Diode Embedded

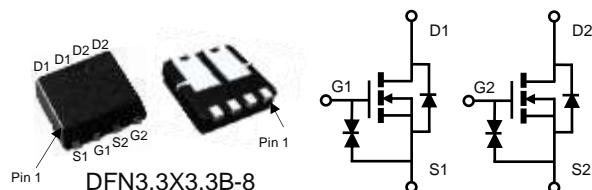
◆ 100% EAS and Guaranteed

APPLICATIONS

◆ Li-Battery Protection

◆ Power Management

◆ Load switch



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C Unless otherwise noted)

Symbol	Parameter	Rating	Units
V _{DSS}	Drain-Source Voltage	20	V
V _{GSS}	Gate-Source Voltage	±10	V
I _D	Continuous Drain Current *	T _C =25°C	13
		T _C =100°C	8.2
I _{DM}	Pulsed Drain Current ^B	52	A
I _D	Continuous Drain Current	T _A =25°C	13
		T _A =70°C	10.4
P _D	Power Dissipation ^A	T _A =25°C	3.1
		T _A =70°C	2
I _{AS}	Avalanche Current ^A	16	A
EAS	Single Pulse Avalanche energy L=0.3mH ^B	38	mJ
P _D	Power Dissipation ^C	T _C =25°C	20.8
		T _C =100°C	8.3
T _J	Operation Junction Temperature	-55/150	°C
T _{STG}	Storage Temperature Range	-55/150	°C

THERMAL RESISTANCE

Symbol	Parameter	Typ	Max	Units
R _{θJA}	Thermal Resistance Junction to Ambient ^A	t ≤ 10s	40	°C/W
	Thermal Resistance Junction to Ambient ^{AC}	Steady-State	65	
R _{θJC}	Thermal Resistance Junction to Case		6	

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise noted)

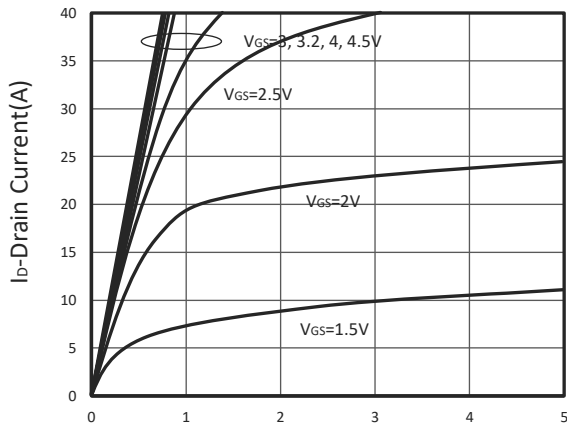
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Parameters						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	30			V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250 μ A	0.4	0.6	1	V
I _{GSS}	Gate Leakage Current	V _{DS} =0V, V _{GS} = \pm 10V			\pm 10	μ A
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V, T _J =25 $^\circ$ C			1	μ A
		V _{DS} =16V, V _{GS} =0V, T _J =75 $^\circ$ C			10	
R _{DS(ON)}	Drain-source On-Resistance ^D	V _{GS} =4.5V, I _D =10A		10.2	12	m Ω
		V _{GS} =4.0V, I _D =8A		10.5	12	
		V _{GS} =3.2V, I _D =6A		11	13	
		V _{GS} =2.5V, I _D =5A		11.5	14	
		V _{GS} =1.8V, I _D =3A		14	17	
G _{fs}	Forward Transconductance	V _{DS} =10V, I _D =10A		15		S
Diode Characteristics						
V _{SD}	Diode Forward Voltage ^D	I _S =1A, V _{GS} =0V		0.6	1	V
I _S	Diode Continuous Forward Current [*]				13	A
Dynamic and Switching Parameters^E						
Q _g	Total Gate Charge	V _{DS} =10V, V _{GS} =4.5V, I _D =10A		16	22.4	nC
Q _{gs}	Gate-Source Charge			1.2	1.7	
Q _{gd}	Gate-Drain Charge			3.8	5.3	
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1MHz		1005		pF
C _{oss}	Output Capacitance			162		
C _{rss}	Reverse Transfer Capacitance			107		
R _g	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz		2		Ω
t _{d(on)}	Turn-On Time	V _{DD} =10V, V _{GEN} =4.5V R _G =6 Ω , I _D =1A		9	17	nS
t _r				16	30	
t _{d(off)}	Turn-Off Time			45	86	
t _f				13	25	

