

# MSKSEMI

SEMICONDUCTOR



ESD



TVS



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PLED

Product data sheet

## Description

The STU417S uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



**TO-252**

## General Features

$V_{DS} = -40V$   $I_D = -40A$

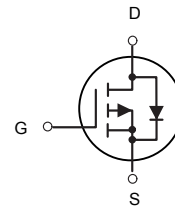
$R_{DS(ON)} < 21\ m\Omega @ V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



P-Channel MOSFET

## Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
VDS	Drain-Source Voltage	-40	V
VGS	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-40	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-25	A
IDM	Pulsed Drain Current <sup>2</sup>	-144	A
$P_D @ T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	30	W
TSTG	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	2.5	$^\circ C/W$

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

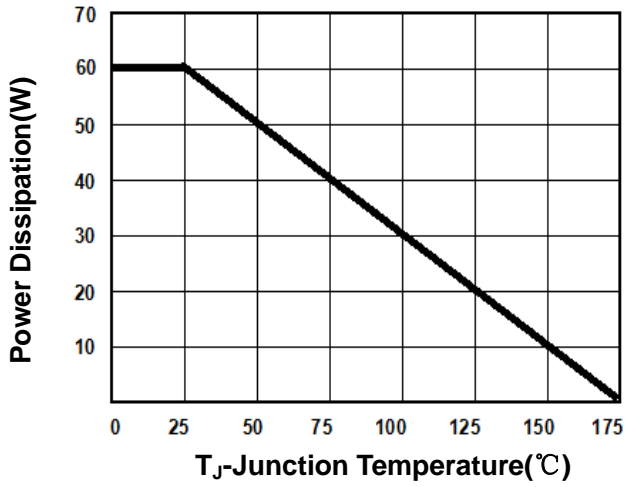
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
<b>BV<sub>DSS</sub></b>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250 μA	-40	---	---	V
<b>I<sub>DSS</sub></b>	Zero Gate Voltage Drain Current	V <sub>GS</sub> =0V, V <sub>DS</sub> =-40V	---	---	-1	μA
<b>I<sub>GSS</sub></b>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0A	---	---	±100	nA
<b>On Characteristics</b>						
<b>V<sub>GS(th)</sub></b>	GATE-Source Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250 μA	-1.1	-1.7	-2.5	V
<b>R<sub>DS(on)</sub></b>	Drain-Source On Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A	---	15	21	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A	---	21	32	
<b>G<sub>FS</sub></b>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-5A	15	---	---	S
<b>Dynamic Characteristics</b>						
<b>C<sub>iss</sub></b>	Input Capacitance	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, f=1MHz	---	2050	---	pF
<b>C<sub>oss</sub></b>	Output Capacitance		---	260	---	
<b>C<sub>rss</sub></b>	Reverse Transfer Capacitance		---	150	---	
<b>Switching Characteristics</b>						
<b>t<sub>d(on)</sub></b>	Turn-On Delay Time	V <sub>DS</sub> =-20V, R <sub>L</sub> =1.6 Ω R <sub>GEN</sub> =3 Ω, V <sub>GS</sub> =-10V	---	10	---	ns
<b>t<sub>r</sub></b>	Rise Time		---	24	---	ns
<b>t<sub>d(off)</sub></b>	Turn-Off Delay Time		---	40	---	ns
<b>t<sub>f</sub></b>	Fall Time		---	9	---	ns
<b>Q<sub>g</sub></b>	Total Gate Charge	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, I <sub>D</sub> =-8A	---	45	---	nC
<b>Q<sub>gs</sub></b>	Gate-Source Charge		---	6	---	nC
<b>Q<sub>gd</sub></b>	Gate-Drain "Miller" Charge		---	11	---	nC
<b>Drain-Source Diode Characteristics</b>						
<b>V<sub>SD</sub></b>	Source-Drain Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-10A,	---	---	-1.2	V
<b>I<sub>SD</sub></b>	Source-Drain Current(Body Diode)		---	---	-36	A

