

## Description

The PSMTL04R05H uses split gate trench technology to provide excellent  $R_{DS(on)}$  and low gate charge. This device is suitable for power management and high efficiency applications at high switching frequencies applications.

### MOSFET Product Summary

$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$ (Typ)	$I_D(A)$
40	0.43@ $V_{GS} = 10V$	726

## Feature

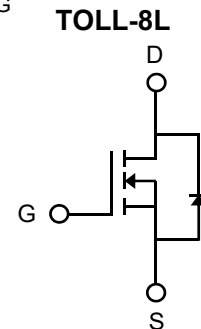
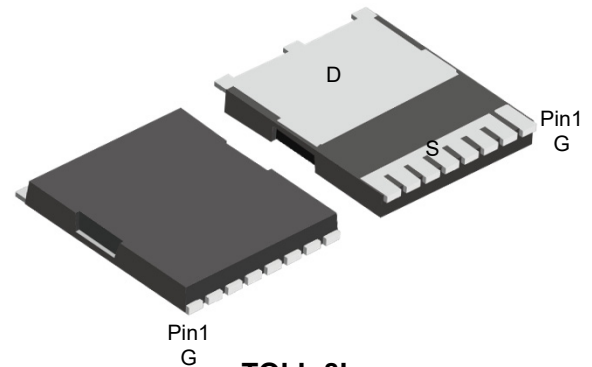
- Low On-Resistance
- Excellent FoM (figure of merit)
- 100%  $\Delta V_{DS}$  & UIS &  $R_g$  Tested
- Lead-Free Finish ; RoHS Compliant
- Halogen and Antimony Free. "Green" Device

## Applications

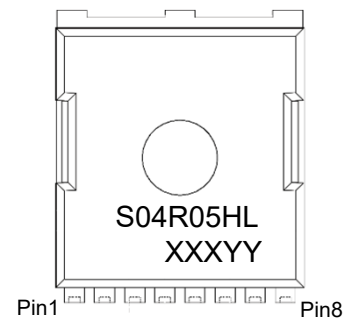
- Load switching
- Motor driver
- High frequency switching, synchronous rectification

## Mechanical Data

- Green Molding Compound
- Moisture Sensitivity: Level 1 per J-STD-020
- UL Flammability Classification Rating 94V-0



**Circuit Diagram**



**Marking (Top View)**

## Absolute maximum rating@25°C

Rating		Symbol	Value	Units
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current-Continuous( $V_{GS}=10V$ ) <sup>1)</sup>	$T_C=25^\circ C$	$I_D$	726	A
	$T_C=100^\circ C$		513	
Pulsed Drain Current <sup>2)</sup>		$I_{DM}$	2905	A
Total Power Dissipation	$T_C=25^\circ C$	$P_D$	441	W
	$T_C=100^\circ C$		221	
Avalanche Current @ $L=0.5mH$		$I_{AS}$	75	A
Avalanche Energy <sup>3)</sup>		$E_{AS}$	2624	mJ
Thermal Resistance , Junction-to-Case <sup>5)</sup>		$R_{\theta JC}$	Typ:0.26 Max:0.34	$^\circ C/W$
Thermal Resistance Junction-to-Ambient <sup>4)</sup>		$R_{\theta JA}$	Typ:22 Max:28	$^\circ C/W$
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+175	$^\circ C$

