N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
20	0.0186 at V_{GS} = 10 V	4.8	7.9 nC
	0.021 at V_{GS} = 4.5 V	4.8	
	0.025 at V_{GS} = 2.5 V	4.5	

FEATURES

- **Halogen-free**
- Trench Power MOSFET
- New Thermally Enhanced SC-70 Package
  - Small Footprint Area
  - Low On-Resistance
- 100 % R_g Tested

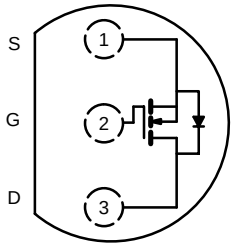
Pb-free

RoHS COMPLIANT

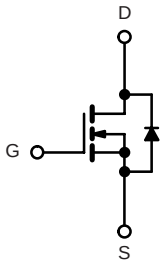
APPLICATIONS

- Load Switch

TO-226AA
(TO-92)



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current (T_J = 150 °C)[a]	T_C = 25 °C	I_D	4.8[a]	A
	T_C = 70 °C		4.5[a]	
	T_A = 25 °C		4.8[a, b, c]	
	T_A = 70 °C		4.5[a, b, c]	
Pulsed Drain Current		I_{DM}	20	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	4.5[a]	
	T_A = 25 °C		2.9[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	1.9	W
	T_C = 70 °C		1.2	
	T_A = 25 °C		0.5[b, c]	
	T_A = 70 °C		0.2[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)			260	

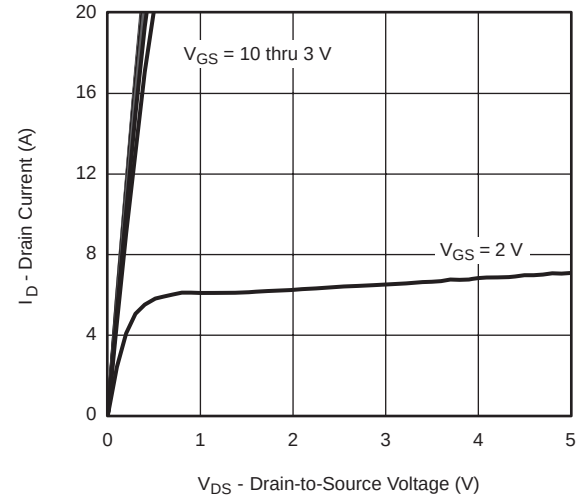
THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient	t ≤ 5 s	R_{thJA}	28	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	5.3	6.5	

Notes:
a. Package limited
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 5 s.

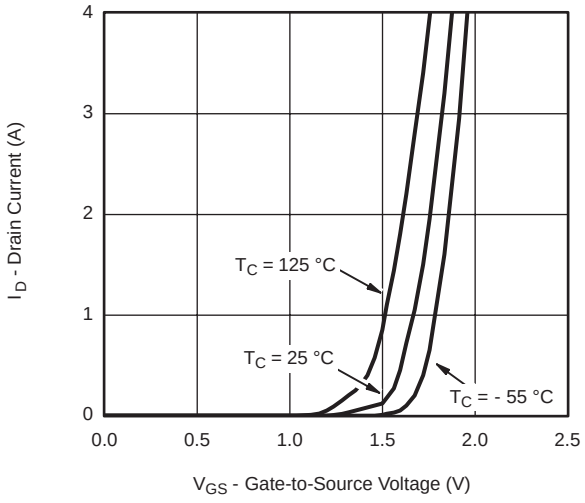
SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		25		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 3.7		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.6		1.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ 5 V, V_{GS} = 4.5 V		20		A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 4.8 A		0.0186		Ω
		V_{GS} = 4.5 V, I_D = 4.8 A		0.021		
		V_{GS} = 2.5 V, I_D = 4.8 A		0.025		
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 4.8 A		20		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		1020		pF
Output Capacitance	C_{oss}			160		
Reverse Transfer Capacitance	C_{rss}			70		
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 10 V, I_D = 4.8 A		17.5	27	nC
		V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 4.8 A		7.9	16	
Gate-Source Charge	Q_{gs}			2.1		
Gate-Drain Charge	Q_{gd}			1.1		
Gate Resistance	R_g	f = 1 MHz	0.6	3	6	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 1.3 Ω $I_D \cong$ 3.9 A, V_{GEN} = 4.5 V, R_g = 1 Ω		12	18	ns
Rise Time	t_r			11	17	
Turn-Off Delay Time	$t_{d(off)}$			27	41	
Fall Time	t_f			11	17	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 1.3 Ω $I_D \cong$ 3.9 A, V_{GEN} = 10 V, R_g = 1 Ω		7	14	
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			8	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			4.5[c]	A
Pulse Diode Forward Current	I_{SM}				20	
Body Diode Voltage	V_{SD}	I_S = 3.9 A, V_{GS} = 0 V		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 7.9 A, dI/dt = 100 A/µs, T_J = 25 °C		16	24	ns
Body Diode Reverse Recovery Charge	Q_{rr}			6	12	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			8		

