



### Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> T <sub>A</sub> = +25°C
-20V	38mΩ @ V <sub>GS</sub> = -4.5V	-5.6A
	52mΩ @ V <sub>GS</sub> = -2.5V	-4.8A

### Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- Low Input Capacitance
- Low On-Resistance
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

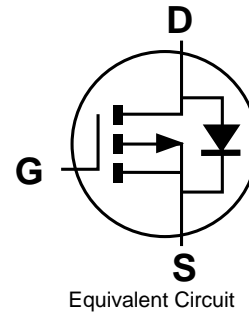
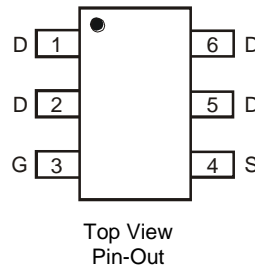
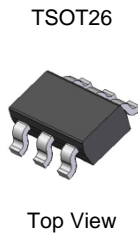
### Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- DC-DC Converters
- Motor Control
- Power Management Functions
- Analog Switch

### Mechanical Data

- Case: TSOT26
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.013 grams (Approximate)

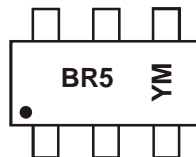


### Ordering Information (Note 5)

Part Number	Case	Packaging
DMPH2040UVTQ-7	TSOT26	3,000/Tape & Reel
DMPH2040UVTQ-13	TSOT26	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, see <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

### Marking Information



BR5 = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: G = 2019)  
 M = Month (ex: 9 = September)

#### Date Code Key

Year Code	2019	2020	2021	2022	2023	2024	2025	2026	2027
	G	H	I	J	K	L	M	N	O

Month Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1	2	3	4	5	6	7	8	9	O	N	D

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			$V_{DSS}$	-20	V
Gate-Source Voltage			$V_{GSS}$	$\pm 12$	V
Continuous Drain Current (Note 7) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	$I_D$	-5.6	A
		$T_A = +100^\circ\text{C}$		-3.9	
Continuous Drain Current (Note 8) $V_{GS} = -4.5\text{V}$	Steady State	$T_C = +25^\circ\text{C}$	$I_D$	-11.7	A
		$T_C = +100^\circ\text{C}$		-8.3	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	-40	A
Continuous Source-Drain Diode Current (Note 7)			$I_S$	-2.0	A