## Electrical characteristics per line@25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Off Characteristics <sup>6)</sup>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	40	-	-	V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V	T <sub>J</sub> =25°C	-	-	1.0	μA
			T <sub>J</sub> =125°C	-	-	100	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	-	-	±100	nA	
On Characteristics <sup>6)</sup>							
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0	3.0	4.0	V	
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 80A	-	0.43	0.5	mΩ	
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 20A	-	73	-	S	
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 2A	-	0.7	1.2	V	
Dynamic Characteristics <sup>7)</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 500KHz	-	14999	-	pF	
Output Capacitance	C <sub>oss</sub>		-	8191	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	320	-		
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	-	2.0	-	Ω	
Switching Characteristics <sup>7)</sup>							
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 10V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 80A	-	0.65	-	ns	
Turn-on Rise Time	t <sub>r</sub>		-	86	-		
Turn-Off Delay Time	t <sub>d(off)</sub>		-	98	-		
Turn-Off Fall Time	t <sub>f</sub>		-	57	-		
Total Gate Charge @ V <sub>GS</sub> = 10V	Q <sub>g</sub>	V <sub>DS</sub> = 20V, I <sub>D</sub> = 80A, V <sub>GS</sub> = 10V	-	194	-	nC	
Total Gate Charge @ V <sub>GS</sub> = 6V			-	118	-		
Gate-Source Charge	Q <sub>gs</sub>		-	68	-		
Gate-Drain Charge	Q <sub>gd</sub>		-	31	-		
Gate Plateau Voltage	V <sub>plateau</sub>		-	5.0	-	V	
Drain-Source Diode Characteristics <sup>7)</sup>							
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =20A, d <sub>i</sub> /d <sub>t</sub> =100A/μs	-	113	-	ns	
Reverse Recovery Charge	Q <sub>rr</sub>		-	229	-	nC	
Diode Forward Current	I <sub>S</sub>	-	-	-	726	A	

## Notes:

1. This current is chip limited, which is calculated based on  $R_{\theta JC}$ .
2. This current is calculated on single pulse with 10 $\mu s$  Single Pulse.
3. Defined by design, not subject to production test, EAS condition:  $T_J = 25^\circ C, V_{DD} = 20V, V_{GS} = 10V, L = 1.0mH$ .
4. Device mounted on FR-4 substrate PC board with 2oz copper in 1inch square cooling area.
5. Thermal resistance from junction to the exposed pad.
6. Short duration pulse test used to minimize self-heating effect.
7. Defined by design, not subject to production.

