MT3415

Single P-Channel Power MOSFET

MT Semiconductor®

http://www.mtsemi.com

General Description

This P-Channel Power MOSFET is produced using MOS-TECH Semiconductor's advanced Power -Trench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

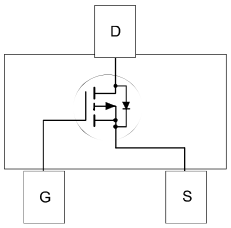
Features

- -4.9 A, –20 V. $R_{DS(ON)}$ = 33mΩ @ V_{GS} = –4.5 V
  $R_{DS(ON)}$ = 45mΩ @ V_{GS} = –4.5 V
- Low gate charge (7.3 nC typical)
- High performance trench technology for extremely low $R_{DS(ON)}$
- SuperSOT™-23 provides low $R_{DS(ON)}$ and 30% higher power handling capability than SOT-23 in the same footprint

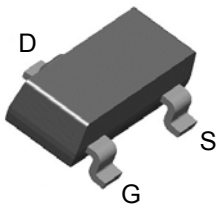
Applications

- Portable electronics
- DC/DC conversion
- Power management
- Battery charging circuits
- Load switching

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23

Absolute Maximum Ratings (T_A = 25℃ unless otherwise noted)

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		–20	V
V_{GSS}	Gate-Source Voltage		± 8	V
I_D	Drain Current – Continuous	(Note 1a)	– 3.5	A
	– Pulsed		– 4.9	
P_D	Maximum Power Dissipation	(Note 1a)	1.1	W
		(Note 1b)	0.73	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	110	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	75	°C/W

Electrical Characteristics (T_A = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 µA	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V			-1	µA
		T_J = 55°C			-10	µA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 8 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -8 V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 µA	-0.35	-0.7	-1.0	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	I_D = -250 µA, Referenced to 25 °C		-3		mV /°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -4.5 V, I_D = -1.3 A		26	33	mΩ
		V_{GS} = -2.5 V, I_D = -1.1 A		34	45	
R_g	Gate Resistance	V = -10 V, V = 0 V, f = 1.0 MHz		21		Ω
g_{FS}	Forward Transconductance	V_{DS} = -4.5 V, I_D = -2 A		10		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz		814		pF
C_{oss}	Output Capacitance			114		pF
C_{rss}	Reverse Transfer Capacitance			92		pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = -10 V, I_D = - 4.1A, V_{GS} = -4.5 V, R_{GEN} = 3 Ω		6.7		ns
t_r	Turn - On Rise Time			15.4		ns
$t_{D(off)}$	Turn - Off Delay Time			72		ns
t_f	Turn - Off Fall Time			35		ns
Q_g	Total Gate Charge	V_{DS} = -10 V, I_D = - 2 A, V_{GS} = -4.5 V		7.3		nC
Q_{gs}	Gate-Source Charge			1.0		nC
Q_{gd}	Gate-Drain Charge			1.6		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				-4.9	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -0.42 A (Note)		-0.7	-1.2	V

Note:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the s older mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

2. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2.0%.

