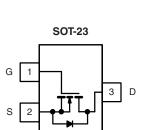


# N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}\left(\Omega\right)$	I <sub>D</sub> (A) <sup>e</sup>	Q <sub>g</sub> (Typ.)			
	0.028 at V <sub>GS</sub> = 4.5 V	6 <sup>a</sup>				
20	0.042 at V <sub>GS</sub> = 2.5 V	6 <sup>a</sup>	8.8 nC			
	0.050 at V <sub>GS</sub> = 1.8 V	5.6				



#### **FEATURES**

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> Tested
- Compliant to RoHS Directive 2002/95/EC



ROHS COMPLIANT HALOGEN FREE

## **APPLICATIONS**

- DC/DC Converters
- Load Switch for Portable Applications

ABSOLUTE MAXIMUM RATIN	<b>IGS</b> $I_A = 25  ^{\circ}\text{C},$	uniess otnei	wise noted		
Parameter	Symbol	Limit	Unit		
Drain-Source Voltage		$V_{DS}$	20	V	
Gate-Source Voltage		$V_{GS}$	± 12		
	T <sub>C</sub> = 25 °C		6 <sup>a</sup>		
Continuous Drain Current /T 150 °C\	T <sub>C</sub> = 70 °C	1 , [	5.1		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>A</sub> = 25 °C	l lo	5 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C	1	4 <sup>b, c</sup>	Α	
Pulsed Drain Current		I <sub>DM</sub>	20		
Ocaliana Carra Desira Disala Carra	T <sub>C</sub> = 25 °C		1.75		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	l <sub>S</sub>	1.04 <sup>b, c</sup>		
	T <sub>C</sub> = 25 °C		2.1		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	]	1.3	w	
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	P <sub>D</sub>	1.25 <sup>b, c</sup>	VV	
	T <sub>A</sub> = 70 °C	1 1	0.8 <sup>b, c</sup>		
Operating Junction and Storage Temperatur	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C		
Soldering Recommendations (Peak Tempera		260			

THERMAL RESISTANCE RATINGS								
Parameter	Symbol	Typical	Maximum	Unit				
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 5 s	R <sub>thJA</sub>	80	100	°C/W			
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	40	60	] 5/**			

#### Notes:

- a. Package limited
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 125  $^{\circ}\text{C/W}.$
- e. Based on  $T_C$  = 25 °C.

