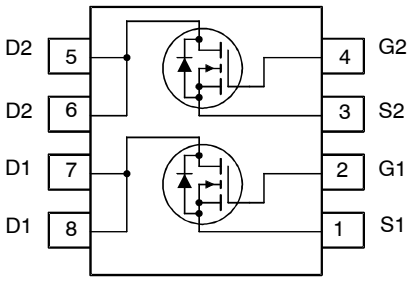
General Description

This N−Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM con trollers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.



Features

- $V_{DS\,(V)}$ = 30V
- I_D = 7.5A (V_{GS} = 10V)
- $R_{DS(ON)}$ < 18mΩ (V_{GS}=10V)
- $R_{DS(ON)}$ < 21 mΩ (V_{GS}=4.5V)
- High Performance Trench Technology for Extremely Low $r_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability

Applications

- DC/DC Converters

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Ratings	Unit
V_{DSS}	Drain to Source Voltage		30	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current	Continuous (T_A = 25°C, V_{GS} = 10 V, $R_{\theta JA}$ = 50°C/W)	7.5	A
		Continuous (T_A = 25°C, V_{GS} = 4.5 V, $R_{\theta JA}$ = 50°C/W)	6.9	A
		Pulsed	49	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)		57	mJ
P_D	Power Dissipation		1.6	W
	Derate above 25°C		13	mW/°C
T_J, T_{STG}	Operating and Storage Temperature		−55 to 150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Starting T_J = 25°C, L = 1 mH, I_{AS} = 7.5 A, V_{DD} = 30 V, V_{GS} = 10 V.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 2)	40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2a)	78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2b)	135	°C/W

2. $R_{\theta JA}$ is the sum of the junction−to−case and case−to−ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
   a. 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper.
   b. 125°C/W when mounted on a 0.02 in^2 pad of 2 oz copper.
   c. 135°C/W when mounted on a minimum pad.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0 V			1	μA
		V_{DS} = 24 V, V_{GS} = 0 V, T_J = 150°C			250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V			±100	nA
$V_{GS(TH)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.2		2.5	V
$r_{DS(on)}$	Drain to Source On Resistance	I_D = 7.5 A, V_{GS} = 10 V		14	18	mΩ
		I_D = 6.9 A, V_{GS} = 4.5 V		17	21	
		I_D = 7.5 A, V_{GS} = 10 V, T_J = 150°C		22	29	
C_{ISS}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		907	1270	pF
C_{OSS}	Output Capacitance			191		pF
C_{RSS}	Reverse Transfer Capacitance			112		pF
R_G	Gate Resistance	V_{GS} = 0.5 V, f = 1 MHz		1.2	4.0	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10 V	V_{GS} = 0 V to 10 V, V_{DD} = 15 V, I_D = 7.5 A		17	26	nC
$Q_{g(5)}$	Total Gate Charge at 5 V	V_{GS} = 0 V to 5 V, V_{DD} = 15 V, I_D = 7.5 A		9	14	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15 V, I_D = 7.5 A		2.3		nC
Q_{gs2}	Gate Charge Threshold to Plateau			1.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.3		nC
t_{ON}	Turn−On Time	V_{DD} = 15 V, I_D = 7.5 A, V_{GS} = 10 V, R_{GS} = 16 Ω		44	66	ns
$t_{d(ON)}$	Turn−On Delay Time			7	10.5	ns
t_r	Rise Time			37	55.5	ns
$t_{d(OFF)}$	Turn−Off Delay Time			48	72	ns
t_f	Fall Time			24	36	ns
t_{OFF}	Turn−Off Time			72	108	ns
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 7.5 A			1.25	V
		I_{SD} = 2.1 A			1.0	V
t_{rr}	Reverse Recovery Time	I_{SD} = 7.5 A, dI_{SD}/dt = 100 A/μs		19	25	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 7.5 A, dI_{SD}/dt = 100 A/μs		10	13	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted)

