

# SI2333CDS-T1-E3-VB Datasheet

SOT23-3 Trench Single-P -20V MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	- 20
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = - 4.5$ V	0.034
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = - 2.5$ V	0.046
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = - 1.8$ V	0.067
$I_D$ (A)	- 5
Configuration	Single

## FEATURES

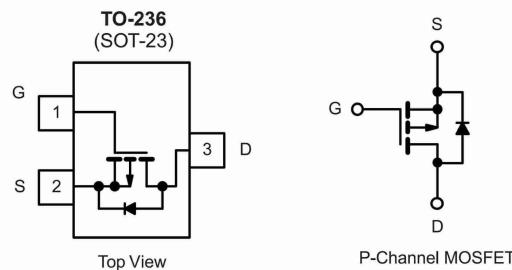
- Halogen-free Option Available
- TrenchFET® Power MOSFET



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Load Switch for Portable Devices



ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	- 20	V
Gate-Source Voltage		$V_{GS}$	$\pm 8$	
Continuous Drain Current	$T_C = 25$ °C	$I_D$	- 5	A
	$T_C = 125$ °C		- 3	
Continuous Source Current (Diode Conduction)		$I_S$	- 2.5	
Pulsed Drain Current <sup>a</sup>		$I_{DM}$	- 20	
Single Pulse Avalanche Current	$L = 0.1$ mH	$I_{AS}$	- 11	mJ
Single Pulse Avalanche Energy		$E_{AS}$	6	
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	2	
	$T_C = 125$ °C		0.67	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to + 175	°C

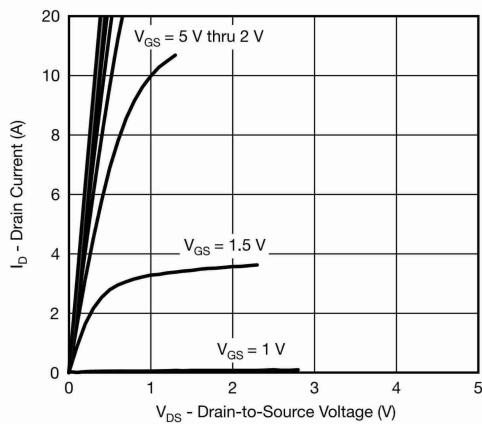
THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>b</sup>	$R_{thJA}$	175	°C/W
Junction-to-Foot (Drain)		$R_{thJF}$	75	

<b>SPECIFICATIONS</b> ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)								
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
<b>Static</b>								
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$		- 20	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$		- 0.45	-	- 1		
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 8\text{ V}$		-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -12\text{ V}$	-	-	- 1	$\mu\text{A}$	
		$V_{GS} = 0\text{ V}$	$V_{DS} = -12\text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	- 50		
		$V_{GS} = 0\text{ V}$	$V_{DS} = -12\text{ V}$ , $T_J = 175^\circ\text{C}$	-	-	- 150		
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{GS} = -4.5\text{ V}$	$V_{DS} \leq -5\text{ V}$	- 10	-	-	A	
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = -4.5\text{ V}$	$I_D = -3.5\text{ A}$	-	0.034	-	$\Omega$	
		$V_{GS} = -4.5\text{ V}$	$I_D = -3.5\text{ A}$ , $T_J = 125^\circ\text{C}$	-	0.066	-		
		$V_{GS} = -4.5\text{ V}$	$I_D = -3.5\text{ A}$ , $T_J = 175^\circ\text{C}$	-	0.075	-		
		$V_{GS} = -2.5\text{ V}$	$I_D = -3\text{ A}$	-	0.046	-		
		$V_{GS} = -1.8\text{ V}$	$I_D = -2\text{ A}$	-	0.067	-		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = -5\text{ V}$ , $I_D = -1.6\text{ A}$		-	7	-	S	
<b>Dynamic<sup>b</sup></b>								
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -6\text{ V}$ , $f = 1\text{ MHz}$	-	695	870	pF	
Output Capacitance	$C_{oss}$			-	265	335		
Reverse Transfer Capacitance	$C_{rss}$			-	190	240		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = -4.5\text{ V}$	$V_{DS} = -6\text{ V}$ , $I_D = -3.85\text{ A}$	-	8.4	13	nC	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	1	-		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	2.4	-		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		4.1	8.2	12.3	$\Omega$	
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = -6\text{ V}$ , $R_L = 1.6\text{ }\Omega$ $I_D \cong -3.85\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_g = 1\text{ }\Omega$		-	17	26	ns	
Rise Time <sup>c</sup>	$t_r$			-	19	29		
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$			-	28	42		
Fall Time <sup>c</sup>	$t_f$			-	13	20		
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>								
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	- 20	A	
Forward Voltage	$V_{SD}$	$I_F = -2\text{ A}$ , $V_{GS} = 0\text{ V}$		-	- 0.8	- 1.2	V	