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Package Limited

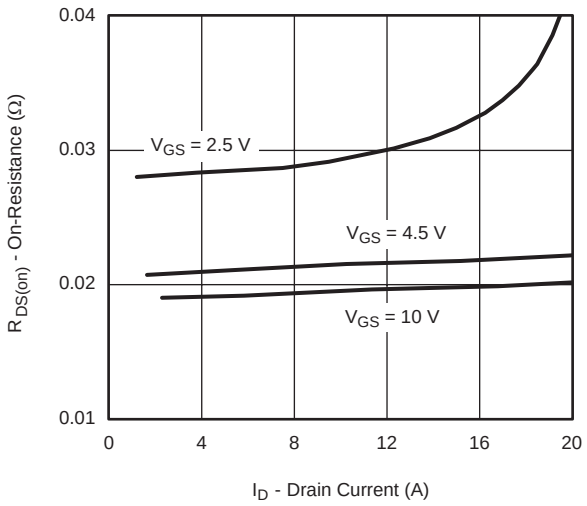
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



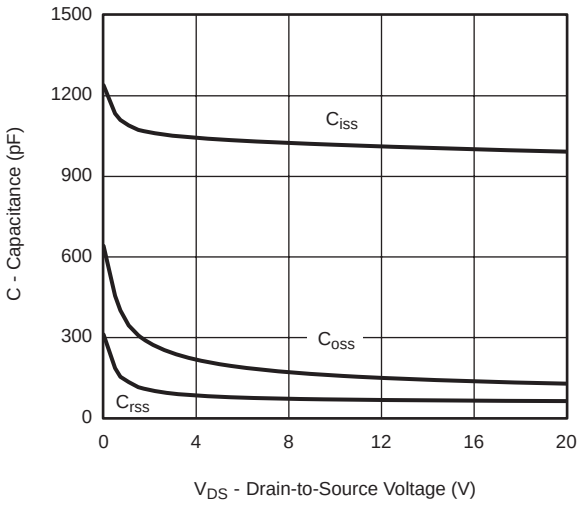
Output Characteristics



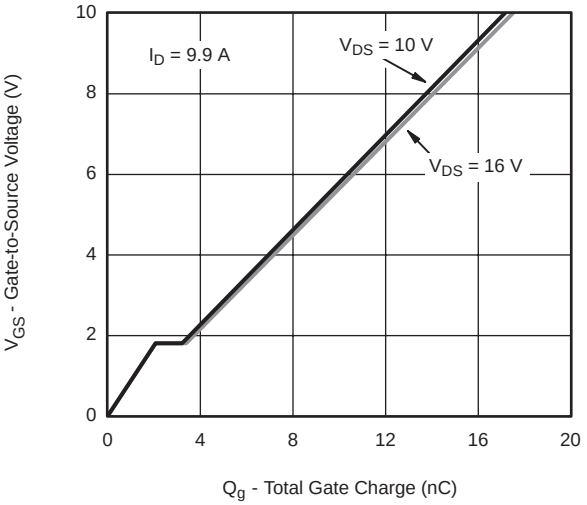
Transfer Characteristics