## Typical Characteristics

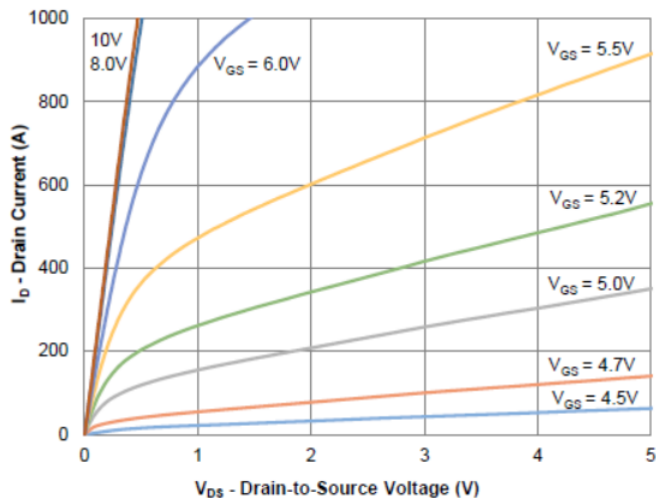


Figure 1: Output Characteristics

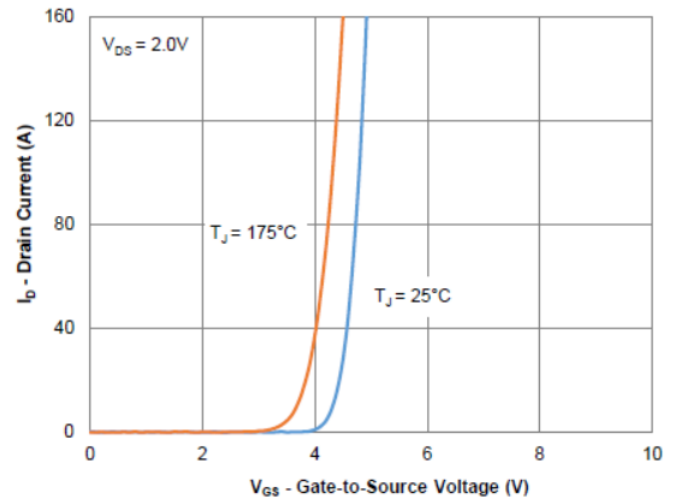


Figure 2: Transfer Characteristics

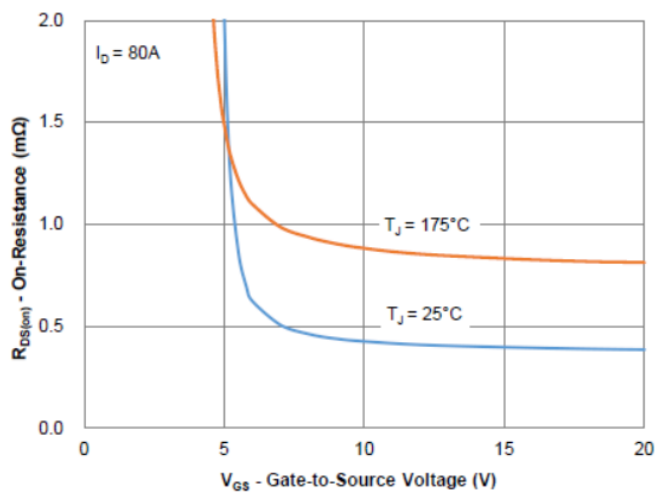


Figure 3: On-Resistance vs. Gate-Source Voltage