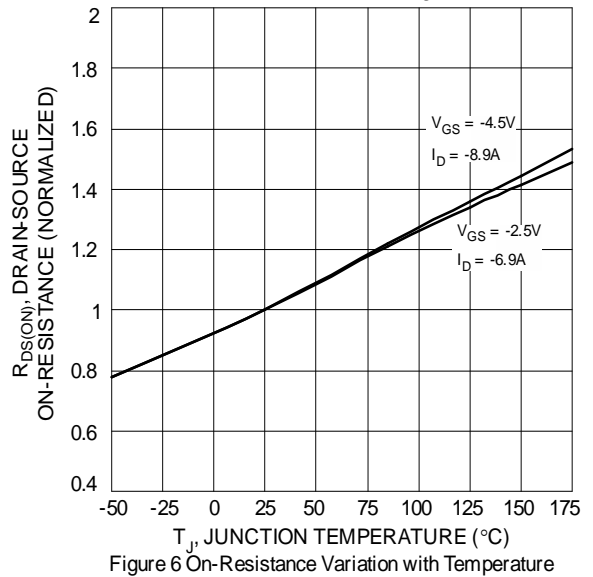
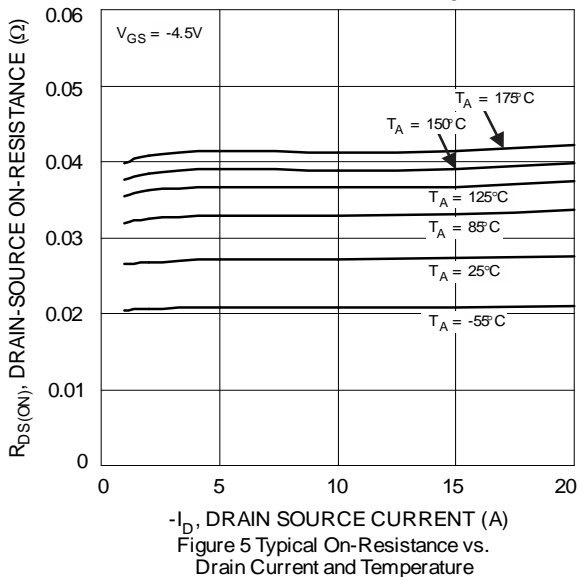
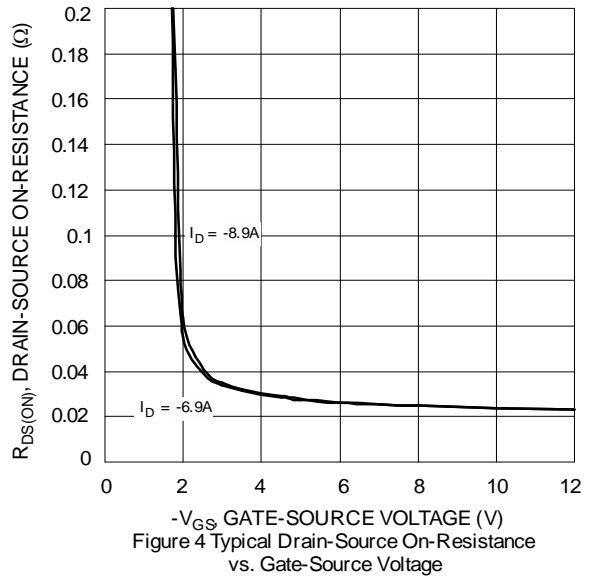
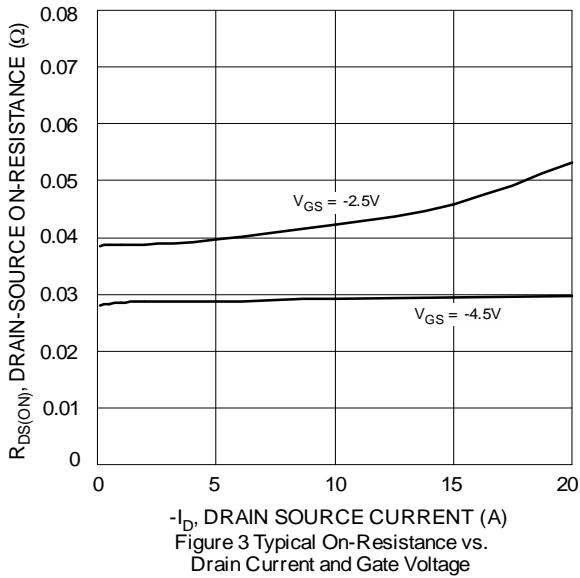
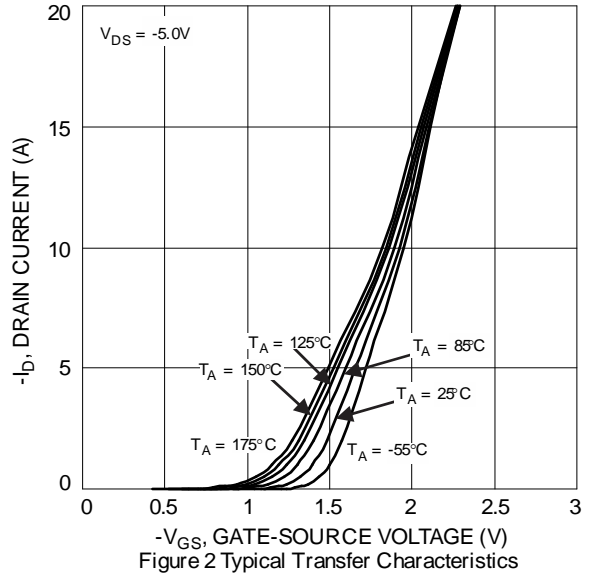
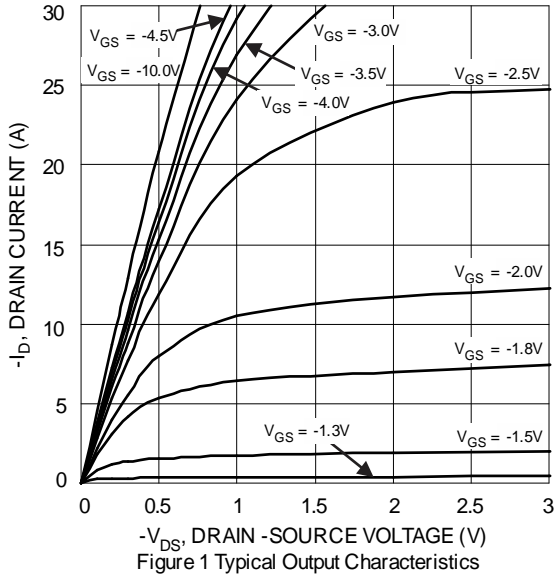
**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	$P_D$	1.0	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	125	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$T_A = +25^\circ\text{C}$	$P_D$	1.5	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	83	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 8)	Steady State	$R_{\theta JC}$	19	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

