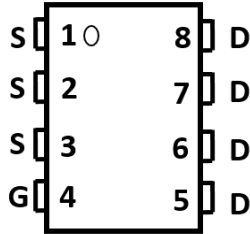
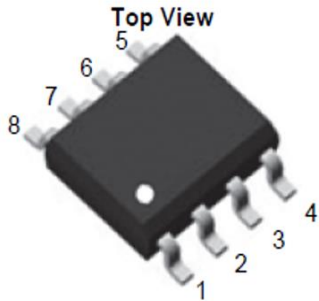
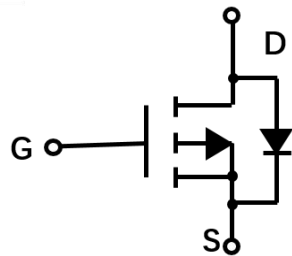


## P-Channel Enhancement Mode Field Effect Transistor


**SOP-8**


### Product Summary

- $V_{DS}$  -20V
- $I_D$  -13A
- $R_{DS(ON)}$ ( at  $V_{GS}=-4.5V$ ) <18 mohm
- $R_{DS(ON)}$ ( at  $V_{GS}=-2.5V$ ) <22 mohm
- $R_{DS(ON)}$ ( at  $V_{GS}=-1.8V$ ) <31 mohm

### General Description

- Trench Power LV MOSFET technology
- High density cell design for Low  $R_{DS(ON)}$
- High Speed switching

### Applications

- Battery protection
- Load switch
- Power management

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

Parameter	Symbol	Maximum	Unit
Drain-source Voltage	$V_{DS}$	-20	V
Gate-source Voltage	$V_{GS}$	$\pm 10$	V
Drain Current	$I_D$	$T_A=25^\circ C$ @ Steady State	-13
		$T_A=70^\circ C$ @ Steady State	-10.4
Pulsed Drain Current <sup>A</sup>	$I_{DM}$	-55	A
Total Power Dissipation @ $T_A=25^\circ C$	$P_D$	3.0	W
Thermal Resistance Junction-to-Ambient @ Steady State <sup>B</sup>	$R_{\theta JA}$	42	$^\circ C/W$
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	$^\circ C$

### ■ Ordering Information (Example)

PREFERRED P/N	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
TPM2020UX	2P18	4000	8000	64000	13" reel



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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =-250μA	-20			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>C</sub> =25°C			-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±10V, V <sub>DS</sub> =0V			±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =-250μA	-0.4	-0.62	-1.0	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> =-10A		14	18	mΩ
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> =-6.5A		17	22	
		V <sub>GS</sub> = -1.8V, I <sub>D</sub> =-4.0A		21	31	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =-13A, V <sub>GS</sub> =0V		-0.8	-1.2	V
Maximum Body-Diode Continuous Current	I <sub>S</sub>				-13	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHZ		2050		pF
Output Capacitance	C <sub>oss</sub>			411		
Reverse Transfer Capacitance	C <sub>rss</sub>			362		
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-9.1A		30		nC
Gate Source Charge	Q <sub>gs</sub>			5.3		
Gate Drain Charge	Q <sub>gd</sub>			7.6		
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-6A, R <sub>GEN</sub> =2.5Ω		14		ns
Turn-on Rise Time	t <sub>r</sub>			20		
Turn-off Delay Time	t <sub>D(off)</sub>			95		
Turn-off Fall Time	t <sub>f</sub>			65		

- A. Repetitive Rating: Pulse width limited by maximum junction temperature.  
 B. Surface Mounted on FR4 Board, t ≤ 10 sec.

