
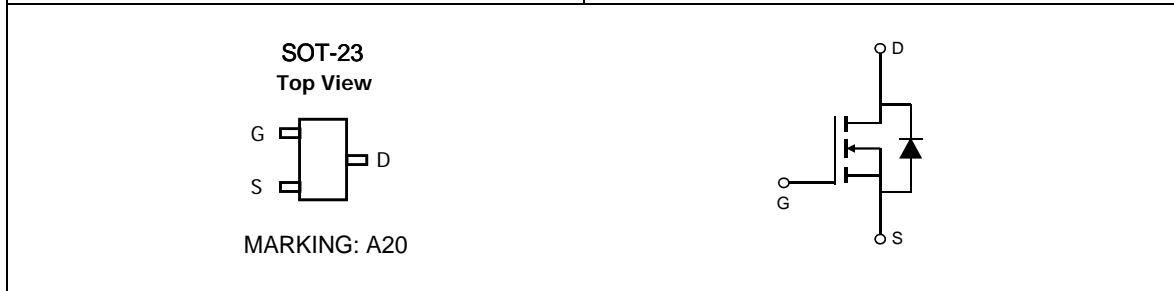


TM3420

N-CHANNEL ENHANCEMENT MOSFET

<p>General Description</p> <p>The TM3420 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V $V_{GS(MAX)}$ rating. This device is suitable for use as a uni-directional or bi-directional load switch.</p>	<p>Product Summary</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">V_{DS}</td> <td style="padding: 2px; text-align: right;">20V</td> </tr> <tr> <td style="padding: 2px;">I_D (at $V_{GS}=10V$)</td> <td style="padding: 2px; text-align: right;">6A</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td style="padding: 2px; text-align: right;">< 24mΩ</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td style="padding: 2px; text-align: right;">< 27mΩ</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(ON)}$ (at $V_{GS}=2.5V$)</td> <td style="padding: 2px; text-align: right;">< 42mΩ</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(ON)}$ (at $V_{GS}=1.8V$)</td> <td style="padding: 2px; text-align: right;">< 55mΩ</td> </tr> </table> <div style="text-align: right; margin-top: 10px;">  </div>	V_{DS}	20V	I_D (at $V_{GS}=10V$)	6A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 24m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 27m Ω	$R_{DS(ON)}$ (at $V_{GS}=2.5V$)	< 42m Ω	$R_{DS(ON)}$ (at $V_{GS}=1.8V$)	< 55m Ω
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Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current	I_D	$T_A=25^\circ\text{C}$	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current ^C	I_{DM}	$T_A=25^\circ\text{C}$	30
		$T_A=70^\circ\text{C}$	5
Power Dissipation ^B	P_D	$T_A=25^\circ\text{C}$	1.4
		$T_A=70^\circ\text{C}$	0.9
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	70	90	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient ^{A D}		100	125	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	63	80	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.4	0.75	1.1	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =6A T _J =125°C		16 23	24 35	mΩ
		V _{GS} =4.5V, I _D =5A		18	27	mΩ
		V _{GS} =2.5V, I _D =4A		23	42	mΩ
		V _{GS} =1.8V, I _D =2A		31	55	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =6A		25		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, f=1MHz	420	525	630	pF
C _{oss}	Output Capacitance		65	95	125	pF
C _{rss}	Reverse Transfer Capacitance		45	75	105	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.8	1.7	2.6	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =10V, I _D =6A		12.5		nC
Q _{g(4.5V)}	Total Gate Charge			6		nC
Q _{gs}	Gate Source Charge			1		nC
Q _{gd}	Gate Drain Charge			2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =10V, R _L =1.7Ω, R _{GEN} =3Ω		3		ns
t _r	Turn-On Rise Time			7.5		ns
t _{D(off)}	Turn-Off DelayTime			20		ns
t _f	Turn-Off Fall Time			6		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =6A, dI/dt=100A/μs		14		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =6A, dI/dt=100A/μs		6		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

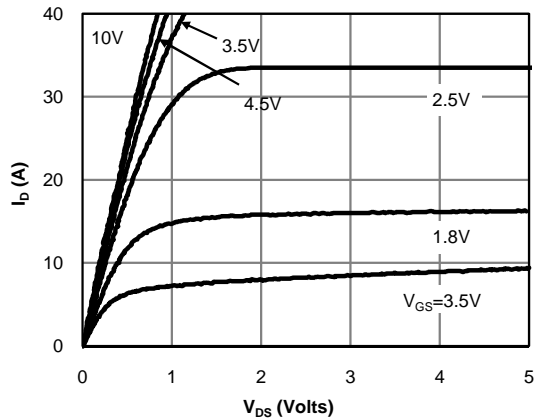


Figure 1: On-Region Characteristics (Note E)