**Electrical Characteristics** ( $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-20	—	—	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-1	$\mu\text{A}$	$V_{DS} = -16\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.6	—	-1.5	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	27	38	m $\Omega$	$V_{GS} = -4.5\text{V}, I_D = -8.9\text{A}$
		—	38	52		$V_{GS} = -2.5\text{V}, I_D = -6.9\text{A}$
Diode Forward Voltage	$V_{SD}$	—	-0.7	-1.2	V	$V_{GS} = 0\text{V}, I_S = -2.9\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	$C_{iss}$	—	834	—	pF	$V_{DS} = -10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	133	—		
Reverse Transfer Capacitance	$C_{rss}$	—	105	—		
Gate Resistance	$R_G$	—	4.9	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ( $V_{GS} = -4.5\text{V}$ )	$Q_g$	—	8.6	—	nC	$V_{DS} = -6\text{V}, I_D = -8.9\text{A}$
Total Gate Charge ( $V_{GS} = -8\text{V}$ )	$Q_g$	—	19	—		
Gate-Source Charge	$Q_{gs}$	—	1.5	—		
Gate-Drain Charge	$Q_{gd}$	—	2.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.8	—	ns	$V_{DD} = -6\text{V}, R_L = 6\Omega, V_{GS} = -4.5\text{V}, R_G = 6\Omega, I_D = -1\text{A}$
Turn-On Rise Time	$t_R$	—	7.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	28.1	—		
Turn-Off Fall Time	$t_F$	—	14.6	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	9.8	—	ns	$I_F = -8.9\text{A}, di/dt = -100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	2.7	—	nC	$I_F = -8.9\text{A}, di/dt = -100\text{A}/\mu\text{s}$

- Notes:
6. Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
  7. Device mounted on FR-4 substrate PCB, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  8. Thermal resistance from junction to soldering point (on the exposed drain pad).
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to product testing.



