

SI7613DN-VB Datasheet

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 20	0.0040 at $V_{GS} = 10$ V	- 52	21.5 nC
	0.0060 at $V_{GS} = 4.5$ V	- 40	

FEATURES

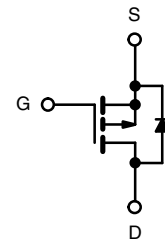
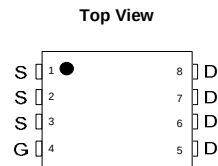
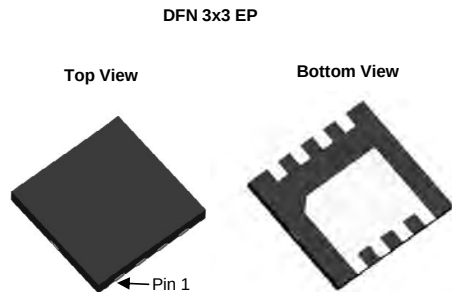
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switch
- Adaptor/Battery Switch



P-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}	± 16	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed Drain Current	I_{DM}	- 150	A
Continuous Source-Drain Diode Current	I_S	- 40 ^g	
		- 4.5 ^{b, c}	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	R_{thJA}	20	25	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	1.8	2.3	

Notes:

- a. Based on $T_C = 25$ °C.
 b. Surface Mounted on 1" x 1" FR4 board.
 c. $t = 10$ 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, I _D = - 250 μA	- 20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 15		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			4.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 1		- 2.2	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 16 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} ≤ - 5 V, V _{GS} = - 10 V	- 30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 10 V, I _D = - 26 A		0.0040		Ω
		V _{GS} = - 4.5 V, I _D = - 21 A		0.0060		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 10 V, I _D = - 26 A		58		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 10 V, V _{GS} = 0 V, f = 1 MHz		4595		pF
Output Capacitance	C _{oss}			910		
Reverse Transfer Capacitance	C _{rss}			813		
Total Gate Charge	Q _g	V _{DS} = - 10 V, V _{GS} = - 10 V, I _D = - 20 A		95.3	143	nC
				46.5	70	
Gate-Source Charge	Q _{gs}	V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 20 A		13.7		
Gate-Drain Charge	Q _{gd}			12.5		
Gate Resistance	R _g	f = 1 MHz	0.4	1.9	3.8	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 10 V, R _L = 1 Ω I _D ≡ - 10 A, V _{GEN} = - 10 V, R _g = 1 Ω		19	30	ns
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			65	98	
Fall Time	t _f			13	20	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 10 V, R _L = 1 Ω I _D ≡ - 10 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		55	83	
Rise Time	t _r			52	78	
Turn-Off Delay Time	t _{d(off)}			53	80	
Fall Time	t _f			25	38	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 40	A
Pulse Diode Forward Current ^a	I _{SM}				- 70	
Body Diode Voltage	V _{SD}	I _S = - 1 A		- 0.74	- 1.1	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 10 A, dI/dt = 100 A/μs, T _J = 25 °C		42	63	ns
Body Diode Reverse Recovery Charge	Q _{rr}			25	38	nC
Reverse Recovery Fall Time	t _a			12		ns
Reverse Recovery Rise Time	t _b			30		

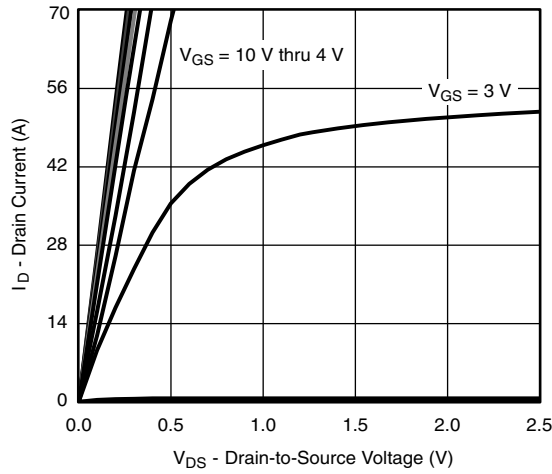
Notes:

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

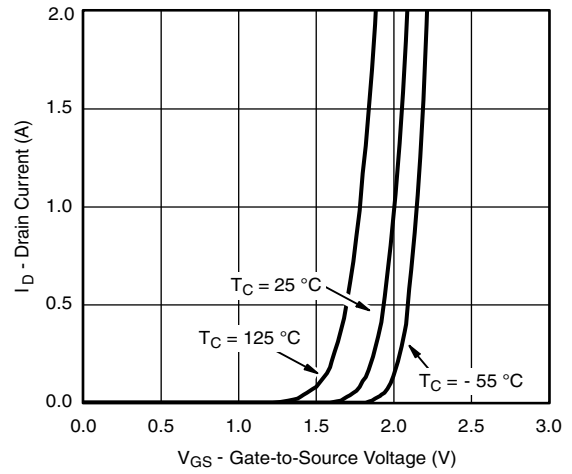
b. Guaranteed by design, not subject to production testing.