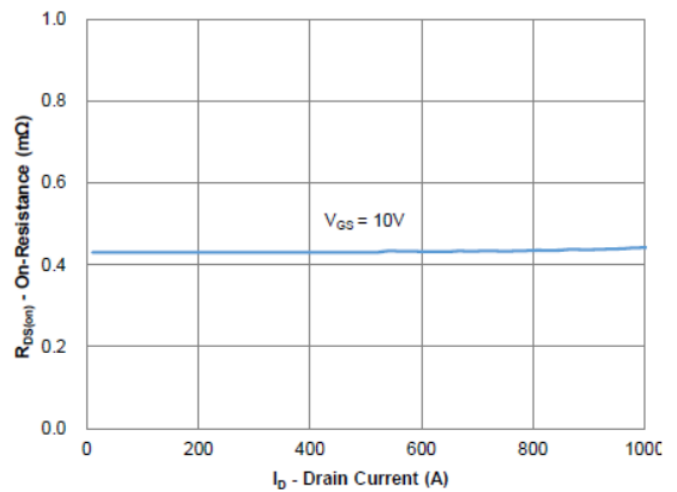


Figure 4: On-Resistance vs. Drain Current

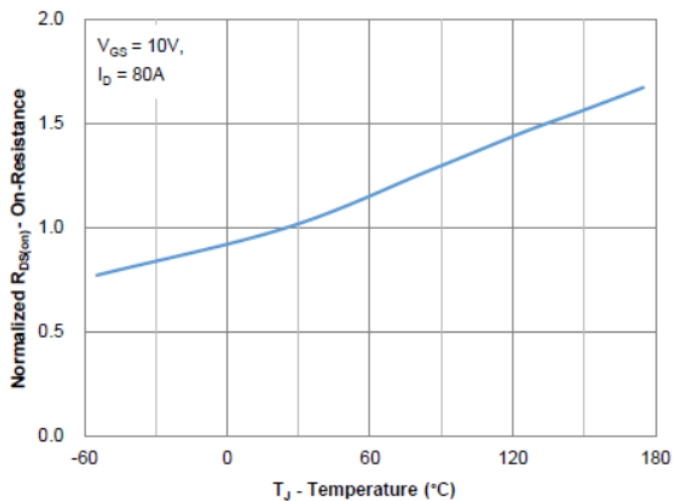


Figure 5: On-Resistance vs. Junction Temperature

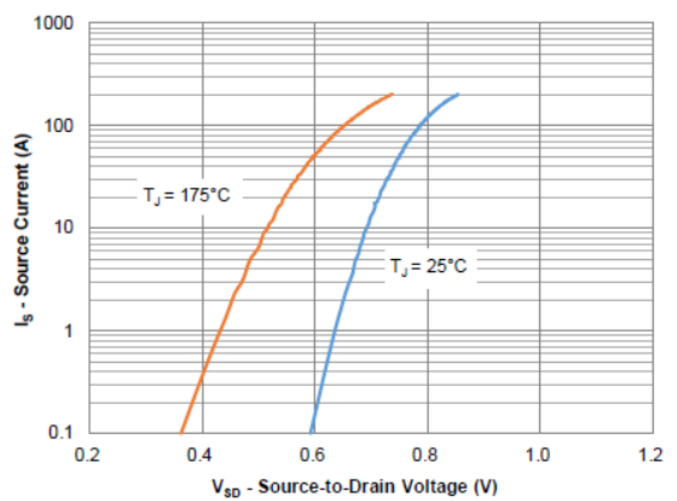


Figure 6: Source-Drain Diode Forward Voltage

