

## Single P-Channel MOSFET

### DESCRIPTION

SMC4233 is the P-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 4233 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

**$V_{DS} = -20V$ ,  $I_D = -42A$**

- $R_{DS(ON)} = 12m\Omega(Typ.) @ V_{GS} = -10V$
- $R_{DS(ON)} = 14m\Omega(Typ.) @ V_{GS} = -4.5V$
- $R_{DS(ON)} = 18m\Omega(Typ.) @ V_{GS} = -2.5V$
- $R_{DS(ON)} = 23m\Omega(Typ.) @ V_{GS} = -1.8V$

### APPLICATIONS

- ◆ Portable Equipment
- ◆ Power Management
- ◆ Battery Powered Systems



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

Symbol	Parameter	Rating	Units	
$V_{DSS}$	Drain-Source Voltage	-20	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V	
$I_D$	Continuous Drain Current ( $V_{GS} = -4.5V$ )	$T_C = 25^\circ C$	-42	A
		$T_C = 100^\circ C$	-27	A
$I_{DM}$	Pulsed Drain Current <sup>A</sup>	-120	A	
$I_D$	Continuous Drain Current ( $V_{GS} = -4.5V$ )	$T_A = 25^\circ C$	-14	A
		$T_A = 70^\circ C$	-11.2	A
$P_D$	Power Dissipation <sup>B</sup>	$T_A = 25^\circ C$	3.1	W
		$T_A = 70^\circ C$	2	W
$I_{AS}$	Avalanche Current <sup>A</sup>	-35	A	
$E_{AS}$	Single Pulse Avalanche energy $L = 0.1mH$ <sup>AF</sup>	61	mJ	
$P_D$	Power Dissipation <sup>C</sup>	$T_C = 25^\circ C$	29	W
		$T_C = 100^\circ C$	11.6	W
$T_J$	Operation Junction Temperature	-55/150	$^\circ C$	
$T_{STG}$	Storage Temperature Range	-55/150	$^\circ C$	

### THERMAL RESISTANCE

Symbol	Parameter	Typ	Max	Units
$R_{JA}$	Thermal Resistance Junction to Ambient <sup>B</sup>	$t \leq 10s$	40	$^\circ C/W$
	Thermal Resistance Junction to Ambient <sup>BD</sup>	Steady-State	65	
$R_{JC}$	Thermal Resistance Junction to Case		4.3	

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

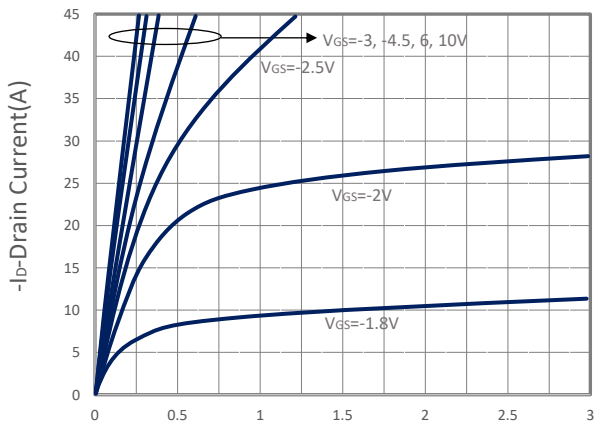
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4	-0.5	-1	V
$I_{GSS}$	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 12V$			$\pm 100$	nA
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$			-1	$\mu A$
		$V_{DS}=-16V, V_{GS}=0V, T_J=75^\circ\text{C}$			-10	
$R_{DS(ON)}$	Drain-source On-Resistance <sup>E</sup>	$V_{GS}=-10V, I_D=-14A$		6.5	8.5	m
		$V_{GS}=-4.5V, I_D=-14A$		7.8	10	
		$V_{GS}=-2.5V, I_D=-10A$		10	13	
		$V_{GS}=-1.8V, I_D=-5A$		13	18	
$G_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-14A$		35		S
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage <sup>E</sup>	$I_S=-1A, V_{GS}=0V$		-0.55	-1	V
$I_S$	Continuous Source Current				-42	A
<b>Dynamic and Switching Parameters</b>						
$Q_g$	Total Gate Charge	$V_{DS}=-10V, V_{GS}=-4.5V, I_D=-14A$		45	60.8	
$Q_{gs}$	Gate-Source Charge			6.2	8.4	
$Q_{gd}$	Gate-Drain Charge			12	16.2	
$C_{iss}$	Input Capacitance	$V_{DS}=-10V, V_{GS}=0V, f=1\text{MHz}$		2785		pF
$C_{oss}$	Output Capacitance			348		
$C_{riss}$	Reverse Transfer Capacitance			213		
$t_{d(on)}$	Turn-On Time <sup>E</sup>	$V_{DD}=-10V, V_{GEN}=-4.5V, R_G=10, I_D=-1A$		17	32	nS
$t_r$				45	86	
$t_{d(off)}$	Turn-Off Time <sup>E</sup>			124	236	
$t_f$				32	61	