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

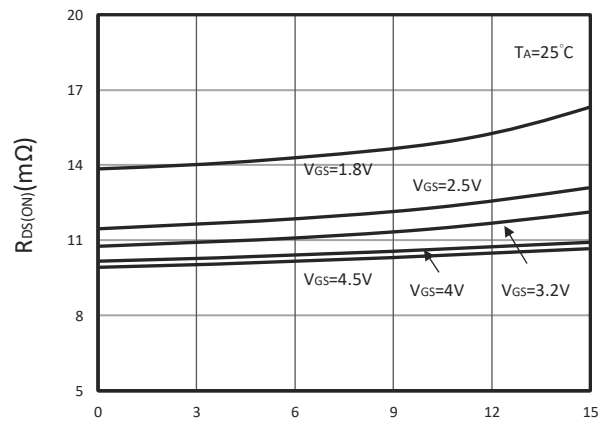
- A. Surface mounted on FR4 board using 1 in² pad size.
- B. Pulsed width limited by maximum junction temperature, T_{J(MAX)}=150 $^\circ$ C.
- C. Using \leq 10s junction-to-ambient thermal resistance is base on T_{J(MAX)}=150 $^\circ$ C.
- D. Pulse test width \leq 300 μ s and duty cycle \leq 2%.
- E. Guaranteed by design, not subject to production testing.
- *. The maximum rating current is limited by bonding wire.

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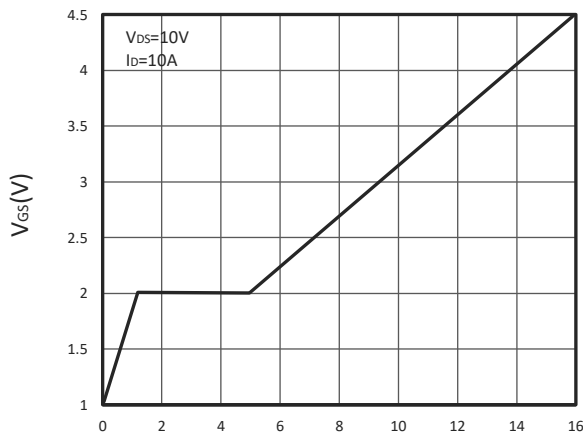
TYPICAL CHARACTERISTICS