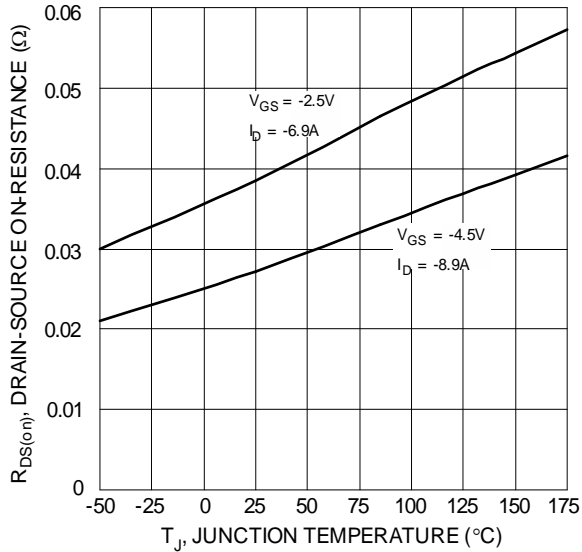


Figure 7 On-Resistance Variation with Temperature

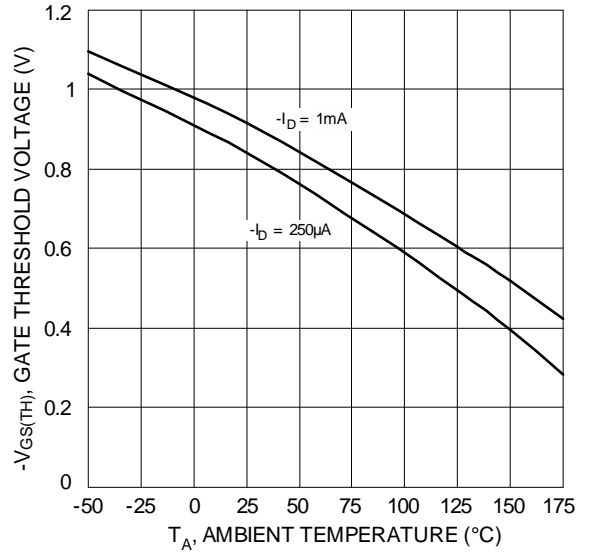


Figure 8 Gate Threshold Variation vs. Ambient Temperature

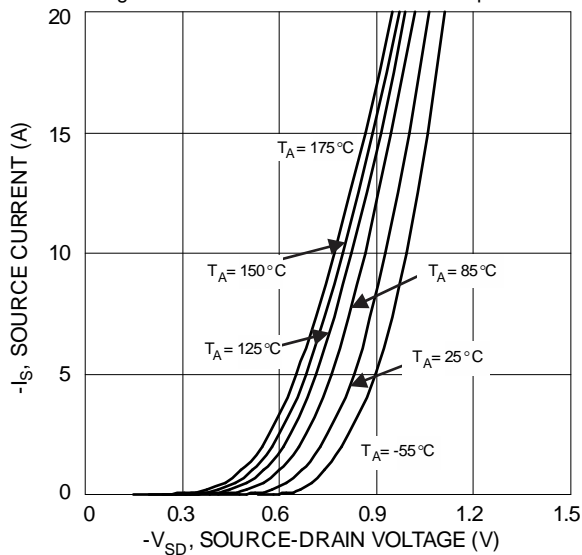


Figure 9 Diode Forward Voltage vs. Current

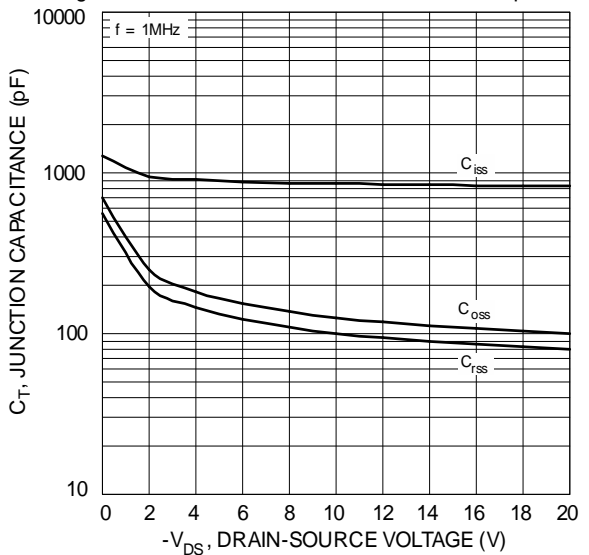


Figure 10 Typical Junction Capacitance

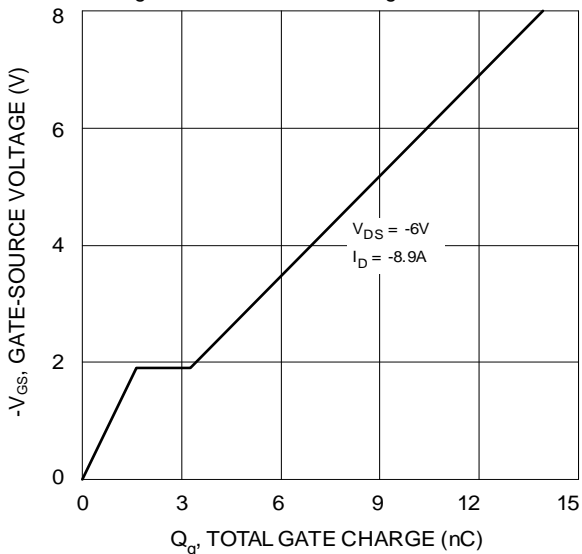


Figure 11 Gate Charge

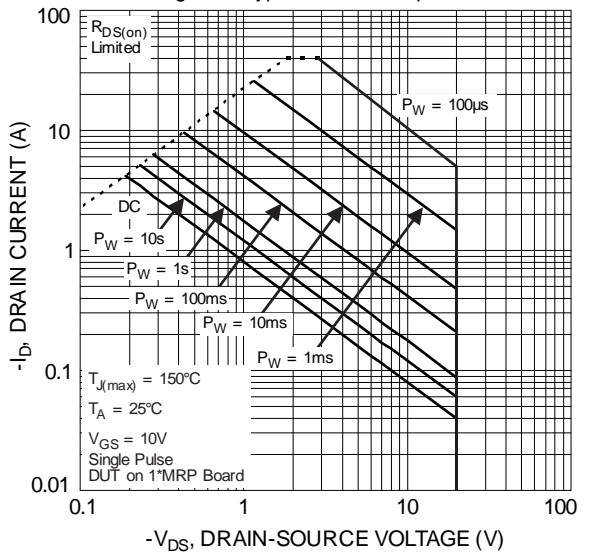


Figure 12 SOA, Safe Operation Area

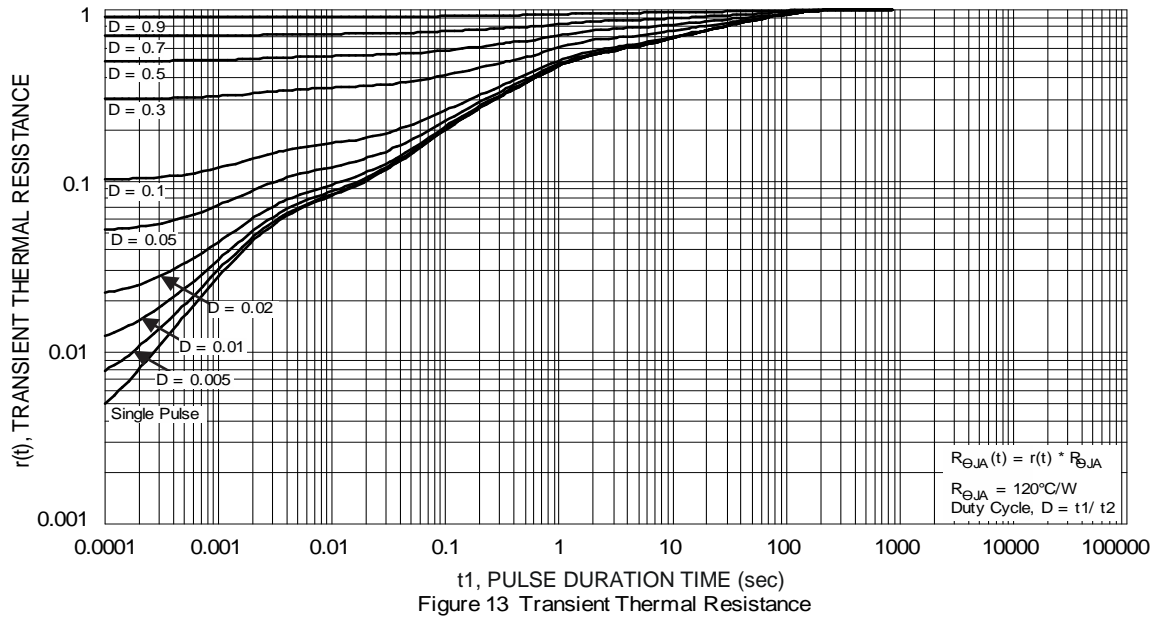
