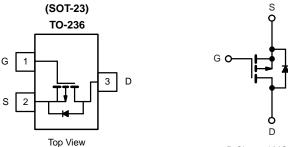


## 304P-VB Datasheet

# P-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}\left(\Omega\right)$ Typ.	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)			
	0.046 at V <sub>GS</sub> = - 10 V	- 5.6				
- 30	0.049 at V <sub>GS</sub> = - 6 V	- 5	11.4 nC			
	0.054 at V <sub>GS</sub> = - 4.5 V	-4.5				



P-Channel MOSFET

#### **FEATURES**

- TrenchFET® Power MOSFET
- 100 % R<sub>g</sub> Tested



#### **APPLICATIONS**

- For Mobile Computing
  - Load Switch
  - Notebook Adaptor Switch
  - DC/DC Converter

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	- 30	V
Gate-Source Voltage		$V_{GS}$	± 20	7 v
	T <sub>C</sub> = 25 °C		- 5.6	
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	- I <sub>D</sub>	- 5.4 <sup>b,c</sup>	
	T <sub>A</sub> = 70 °C		- 4.3 <sup>b,c</sup>	А
Pulsed Drain Current (t = 100 μs)		I <sub>DM</sub>	- 18	
Contingua Source Prain Diade Current	T <sub>C</sub> = 25 °C	- I <sub>S</sub>	- 2.1	1
Continous Source-Drain Diode Current	T <sub>A</sub> = 25 °C		- 1 <sup>b,c</sup>	1
	T <sub>C</sub> = 25 °C	- P <sub>D</sub>	2.5	
Maximum Power Dissipation	T <sub>C</sub> = 70 °C		1.6	w
	T <sub>A</sub> = 25 °C		1.25 <sup>b,c</sup>	
	T <sub>A</sub> = 70 °C		0.8 <sup>b,c</sup>	1
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b,d</sup>	t ≤ 5 s	R <sub>thJA</sub>	75	100	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	40	50	C/VV

#### Notes:

- a. Based on  $T_C$  = 25 °C. b. Surface mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 166 °C/W.