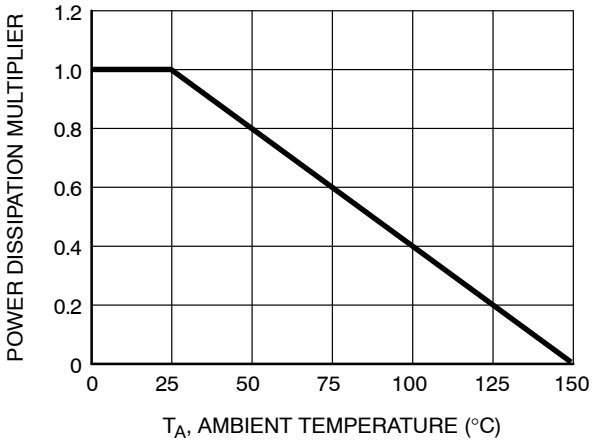


Figure 1. Normalized Power Dissipation vs. Ambient Temperature

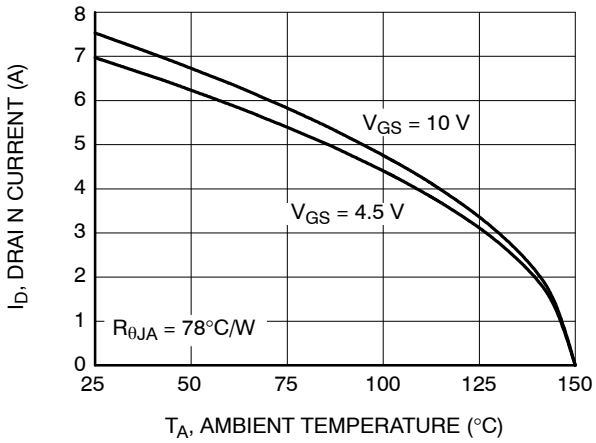


Figure 2. Maximum Continuous Drain Current vs. Ambient Temperature

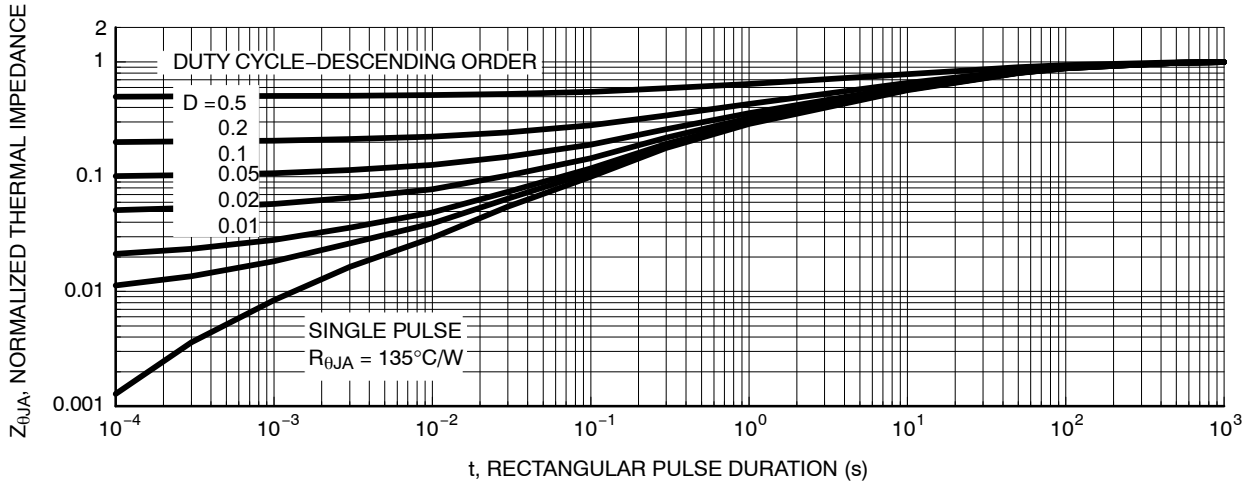


Figure 3. Normalized Maximum Transient Thermal Impedance

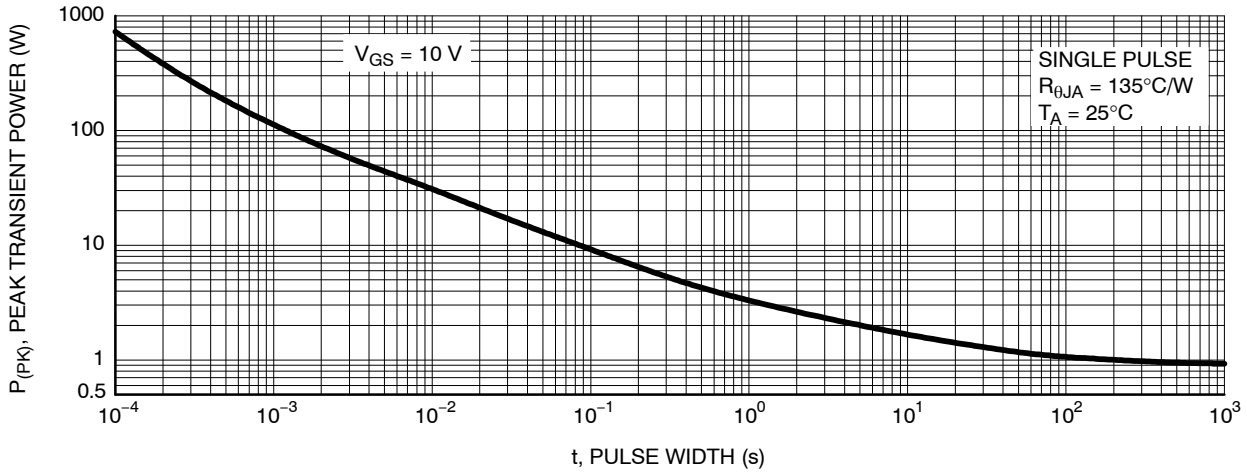


Figure 4. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted) (continued)

