

P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
- 20	0.018 at V _{GS} = - 4.5 V	- 9 ^a	20 nC
	0.027 at V _{GS} = - 2.5 V	- 6 ^a	

FEATURES

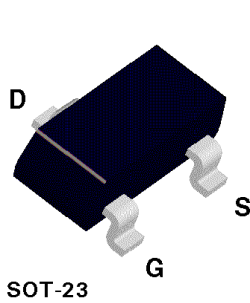
- DT-Trench Power MOSFET
- 100 % R_g Tested
- Built in ESD Protection with Zener Diode
- Typical ESD Performance: 1800 V
- Compliant to RoHS Directive 2002/95/EC



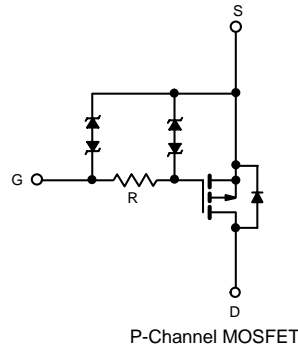
RoHS
COMPLIANT

APPLICATIONS

- Portable Devices
 - Load Switch
 - Battery Switch
 - Charger Switch



SOT-23



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	- 20	V
Gate-Source Voltage	V _{GS}	± 12	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	- 9 ^a	A
	T _C = 70 °C	- 6 ^a	
	T _A = 25 °C	- 5 ^{b, c}	
	T _A = 70 °C	- 4.1 ^{b, c}	
Pulsed Drain Current	I _{DM}	- 27	
Continuous Source-Drain Diode Current	T _C = 25 °C	- 6 ^a	
	T _A = 25 °C	- 2.9 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	19	W
	T _C = 70 °C	12	
	T _A = 25 °C	3.5 ^{b, c}	
	T _A = 70 °C	2.2 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^{b, e}	t ≤ 5 s	R _{thJA}	28	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	5.3	6.5	

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 5 s.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under Steady State conditions is 80 °C/W.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-12		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.5		-1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 20	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 0.5	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -2.6\text{ A}$		0.018	0.024	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -2.3\text{ A}$		0.027	0.030	
		$V_{GS} = -1.8\text{ V}, I_D = -1.5\text{ A}$		0.040	0.065	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -1.6\text{ A}$		35		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		3050		pF
Output Capacitance	C_{oss}			1172		
Reverse Transfer Capacitance	C_{rss}			256		
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -5\text{ A}$		50	75	nC
Gate-Source Charge			$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5\text{ A}$		20	
Gate-Drain Charge	Q_{gds}			3.3		
Gate Resistance	Q_{gd}			8.4		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.2	1	2	k Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		0.71	1.1	us
Rise Time	t_r			1.7	2.6	
Turn-Off Delay Time	$t_{d(off)}$			6	9	
Fall Time	t_f			3.2	5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		0.3	0.45	
Rise Time	t_r			0.6	0.9	
Turn-Off Delay Time	$t_{d(off)}$			10	15	
Fall Time	t_f			3.5	5.5	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-9	A
Pulse Diode Forward Current	I_{SM}				-27	
Body Diode Voltage	V_{SD}	$I_S = -5\text{ A}, V_{GS} = 0\text{ V}$		-0.85	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 6\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		30	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			20	40	nC
Reverse Recovery Fall Time	t_a			13		ns
Reverse Recovery Rise Time	t_b			17		

Notes:

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



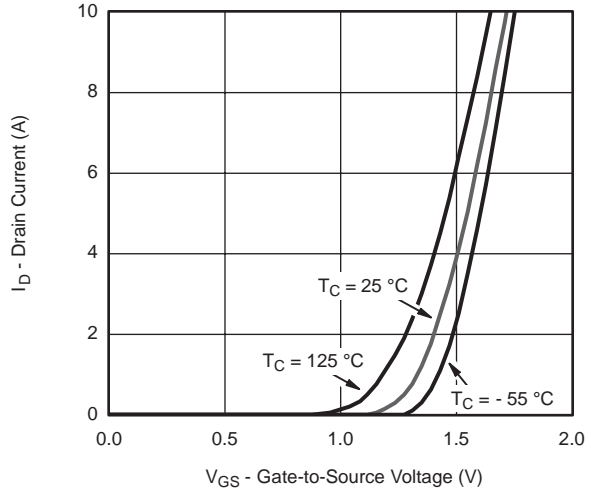
Gate Current vs. Gate-Source Voltage



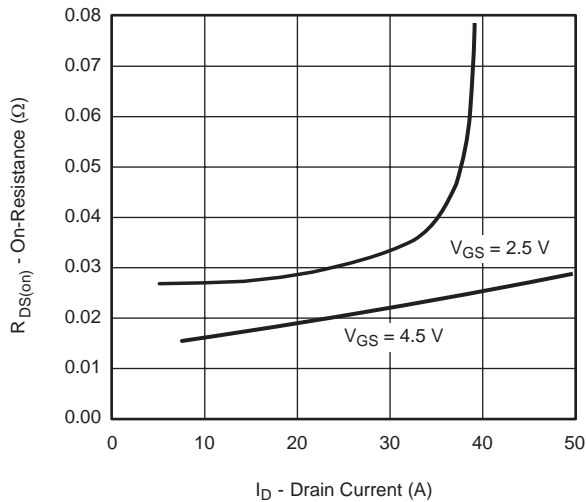
Gate Current vs. Gate-Source Voltage



Output Characteristics



Transfer Characteristics



On-Resistance vs. Drain Current

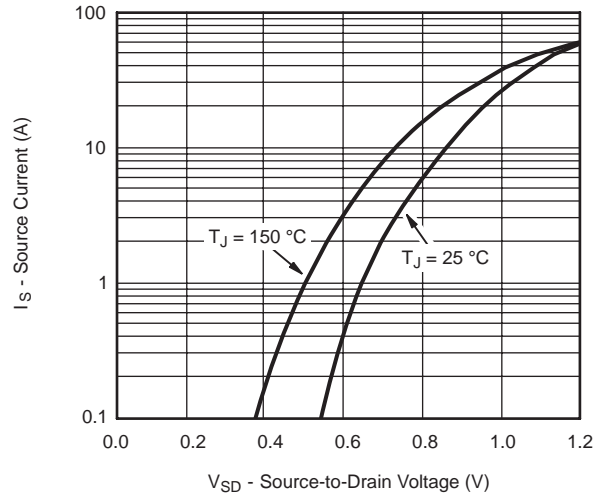


Gate Charge

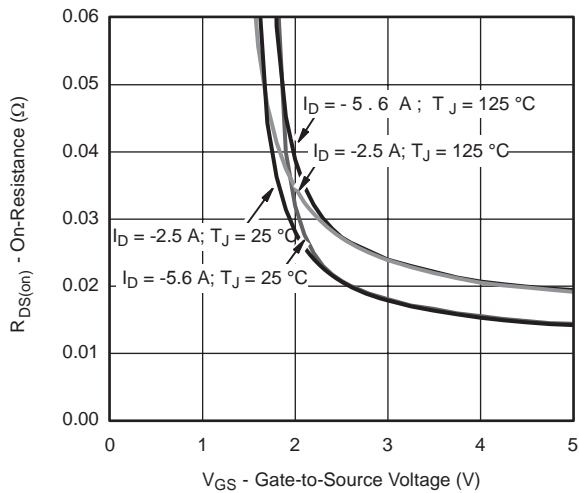
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



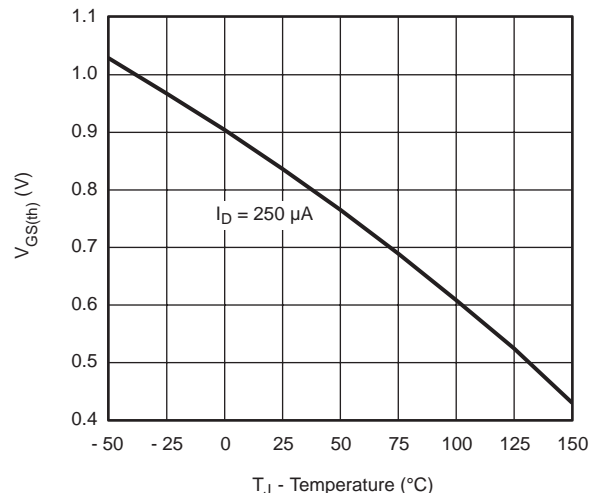
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