Parameter         Syminarian           Static         VDrain-Source Breakdown Voltage         VDS           VDS Temperature Coefficient         △VDS           VGS(th) Temperature Coefficient         △VGS(th)           Gate-Source Threshold Voltage         VGS(th)           Gate-Source Leakage         IGS           Zero Gate Voltage Drain Current         IDS           On-State Drain Currentare         ID(or           Drain-Source On-State Resistancear         RDS(r           Forward Transconductancear         9ts           Dynamicb         Input Capacitance           Input Capacitance         Cos           Reverse Transfer Capacitance         Crs           Total Gate Charge         Qg           Gate-Source Charge         Qg           Gate Resistance         Rg           Turn-On Delay Time         td(or           Rise Time         tr           Turn-Off Delay Time         td(or           Fall Time         tf           Turn-On Delay Time         td(or	S	Test Conditions $V_{GS} = 0 \text{ V, } I_D = -250 \text{ μA}$ $I_D = -250 \text{ μA}$ $V_{DS} = V_{GS}, I_D = -250 \text{ μA}$ $V_{DS} = 0 \text{ V, } V_{GS} = \pm 20 \text{ V}$ $V_{DS} = -30 \text{ V, } V_{GS} = 0 \text{ V}$ $V_{DS} = -30 \text{ V, } V_{GS} = 0 \text{ V}$ $V_{DS} = -30 \text{ V, } V_{GS} = -10 \text{ V}$ $V_{GS} = -10 \text{ V, } I_D = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V, } I_D = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V, } I_D = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V, } V_{GS} = 0 \text{ V, } f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V, } V_{GS} = -10 \text{ V, } I_D = -5.4 \text{ A}$ $V_{DS} = -15 \text{ V, } V_{GS} = -10 \text{ V, } I_D = -5.4 \text{ A}$ $V_{DS} = -15 \text{ V, } V_{GS} = -4.5 \text{ V, } I_D = -5.4 \text{ A}$	- 30 - 0.5	7yp.  - 19  4  0.046  0.049  0.054  18  1295  150  130  24  11.4  3.4	- 2.0 ± 100 - 1 - 5 36 17	V mV/°C V nA A A A PF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	S/T_J	$\begin{split} I_D = & - 250 \ \mu A \\ V_{DS} = & V_{GS} \ , I_D = - 250 \ \mu A \\ V_{DS} = & 0 \ V, V_{GS} = \pm 20 \ V \\ V_{DS} = & - 30 \ V, V_{GS} = 0 \ V \\ V_{DS} = & - 30 \ V, V_{GS} = 0 \ V, T_J = 55 \ ^{\circ}C \\ V_{DS} \leq & - 5 \ V, V_{GS} = - 10 \ V \\ V_{GS} = & - 10 \ V, I_D = - 4.4 \ A \\ V_{GS} = & - 6 \ V, I_D = - 4.4 \ A \\ V_{GS} = & - 6 \ V, I_D = - 3.6 \ A \\ V_{DS} = & - 15 \ V, I_D = - 3.4 \ A \\ \end{split}$	- 0.5	0.046 0.049 0.054 18 1295 150 130 24 11.4	±100 -1 -5	mV/°C V nA μA A S
$\begin{array}{c} V_{DS} \   \text{Temperature Coefficient} & \Delta V_{DS} \\ V_{GS(th)} \   \text{Temperature Coefficient} & \Delta V_{GS(th)} \\ V_{GS(th)} \   \text{Temperature Coefficient} & \Delta V_{GS(th)} \\ Gate-Source Threshold Voltage & V_{GS(th)} \\ Gate-Source Leakage & I_{GS} \\ Zero \   \text{Gate Voltage Drain Current} & I_{DS(th)} \\ Zero \   \text{Gate Voltage Drain Current} & I_{D(th)} \\ On-State \   \text{Drain Current}^a & I_{D(th)} \\ Drain-Source \   \text{On-State Resistance}^a & R_{DS(th)} \\ \hline   \text{Drain-Source On-State Resistance}^a & g_{fs} \\ \hline                  $	S/T_J	$\begin{split} I_D = & - 250 \ \mu A \\ V_{DS} = & V_{GS} \ , I_D = - 250 \ \mu A \\ V_{DS} = & 0 \ V, V_{GS} = \pm 20 \ V \\ V_{DS} = & - 30 \ V, V_{GS} = 0 \ V \\ V_{DS} = & - 30 \ V, V_{GS} = 0 \ V, T_J = 55 \ ^{\circ}C \\ V_{DS} \leq & - 5 \ V, V_{GS} = - 10 \ V \\ V_{GS} = & - 10 \ V, I_D = - 4.4 \ A \\ V_{GS} = & - 6 \ V, I_D = - 4.4 \ A \\ V_{GS} = & - 6 \ V, I_D = - 3.6 \ A \\ V_{DS} = & - 15 \ V, I_D = - 3.4 \ A \\ \end{split}$	- 0.5	0.046 0.049 0.054 18 1295 150 130 24 11.4	±100 -1 -5	mV/°C V nA μA A S