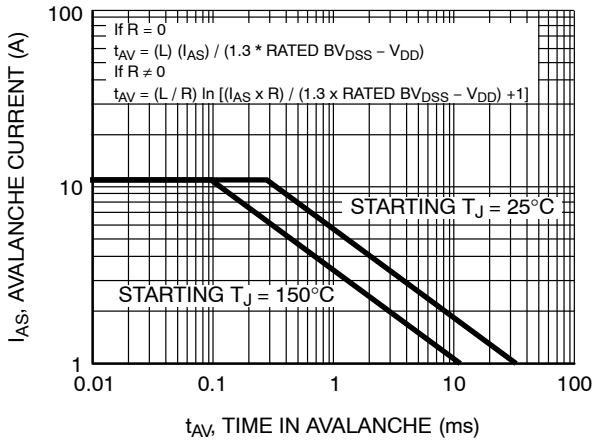


Figure 5. Unclamped Inductive Switching Capability

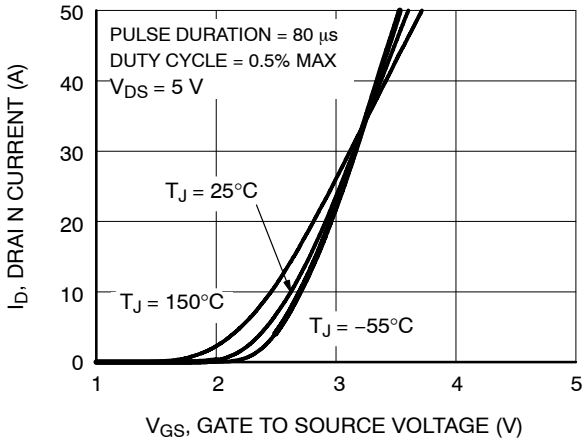


Figure 6. Transfer Characteristics

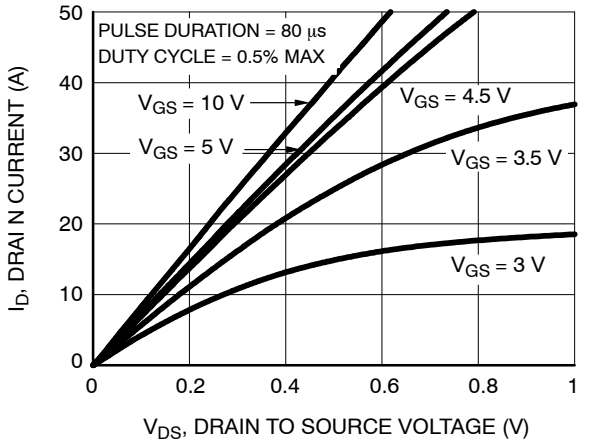


Figure 7. Saturation Characteristics

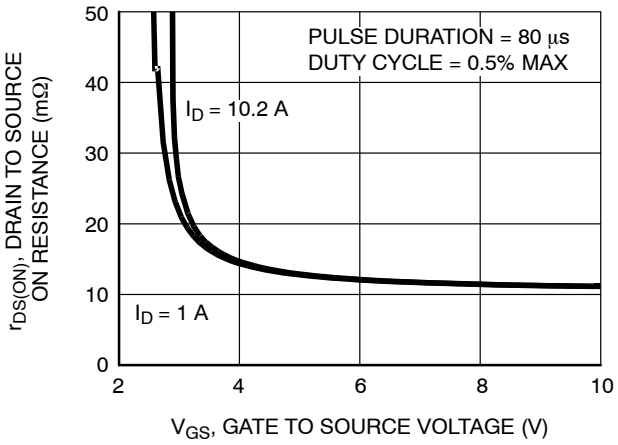


Figure 8. Drain to Source On Resistance vs. Gate Voltage and Drain Current

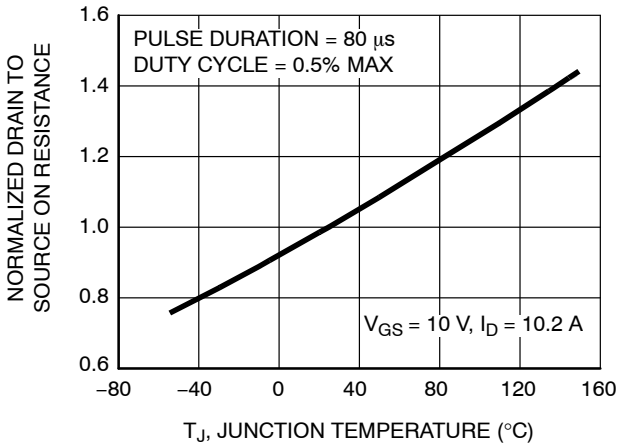


Figure 9. Normalized Drain to Source On Resistance vs. Junction Temperature

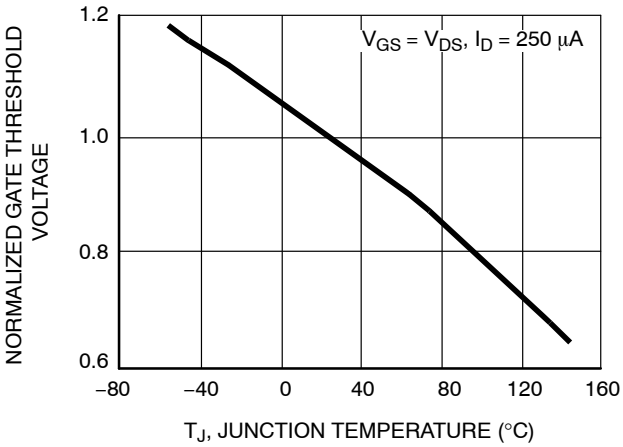


Figure 10. Normalized Gate Threshold Voltage vs. Junction Temperature

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted) (continued)