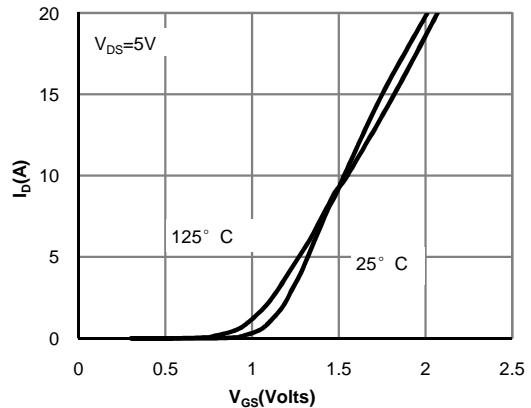


Figure 2: Transfer Characteristics (Note E)

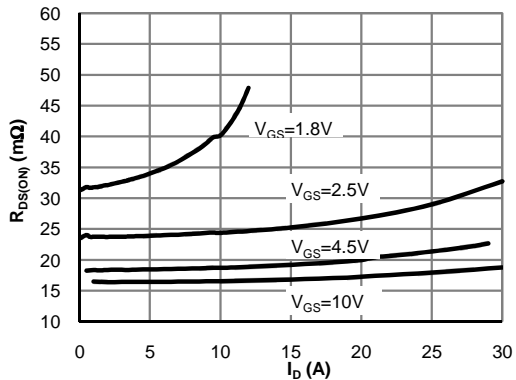


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

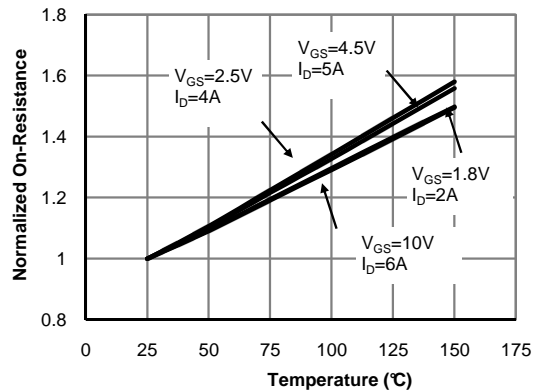


Figure 4: On-Resistance vs. Junction Temperature (Note E)