V <sub>GS(th)</sub> Temperature Coefficient       ΔV <sub>GS(th)</sub> Gate-Source Threshold Voltage       V <sub>GS(th)</sub> Gate-Source Leakage       I <sub>GS</sub> Zero Gate Voltage Drain Current       I <sub>DS</sub> On-State Drain Current <sup>a</sup> I <sub>D(o)</sub> Drain-Source On-State Resistance <sup>a</sup> R <sub>DS(th)</sub> Forward Transconductance <sup>a</sup> gfs         Dynamic <sup>b</sup> Diput Capacitance       C <sub>is</sub> Output Capacitance       C <sub>os</sub> Reverse Transfer Capacitance       C <sub>rs</sub> Total Gate Charge       Q <sub>g</sub> Gate-Source Charge       Q <sub>g</sub> Gate Resistance       R <sub>g</sub> Turn-On Delay Time       t <sub>d(o)</sub> Rise Time       t <sub>r</sub> Turn-Off Delay Time       t <sub>d(o)</sub> Fall Time       t <sub>f</sub> Turn-On Delay Time       t <sub>d(o)</sub>	hh/TJ tth) SS S The state of	$\begin{split} V_{DS} &= V_{GS} , I_D = -250 \mu\text{A} \\ V_{DS} &= 0 \text{V}, V_{GS} = \pm 20 \text{V} \\ V_{DS} &= -30 \text{V}, V_{GS} = 0 \text{V} \\ V_{DS} &= -30 \text{V}, V_{GS} = 0 \text{V}, T_J = 55 ^{\circ}\text{C} \\ V_{DS} &\leq -5 \text{V}, V_{GS} = -10 \text{V} \\ V_{GS} &= -10 \text{V}, I_D = -4.4 \text{A} \\ V_{GS} &= -6 \text{V}, I_D = -4.4 \text{A} \\ V_{GS} &= -6 \text{V}, I_D = -3.6 \text{A} \\ V_{DS} &= -15 \text{V}, I_D = -3.4 \text{A} \\ \end{split}$		0.046 0.049 0.054 18 1295 150 130 24 11.4	±100 -1 -5	V nA μA A Ω S
Gate-Source Threshold Voltage         V <sub>GS(</sub> Gate-Source Leakage         I <sub>GS</sub> Zero Gate Voltage Drain Current         I <sub>DS</sub> On-State Drain Currenta         I <sub>D(o)</sub> Drain-Source On-State Resistancea         R <sub>DS()</sub> Forward Transconductancea         g <sub>fs</sub> Dynamicb         C           Input Capacitance         C <sub>os</sub> Reverse Transfer Capacitance         C <sub>rs</sub> Total Gate Charge         Q <sub>g</sub> Gate-Source Charge         Q <sub>g</sub> Gate Resistance         R <sub>g</sub> Turn-On Delay Time         t <sub>d</sub> (or           Rise Time         t <sub>f</sub> Turn-Off Delay Time         t <sub>d</sub> (or           Fall Time         t <sub>f</sub> Turn-On Delay Time         t <sub>d</sub> (or	tth) S S S In) On) S S S S S S S S S S S S S S S S S S S	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$ $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$ $V_{DS} \le -5 \text{ V}, V_{GS} = -10 \text{ V}$ $V_{GS} = -10 \text{ V}, I_{D} = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_{D} = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_{D} = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_{D} = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_{D} = -5.4 \text{ A}$		0.046 0.049 0.054 18 1295 150 130 24 11.4	±100 -1 -5	nA μA A Ω S
Gate-Source Leakage  Zero Gate Voltage Drain Current  On-State Drain Current  Drain-Source On-State Resistance  Forward Transconductance  Dynamicb  Input Capacitance  Output Capacitance  Reverse Transfer Capacitance  Coss  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  Turn-On Delay Time  Fall Time  Turn-On Delay Time	S S S S S S S S S S S S S S S S S S S	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$ $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$ $V_{DS} \le -5 \text{ V}, V_{GS} = -10 \text{ V}$ $V_{GS} = -10 \text{ V}, I_{D} = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_{D} = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_{D} = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_{D} = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_{D} = -5.4 \text{ A}$		0.049 0.054 18 1295 150 130 24 11.4	±100 -1 -5	nA μA A Ω S