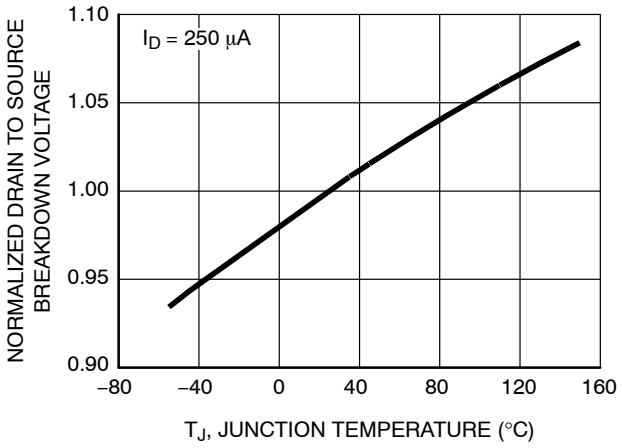


Figure 11. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

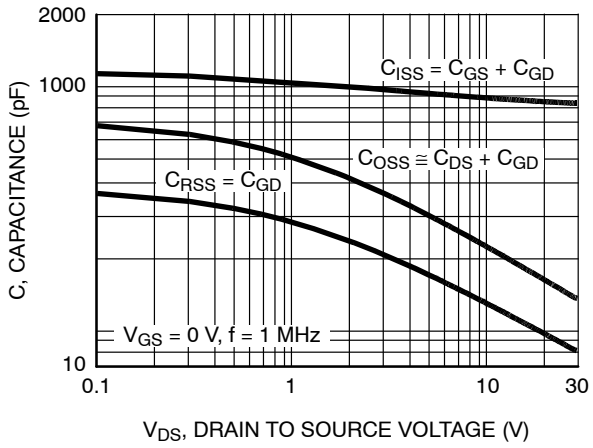


Figure 12. Capacitance vs. Drain to Source Voltage

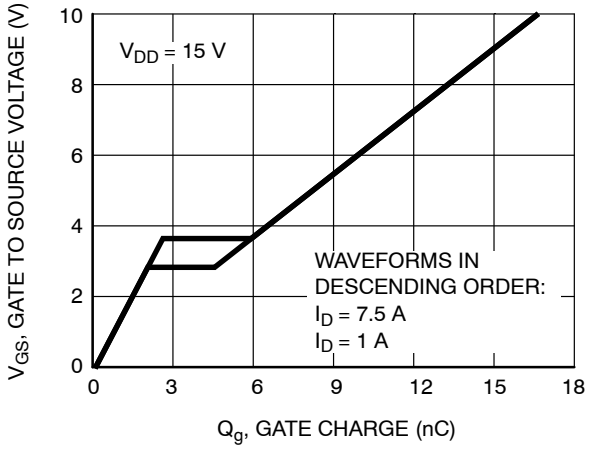


Figure 13. Gate Charge Waveforms for Constant Gate Currents