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

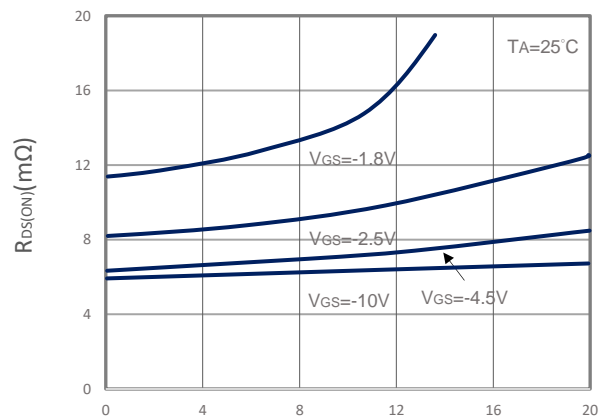
- Pulsed width limited by maximum junction temperature,  $T_{J(MAX)}=150^\circ\text{C}$ .
- Measure the value in a still air environment at  $T_A=25^\circ\text{C}$ , using an installation mounted on a 1 in2 FR-4 board, maximum junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ .
- Using junction-to-case thermal resistance, dissipation limit in the case of additional heat.
- $T_{J(MAX)}=150^\circ\text{C}$ , using junction-to-case thermal resistance ( $R_{JC}$ ) is more useful in additional heat sinking is used.
- The pulse test width is  $300\mu\text{s}$  and the duty cycle  $\leq 2\%$ .
- The EAS data shows Maximum, tested and pulse width limited by maximum.

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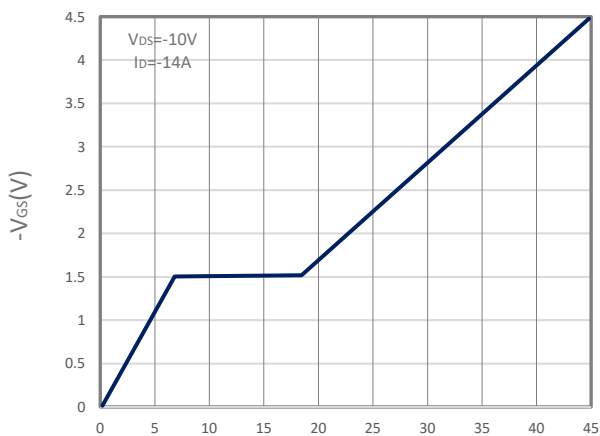
## TYPICAL CHARACTERISTICS



