
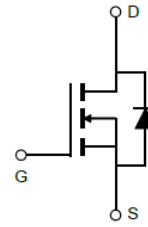
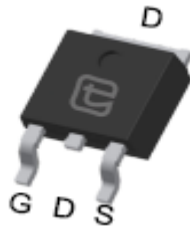


**60V N-Channel Trench MOSFET**

<p>General Description</p> <ul style="list-style-type: none"> ● Trench Power SGT technology ● Very low on-resistance $R_{DS(ON)}$ ● Low Gate Charge ● Excellent Gate Charge x $R_{DS(ON)}$ Product <p>Applications</p> <ul style="list-style-type: none"> ● High Frequency Switching and Synchronous Rectification 	<p>Product Summary</p> <table> <tr> <td>V_{DS}</td> <td>60V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>45A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 15mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td>< 19mΩ</td> </tr> </table> <p>100% UIS Tested</p> 	V_{DS}	60V	I_D (at $V_{GS}=10V$)	45A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 15m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 19m Ω
V_{DS}	60V								
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TO-252



Part Number	Package Type	Form	Marking
TSD10N06AT	TO-252	Tape & Reel	D10N06AT

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^B	I_D	$T_C = 25^\circ\text{C}$	45
		$T_C = 100^\circ\text{C}$	27
Pulsed Drain Current ^A	I_{DM}	180	A
Avalanche Current ^A	I_{AS}	20	A
Single Pulse Avalanche Energy $L = 0.3\text{mH}$ ^A	E_{AS}	20	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	56.5
		$T_C = 100^\circ\text{C}$	35.7
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Case	$R_{\theta JC}$	2.1	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient			
	$R_{\theta JA}$	50	



Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted)							
Symbol	Parameter	Conditions	Value			Units	
			Min	Typ	Max		
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	--	--	V	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$	--	--	1	μA
			$T_J = 125^\circ\text{C}$	--	--	100	
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	--	--	± 100	nA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.1	--	2.5	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	--	12	15	$\text{m}\Omega$	
		$V_{GS} = 4.5\text{V}, I_D = 20\text{A}$	--	15	19	$\text{m}\Omega$	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 20\text{A}$	--	100	--	S	
V_{SD}	Diode Forward Voltage	$I_S = 1\text{A}, V_{GS} = 0\text{V}$	--	--	1	V	
I_S	Maximum Body-Diode Continuous Current ^B		--	--	30	A	
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	--	1134	--	pF	
C_{oss}	Output Capacitance		--	123	--		
C_{rss}	Reverse Transfer Capacitance		--	12	--		
SWITCHING PARAMETERS							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 20\text{A}$	--	21	--	nC	
$Q_g(4.5\text{V})$			--	11	--		
Q_{gs}			Gate Source Charge	--	3.1		--
Q_{gd}			Gate Drain Charge	--	5.1		--
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 20\text{A}, R_G = 3\Omega$	--	7	--	ns	
t_r	Turn-On Rise Time		--	3	--		
$T_{D(off)}$	Turn-Off Delay Time		--	20	--		
t_f	Turn-Off Fall Time		--	3	--		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 500\text{A}/\mu\text{s}$	--	17	--	ns	
Q_{rr}	Body Diode Reverse Recovery Charge		--	60	--	nC	