Typical Electrical and Thermal Characteristics

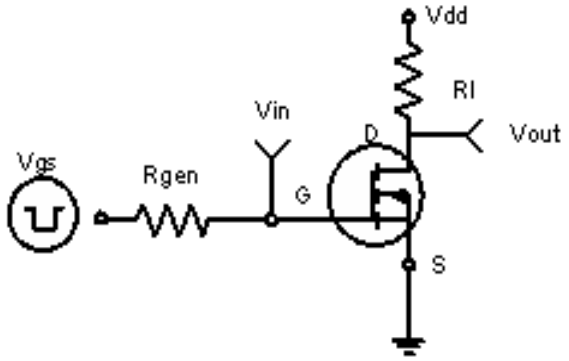


Figure 1:Switching Test Circuit

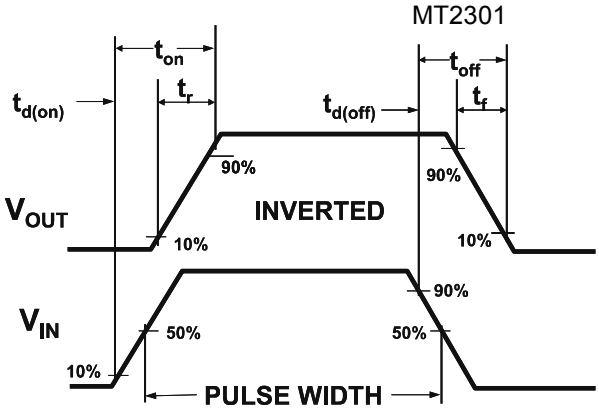


Figure 2:Switching Waveforms

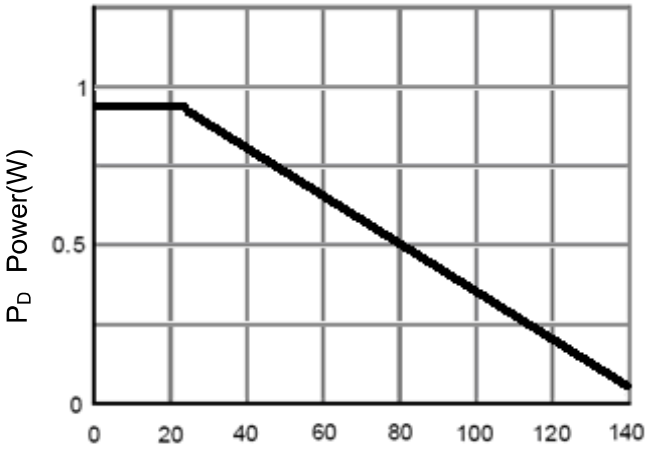


Figure 3 Power Dissipation

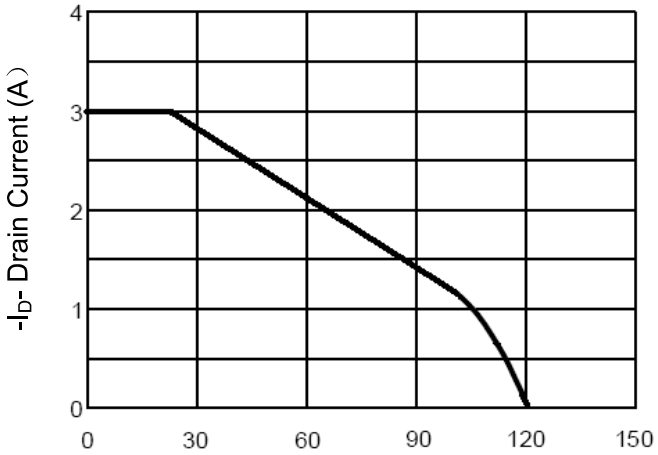


Figure 4 Drain Current

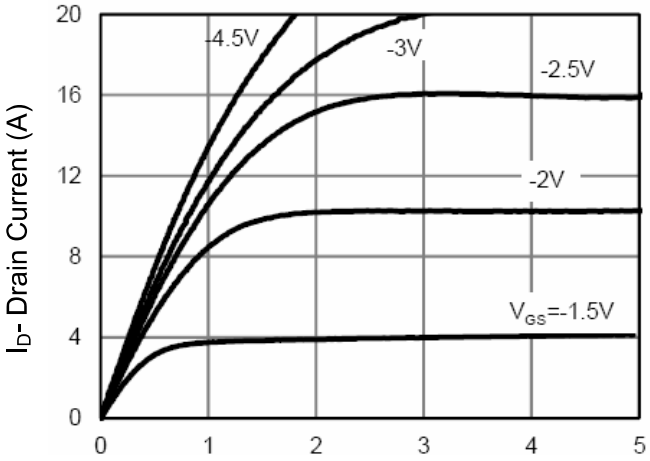


Figure 5 Output Characteristics

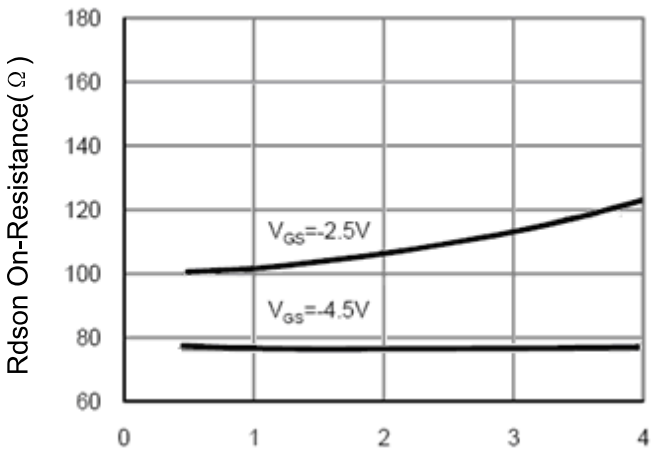


Figure 6 Drain-Source On-Resistance