■ Typical Performance Characteristics

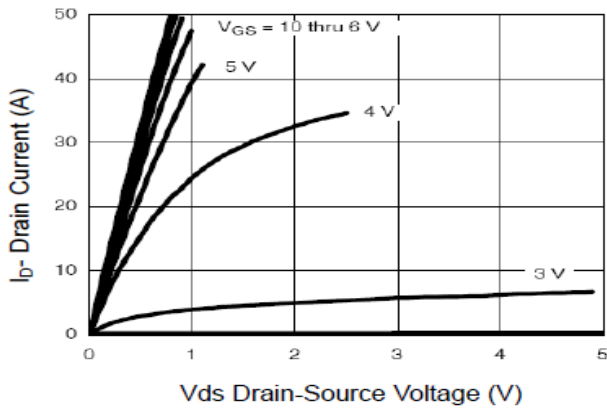


Figure1. Output Characteristics

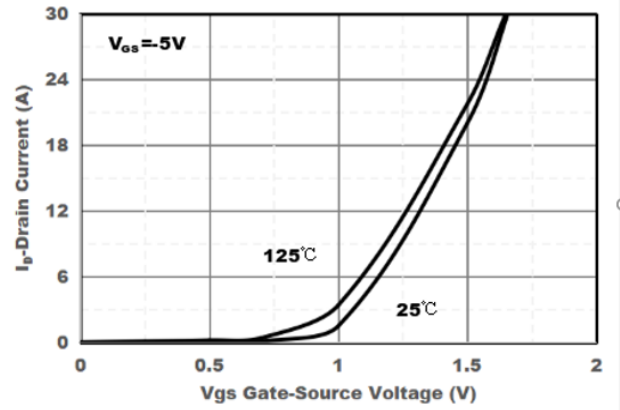


Figure2. Transfer Characteristics

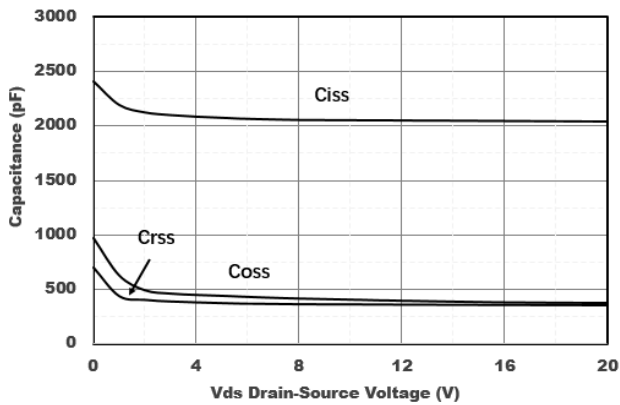


Figure3. Capacitance Characteristics

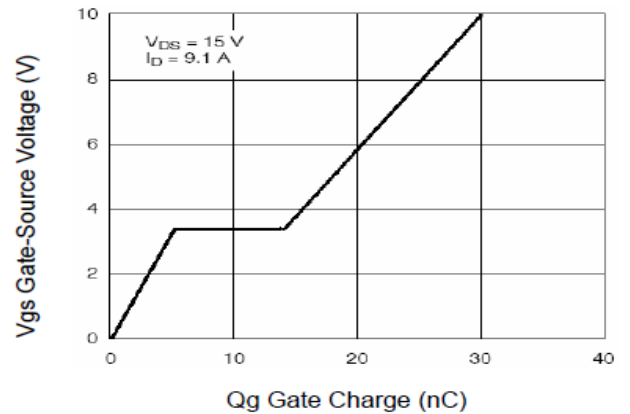


Figure4. Gate Charge

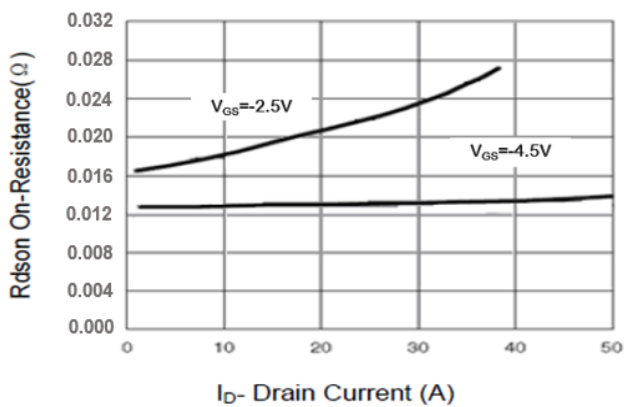