服务热线:400-655-8788

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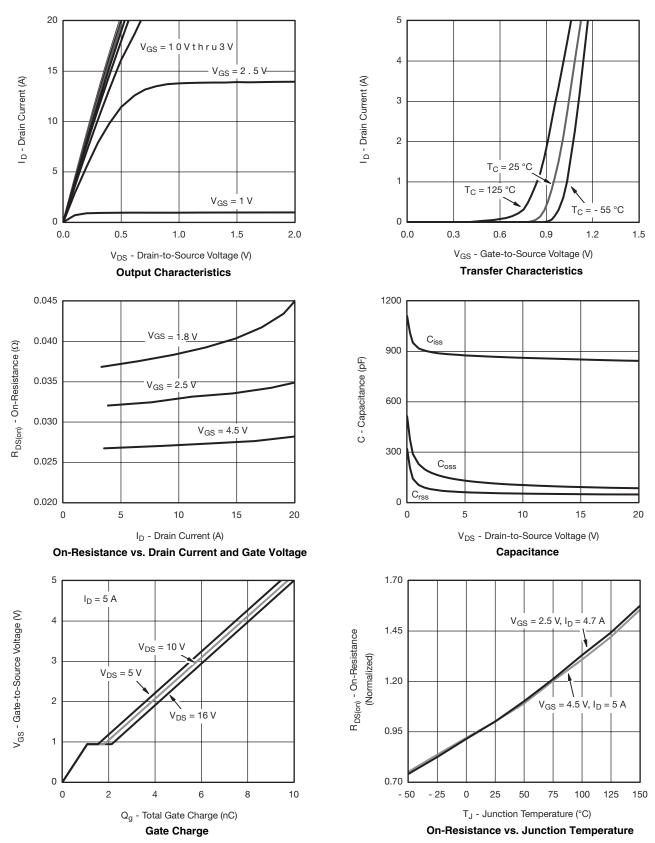
Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static			l .				
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	20			V	
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	I <sub>D</sub> = 250 μA		25		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I <sub>D</sub> = 250 μA		- 2.6			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_{D} = 250 \mu A$	0.45		1.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			± 100	nA	
	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μΑ	
Zero Gate Voltage Drain Current		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C			10		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \le 5 \text{ V}, V_{GS} = 4.5 \text{ V}$	20			Α	
	(* )	$V_{GS} = 4.5 \text{ V}, I_D = 5.0 \text{ A}$		0.028	+ +		
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 2.5 \text{ V}, I_D = 4.7 \text{ A}$		0.042		Ω	
	= = (,	V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 4.3 A		0.050		┤	
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 5.0 A		24		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>			865		pF	
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		105			
Reverse Transfer Capacitance	C <sub>rss</sub>	50 - 7 do - 7		55			
Tieverse transier Capacitance		V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 5 V, I <sub>D</sub> = 5.0 A		12	18		
Total Gate Charge	Qg	103 10 1, 103 0 1, 10 010 11		8.8	14	nC	
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 5.0 \text{ A}$		1.1			
Gate-Drain Charge	Q <sub>gd</sub>	1 DS 10 1, 1 GS 110 1, 1 D 010 / 1		0.7			
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.5	2.4	4.8	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			8	16		
Rise Time	t <sub>r</sub>	$V_{DD}$ = 10 V, $R_L$ = 2.2 $\Omega$		17	26	1	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 4 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		31	47		
Fall Time	t <sub>f</sub>			8	16	ns	
Turn-On Delay Time	t <sub>d(on)</sub>			5	10		
Rise Time	t <sub>r</sub>	$V_{DD} = 10 \text{ V}, R_1 = 2.2 \Omega$		13	20		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 4 \text{ A}, V_{GEN} = 5 \text{ V}, R_g = 1 \Omega$		21	32		
Fall Time	t <sub>f</sub>			6	12		
Drain-Source Body Diode Characteristic	-		<u> </u>				
Continuous Source-Drain Diode Current	Is	T <sub>C</sub> = 25 °C			1.75		
Pulse Diode Forward Current	I <sub>SM</sub>	<u> </u>			20	A	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 4 A, V <sub>GS</sub> = 0 V		0.75	1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	- 40		12	20	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			5	10	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 4$ A, $dI/dt = 100$ A/ $\mu$ s, $T_J = 25$ °C		7	-		
Reverse Recovery Rise Time	t <sub>b</sub>			5		ns	

### Notes:

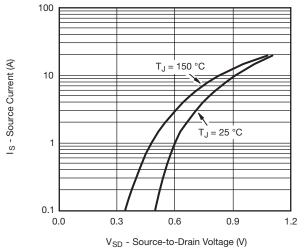
- a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 % b. Guaranteed by design, not subject to production testing.

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.

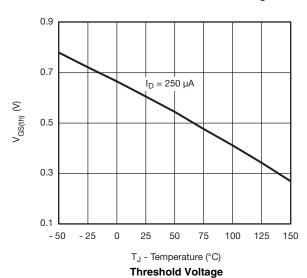








Source-Drain Diode Forward Voltage

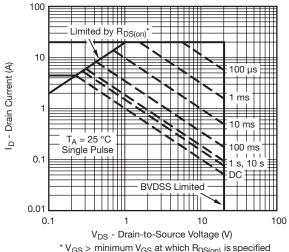


0.06  $I_D = 5 A$ R<sub>DS(on)</sub> - On-Resistance (Ω) 0.05 0.04 T<sub>J</sub> = 125 °C 0.03  $T_J = 25$  °C 0.02 0 4 6 V<sub>GS</sub> - Gate-to-Source Voltage (V)

On-Resistance vs. Gate-to-Source Voltage



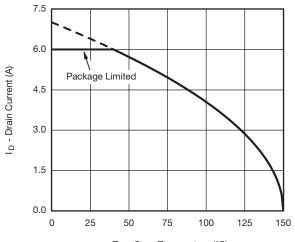
Single Pulse Power (Junction-to-Ambient)