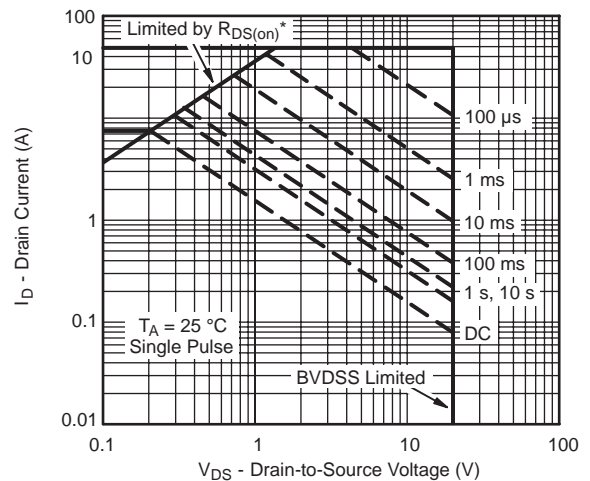
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

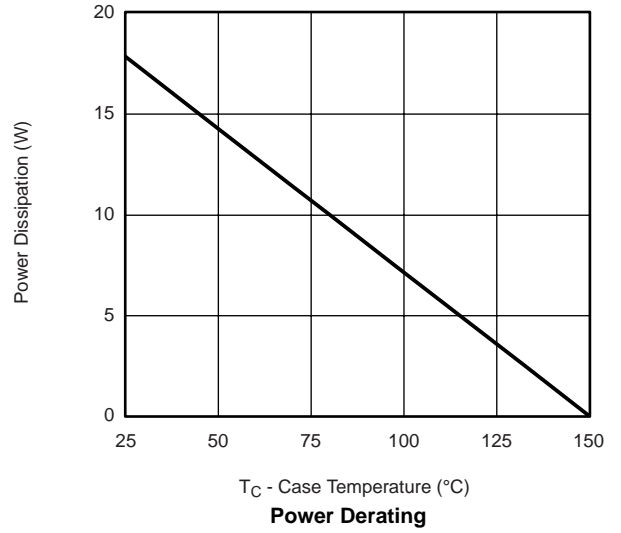
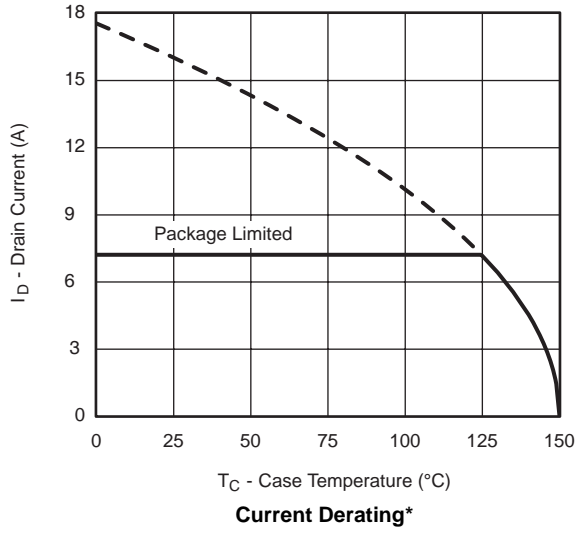


