

## AP9402GYT-HF-VB Datasheet

### N-Channel 30-V (D-S) MOSFET

$V_{DS}$		30	V
$R_{DS(on),typ}$	$V_{GS}=10V$	13	$m\Omega$
$R_{DS(on),typ}$	$V_{GS}=4.5V$	19	$m\Omega$
$I_D$		30	A

**FEATURES**

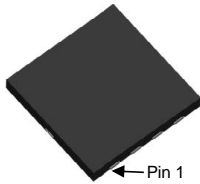
- Halogen-free
- TrenchFET® Power MOSFET
- 100 %  $R_g$  and UIS Tested


**RoHS**  
 COMPLIANT
**APPLICATIONS**

- DC/DC Conversion  
- Low-Side Switch
- Notebook PC
- Gaming

DFN 3x3 EP

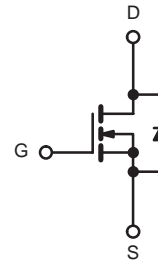
Top View



Bottom View



Top View



N-Channel MOSFET

**ABSOLUTE MAXIMUM RATINGS**  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_J = 150\text{ }^{\circ}\text{C}$ )	$I_D$	$T_C = 25\text{ }^{\circ}\text{C}$	30
		$T_C = 70\text{ }^{\circ}\text{C}$	20
		$T_A = 25\text{ }^{\circ}\text{C}$	21.5 <sup>b, c</sup>
		$T_A = 70\text{ }^{\circ}\text{C}$	17.1 <sup>b, c</sup>
Pulsed Drain Current	$I_{DM}$	100	A
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$	13
		$T_A = 25\text{ }^{\circ}\text{C}$	3.1 <sup>b, c</sup>
Single Pulse Avalanche Current	$I_{AS}$	10	A
Avalanche Energy	$E_{AS}$	5	mJ
Maximum Power Dissipation	$P_D$	$T_C = 25\text{ }^{\circ}\text{C}$	60
		$T_C = 70\text{ }^{\circ}\text{C}$	30
		$T_A = 25\text{ }^{\circ}\text{C}$	3.7 <sup>b, c</sup>
		$T_A = 70\text{ }^{\circ}\text{C}$	2.4 <sup>b, c</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^{\circ}\text{C}$

**THERMAL RESISTANCE RATINGS**

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	$R_{thJA}$	27	34	$^{\circ}\text{C/W}$
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	6	7.5	$^{\circ}\text{C/W}$

Notes:

- Based on  $T_C = 25\text{ }^{\circ}\text{C}$ .
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10\text{ s}$ .
- Maximum under Steady State conditions is  $85\text{ }^{\circ}\text{C/W}$ .