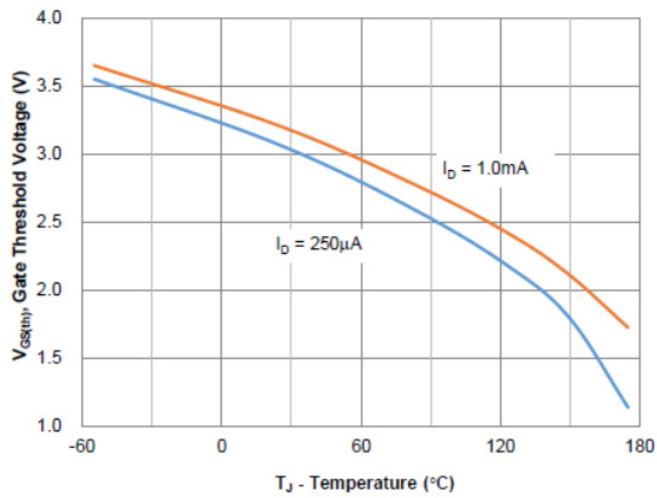


Figure 7: Gate Threshold Variation vs. Junction Temperature

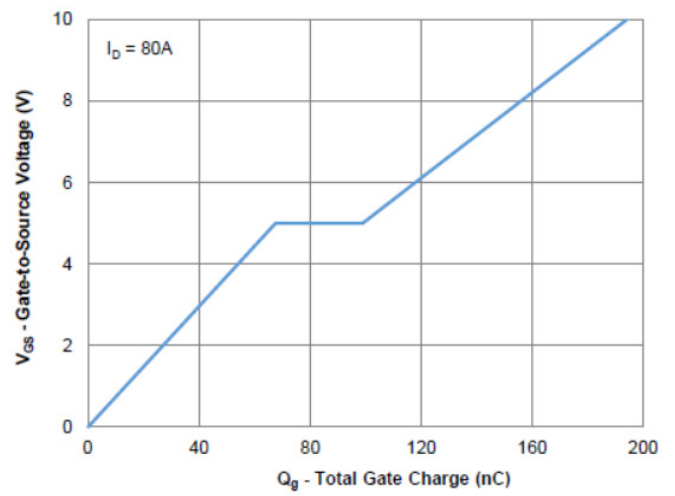


Figure 8: Gate Charge Characteristics

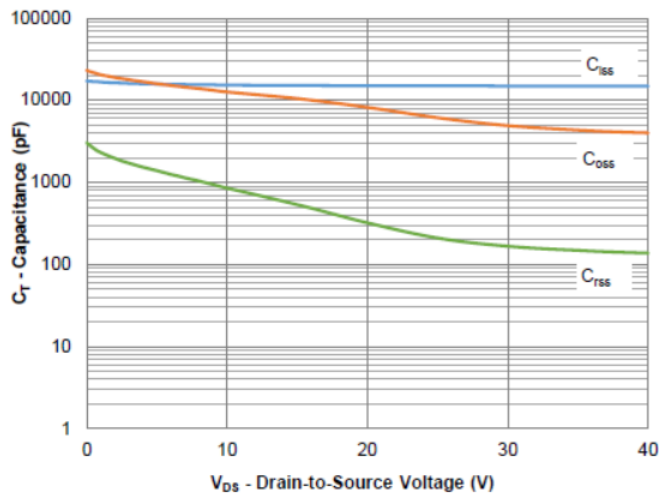


Figure 9: Capacitance Characteristics

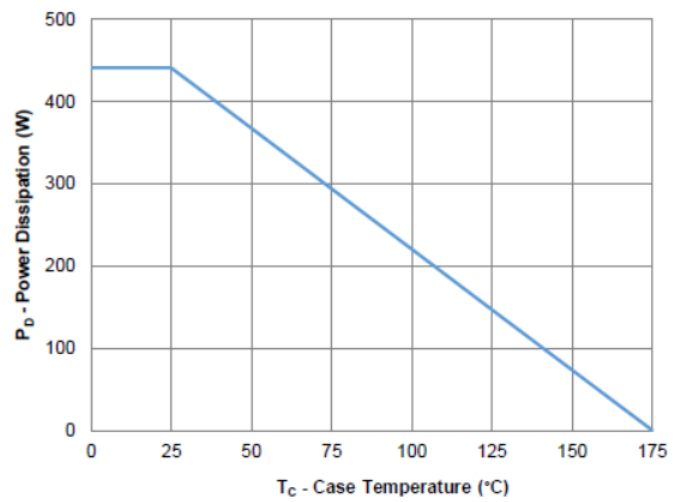


