

RoHS Compliant Product
A suffix of "-C" specifies halogen free

DESCRIPTION

SMS501DE is the highest performance trench N-ch MOSFETs with extreme high cell density, which provides excellent $R_{DS(on)}$ and gate charge for most synchronous buck converter applications.

FEATURES

- Advanced high cell density Trench technology
- Super low gate charge
- Excellent CdV/dt effect decline
- Green device available

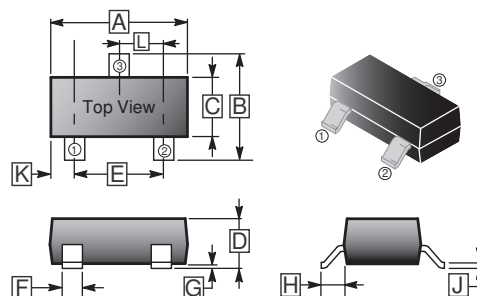
MARKING

501DE

PACKAGE INFORMATION

Package	MPQ	Leader Size
SOT-23	3K	7 inch

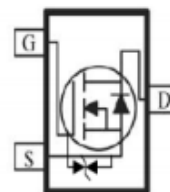
SOT-23



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	0.09	0.18
B	2.10	2.65	H	0.35	0.65
C	1.20	1.40	J	0.08	0.20
D	0.89	1.15	K	0.6 REF.	
E	1.78	2.04	L	0.95 BSC.	
F	0.30	0.50			

ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	0.03
		$T_C=100^\circ\text{C}$	0.024
Pulsed Drain Current	I_{DM}	0.12	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	0.5
		Derate above 25°C	0.004
Operating Junction and Storage Temperature Range	T_J, T_{STG}	150, -55~150	$^\circ\text{C}$
Thermal Resistance Rating			
Maximum Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	250	$^\circ\text{C} / \text{W}$
Maximum Thermal Resistance from Junction to Case	$R_{\theta JC}$	50	$^\circ\text{C} / \text{W}$



ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Static						
Drain-Source Breakdown Voltage	BV_{DSS}	600	-	-	V	$V_{GS} = -5V, I_D = 250\mu A$
Drain-Source Leakage Current	$I_{D(off)}$	-	-	0.1	μA	$V_{GS} = -5V, V_{DS} = 600V$
Gate-Source Leakage Current	I_{GSS}	-	-	± 100	nA	$V_{DS} = 0V, V_{GS} = \pm 20V$
Gate-Threshold Voltage	$V_{GS(th)}$	-2.7	-	-1	V	$V_{DS} = 3V, I_D = 8\mu A$
Drain-Source Leakage Current	I_{DSS}	12	-	-	mA	$V_{DS} = 25V, V_{GS} = 0$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	-	310	700	Ω	$V_{GS} = 0V, I_D = 3mA$
		-	330	700		$V_{GS} = 10V, I_D = 16mA$
Total Gate Charge ^{1,2}	Q_g	-	1.8	-	nC	$V_{DS} = 400V$ $V_{GS} = -5V$ to $5V$ $I_D = 0.01A$
Gate-Source Charge ^{1,2}	Q_{gs}	-	0.75	-		
Gate-Drain Charge ^{1,2}	Q_{gd}	-	0.56	-		
Turn-on Delay Time ^{1,2}	$T_{d(on)}$	-	18	-	nS	$V_{DD} = 300V$ $V_{GS} = -5V \dots 7V$ $R_G = 6\Omega$ $I_D = 0.01A$
Rise Time ^{1,2}	T_r	-	90	-		
Turn-off Delay Time ^{1,2}	$T_{d(off)}$	-	93	-		
Fall Time ^{1,2}	T_f	-	210	-		
Input Capacitance	C_{iss}	-	99	-	pF	$V_{DS} = 25V$ $V_{GS} = -5V$ $f = 1MHz$
Output Capacitance	C_{oss}	-	9.1	-		
Reverse Transfer Capacitance	C_{rss}	-	5	-		
Source-Drain Diode						
Diode Forward Voltage	V_{SD}	-	-	1.2	V	$I_S = 16mA, V_{GS} = -5V$
Continuous Source Current	I_S	-	-	0.03	A	Integral Reverse P-N Junction Diode in MOSFET
Pulsed Source Current	I_{SM}	-	-	0.12	A	
Reverse Recovery Time	T_{RR}	-	-	367	ns	$I_F = 0.01A, V_R = 300V,$ $dI_F/dt = 100A/\mu S$
Reverse Recovery Charge	Q_{RR}	-	-	963	μC	

Notes:

1. Pulse Test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
2. Essentially independent of operating temperature.

CHARACTERISTIC CURVES

Figure 1. On-Region Characteristics

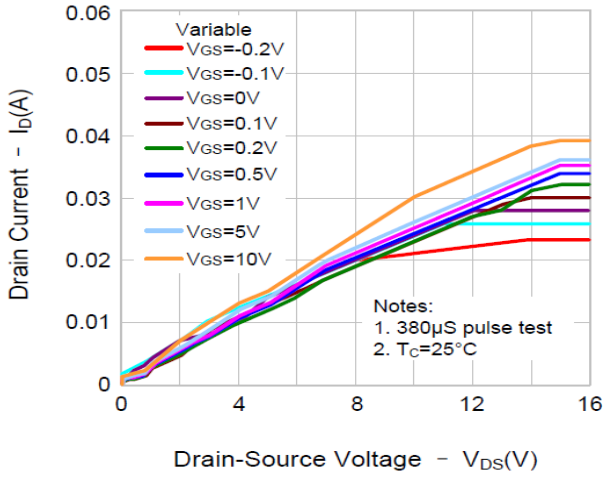


Figure 2. Transfer Characteristics

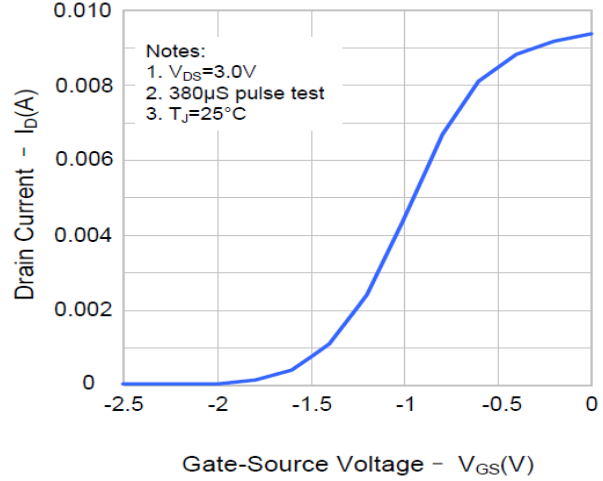


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

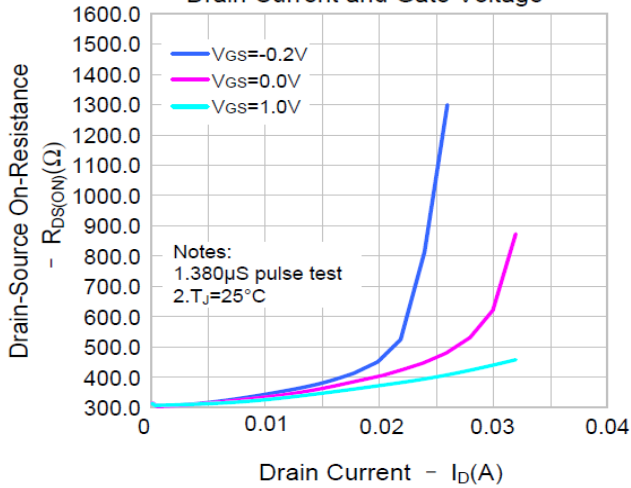


Figure 4. Forward characteristics of reverse diode

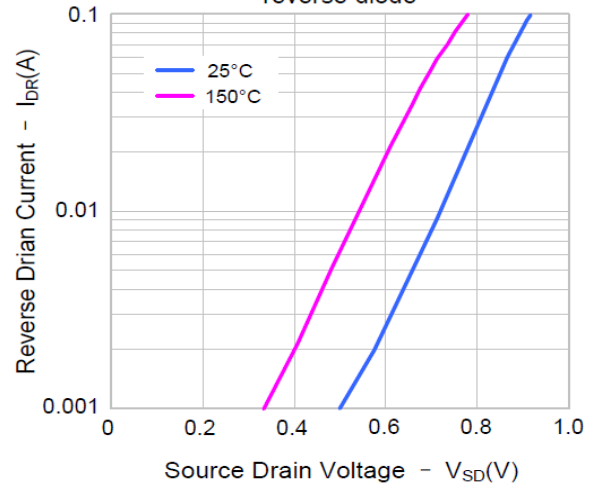


Figure 5. Breakdown Voltage Variation vs. Temperature

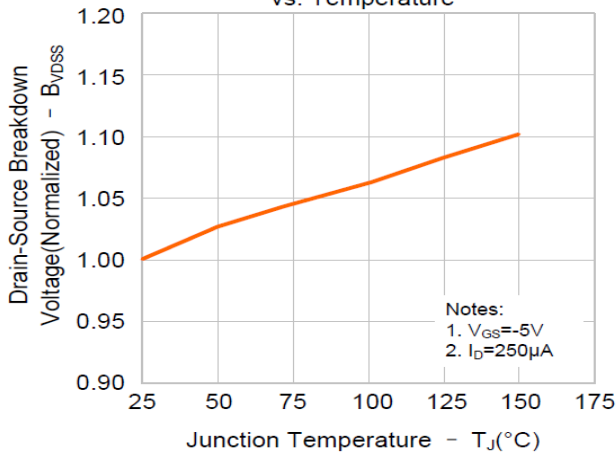
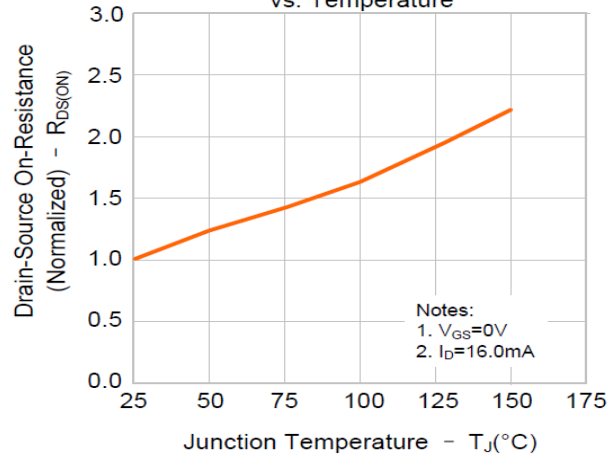