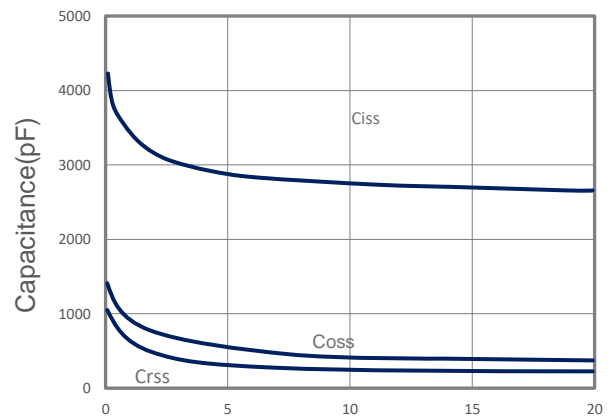
**Output Characteristics**



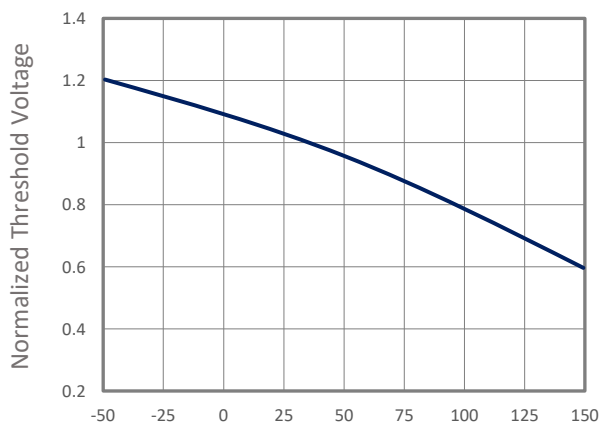
**Drain-Source On Resistance**



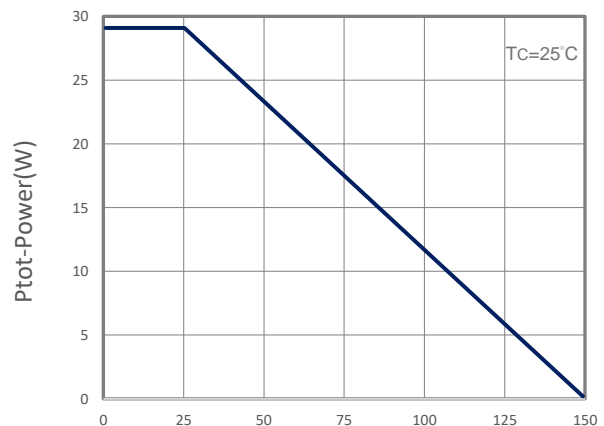
**Gate Charge**



**Capacitance**

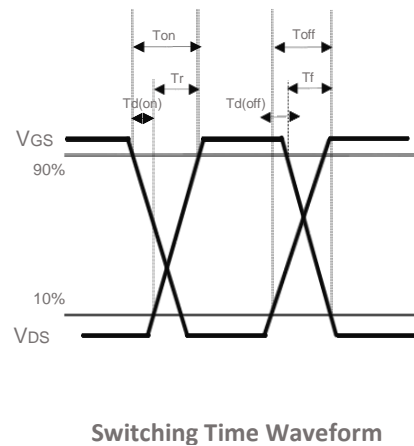
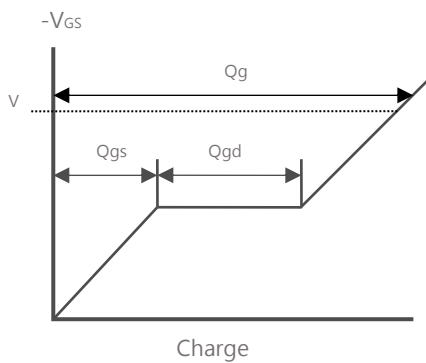
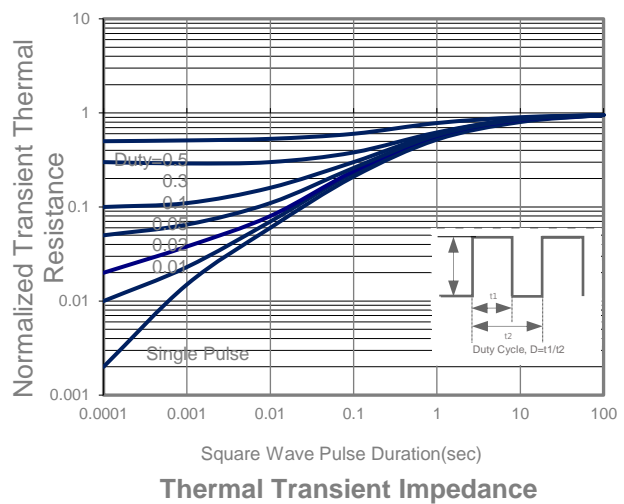
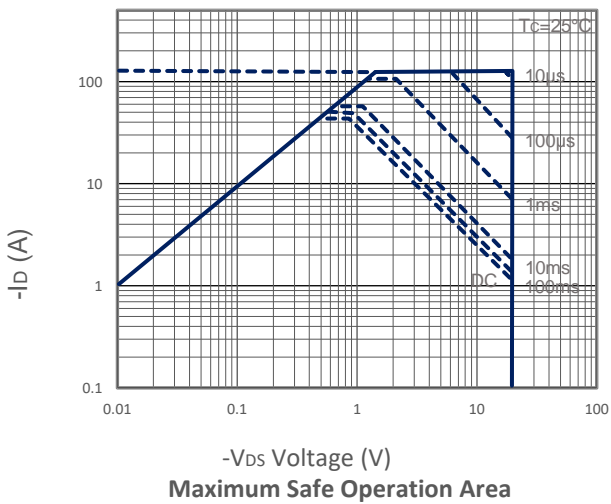
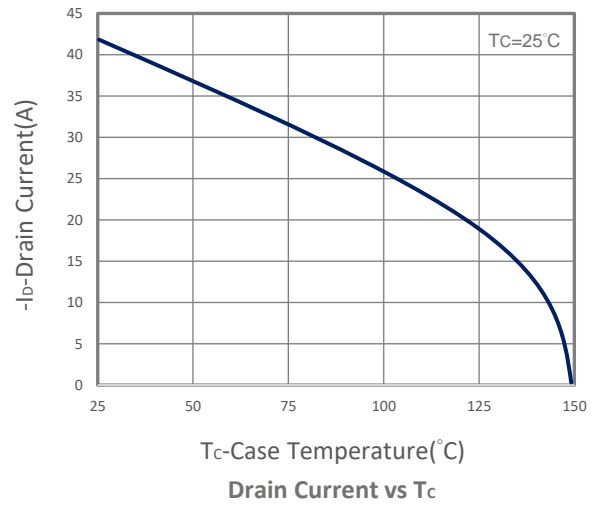
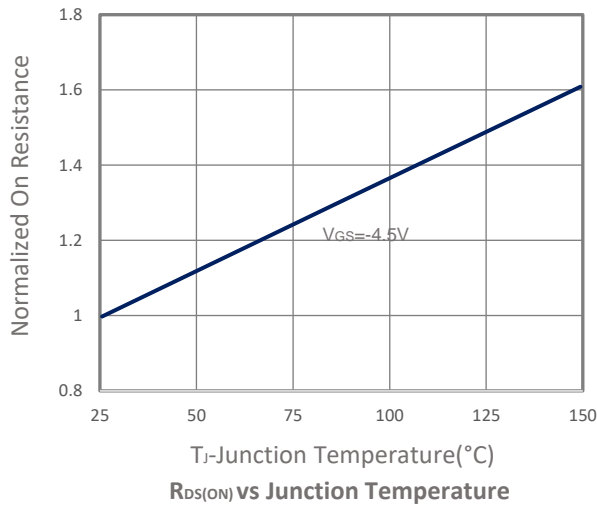