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.

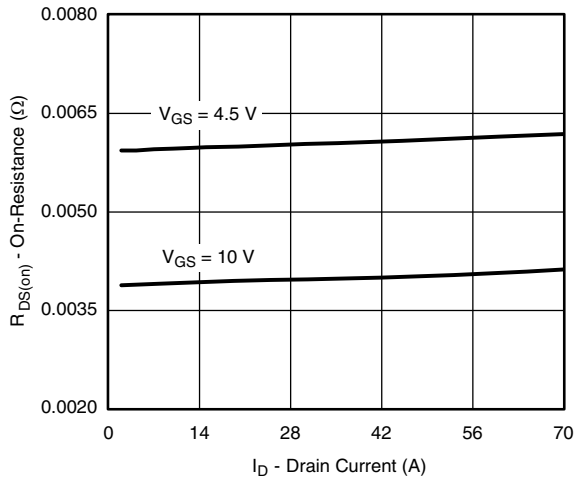
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



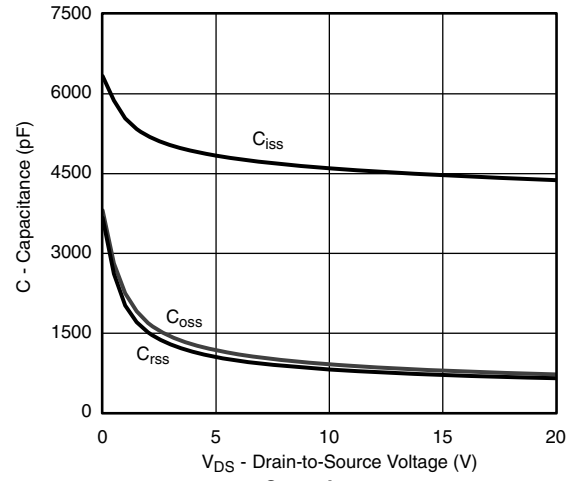
Output Characteristics



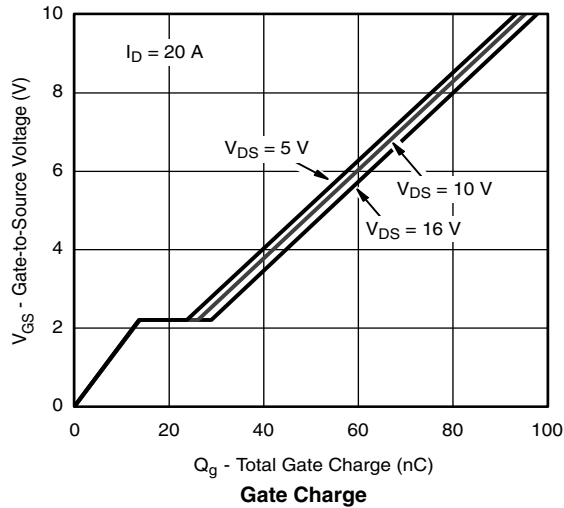
Transfer Characteristics



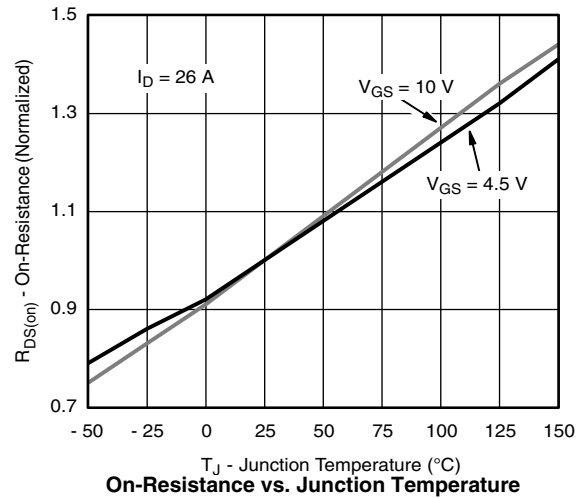
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