\*  $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

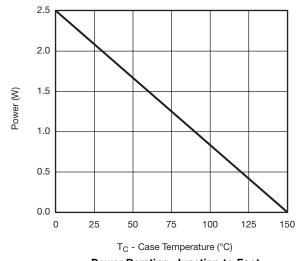
Safe Operating Area, Junction-to-Ambient

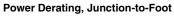


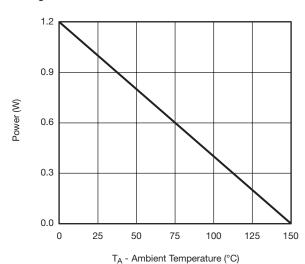


T<sub>C</sub> - Case Temperature (°C)

#### **Current Derating\***



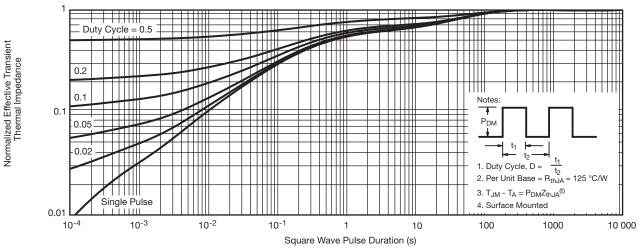


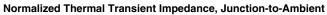


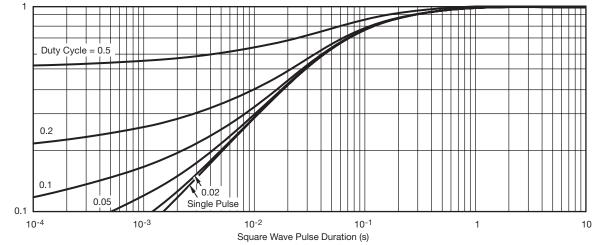
Power Derating, Junction-to-Ambient

<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max.)}$  = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.







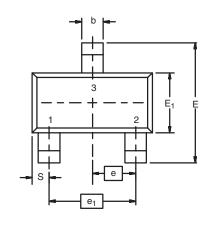


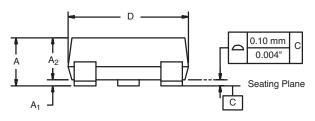
Normalized Thermal Transient Impedance, Junction-to-Foot

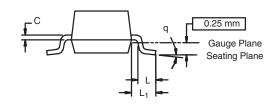
Normalized Effective Transient Thermal Impedance



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







Dim	MILLI	METERS	INCHES		
	Min	Max	Min	Max	
Α	0.89	1.12	0.035	0.044	
A <sub>1</sub>	0.01	0.10	0.0004	0.004	
A <sub>2</sub>	0.88	1.02	0.0346	0.040	
b	0.35	0.50	0.014	0.020	
С	0.085	0.18	0.003	0.007	
D	2.80	3.04	0.110	0.120	
E	2.10	2.64	0.083	0.104	
E <sub>1</sub>	1.20	1.40	0.047	0.055	
е	0.95 BSC		0.0374 Ref		
e <sub>1</sub>	1.9	0 BSC	0.0748 Ref		
L	0.40	0.60	0.016	0.024	
L <sub>1</sub>	0.64 Ref		0.025 Ref		
S	0.50 Ref		0.020 Ref		
q	3°	8°	3°	8°	
FCN: S-03946-Rev K 09-	Jul-01	•			

ECN: S-03946-Rev. K, 09-Jul-01

DWG: 5479



# **RECOMMENDED MINIMUM PADS FOR SOT-23**



Recommended Minimum Pads Dimensions in Inches/(mm)



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DMN2080UCB4-7 DMN61D9UWQ-13 US6M2GTR DMN31D5UDJ-7 DMP22D4UFO-7B DMN1006UCA6-7 DMN16M9UCA6-7
STF5N65M6 IRF40H233XTMA1 STU5N65M6 DMN6022SSD-13 DMN13M9UCA6-7 DMTH10H4M6SPS-13 DMN2990UFB-7B
IPB80P04P405ATMA2 2N7002W-G MCAC30N06Y-TP MCQ7328-TP NTMC083NP10M5L NVMFS2D3P04M8LT1G BXP7N65D
BXP4N65F AOL1454G WMJ80N60C4 BXP2N20L BXP2N65D BXT1150N10J BXT1700P06M TSM60NB380CP ROG RQ7L055BGTCR
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