Figure 6. On-resistance Variation vs. Temperature



CHARACTERISTIC CURVES

Figure 7. Gate Threshold Voltage vs. Temperature

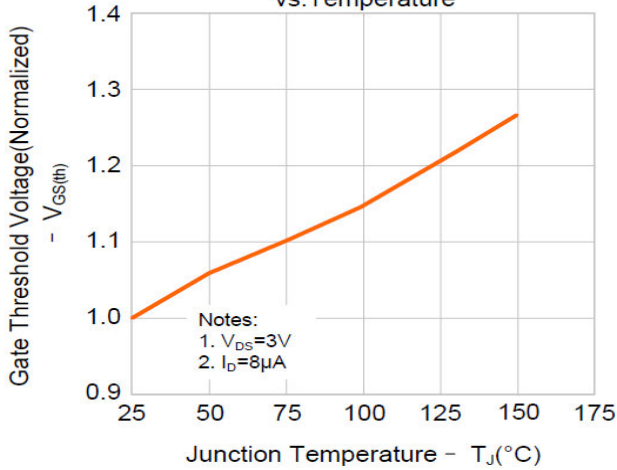


Figure 8. Typ. Forward Transconductance

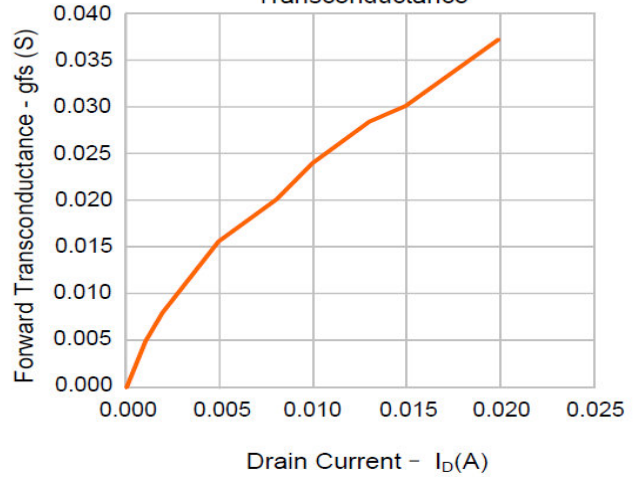


Figure 9. Power Dissipation vs. Case Temperature

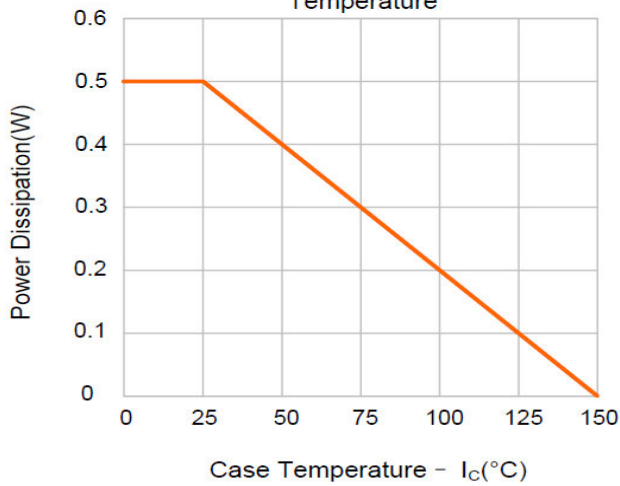


Figure 10. Max. Safe Operating Area

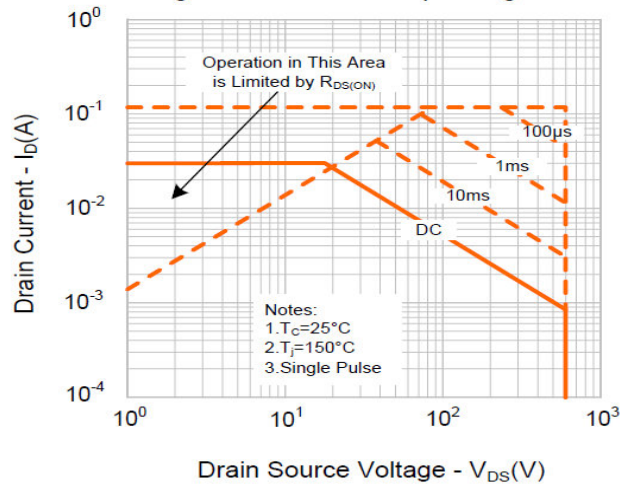


Figure 11. Maximum Drain Current vs. Case Temperature