Figure 10: Power Derating

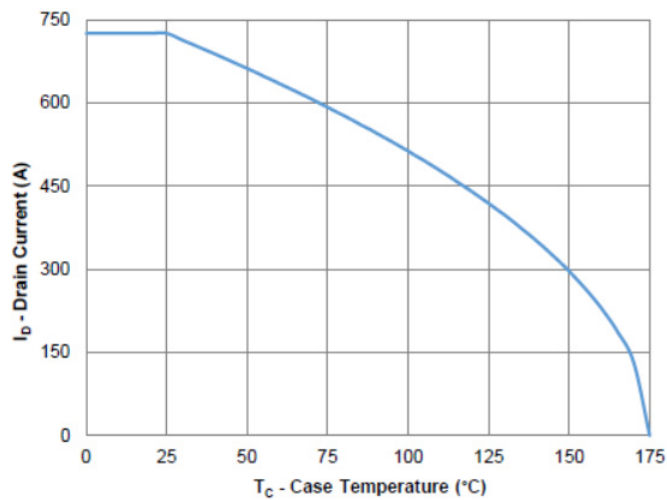


Figure 11: Current Derating

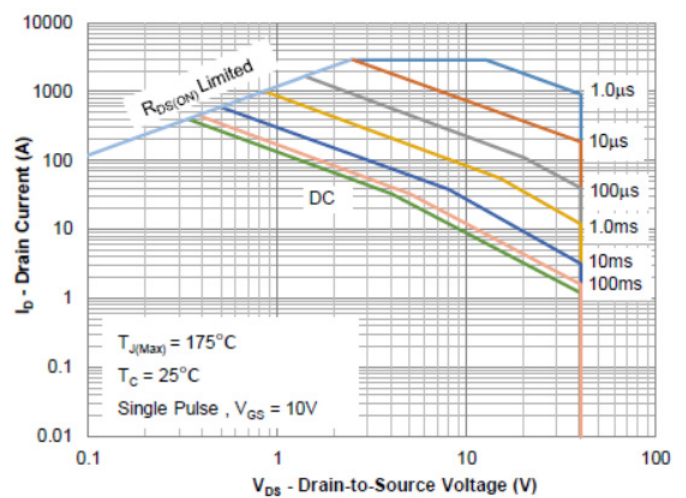


Figure 12: Safe Operating Area

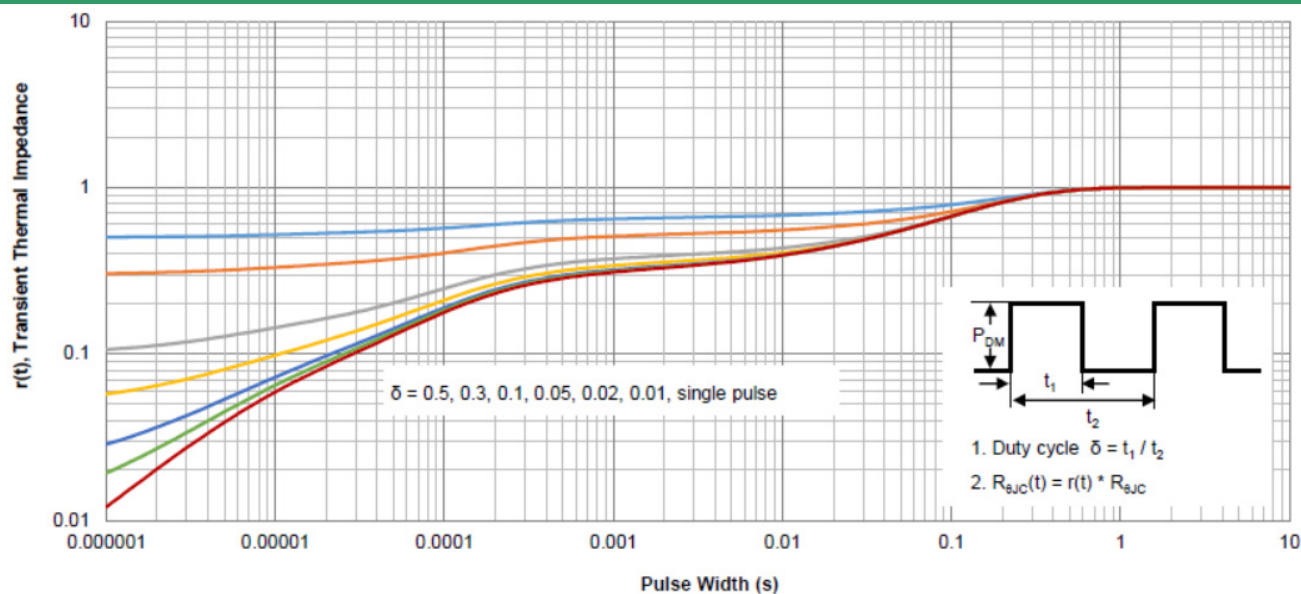
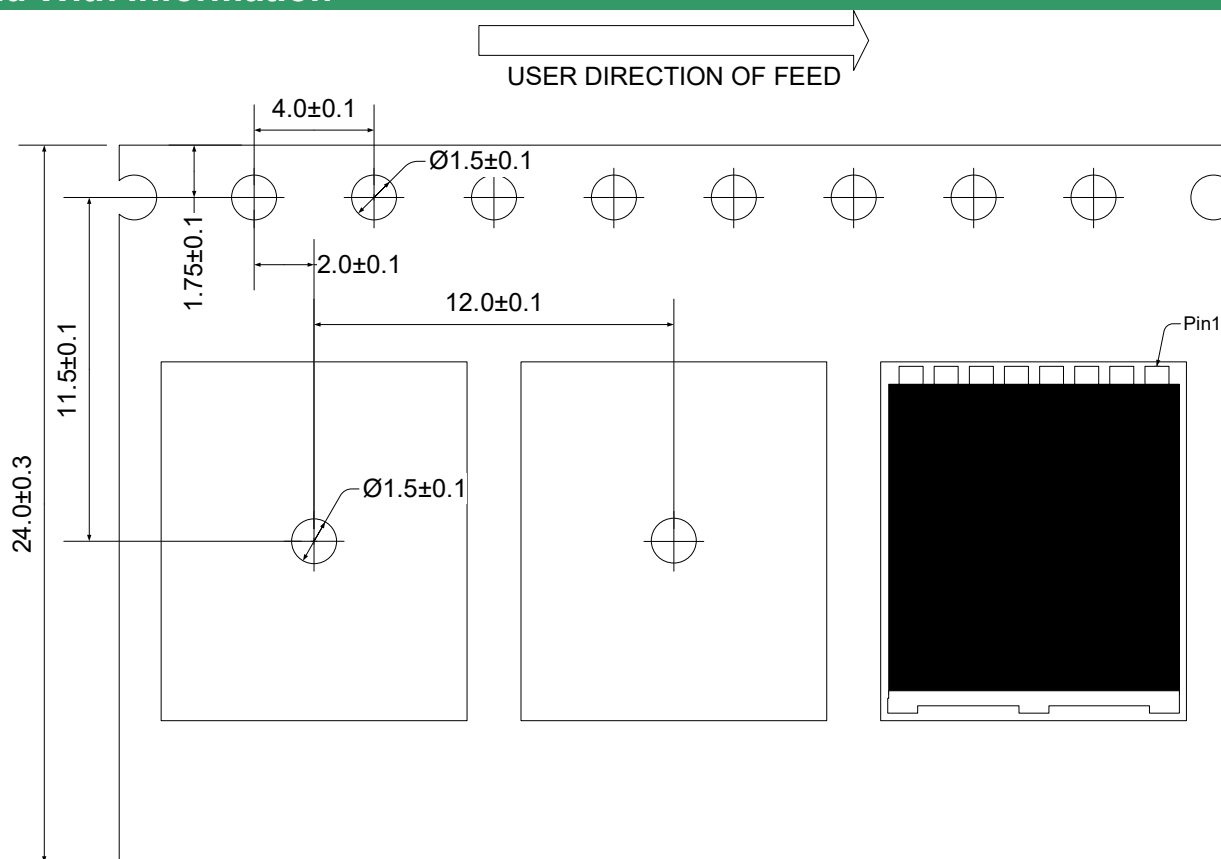