Zero Gate Voltage Drain Current  On-State Drain Current <sup>a</sup> Drain-Source On-State Resistance <sup>a</sup> Forward Transconductance <sup>a</sup> Dynamic <sup>b</sup> Input Capacitance  Output Capacitance  Reverse Transfer Capacitance  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  Turn-On Delay Time  Fall Time  Turn-On Delay Time	S - n) - n - n - n - n - n - n - n - n -	$\begin{split} &V_{DS} =  30 \text{ V}, V_{GS} = 0 \text{ V} \\ &V_{DS} =  30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C} \\ &V_{DS} \leq  5 \text{ V}, V_{GS} =  10 \text{ V} \\ &V_{GS} =  10 \text{ V}, I_{D} =  4.4 \text{ A} \\ &V_{GS} =  6 \text{ V}, I_{D} =  4.4 \text{ A} \\ &V_{GS} =  4.5 \text{ V}, I_{D} =  3.6 \text{ A} \\ &V_{DS} =  15 \text{ V}, I_{D} =  3.4 \text{ A} \\ \end{split}$	- 2.5	0.049 0.054 18 1295 150 130 24 11.4	-1 -5	μA A Ω S PF
On-State Drain Current <sup>a</sup> On-State Drain Current <sup>a</sup> Drain-Source On-State Resistance <sup>a</sup> Forward Transconductance <sup>a</sup> 9fs  Dynamic <sup>b</sup> Input Capacitance  Output Capacitance  Reverse Transfer Capacitance  Cos  Total Gate Charge  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  Turn-On Delay Time  Turn-Off Delay Time  Tall Time  Turn-On Delay Time	n) on) sssssssssssssssssssssssssssssssss	$\begin{split} V_{DS} &=  30 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55 \text{ °C} \\ V_{DS} &\leq  5 \text{ V}, V_{GS} =  10 \text{ V} \\ V_{GS} &=  10 \text{ V}, I_D =  4.4 \text{ A} \\ V_{GS} &=  6 \text{ V}, I_D =  4.4 \text{ A} \\ V_{GS} &=  6 \text{ V}, I_D =  3.6 \text{ A} \\ V_{DS} &=  15 \text{ V}, I_D =  3.4 \text{ A} \end{split}$ $V_{DS} &=  15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} &=  15 \text{ V}, V_{GS} =  10 \text{ V}, I_D =  5.4 \text{ A} \end{split}$	- 2.5	0.049 0.054 18 1295 150 130 24 11.4	-5	A Ω S
Drain-Source On-State Resistance <sup>a</sup> R <sub>DS(i</sub> Forward Transconductance <sup>a</sup> 9fs  Dynamic <sup>b</sup> Input Capacitance  C <sub>is</sub> Output Capacitance  Reverse Transfer Capacitance  C <sub>rs</sub> Total Gate Charge  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  R <sub>g</sub> Turn-On Delay Time  Turn-Off Delay Time  t <sub>d</sub> (on  Fall Time  Turn-On Delay Time  t <sub>d</sub> (on	s s s	$V_{DS} \le -5 \text{ V}, V_{GS} = -10 \text{ V}$ $V_{GS} = -10 \text{ V}, I_D = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_D = -4 \text{ A}$ $V_{GS} = -4.5 \text{ V}, I_D = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_D = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -5.4 \text{ A}$	- 2.5	0.049 0.054 18 1295 150 130 24 11.4	36	Ω S
Drain-Source On-State Resistance <sup>a</sup> R <sub>DS(i</sub> Forward Transconductance <sup>a</sup> 9fs  Dynamic <sup>b</sup> Input Capacitance  Output Capacitance  C <sub>os</sub> Reverse Transfer Capacitance  C <sub>rs</sub> Total Gate Charge  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  R <sub>g</sub> Turn-On Delay Time  t <sub>d(or</sub> Fall Time  Turn-On Delay Time  t <sub>d(or</sub> t <sub>d(or</sub> Total Time  Turn-On Delay Time  t <sub>d(or</sub> Turn-On Delay Time  t <sub>d(or</sub> Turn-On Delay Time  t <sub>d(or</sub>	s s s	$V_{GS} = -10 \text{ V}, I_D = -4.4 \text{ A}$ $V_{GS} = -6 \text{ V}, I_D = -4 \text{ A}$ $V_{GS} = -4.5 \text{ V}, I_D = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_D = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -5.4 \text{ A}$	- 2.3	0.049 0.054 18 1295 150 130 24 11.4		Ω S