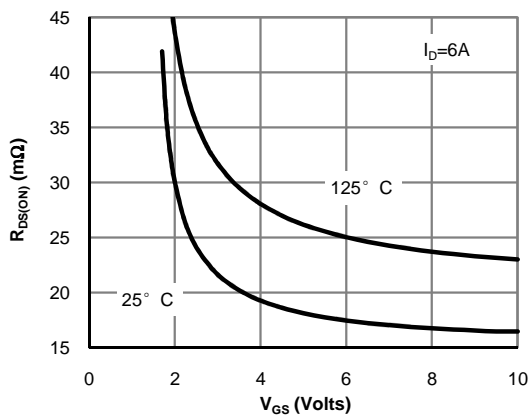


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

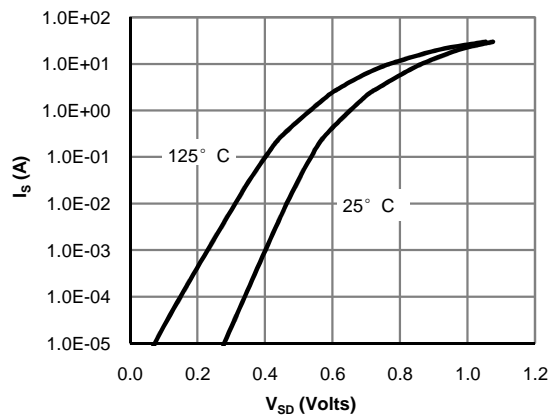


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

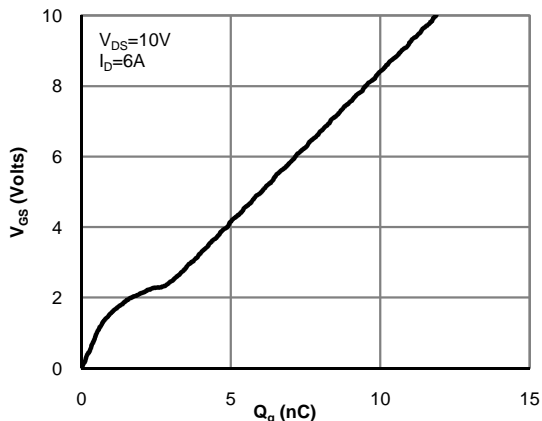


Figure 7: Gate-Charge Characteristics

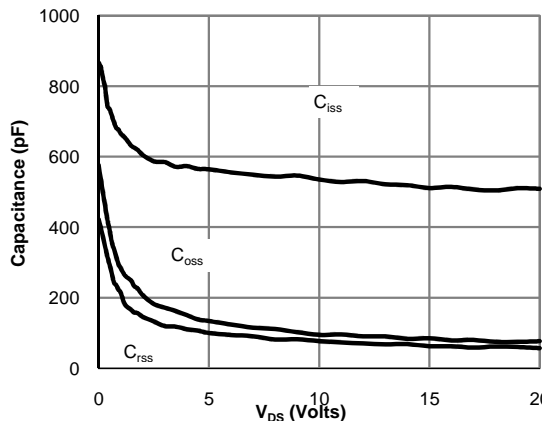


Figure 8: Capacitance Characteristics

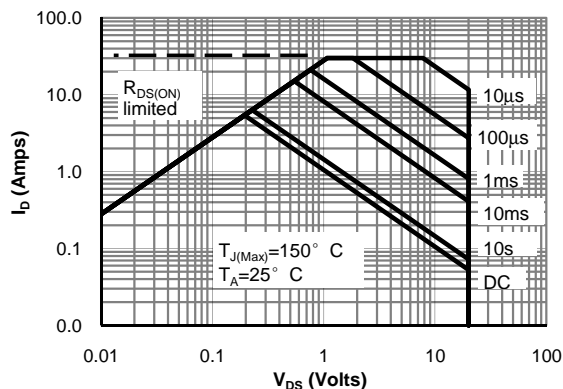


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

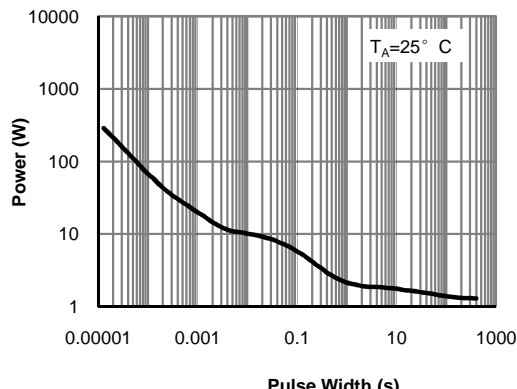


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

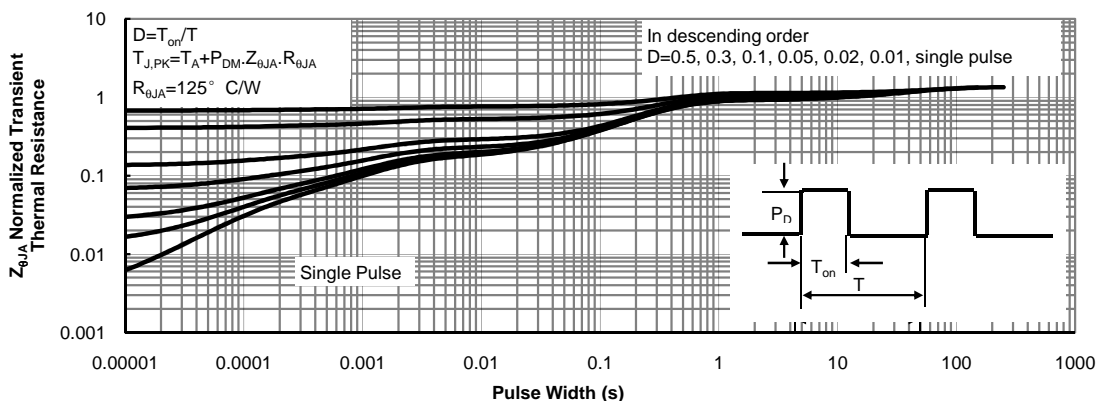
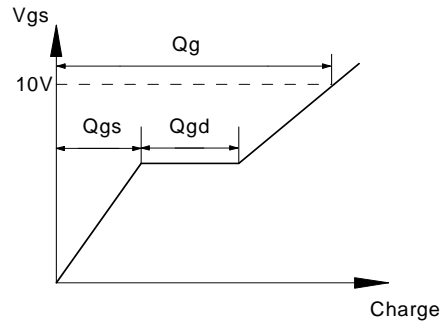
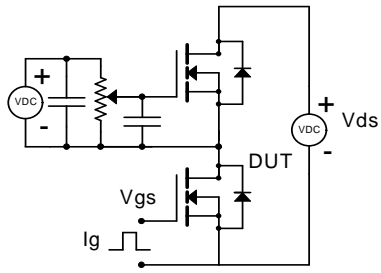
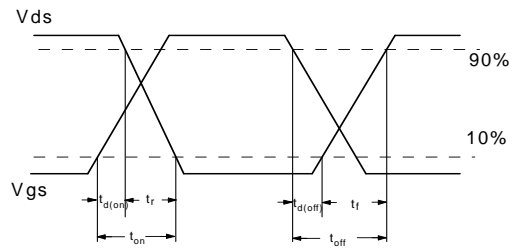
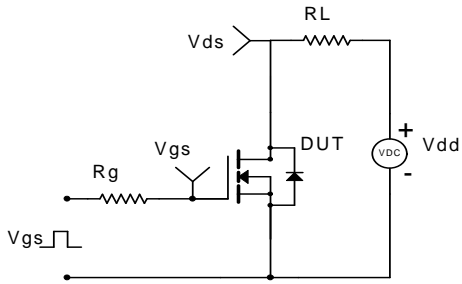