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

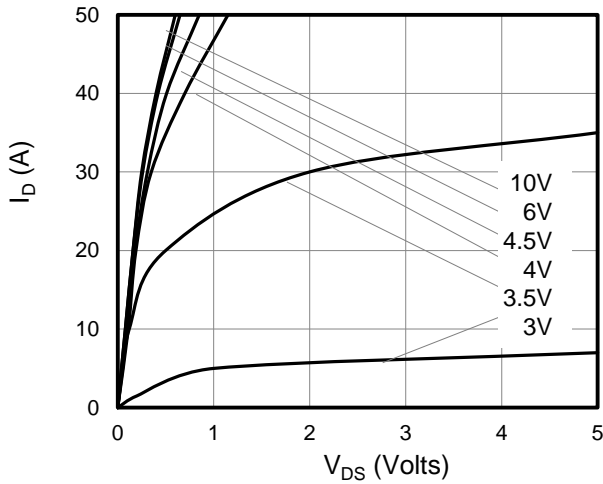


Figure 1: On-Region Characteristics

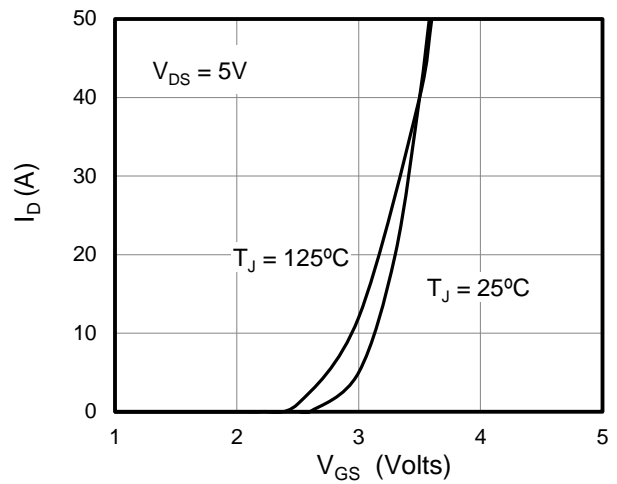


Figure 2: Transfer Characteristics

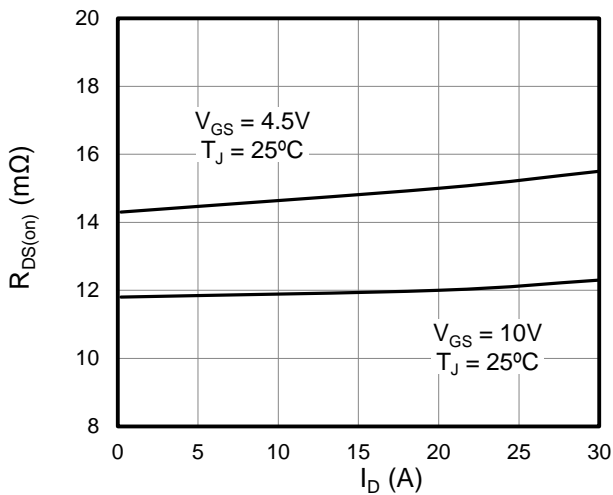


Figure 3: On-Resistance vs. Drain Current

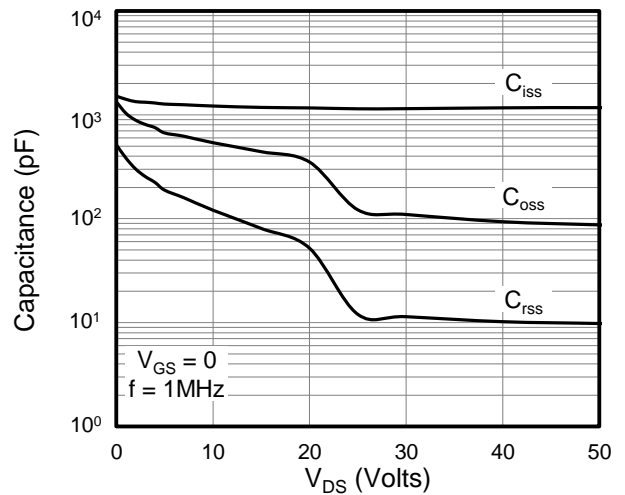


Figure 4: Capacitance Characteristics

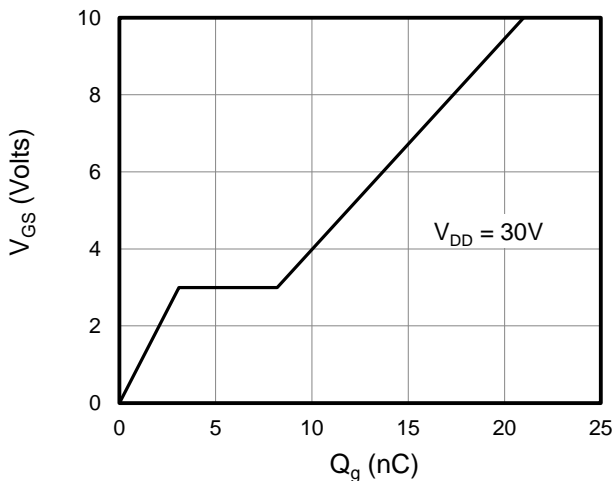


Figure 5: Gate Charge Characteristics