**Notes:**

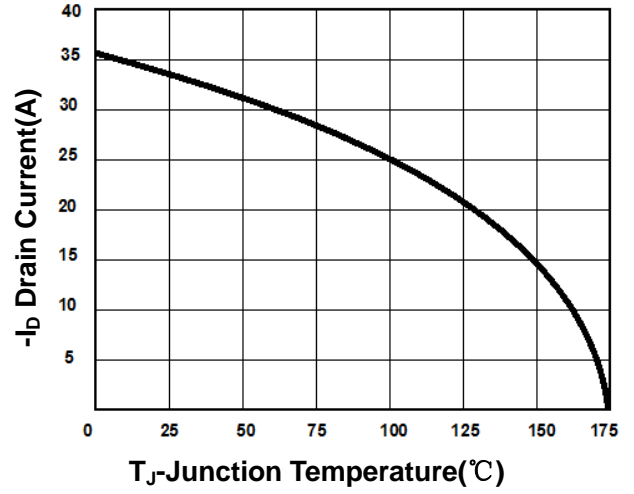
1.Repetitive Rating: Pulse width limited by maximum junction temperature

**Typical Characteristics**

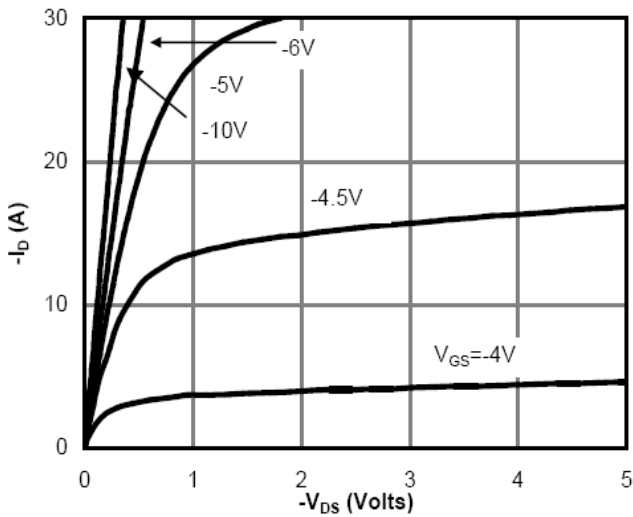
**Figure1. Power Dissipation**



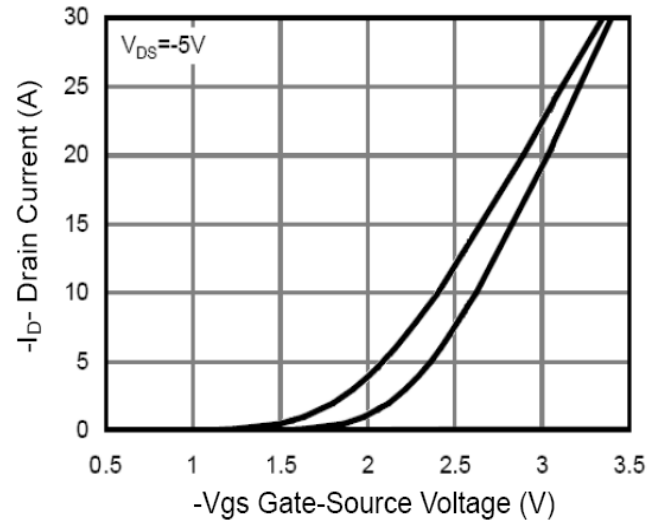
**Figure2. Drain Current**



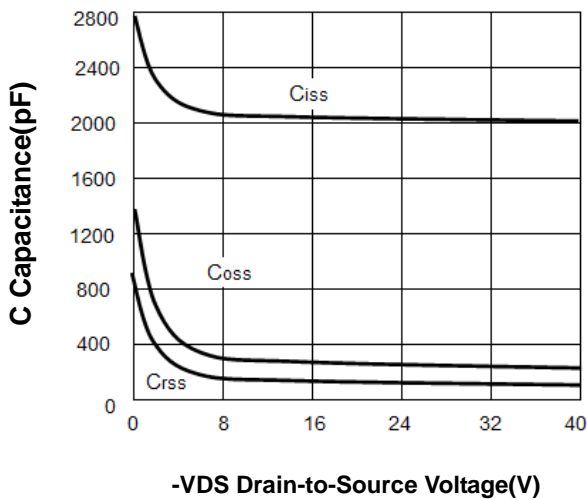