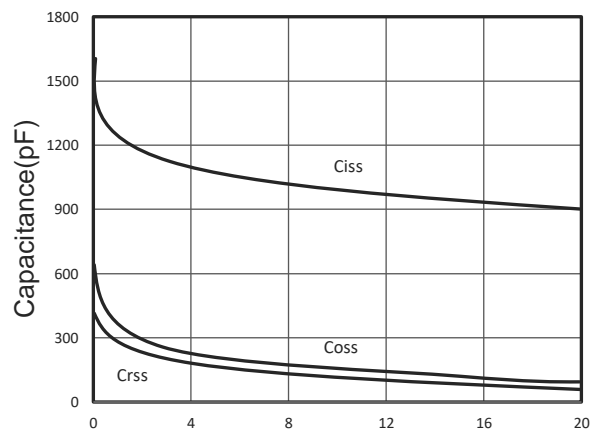
Output Characteristics



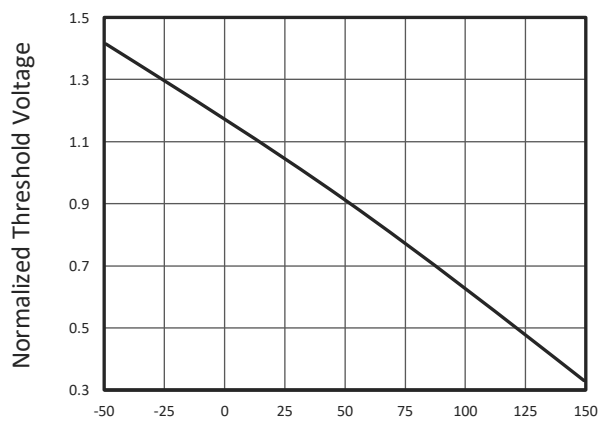
Drain-Source On Resistance



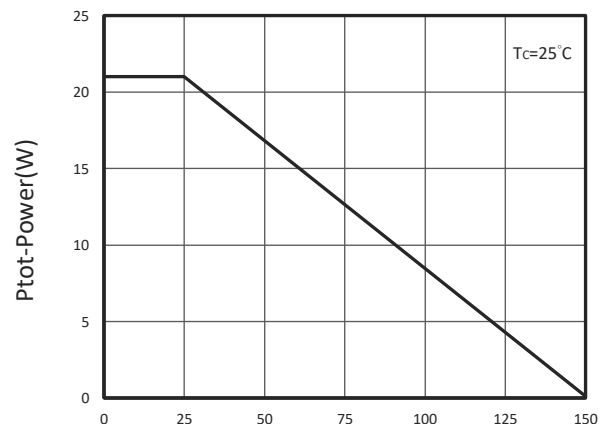
Gate Charge



Capacitance

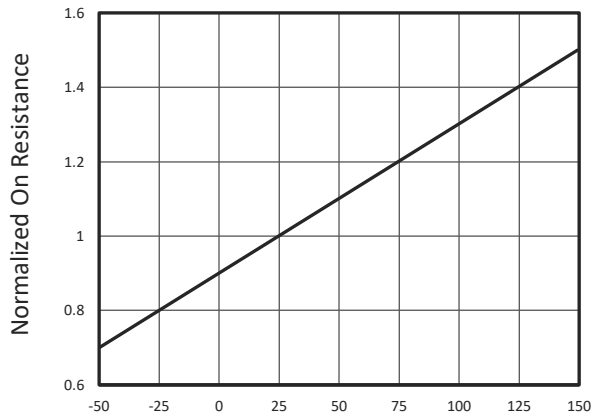


Gate Threshold Voltage

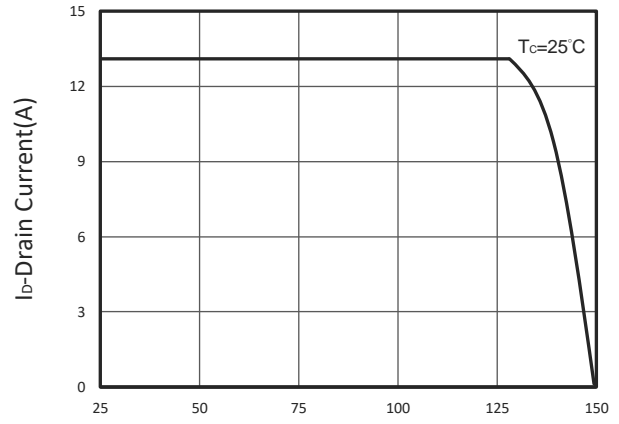


Power Dissipation

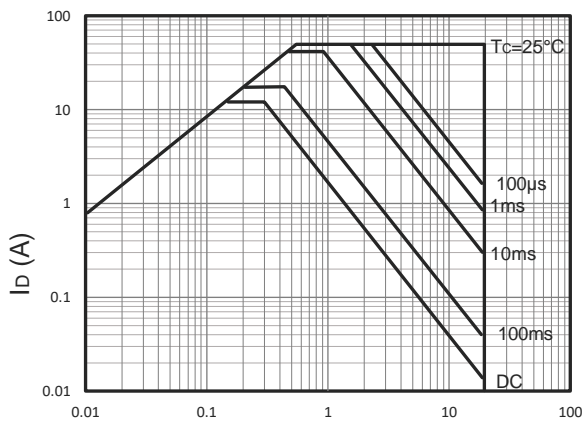
TYPICAL CHARACTERISTICS



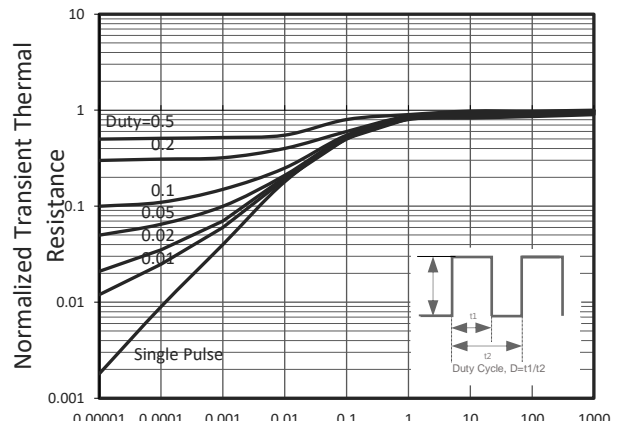
$R_{DS(ON)}$ vs Junction Temperature



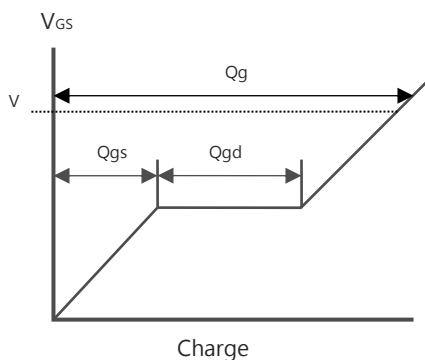
Drain Current vs T_c



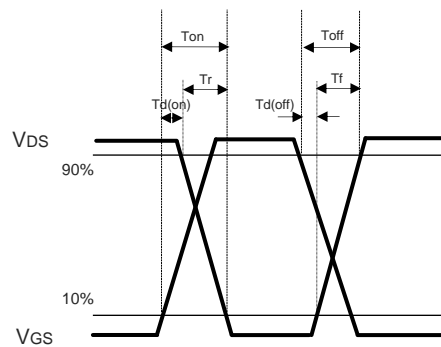