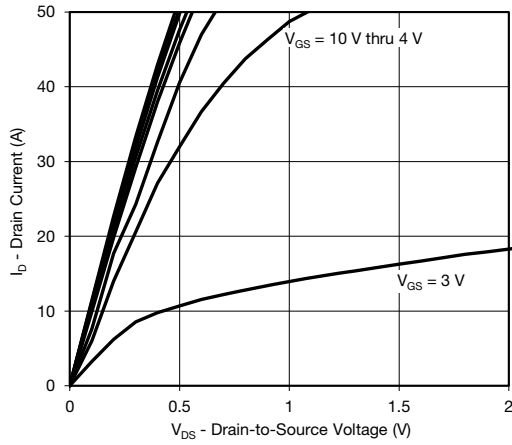
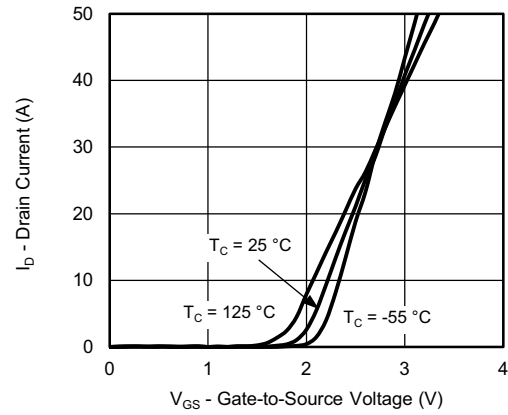
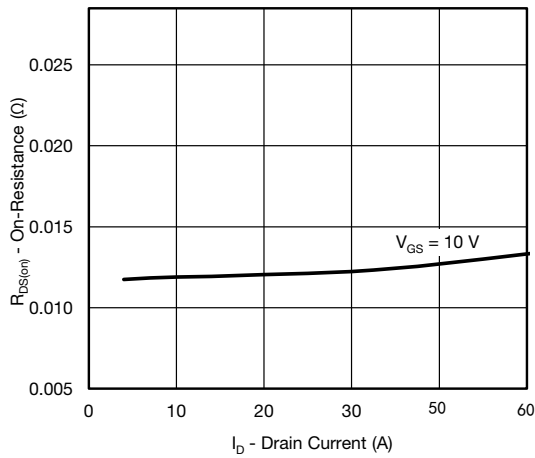
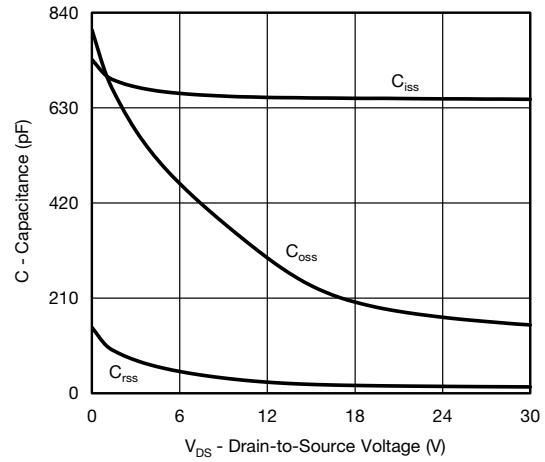
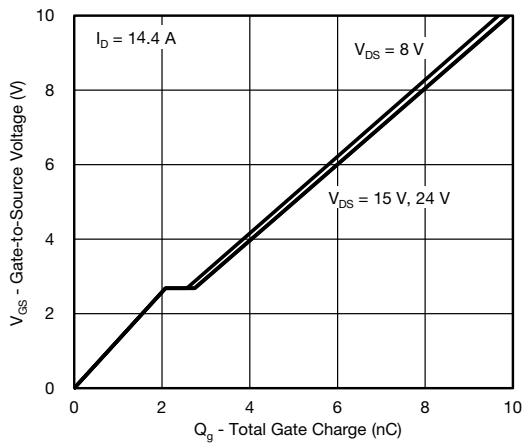
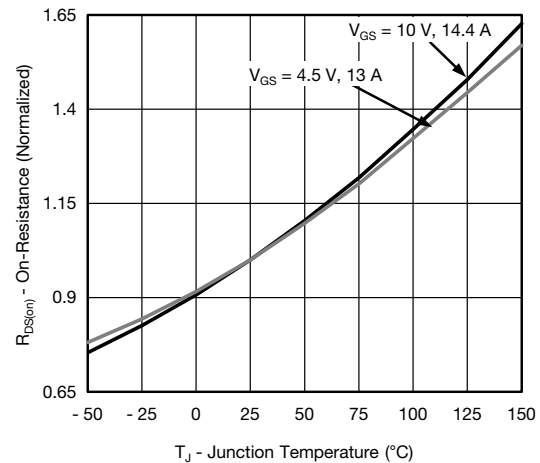
SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA	30			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		27		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			- 5.6		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1.0		3.0	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	30			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A		13		mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		19		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A		75		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz			900	pF
Output Capacitance	C <sub>oss</sub>				236	
Reverse Transfer Capacitance	C <sub>rss</sub>				20	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A			20	nC
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A			9	
Gate-Drain Charge	Q <sub>gd</sub>				2.1	
					0.7	
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.2	1.1	2.2	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω		8	16	ns
Rise Time	t <sub>r</sub>			16	30	
Turn-Off Delay Time	t <sub>d(off)</sub>			17	35	
Fall Time	t <sub>f</sub>			7	15	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		14	30	
Rise Time	t <sub>r</sub>			50	100	
Turn-Off Delay Time	t <sub>d(off)</sub>			16	30	
Fall Time	t <sub>f</sub>			8	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			13	A
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				100	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 3 A			1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 10 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C			40	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				20	nC
Reverse Recovery Fall Time	t <sub>a</sub>			12.5		ns
Reverse Recovery Rise Time	t <sub>b</sub>			7.5		

