

Single N-Channel MOSFET

DESCRIPTION

SMC4456NA is the N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior fast switching performance and withstand high energy pulse in the avalanche and commutation mode.

PART NUMBER INFORMATION

SMC 4456 NA - TR G
 a b c d e

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

FEATURES

$V_{DS}=40V, I_D=40A$

$R_{DS(ON)}=7m\Omega(Typ.)@V_{GS}=10V$

$R_{DS(ON)}=10m\Omega(Typ.)@V_{GS}=4.5V$

◆100% EAS Guaranteed

APPLICATIONS

- ◆Load Switch
- ◆Power Management
- ◆DC/DC Converter



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ C$ Unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-Source Voltage	40	V
V_{GSS}	Gate-Source Voltage	± 20	V
I_D	Continuous Drain Current [*]	$T_C=25^\circ C$	40
		$T_C=100^\circ C$	27.4
I_{DM}	Pulsed Drain Current ^B	120	A
I_D	Continuous Drain Current	$T_A=25^\circ C$	15.7
		$T_A=70^\circ C$	12.6
P_D	Power Dissipation ^A	$T_A=25^\circ C$	3.6
		$T_A=70^\circ C$	2.3
I_{AS}	Avalanche Current ^A	25	A
EAS	Single Pulse Avalanche energy $L=0.1mH$ ^B	31	mJ
P_D	Power Dissipation ^C	$T_C=25^\circ C$	27.2
		$T_C=100^\circ C$	10.9
T_J	Operation Junction Temperature	-55/150	$^\circ C$
T_{STG}	Storage Temperature Range	-55/150	$^\circ C$

THERMAL RESISTANCE

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Thermal Resistance Junction to Ambient ^A		35	$^\circ C/W$
	Thermal Resistance Junction to Ambient ^{AC}	$t \leq 10s$	65	
$R_{\theta JC}$	Thermal Resistance Junction to Case	Steady-State	4.6	