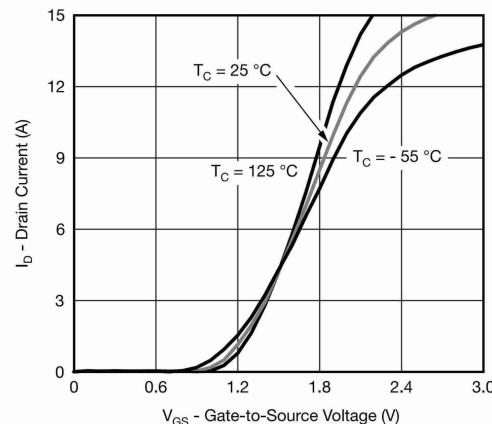
**Notes**

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\text{ \%}$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

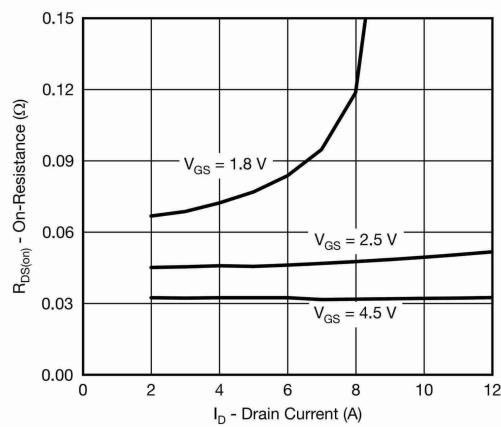
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