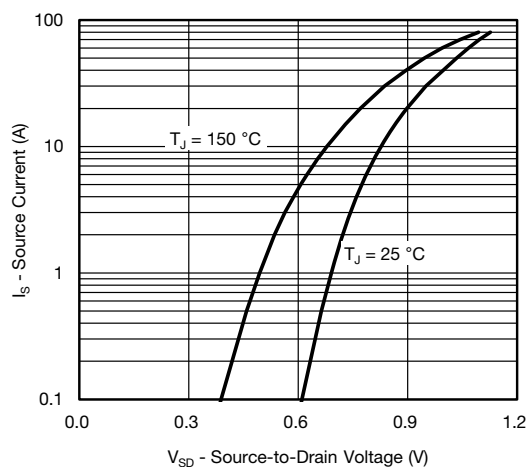
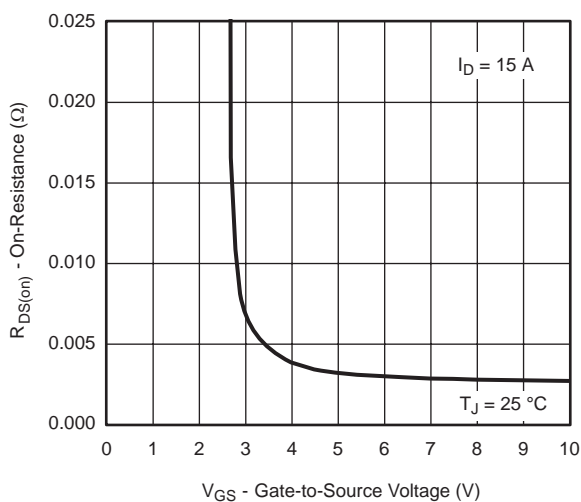
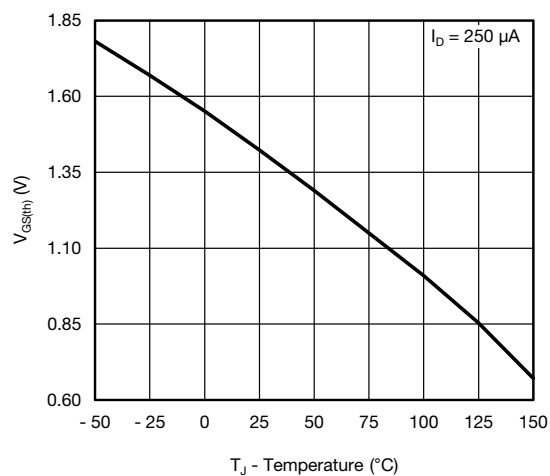
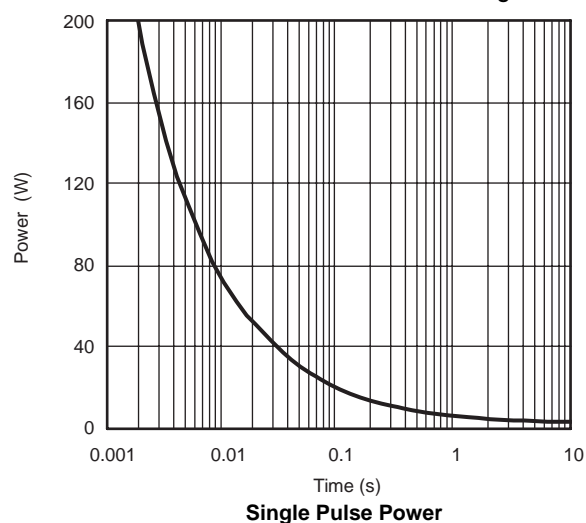
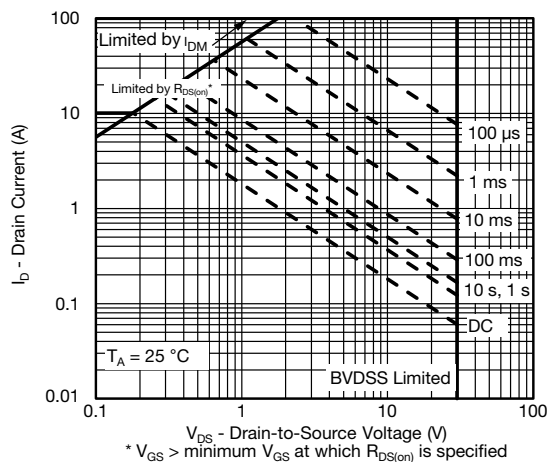
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ 