Figure5. Drain-Source on Resistance

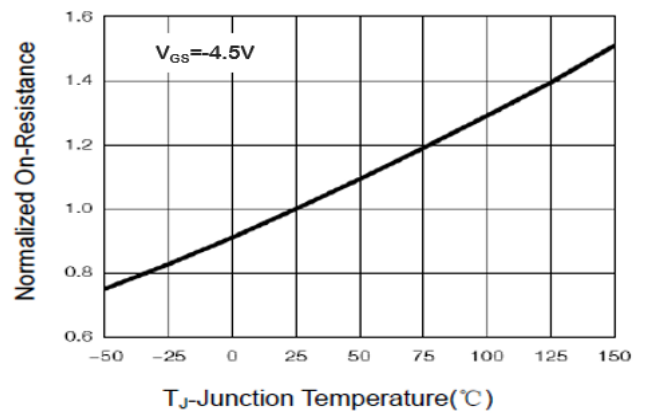


Figure6. Drain-Source on Resistance

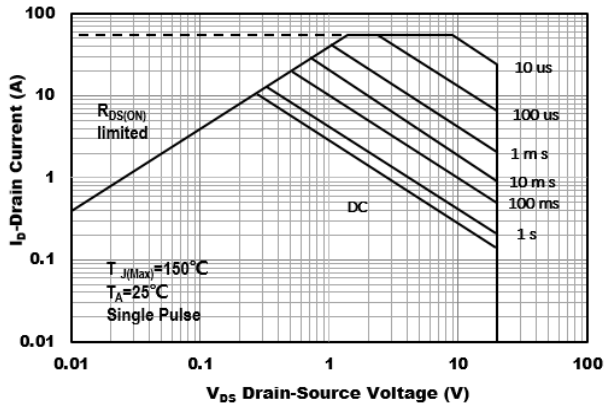


Figure7. Safe Operation Area

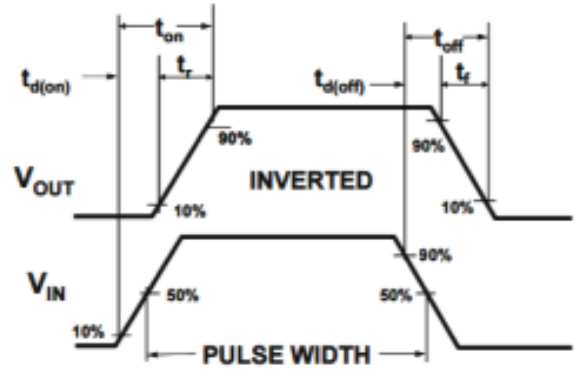
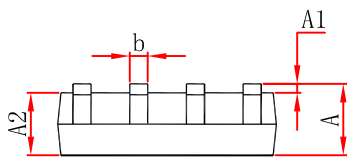
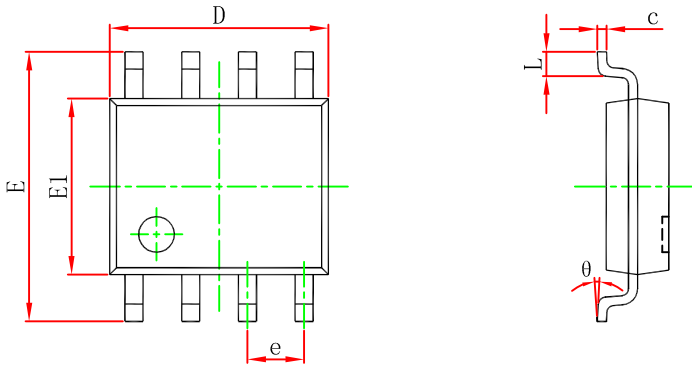
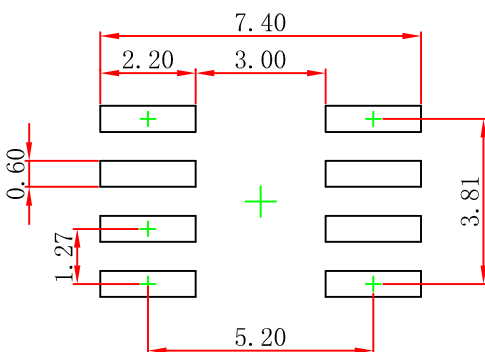