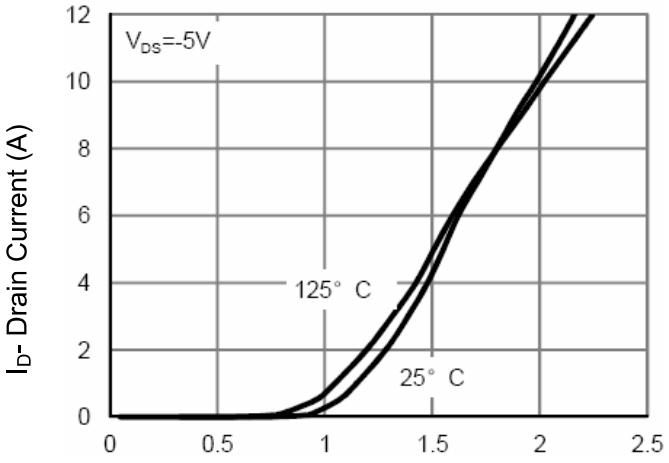


Figure 7 Transfer Characteristics

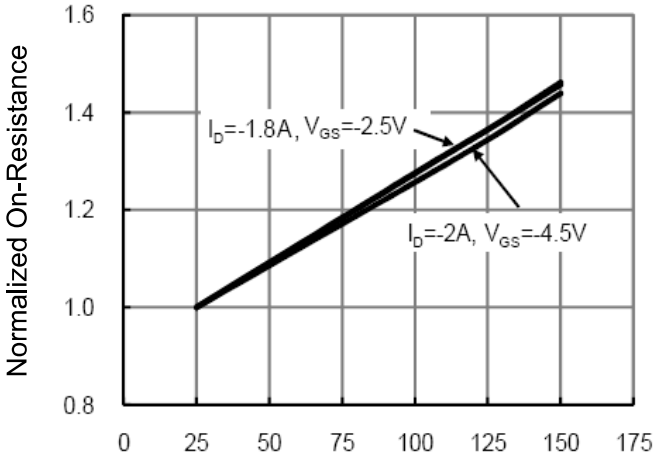


Figure 8 Drain-Source On-Resistance

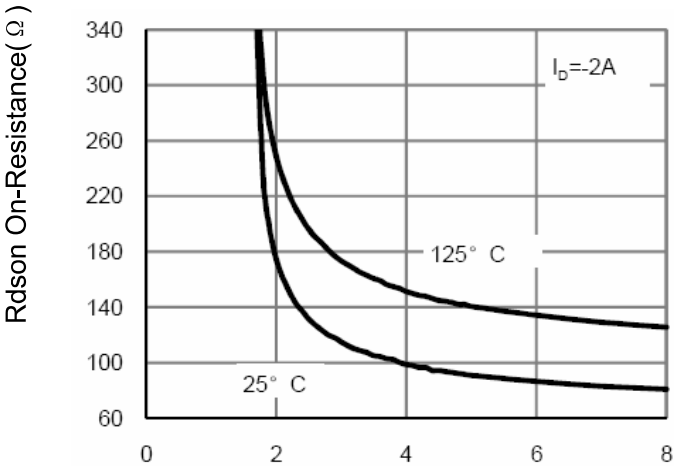


Figure 9 Rdson vs Vgs

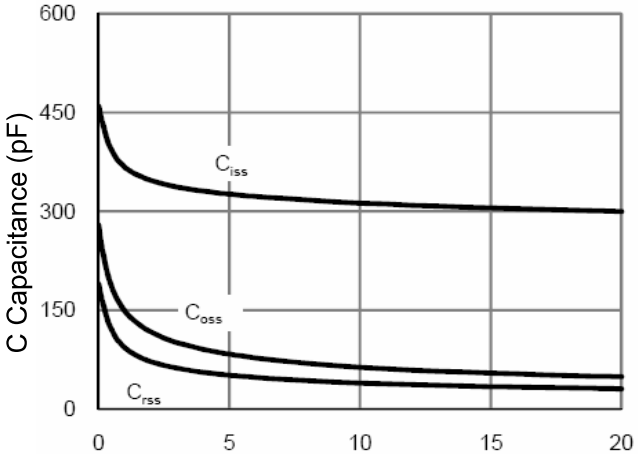


Figure 10 Capacitance vs Vds

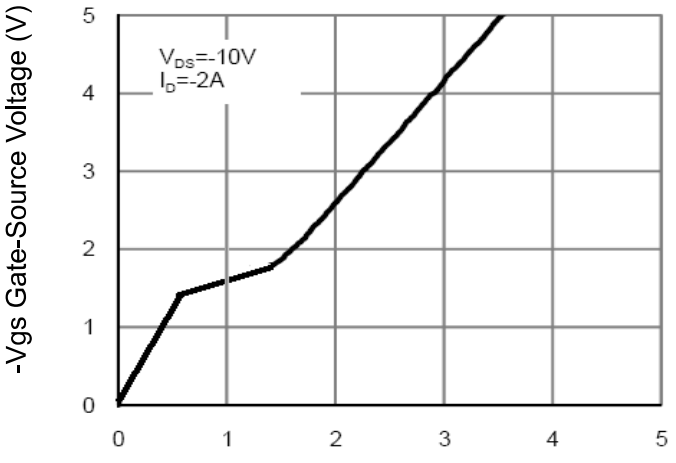


Figure 11 Gate Charge

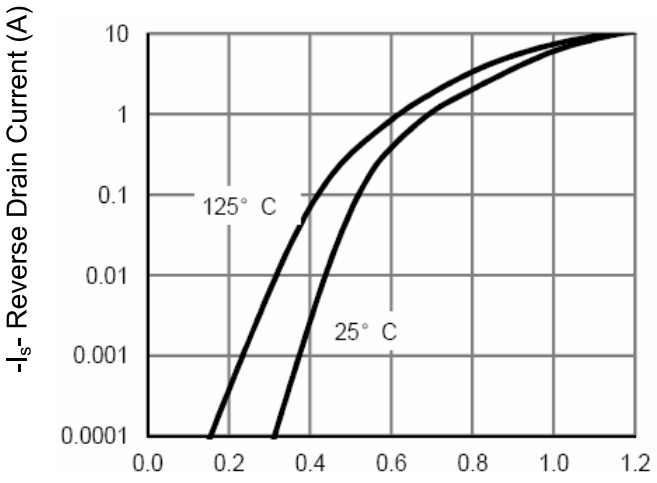


Figure 12 Source- Drain Diode Forward

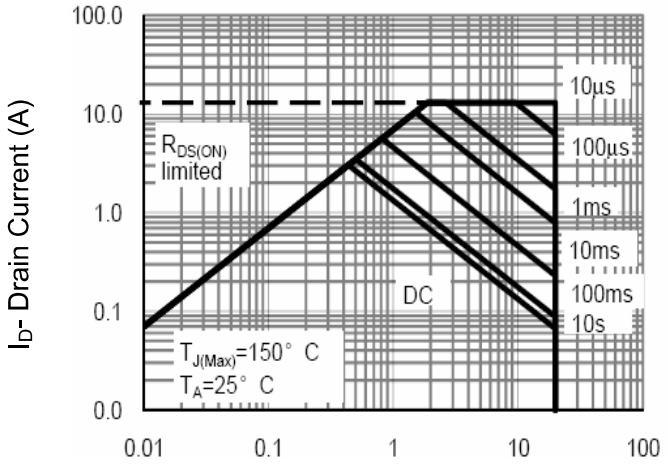


Figure 13 Safe Operation Area