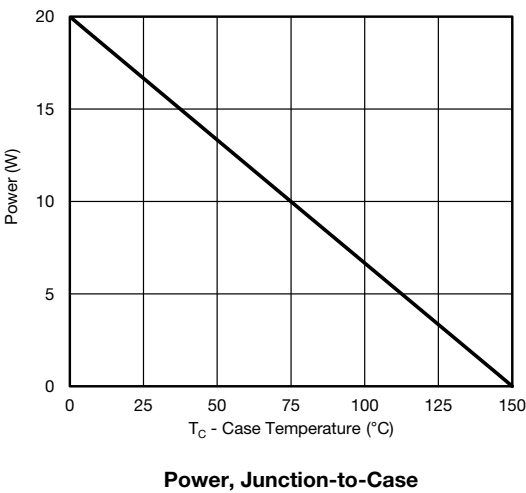
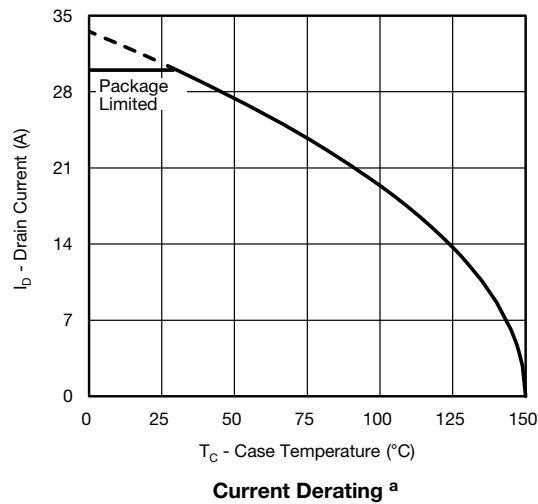
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Source-Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Single Pulse Power**

**Safe Operating Area, Junction-to-Ambient**

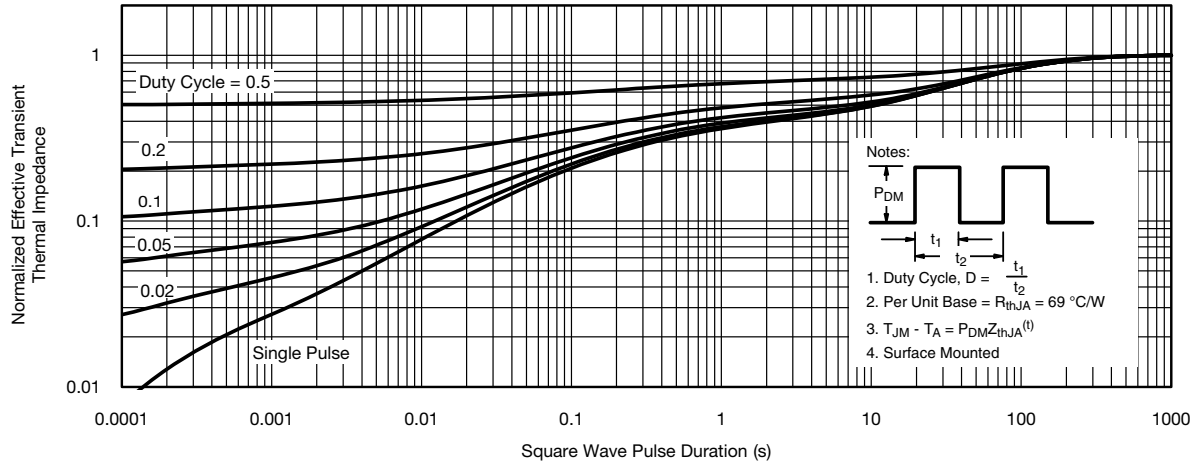
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