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

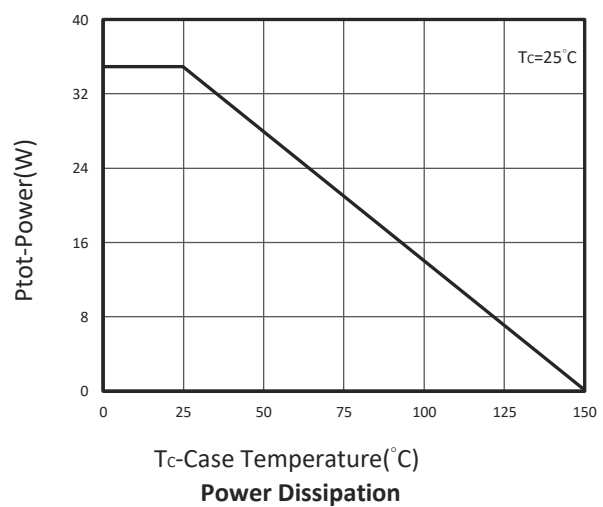
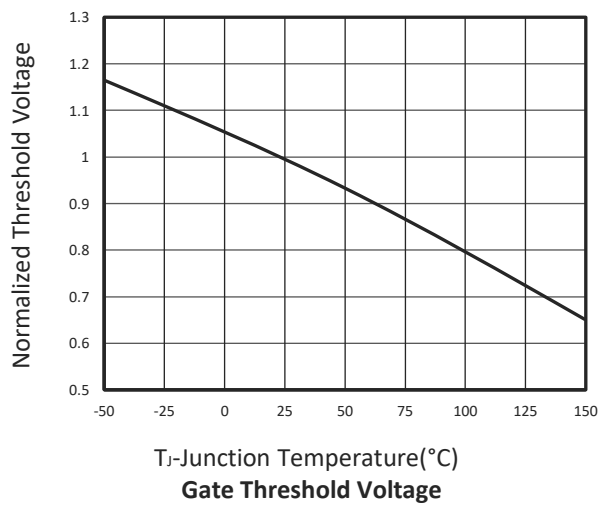
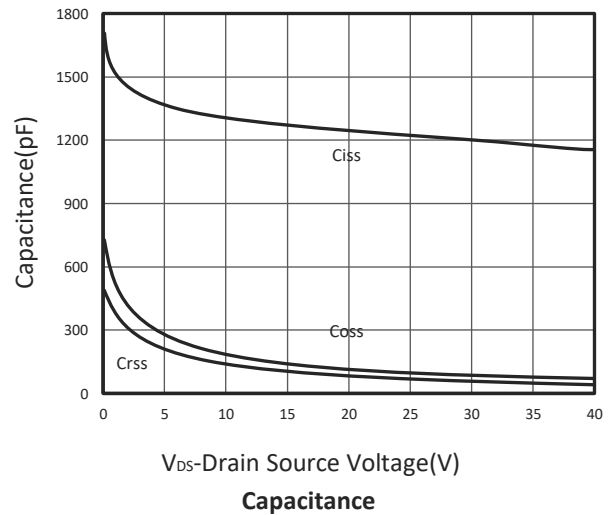
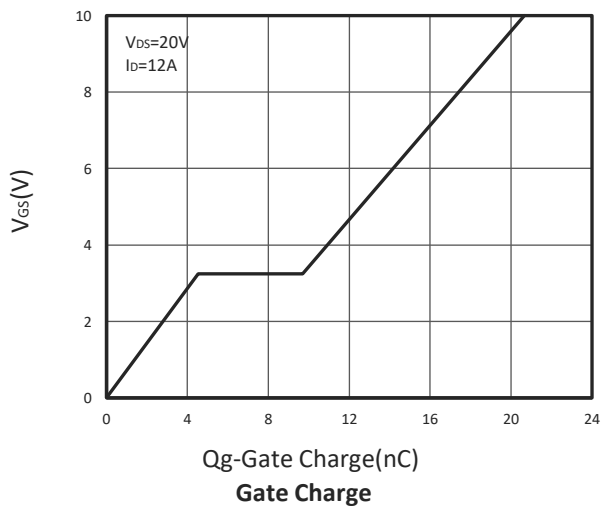
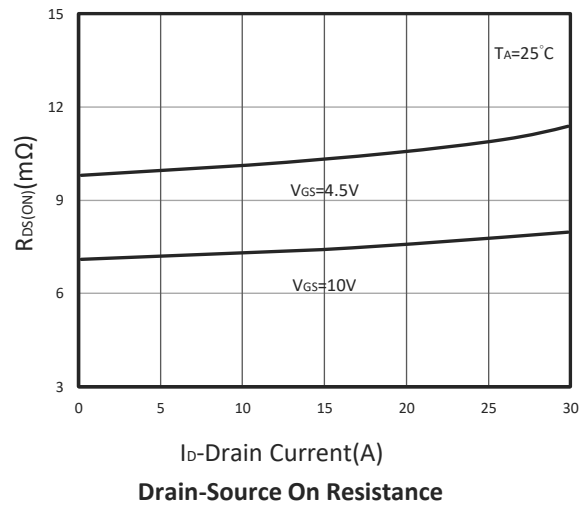
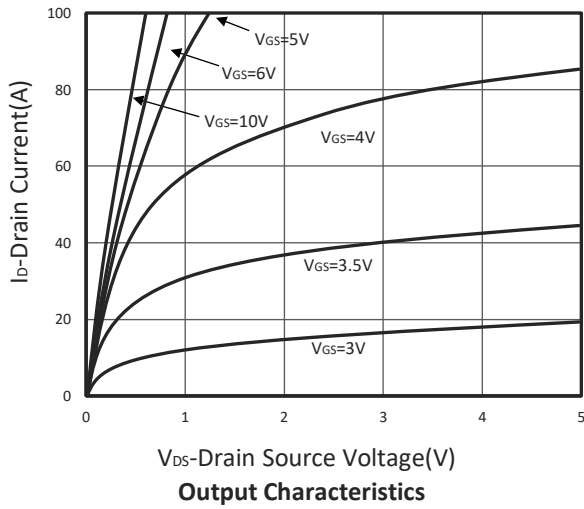
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Parameters						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40			V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.2	1.8	2.5	V
I _{GSS}	Gate Leakage Current	V _{DS} =0V, V _{GS} =±20V			±100	nA
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V, T _J =25°C			1	μA
		V _{DS} =32V, V _{GS} =0V, T _J =75°C			10	
R _{DS(ON)}	Drain-source On-Resistance ^D	V _{GS} =10V, I _D =15A		7	8.5	mΩ
		V _{GS} =4.5V, I _D =10A		10	12.5	
G _{fs}	Forward Transconductance	V _{DS} =10V, I _D =12A		20		S
Diode Characteristics						
V _{SD}	Diode Forward Voltage ^D	I _S =1A, V _{GS} =0V			1	V
I _S	Diode Continuous Forward Current [*]				40	A
t _{rr}	Reverse Recovery Time	I _S =15A, dI/dt=100A/μs		19		ns
Q _{rr}	Reverse Recovery Charge			10.5		nC
Dynamic and Switching Parameters^E						
Q _g	Total Gate Charge	V _{DS} =20V, V _{GS} =10V, I _D =12A		20.9	28.2	nC
Q _g	Total Gate Charge (4.5V)			10.2	13.8	
Q _{gs}	Gate-Source Charge			4.4	5.9	
Q _{gd}	Gate-Drain Charge			5.3	7.2	
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1MHz		1250		pF
C _{oss}	Output Capacitance			145		
C _{rss}	Reverse Transfer Capacitance			98		
R _g	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz		2.1		Ω
t _{d(on)}	Turn-On Time	V _{DD} =20V, V _{GS} =10V R _G =3.3Ω, I _D =1A		14	27	nS
t _r				9	17	
t _{d(off)}	Turn-Off Time			32	61	
t _f				9.2	17	