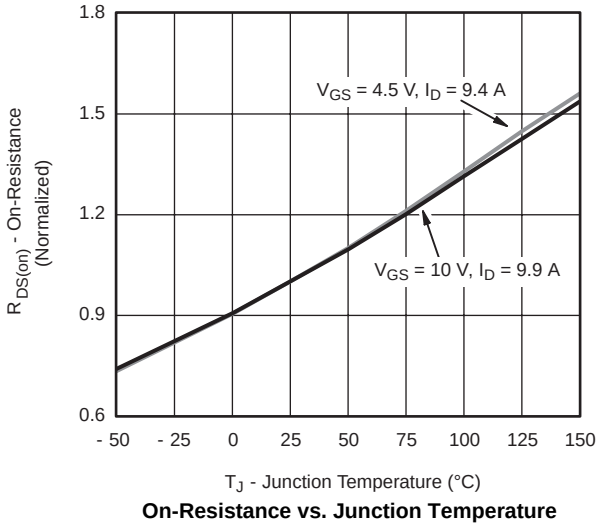
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

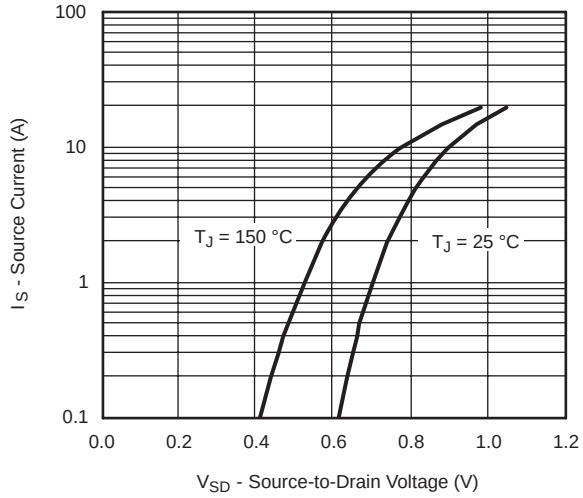


Gate Charge

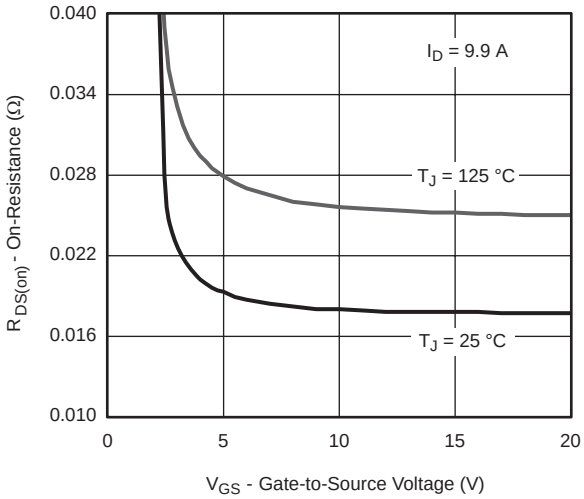


On-Resistance vs. Junction Temperature

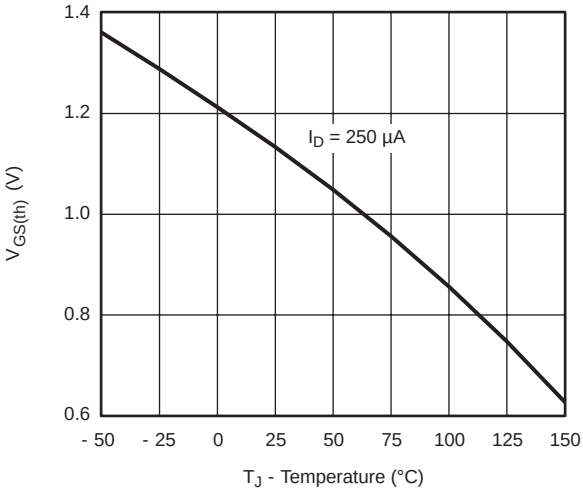
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