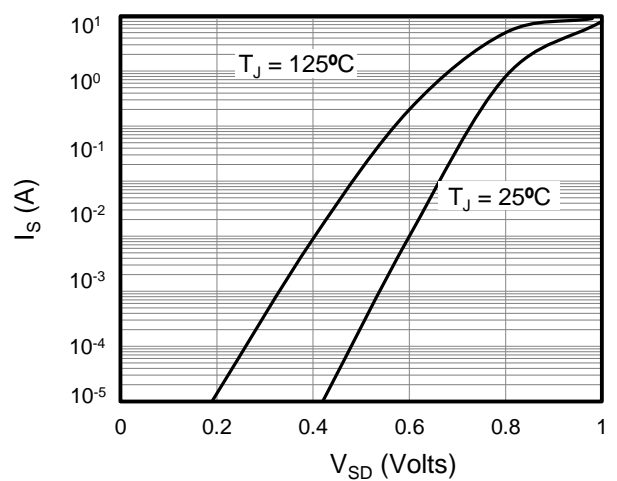


Figure 6: Body Diode Forward Voltage



Typical Characteristics $T_J = 25^{\circ}\text{C}$, unless otherwise noted

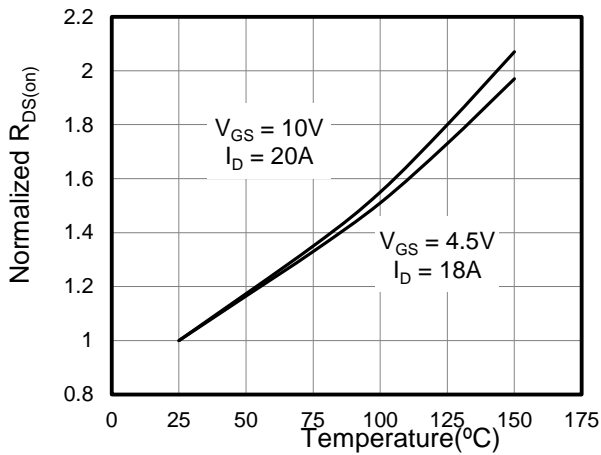


Figure 7: On-Resistance vs. Junction Temperature

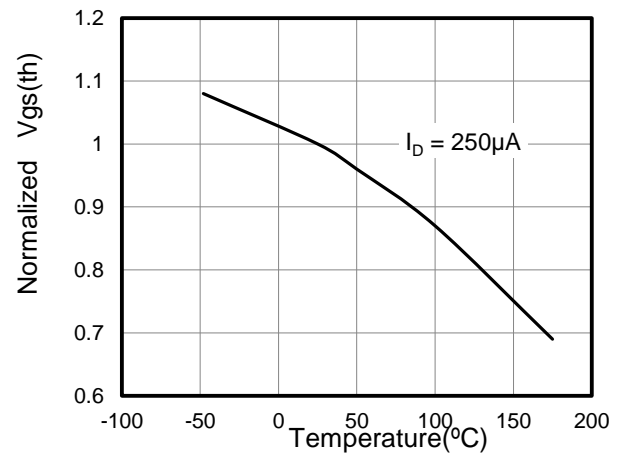


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

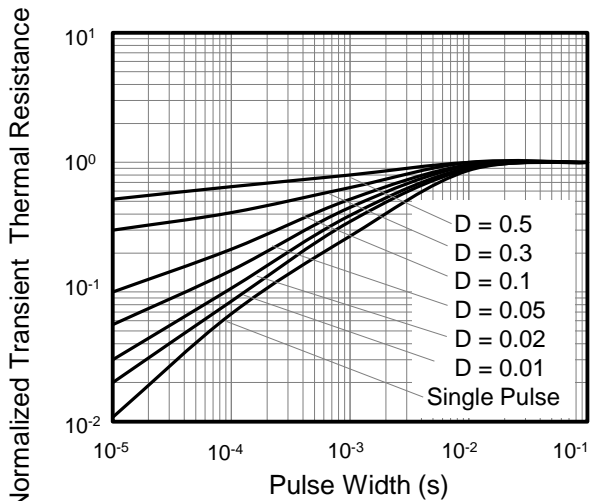


Figure 9: Normalized Transient Thermal Resistance