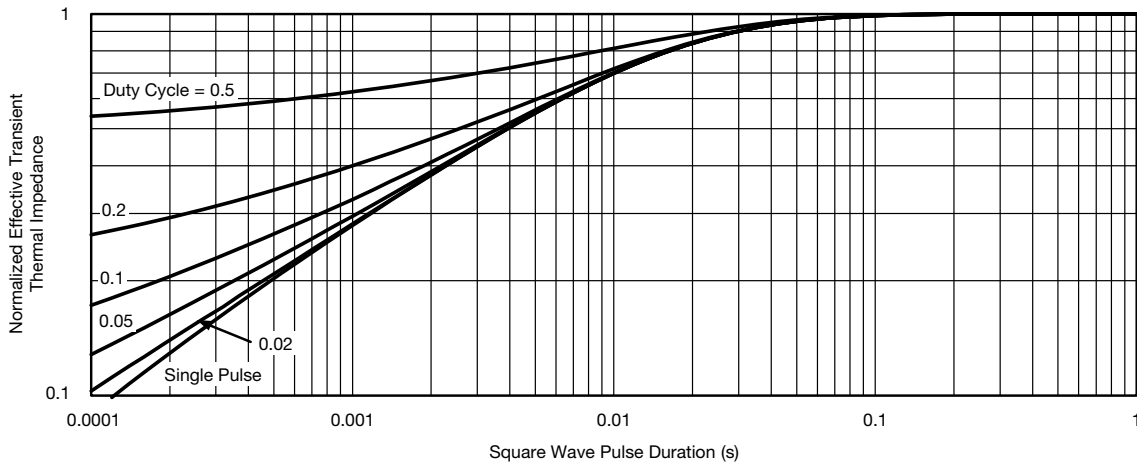
**Note**

- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

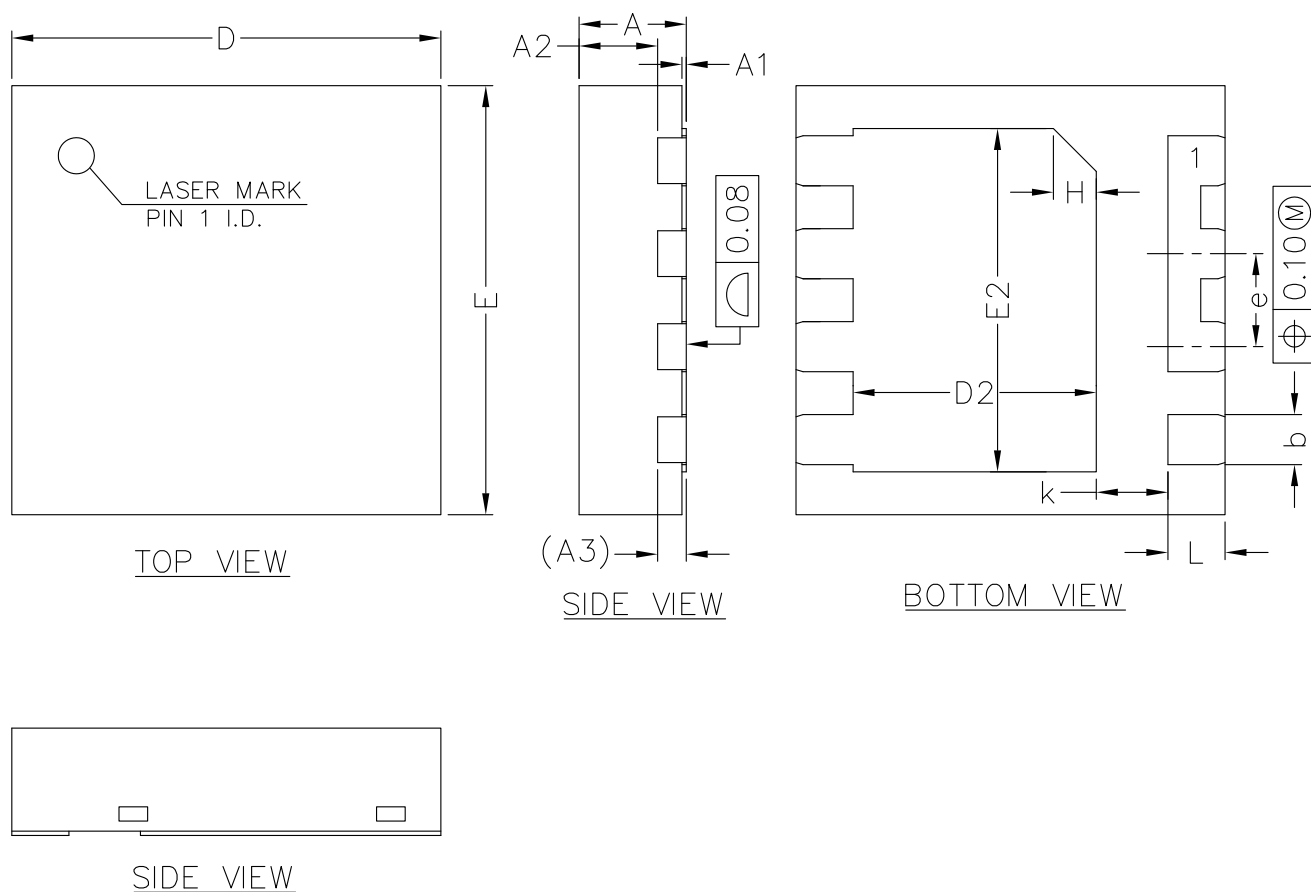
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.50	0.55	0.60
A3	0.20REF		
b	0.30	0.35	0.40
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.60	1.70	1.80
E2	2.30	2.40	2.50
e	0.55	0.65	0.75
K	0.40	0.50	0.60
L	0.35	0.40	0.45

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