Forward Transconductance <sup>a</sup> Dynamic <sup>b</sup> Input Capacitance  Output Capacitance  Reverse Transfer Capacitance  Cos  Total Gate Charge  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  Turn-On Delay Time  Turn-Off Delay Time  Turn-On Delay Time	s s s	$V_{GS} = -6 \text{ V}, I_D = -4 \text{ A}$ $V_{GS} = -4.5 \text{ V}, I_D = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_D = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -5.4 \text{ A}$		0.049 0.054 18 1295 150 130 24 11.4		S pF
Forward Transconductance <sup>a</sup> Dynamic <sup>b</sup> Input Capacitance  Output Capacitance  Reverse Transfer Capacitance  Cos  Total Gate Charge  Gate-Source Charge  Gate-Drain Charge  Gate Resistance  Turn-On Delay Time  Turn-Off Delay Time  Turn-On Delay Time  Turn-On Delay Time  Turn-On Delay Time  total Gate Charge  Turn-Off Delay Time  Turn-Off Delay Time  Turn-On Delay Time	s s s	$V_{GS} = -4.5 \text{ V}, I_D = -3.6 \text{ A}$ $V_{DS} = -15 \text{ V}, I_D = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -5.4 \text{ A}$		0.054 18 1295 150 130 24 11.4		S pF
Dynamic <sup>b</sup> Input Capacitance     C <sub>is</sub> Output Capacitance     C <sub>os</sub> Reverse Transfer Capacitance     C <sub>rs</sub> Total Gate Charge     Q <sub>g</sub> Gate-Source Charge     Q <sub>g</sub> Gate-Drain Charge     Q <sub>g</sub> Gate Resistance     R <sub>g</sub> Turn-On Delay Time     t <sub>d</sub> (or       Rise Time     t <sub>r</sub> Turn-Off Delay Time     t <sub>d</sub> (or       Fall Time     t <sub>f</sub> Turn-On Delay Time     t <sub>d</sub> (or	s s	$V_{DS} = -15 \text{ V}, I_{D} = -3.4 \text{ A}$ $V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_{D} = -5.4 \text{ A}$		18 1295 150 130 24 11.4		pF
Dynamic <sup>b</sup> Input Capacitance       C <sub>is</sub> Output Capacitance       C <sub>os</sub> Reverse Transfer Capacitance       C <sub>rs</sub> Total Gate Charge       Q <sub>g</sub> Gate-Source Charge       Q <sub>g</sub> Gate-Drain Charge       Q <sub>g</sub> Gate Resistance       R <sub>g</sub> Turn-On Delay Time       t <sub>d</sub> (or         Rise Time       t <sub>r</sub> Turn-Off Delay Time       t <sub>d</sub> (or         Fall Time       t <sub>f</sub> Turn-On Delay Time       t <sub>d</sub> (or         Turn-On Delay Time       t <sub>f</sub>	s s	$V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $V_{DS} = -15 \text{ V}, V_{GS} = -10 \text{ V}, I_{D} = -5.4 \text{ A}$		1295 150 130 24 11.4		pF
$\begin{array}{c} \text{Input Capacitance} & C_{\text{is}} \\ \text{Output Capacitance} & C_{\text{os}} \\ \text{Reverse Transfer Capacitance} & C_{\text{rs}} \\ \text{Reverse Transfer Capacitance} & C_{\text{rs}} \\ \text{Total Gate Charge} & Q_{\text{g}} \\ \text{Gate-Source Charge} & Q_{\text{gr}} \\ \text{Gate-Drain Charge} & Q_{\text{gr}} \\ \text{Gate Resistance} & R_{\text{g}} \\ \text{Turn-On Delay Time} & t_{\text{d(oi)}} \\ \text{Rise Time} & t_{\text{r}} \\ \text{Turn-Off Delay Time} & t_{\text{d(oi)}} \\ \text{Fall Time} & t_{\text{f}} \\ \text{Turn-On Delay Time} & t_{\text{d(oi)}} \\ \end{array}$	s s	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 5.4 A		150 130 24 11.4		-
$\begin{array}{c} \text{Output Capacitance} &  &  &  &  &  &  &  &  &  & $	s s	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 5.4 A		150 130 24 11.4		- -