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

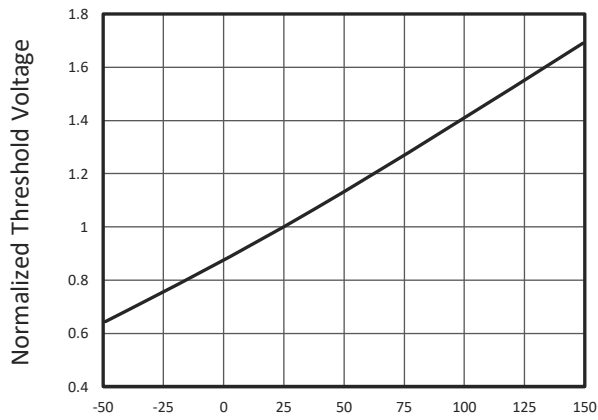
- A. Surface mounted on FR4 board using 1 in² pad size.
- B. Pulsed width limited by maximum junction temperature, T_{J(MAX)}=150°C.
- C. Using ≤ 10s junction-to-ambient thermal resistance is base on T_{J(MAX)}=150°C.
- D. Pulse test width ≤ 300μs and duty cycle ≤ 2%.
- E. Guaranteed by design, not subject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

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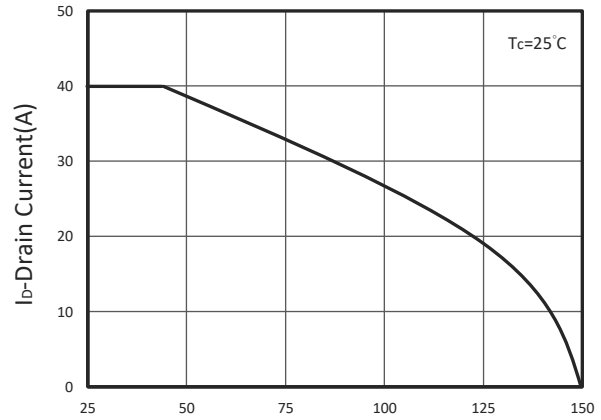
TYPICAL CHARACTERISTICS



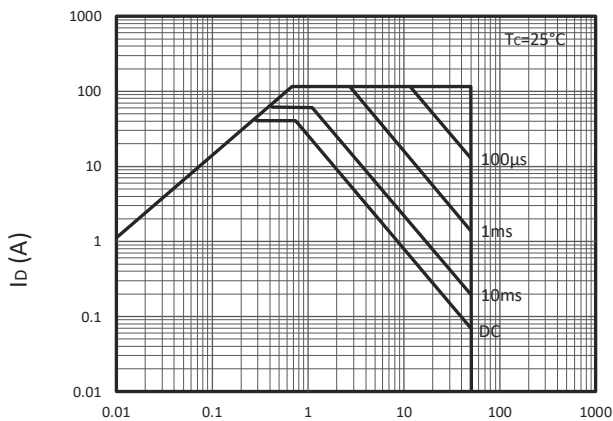
TYPICAL CHARACTERISTICS



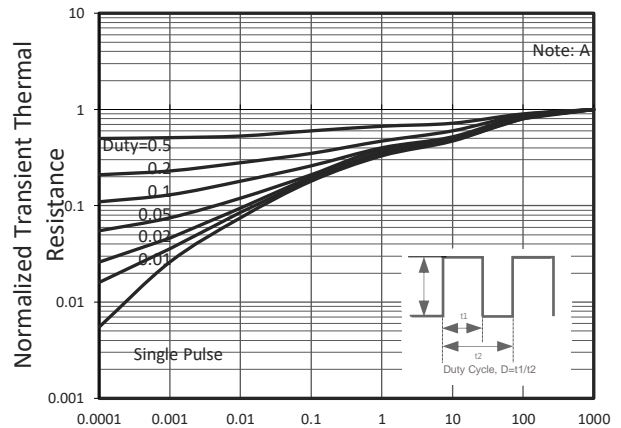
T_J-Junction Temperature(°C)
Gate Threshold Voltage