Maximum Safe Operation Area



Thermal Transient Impedance

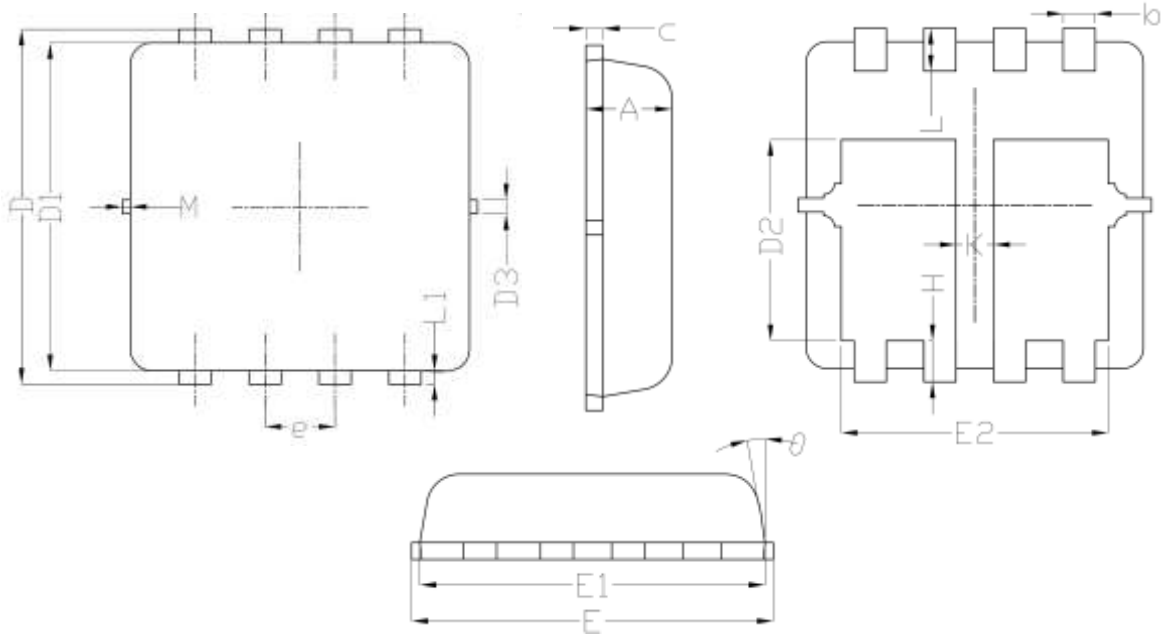


Gate Charge Waveform



Switching Time Waveform

DFN3.3X3.3B-8 PACKAGE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.032
b	0.250	0.350	0.010	0.014
c	0.100	0.250	0.004	0.010
D	3.250	3.450	0.128	0.136
D1	3.000	3.200	0.118	0.126
D2	1.780	1.980	0.070	0.078
D3		0.130		0.005
E	3.200	3.400	0.126	0.134
E1	3.000	3.200	0.118	0.126
E2	2.390	2.590	0.094	0.102
e	0.65BSC.		0.65BSC.	
H	0.300	0.500	0.012	0.020
L	0.300	0.500	0.012	0.020
L1		0.130		0.005
M		0.150		0.006
θ	0°	15°	0°	15°

Recommended Land Pattern