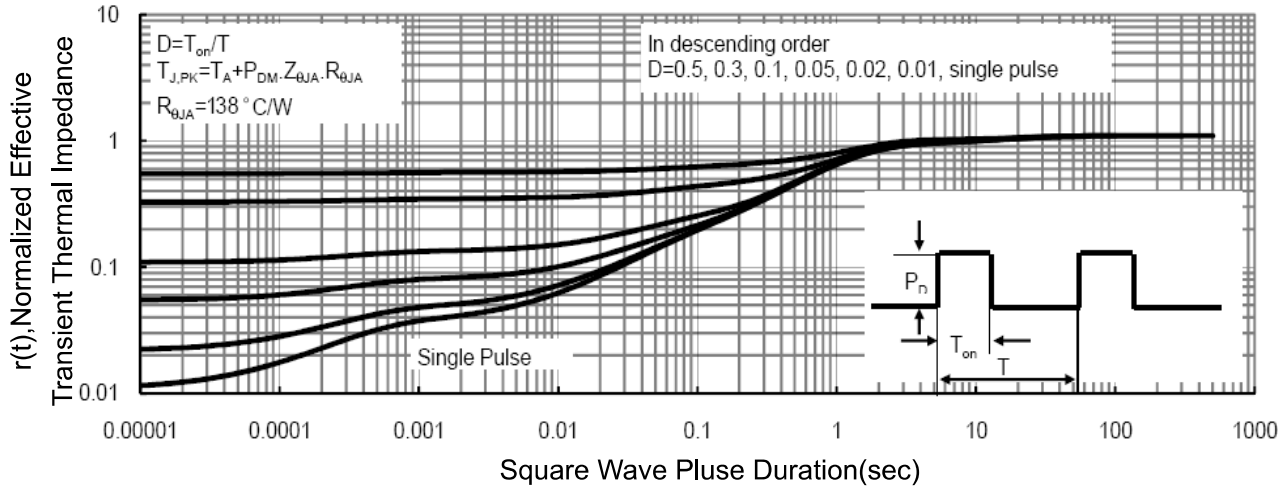


Figure 14 Normalized Maximum Transient Thermal Impedance

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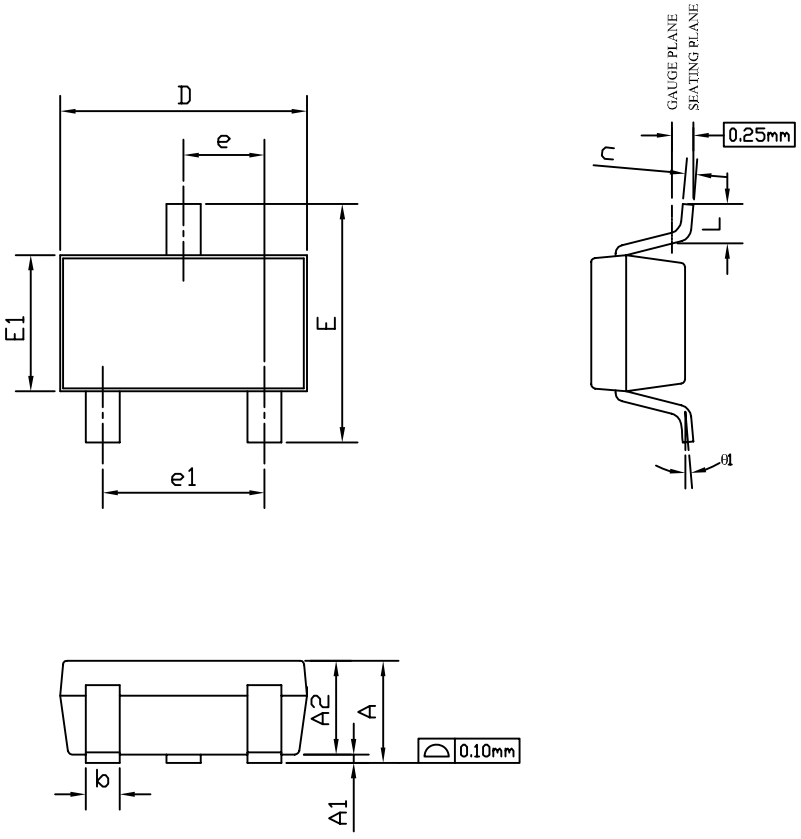
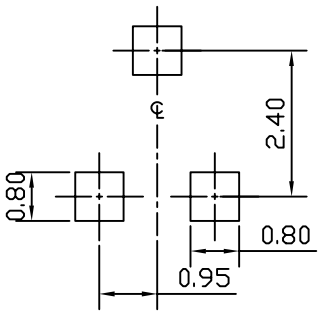
SOT23 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	——	1.25	0.033	——	0.049
A1	0.00	——	0.13	0.000	——	0.005
A2	0.70	1.00	1.15	0.028	0.039	0.045
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.80	2.90	3.10	0.110	0.114	0.122
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.40	1.60	1.80	0.055	0.063	0.071
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	——	0.60	0.012	——	0.024
θ1	0°	5°	8°	0°	5°	8°

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2. TOLERANCE ±0.100 mm (4 mil) UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAUGE PLANE.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS
   ARE NOT NECESSARILY EXACT.
5. ALL DIMENSIONS ARE IN MILLIMETERS.

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