Single Pulse Power, Junction-to-Ambient



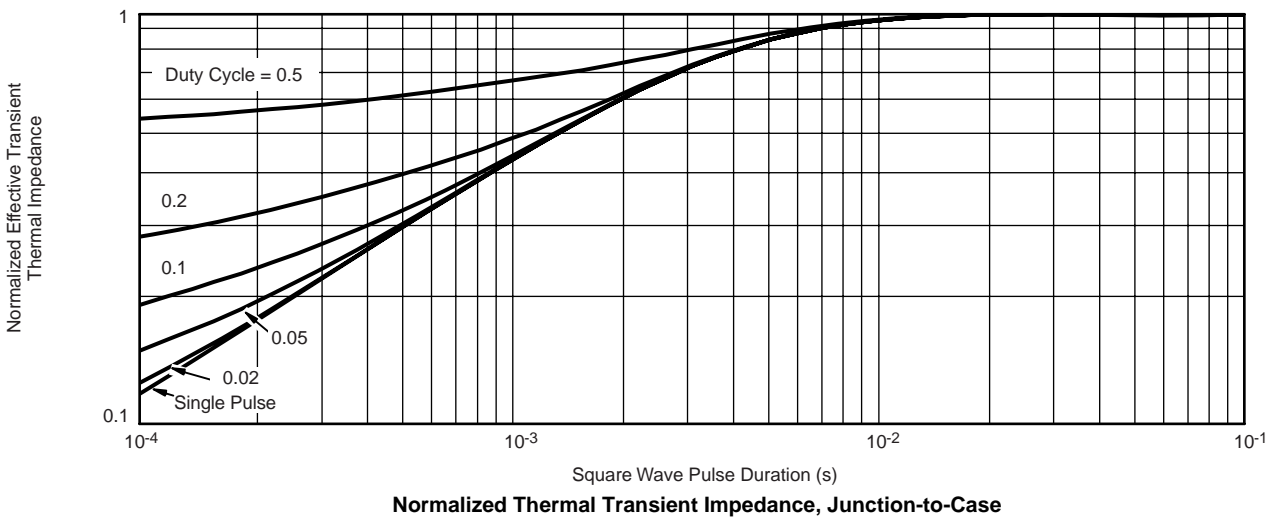
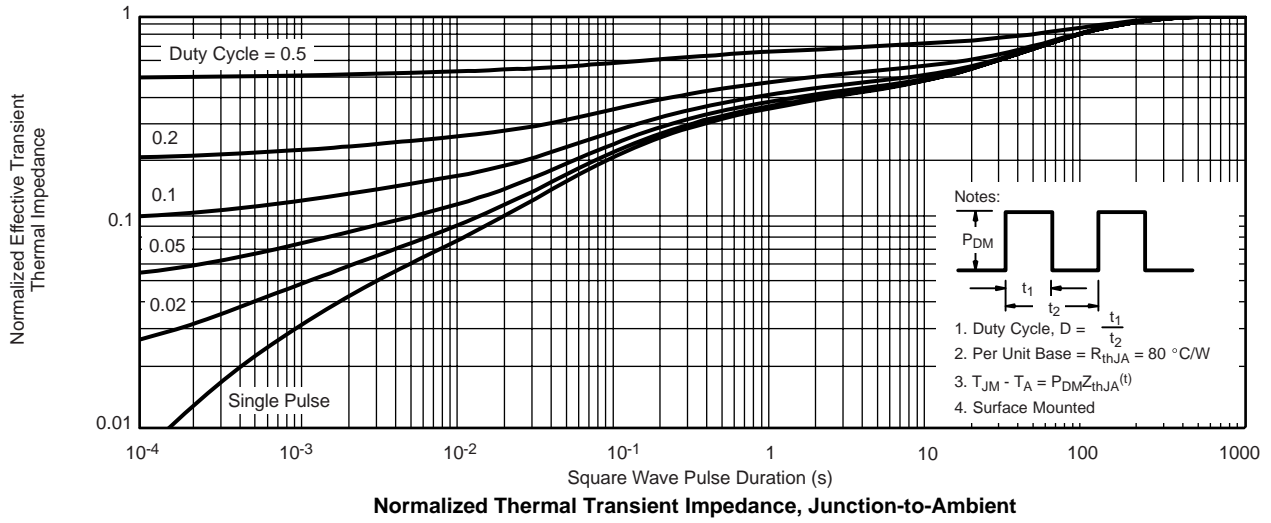
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



SOT-23 : 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A ₁	0.01	0.10	0.0004	0.004
A ₂	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	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 ₁	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e ₁	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L ₁	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°

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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