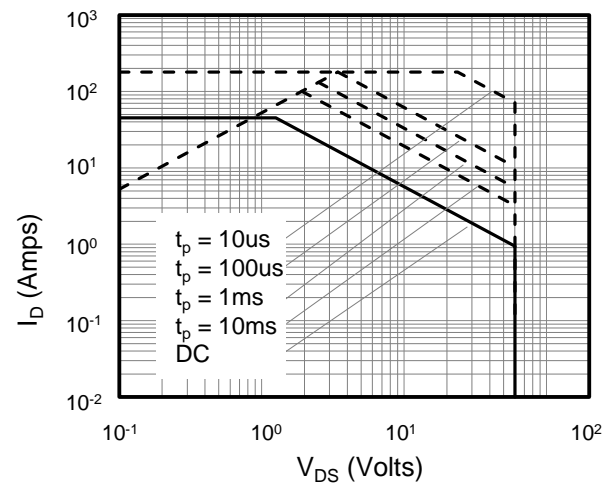


Figure 10: Safe Operating Area

$Z_{\theta,JC}$ Normalized Transient Thermal Resistance



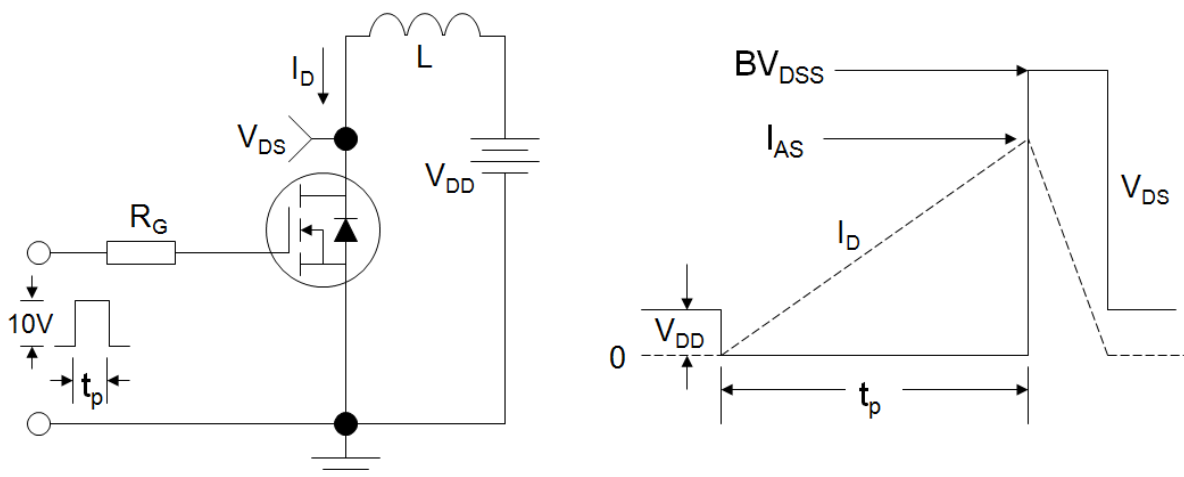
Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

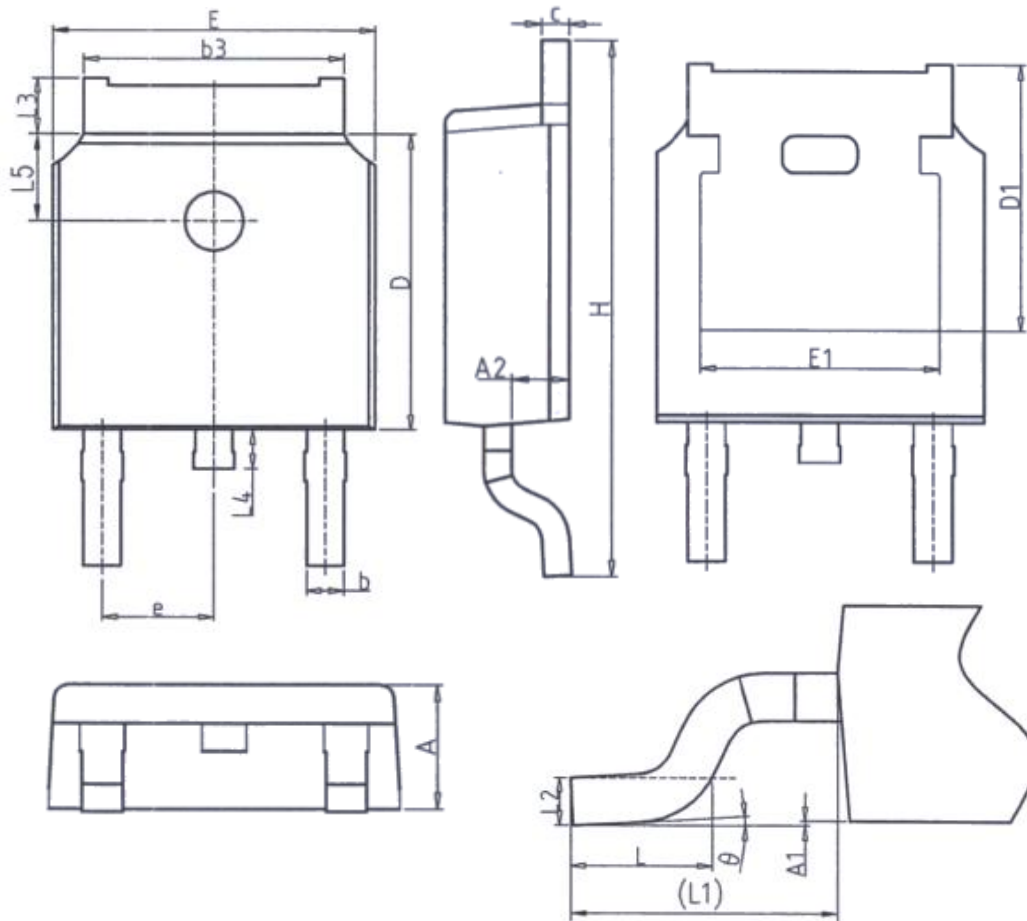


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	-

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	-	1.00
L5	1.65	1.95
θ	0°	8°



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