$ \begin{array}{c} \text{Reverse Transfer Capacitance} & C_{rs} \\ \hline \text{Total Gate Charge} & Q_g \\ \hline \text{Gate-Source Charge} & Q_{gs} \\ \hline \text{Gate-Drain Charge} & Q_g \\ \hline \text{Gate Resistance} & R_g \\ \hline \text{Turn-On Delay Time} & t_{d(o)} \\ \hline \text{Rise Time} & t_r \\ \hline \text{Turn-Off Delay Time} & t_{d(o)} \\ \hline \text{Fall Time} & t_f \\ \hline \text{Turn-On Delay Time} & t_{d(o)} \\ \hline \end{array} $	s s	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 5.4 A		130 24 11.4		-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	s			24 11.4		
$\begin{array}{c} \text{Gate-Source Charge} & Q_{gi} \\ \text{Gate-Drain Charge} & Q_{gi} \\ \text{Gate Resistance} & R_{g} \\ \text{Turn-On Delay Time} & t_{d(oi)} \\ \text{Rise Time} & t_{r} \\ \text{Turn-Off Delay Time} & t_{d(oi)} \\ \text{Fall Time} & t_{f} \\ \text{Turn-On Delay Time} & t_{d(oi)} \\ \end{array}$	s d			11.4		
$\begin{array}{c} \text{Gate-Source Charge} & Q_{gi} \\ \text{Gate-Drain Charge} & Q_{gi} \\ \text{Gate Resistance} & R_{g} \\ \text{Turn-On Delay Time} & t_{d(oi)} \\ \text{Rise Time} & t_{r} \\ \text{Turn-Off Delay Time} & t_{d(oi)} \\ \text{Fall Time} & t_{f} \\ \text{Turn-On Delay Time} & t_{d(oi)} \\ \end{array}$	s d	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 5.4 A			17	~~
$\begin{array}{c} \text{Gate-Drain Charge} & \text{$Q_{gt}$} \\ \text{Gate Resistance} & \text{$R_g$} \\ \text{Turn-On Delay Time} & \text{$t_{d(o)}$} \\ \text{Rise Time} & \text{$t_r$} \\ \text{Turn-Off Delay Time} & \text{$t_{d(o)}$} \\ \text{Fall Time} & \text{$t_f$} \\ \text{Turn-On Delay Time} & \text{$t_{d(o)}$} \\ \end{array}$	d	$V_{DS} = -15 \text{ V}, V_{GS} = -4.5 \text{ V}, I_{D} = -5.4 \text{ A}$		3.4		nC
$ \begin{array}{ccc} \text{Gate Resistance} & & R_g \\ \hline \text{Turn-On Delay Time} & & t_{d(o)} \\ \hline \text{Rise Time} & & t_r \\ \hline \text{Turn-Off Delay Time} & & t_{d(o)} \\ \hline \text{Fall Time} & & t_f \\ \hline \text{Turn-On Delay Time} & & t_{d(o)} \\ \hline \end{array} $				0	<u> </u>	
$ \begin{array}{llllllllllllllllllllllllllllllllllll$				3.8		
$ \begin{array}{ccc} \text{Rise Time} & & & t_r \\ \text{Turn-Off Delay Time} & & & t_{d(ol)} \\ \text{Fall Time} & & & t_f \\ \text{Turn-On Delay Time} & & & t_{d(ol)} \\ \end{array} $		f = 1 MHz	1.5	7.7	15.4	Ω
	1)			13	20	
$ \begin{array}{ccc} & & & & \\ \text{Fall Time} & & & & \\ \text{Turn-On Delay Time} & & & & \\ & & & & \\ & & & & \\ \end{array} $		$V_{DD}$ = - 15 V, $R_L$ = 3.5 $\Omega$		4	8	- - -
Turn-On Delay Time t <sub>d(or</sub>	f)	$I_D\cong$ - 4.3 A, $V_{GEN}$ = - 10 V, $R_g$ = 1 $\Omega$		38	57	
,				6	12	
	n)			28	42	ns
Rise Time t <sub>r</sub>	.,	$V_{DD} = -15 \text{ V, R}_{L} = 3.5 \Omega$		16	24	- - -
Turn-Off Delay Time t <sub>d(of</sub>	f)	$I_D \cong -4.3 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_q = 1 \Omega$		30	45	
Fall Time t <sub>f</sub>	.,	, i		10	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current I <sub>S</sub>					- 2.1	
Pulse Diode Forward Current (t = 100 μs)		T <sub>C</sub> = 25 °C			- 80	A
Body Diode Voltage V <sub>SI</sub>		I <sub>S</sub> = - 4.3 A, V <sub>GS</sub> = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time t <sub>rr</sub>		5 / GC		15	23	ns
Body Diode Reverse Recovery Charge Q <sub>ri</sub>				7	14	nC
		$I_F = -4.3 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 ^{\circ}\text{C}$		8	17	110
$ \begin{array}{lll} \text{Reverse Recovery Fall Time} & & t_a \\ \text{Reverse Recovery Rise Time} & & t_b \end{array} $				0	1	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.