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

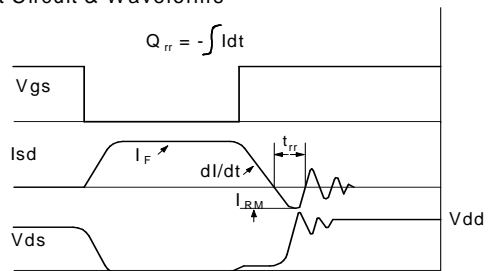
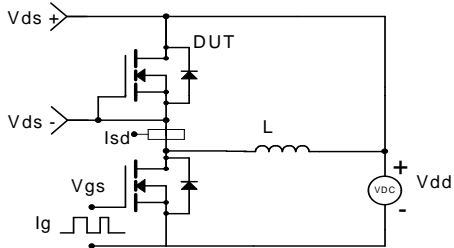
Gate Charge Test Circuit & Waveform



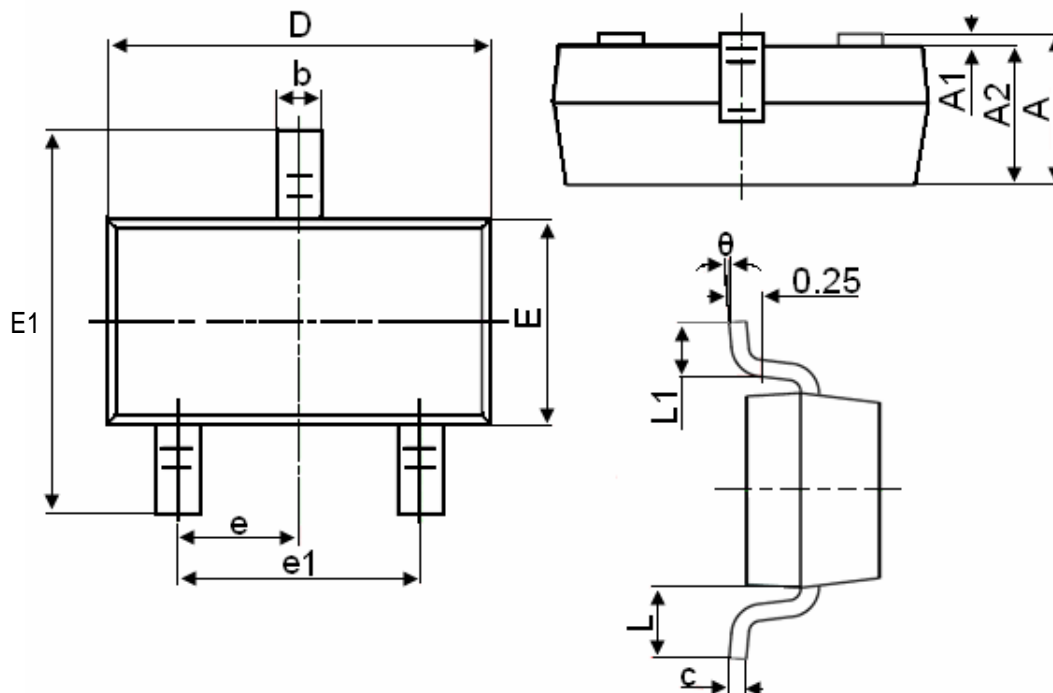
Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.