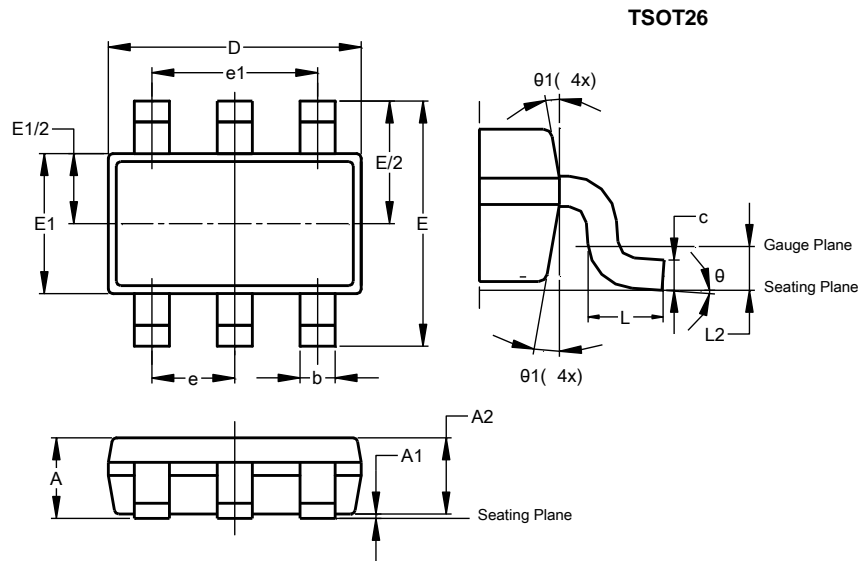


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

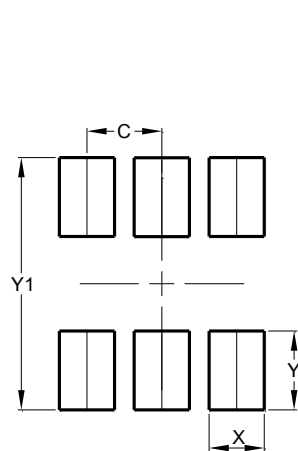
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



TSOT26			
Dim	Min	Max	Typ
A	—	1.00	—
A1	0.010	0.100	—
A2	0.840	0.900	—
D	2.800	3.000	2.900
E	2.800 BSC		
E1	1.500	1.700	1.600
b	0.300	0.450	—
c	0.120	0.200	—
e	0.950 BSC		
e1	1.900 BSC		
L	0.30	0.50	—
L2	0.250 BSC		
$\theta$	0°	8°	4°
$\theta_1$	4°	12°	—
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.199

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