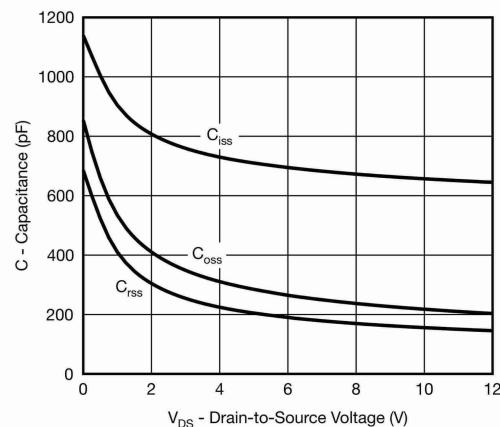
Output Characteristics



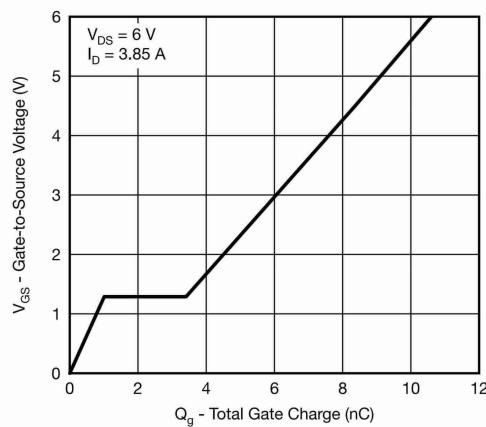
Transfer Characteristics



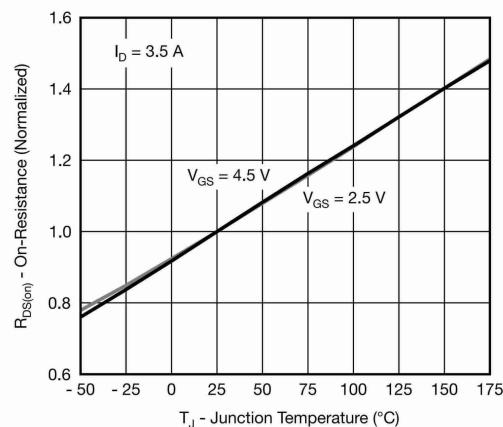
On-Resistance vs. Drain Current



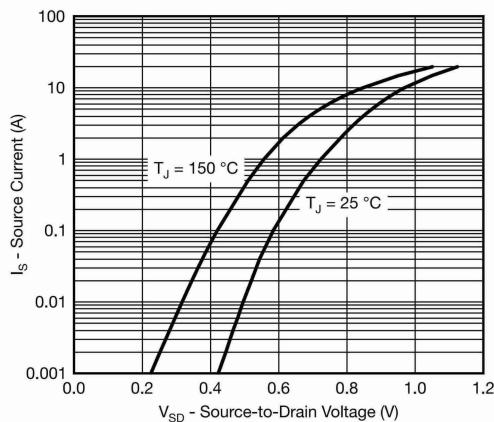
Capacitance



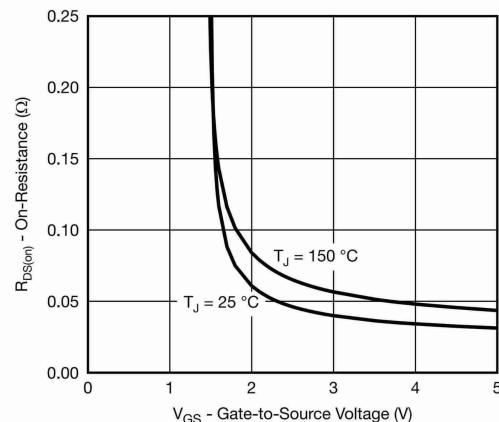
Gate Charge



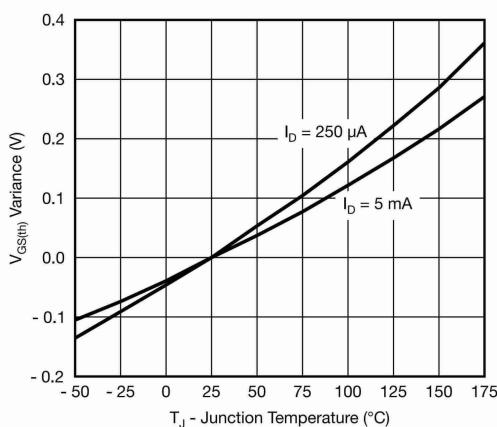
On-Resistance vs. Junction Temperature

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


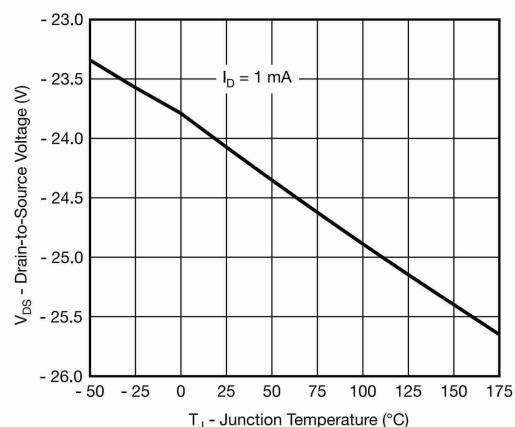
Source-Drain Diode Forward Voltage



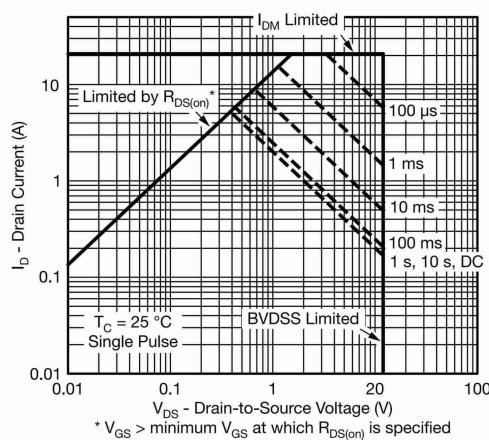
On-Resistance vs. Gate-to-Source Voltage