Figure 13: Normalized Maximum Transient Thermal Impedance

## Ordering Information

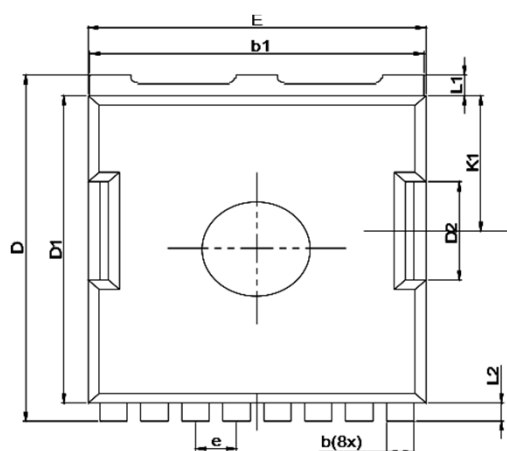
Device	Package	Reel	Shipping
PSMTL04R05H	TOLL-8L	13"	2000 / Tape & Reel

## Load With Information

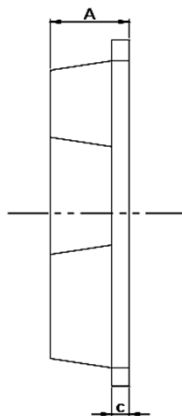


Unit:mm

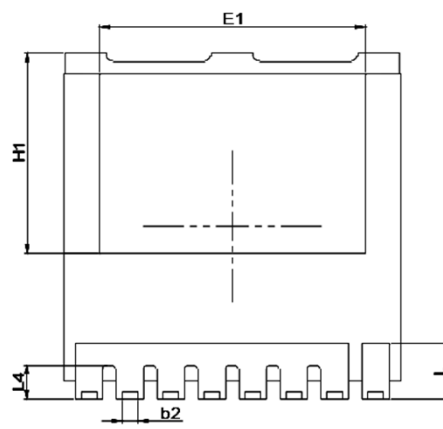
## Product Dimension (TOLL-8L)



Top View



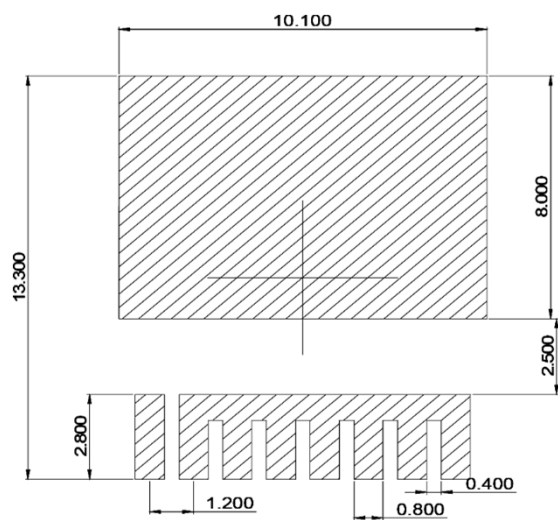
Side View



Bottom View



Front View




Unit: mm

Suggested PCB Layout

Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	2.20	2.40	0.087	0.094
b	0.70	0.90	0.028	0.035
b1	9.65	9.95	0.380	0.392
c	0.40	0.60	0.016	0.024
D	11.48	11.95	0.452	0.470
D1	10.28	10.70	0.405	0.421
D2	3.30 BSC		0.130 BSC	
E	9.70	10.10	0.382	0.398
E1	8.10 BSC		0.319 BSC	
e	1.20 BSC		0.047 BSC	
H1	6.70	7.30	0.264	0.287
K1	4.55 BSC		0.179 BSC	
L	1.35	2.10	0.053	0.083
L1	0.70 BSC		0.028 BSC	
L2	0.60 BSC		0.024 BSC	
L4	0.95	1.35	0.037	0.053


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