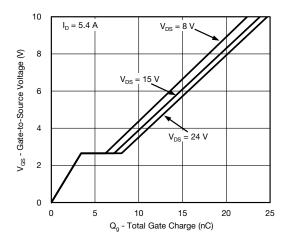




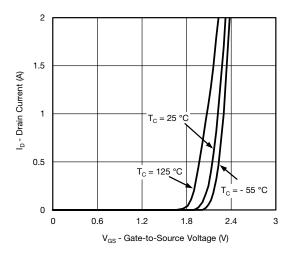
#### **Output Characteristics**



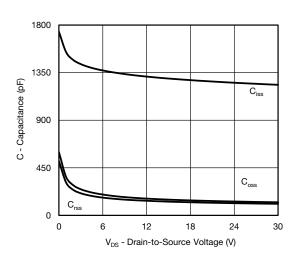
On-Resistance vs. Drain Current



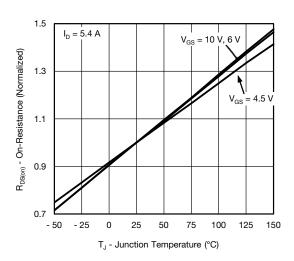
**Gate Charge** 



**Transfer Characteristics** 

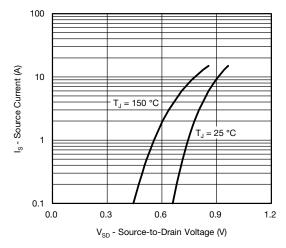


Capacitance

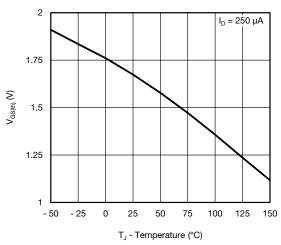


On-Resistance vs. Junction Temperature

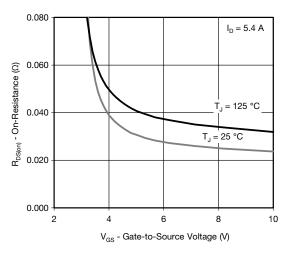




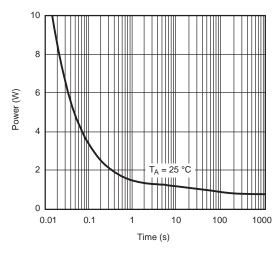
#### Source-Drain Diode Forward Voltage



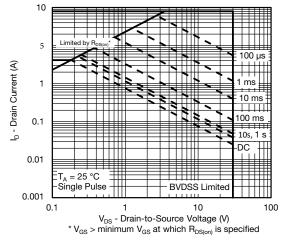
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage