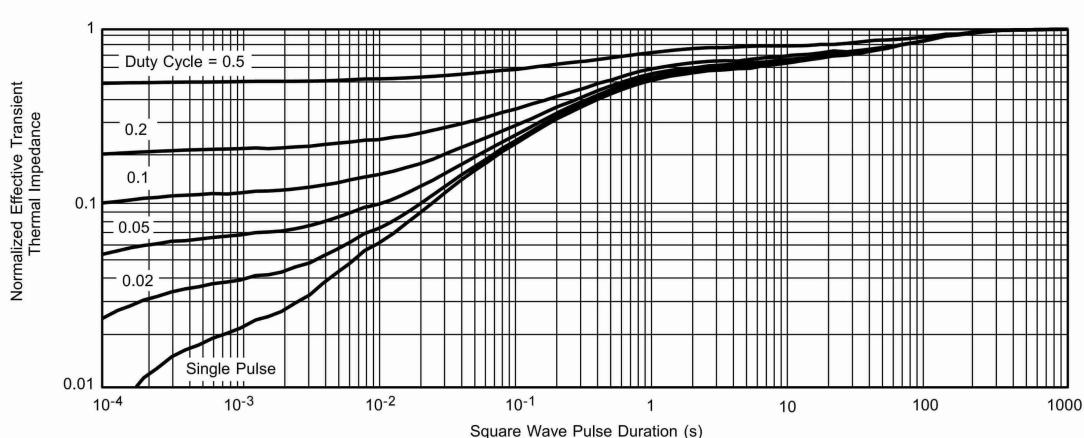
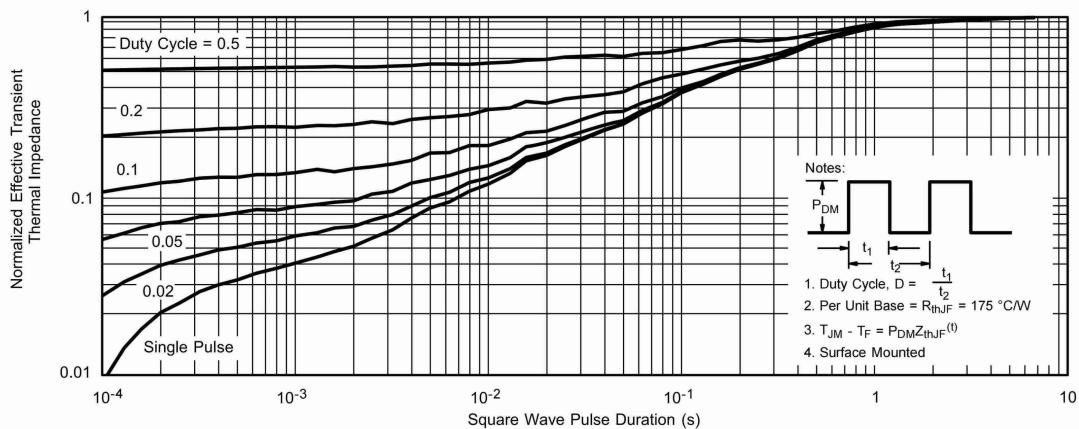
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