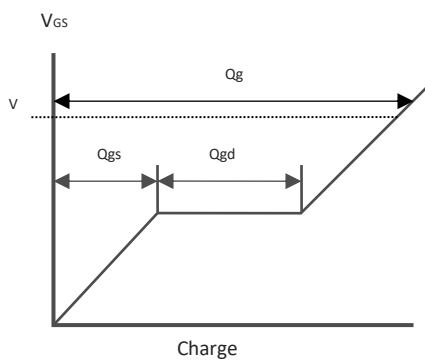
T_C-Case Temperature(°C)
Drain Current vs T_C



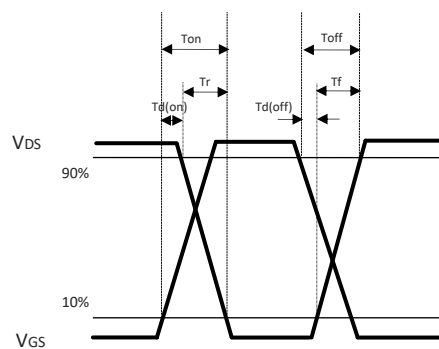
VD_S Voltage (V)
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec) (Note:A)
Thermal Transient Impedance

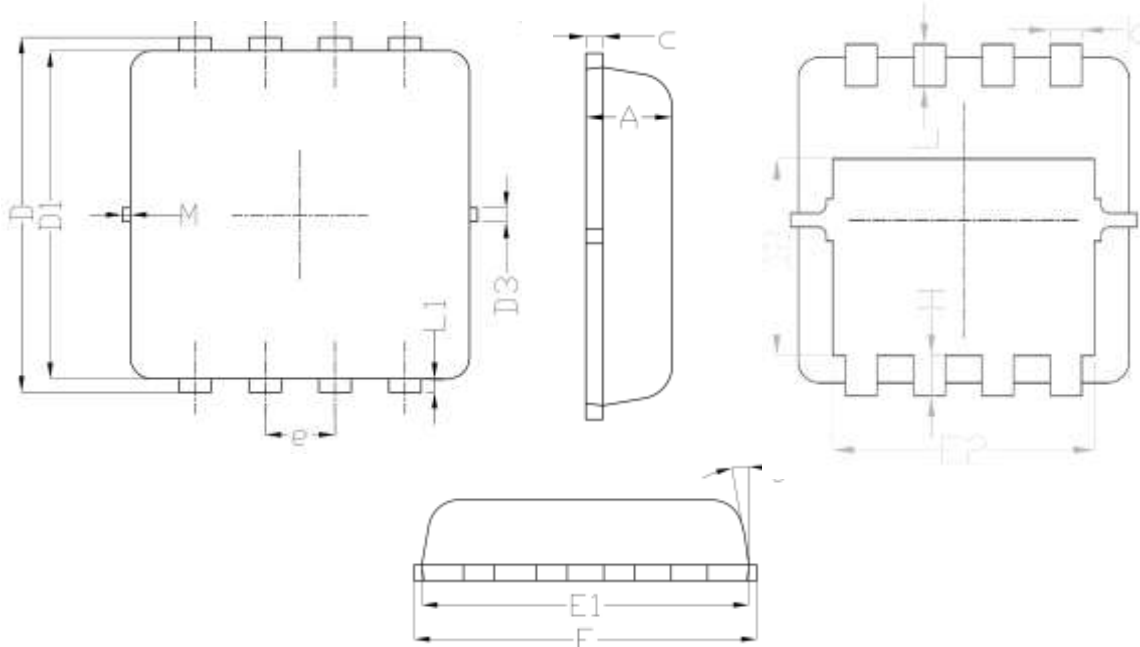


Gate Charge Waveform



Switching Time Waveform

DFN3.3X3.3A-8 PACKAGE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
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.		0.026BSC.	
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°	12°	0°	12°

Recommended Land Pattern