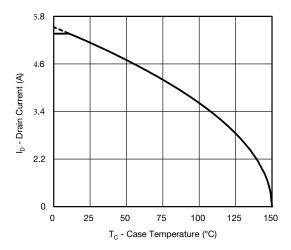


Single Pulse Power (Junction-to-Ambient)

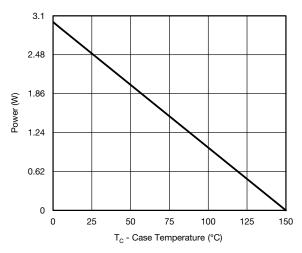


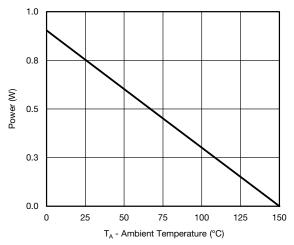
Safe Operating Area, Junction-to-Ambient





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



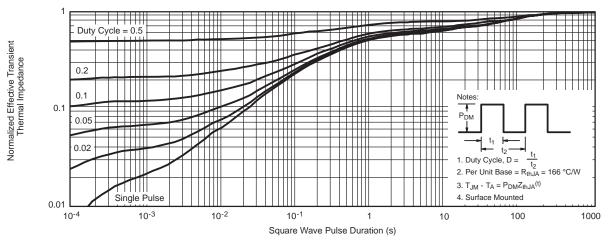


Power, Junction-to-Foot

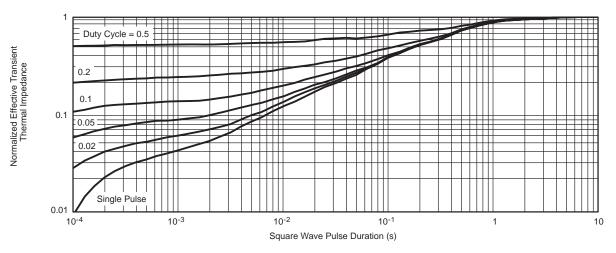
Power, Junction-to-Ambient

<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.





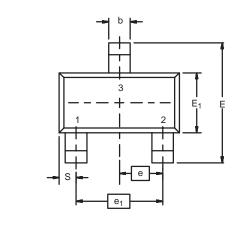
#### Normalized Thermal Transient Impedance, Junction-to-Ambient

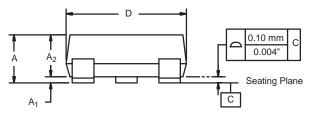


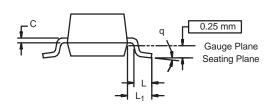
Normalized Thermal Transient Impedance, Junction-to-Foot



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







Dim	MILLIN	IETERS	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>	1.90 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°	
ECN: S-03946-Rev. K. 09-	Jul-01				

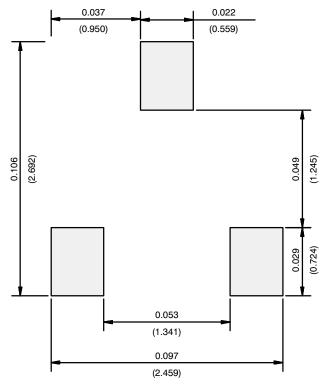
DWG: 5479

服务热线:400-655-8788

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



Recommended Minimum Pads Dimensions in Inches/(mm)



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