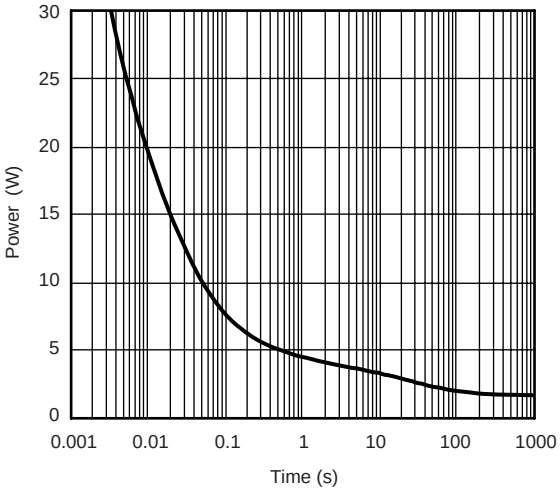
Soure-Drain Diode Forward Voltage



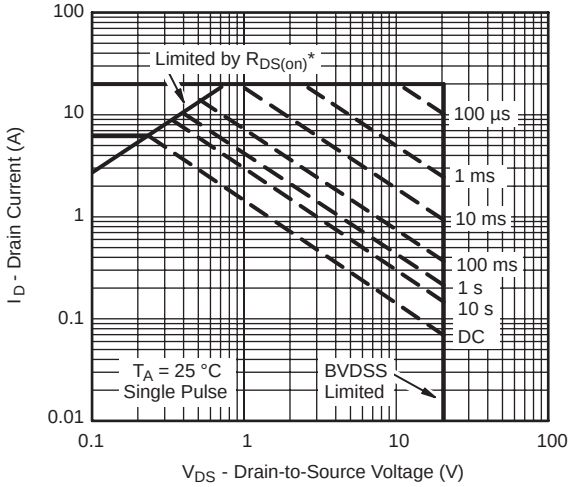
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



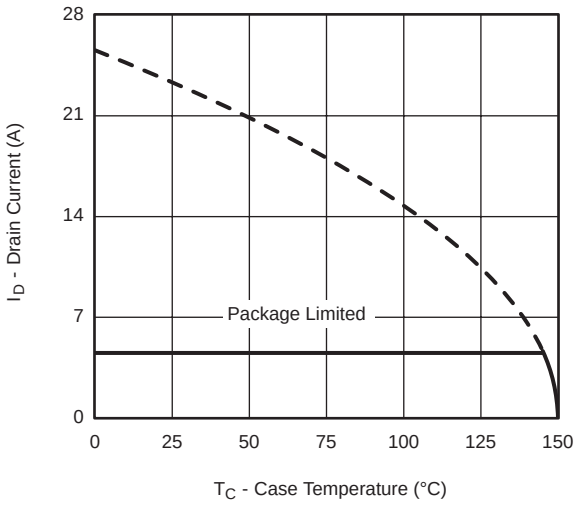
Single Pulse Power, Junction-to-Ambient



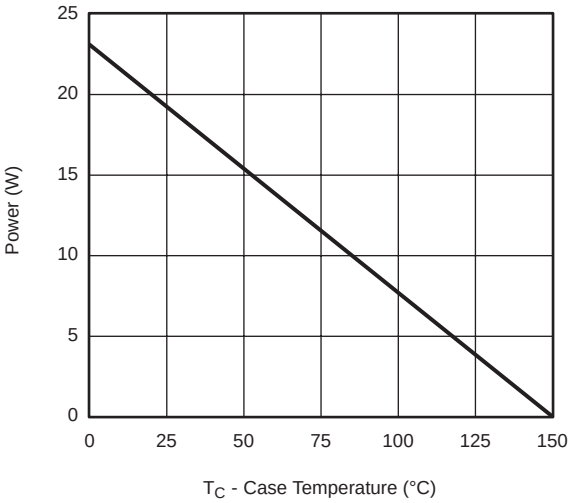
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