**Figure3. Output Characteristics**



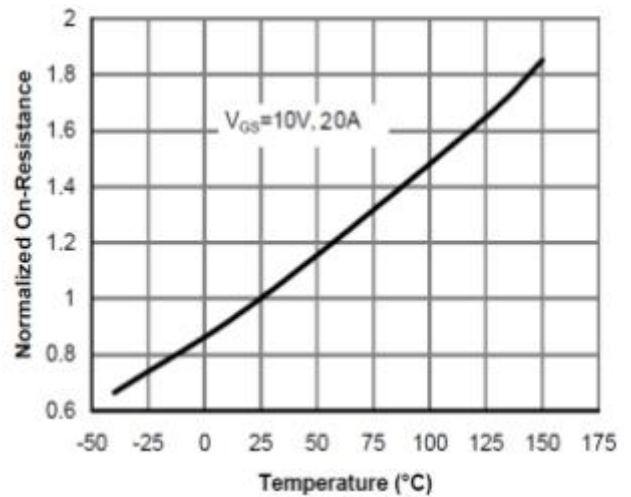
**Figure4. Transfer Characteristics**



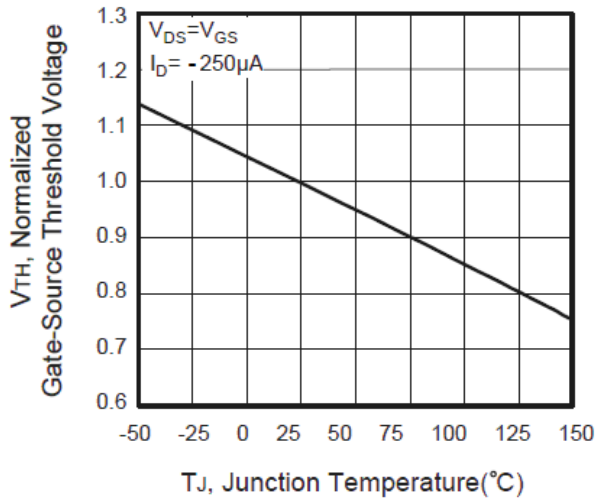
**Figure5. Capacitance**



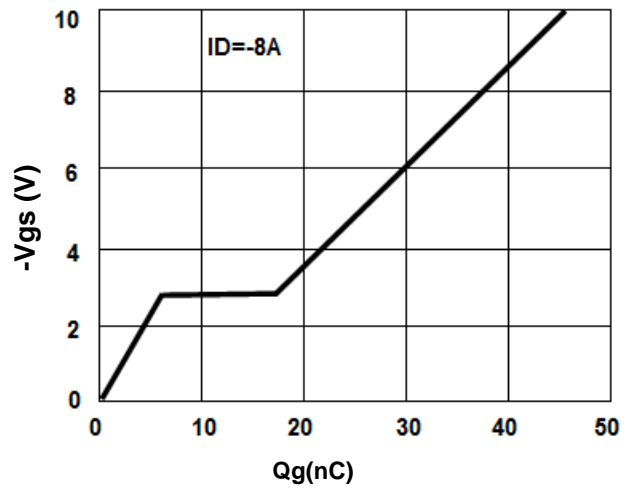
**Figure6. R<sub>DS(ON)</sub> vs Junction Temperature**