**Gate Threshold Voltage**

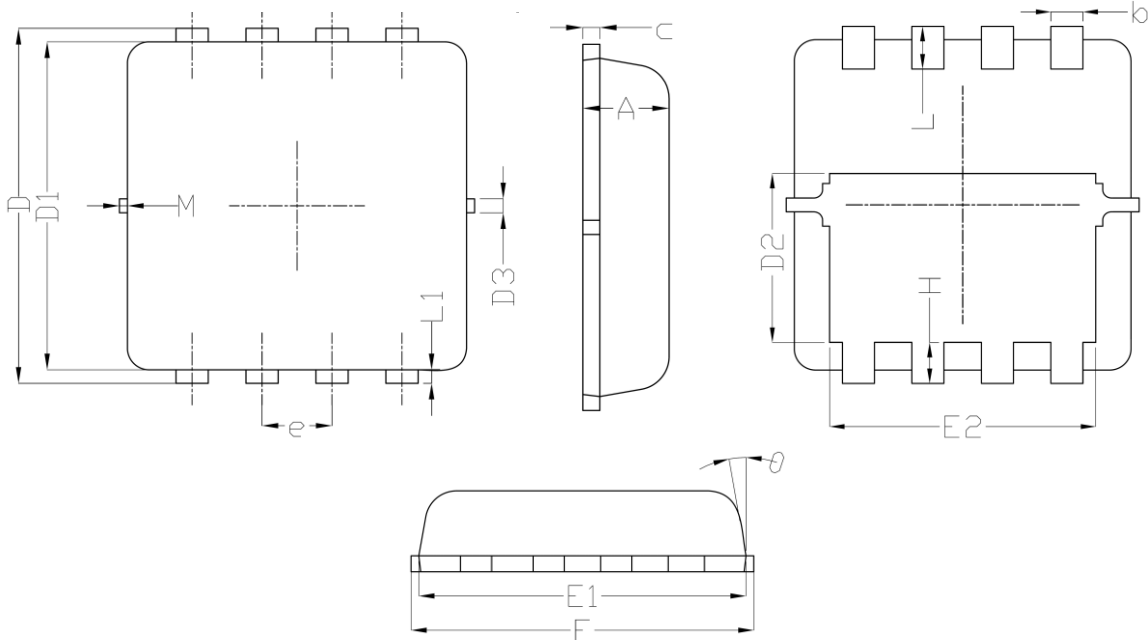


**Power Dissipation**

## TYPICAL CHARACTERISTICS



## 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	3.300	3.400	0.130	0.134
D1	3.250	3.450	0.128	0.136
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
	0°	12°	0°	15°

Recommended Land Pattern