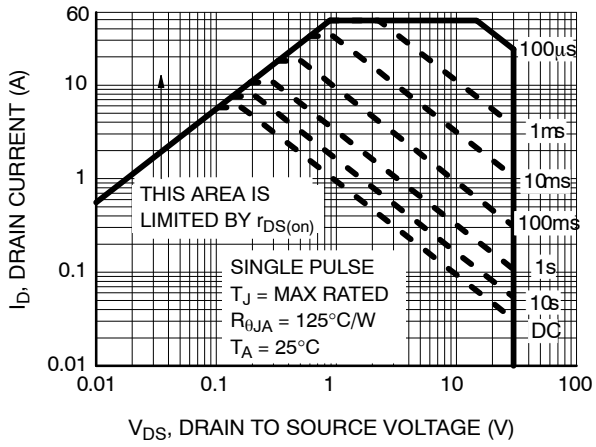
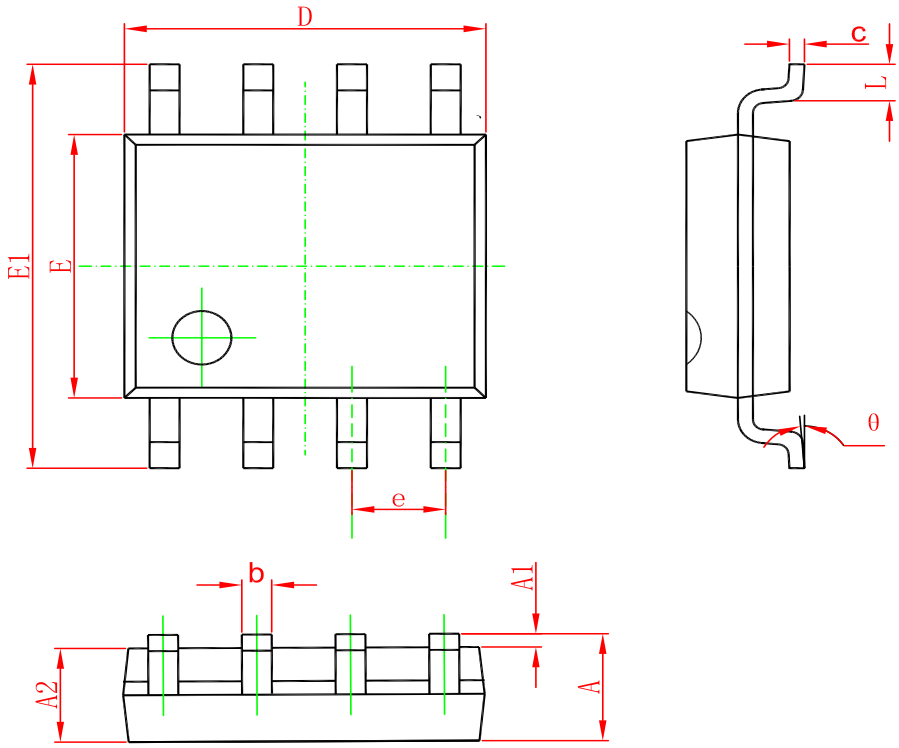


Figure 14. Forward Bis Safe Operating Area

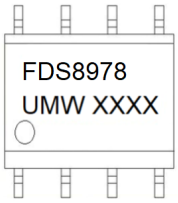
PACKAGE OUTLINE DIMENSIONS

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW FDS8978	SOP-8	3000	Tape and reel