Figure8. Switching wave

**■ SOP-8 Package information**


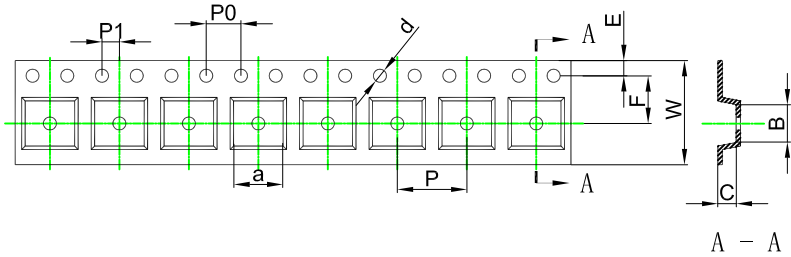
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

**■ SOP-8 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.

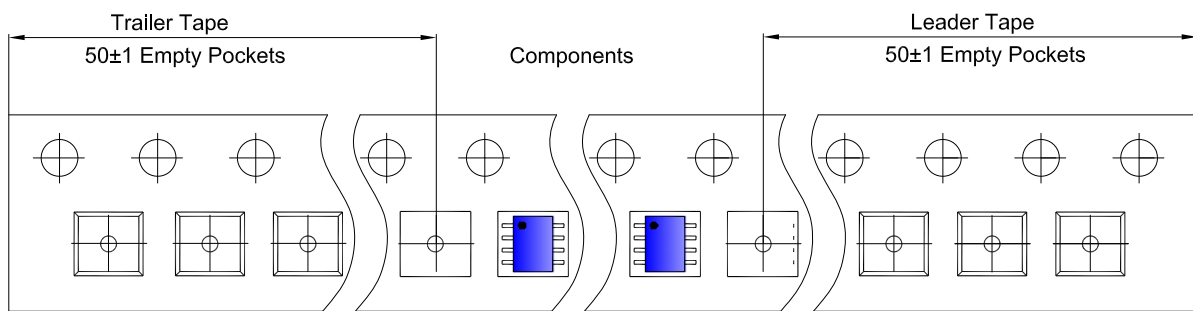
## SOP8 Tape and Reel

### SOP8 Embossed Carrier Tape

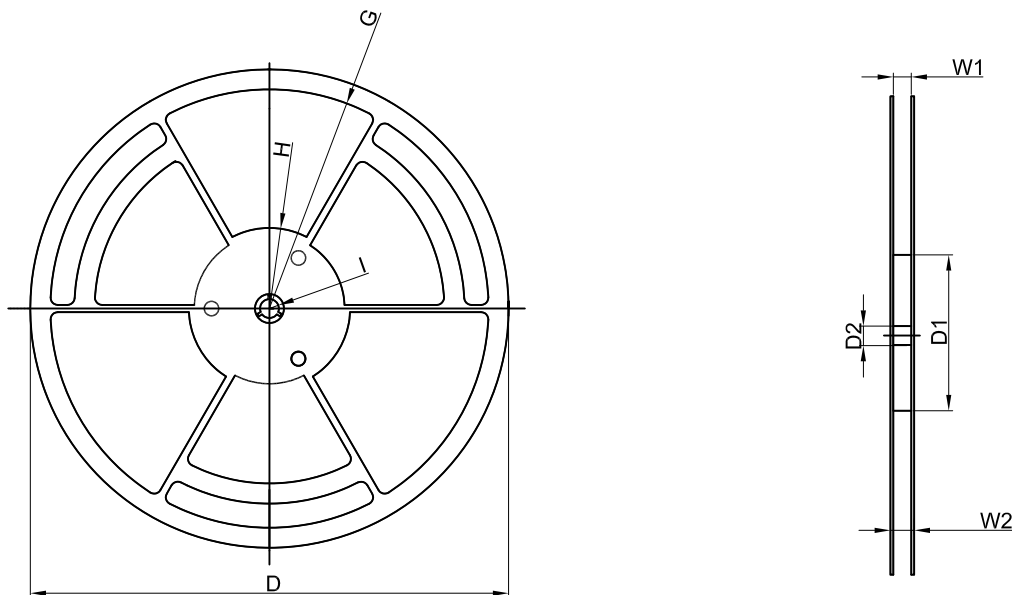


Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOP8	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

### SOP8 Tape Leader and Trailer



### SOP8 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13"Dia	Ø330.00	100.00	13.00	R151.00	R56.00	R6.50	12.40	17.60

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