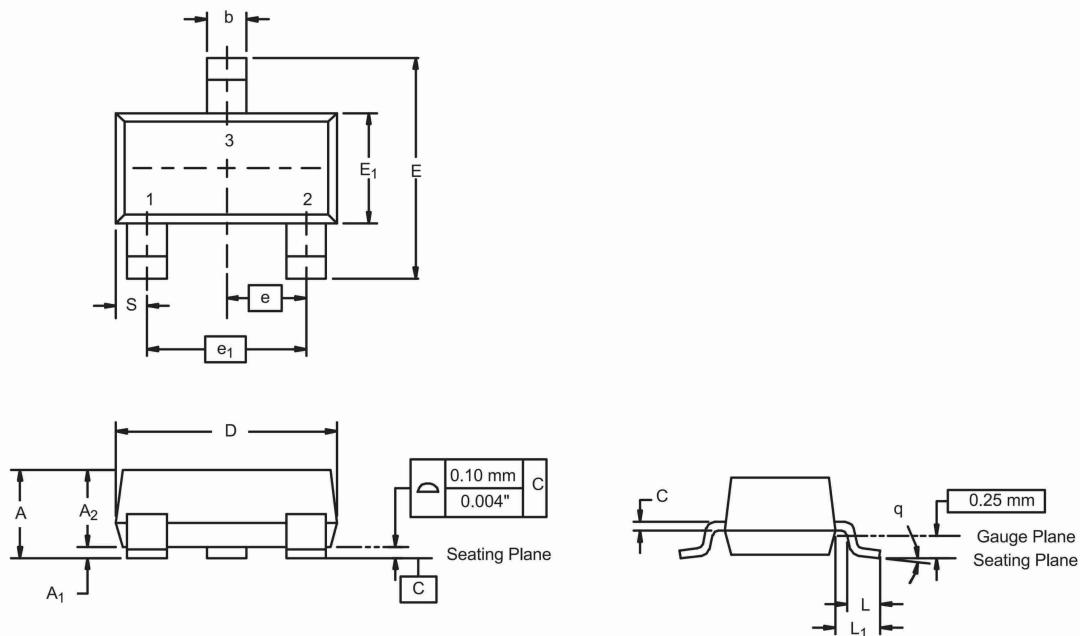


Safe Operating Area

**THERMAL RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Foot (25 °C)

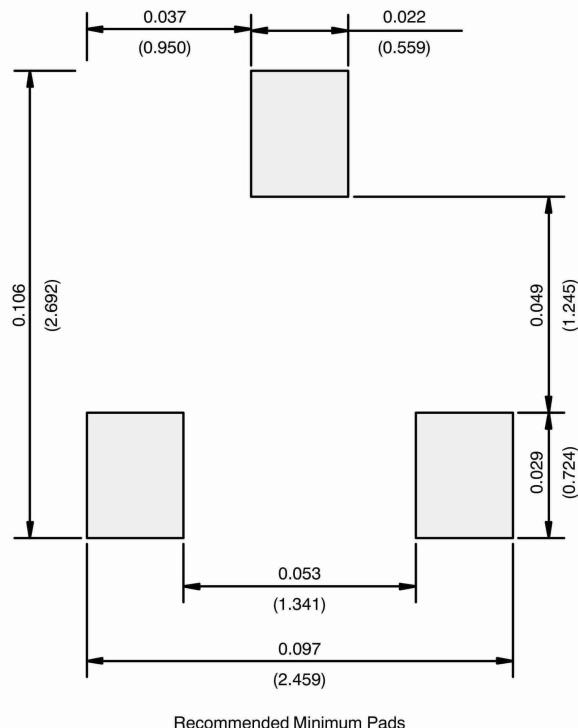
are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

**SOT-23 (TO-236): 3-LEAD**

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
<b>A</b>	0.89	1.12	0.035	0.044
<b>A<sub>1</sub></b>	0.01	0.10	0.0004	0.004
<b>A<sub>2</sub></b>	0.88	1.02	0.0346	0.040
<b>b</b>	0.35	0.50	0.014	0.020
<b>c</b>	0.085	0.18	0.003	0.007
<b>D</b>	2.80	3.04	0.110	0.120
<b>E</b>	2.10	2.64	0.083	0.104
<b>E<sub>1</sub></b>	1.20	1.40	0.047	0.055
<b>e</b>	0.95 BSC		0.0374 Ref	
<b>e<sub>1</sub></b>	1.90 BSC		0.0748 Ref	
<b>L</b>	0.40	0.60	0.016	0.024
<b>L<sub>1</sub></b>	0.64 Ref		0.025 Ref	
<b>S</b>	0.50 Ref		0.020 Ref	
<b>q</b>	3°	8°	3°	8°

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 DWG: 5479

## RECOMMENDED MINIMUM PADS FOR SOT-23

[Return to Index](#)

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