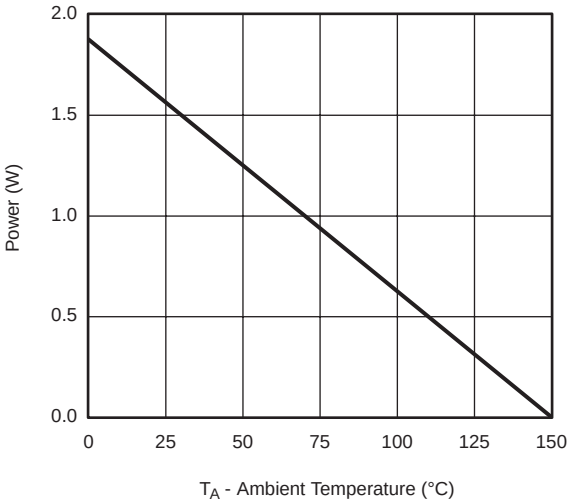
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



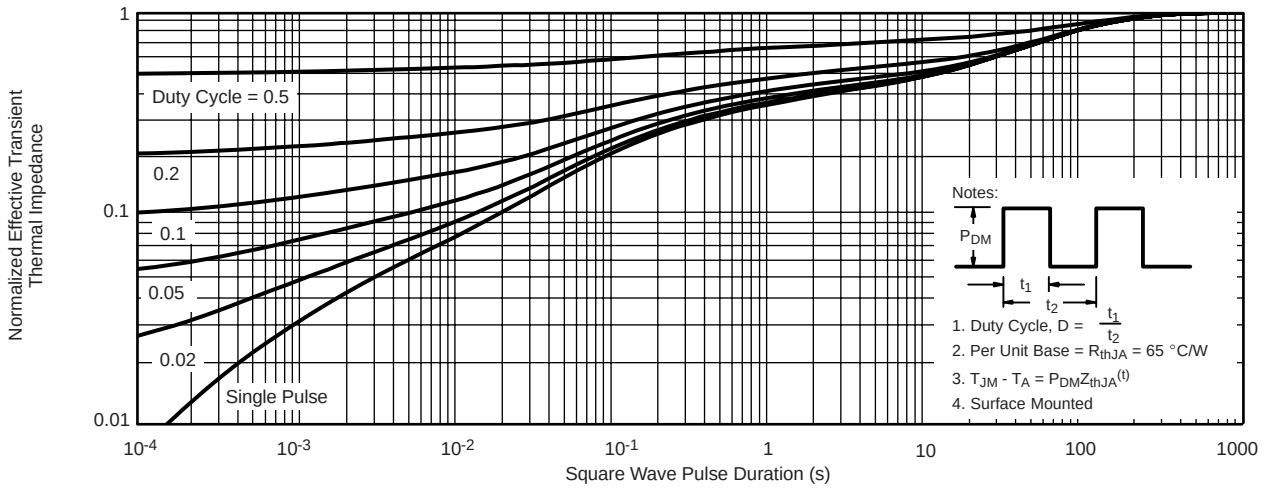
Power, Junction-to-Case



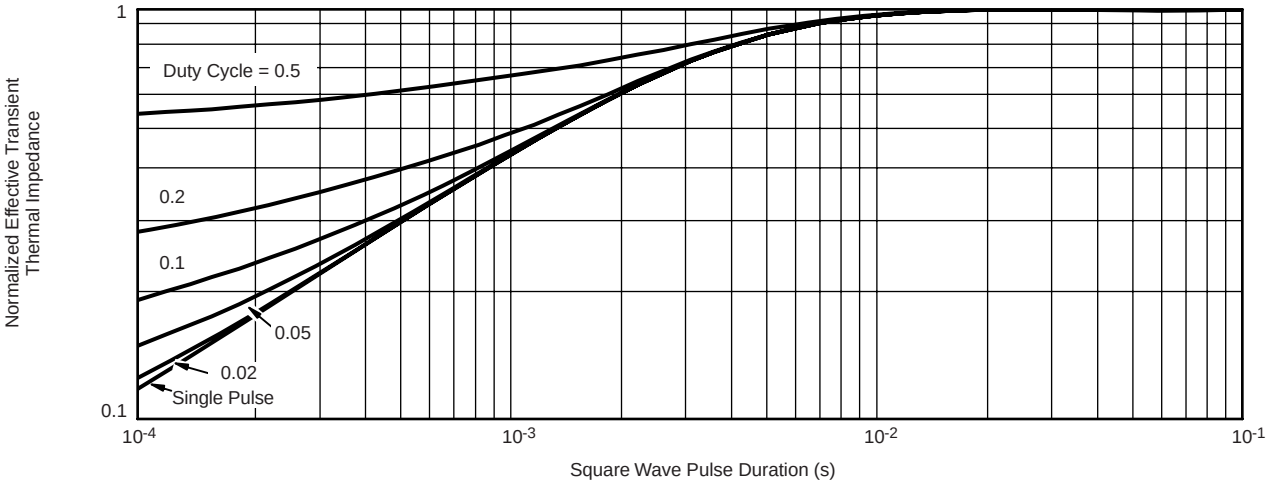
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °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



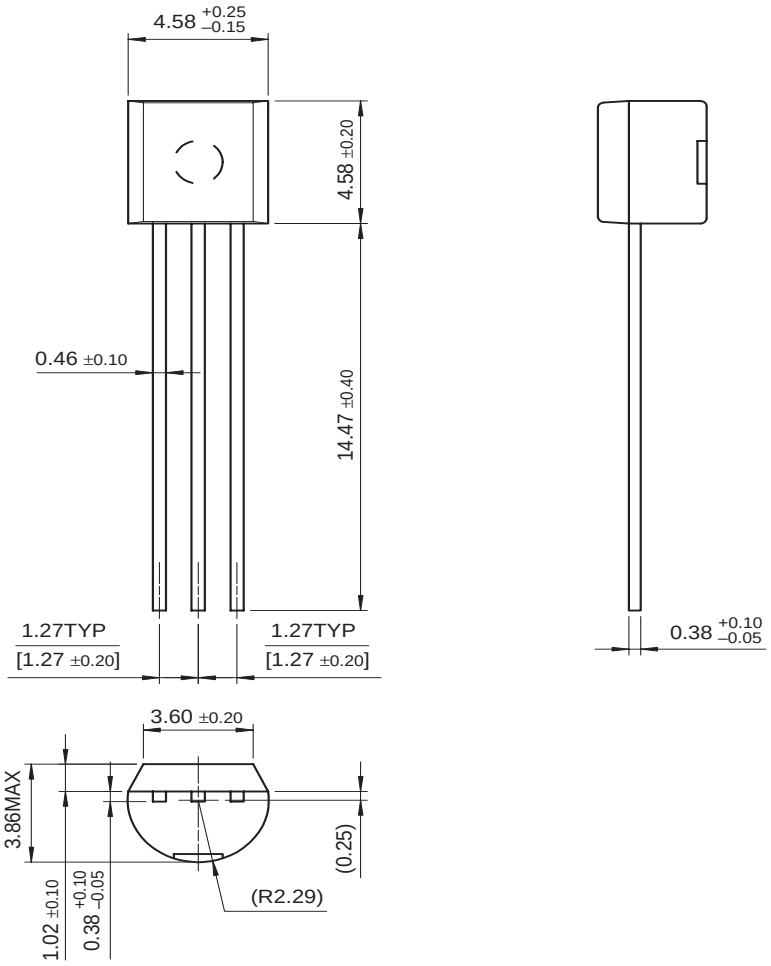
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Mechanical Dimensions

TO-92



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