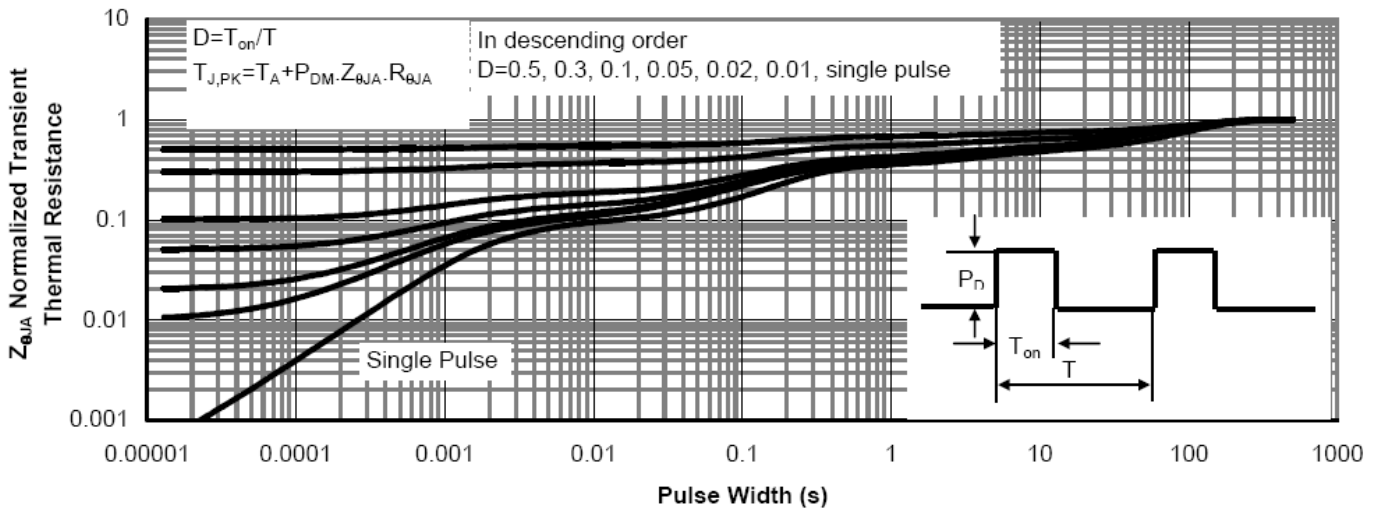
**Figure7.  $V_{GS(th)}$  vs Junction Temperature**



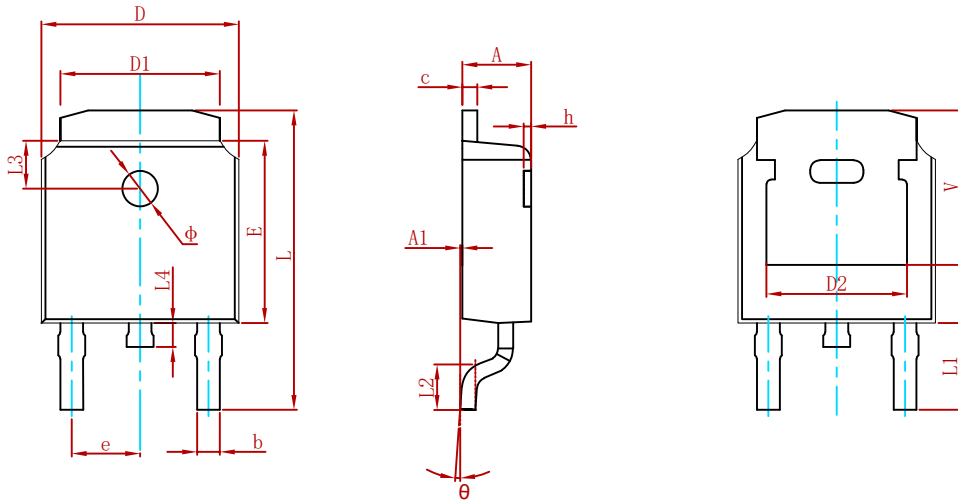
**Figure8. Gate Charge Waveforms**



**Figure9. Normalized Maximum Transient Thermal Impedance**

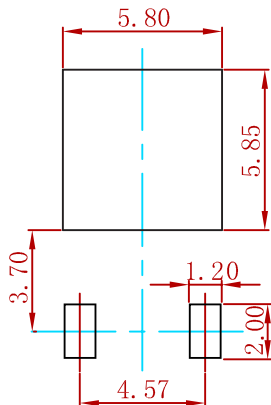


**PACKAGE MECHANICAL DATA**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

**Suggested Pad Layout**



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.

**REEL SPECIFICATION**

P/N	PKG	QTY
STU417S	TO-252	2500

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