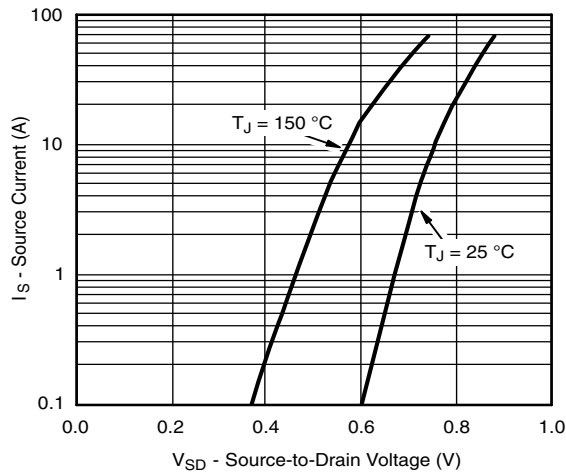


Gate Charge

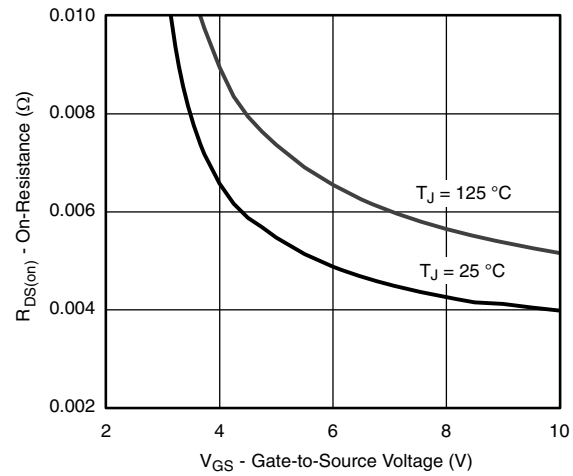


On-Resistance vs. Junction Temperature

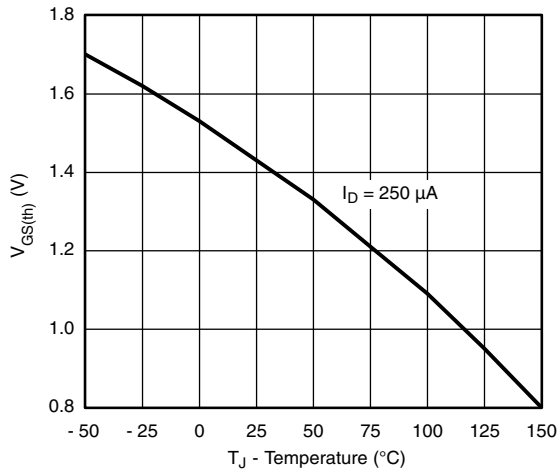
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



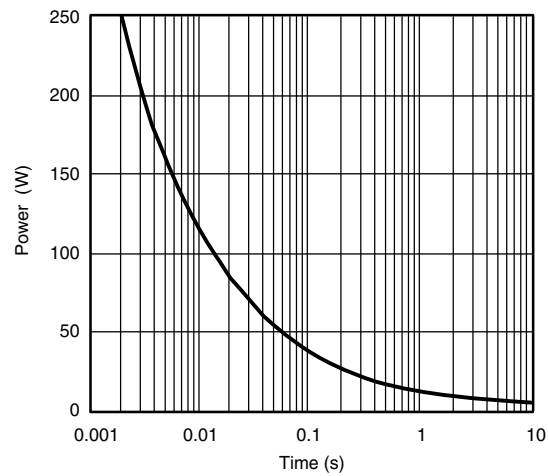
Source-Drain Diode Forward Voltage



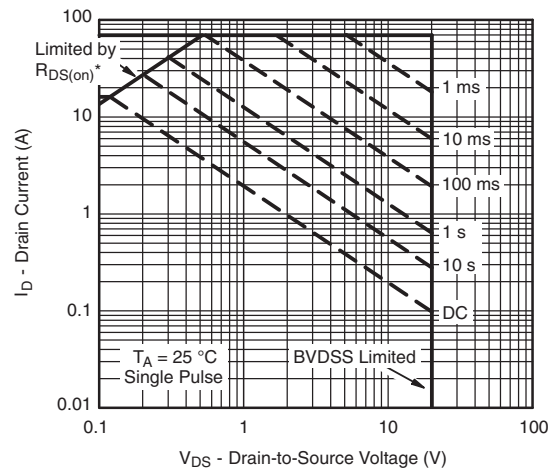
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



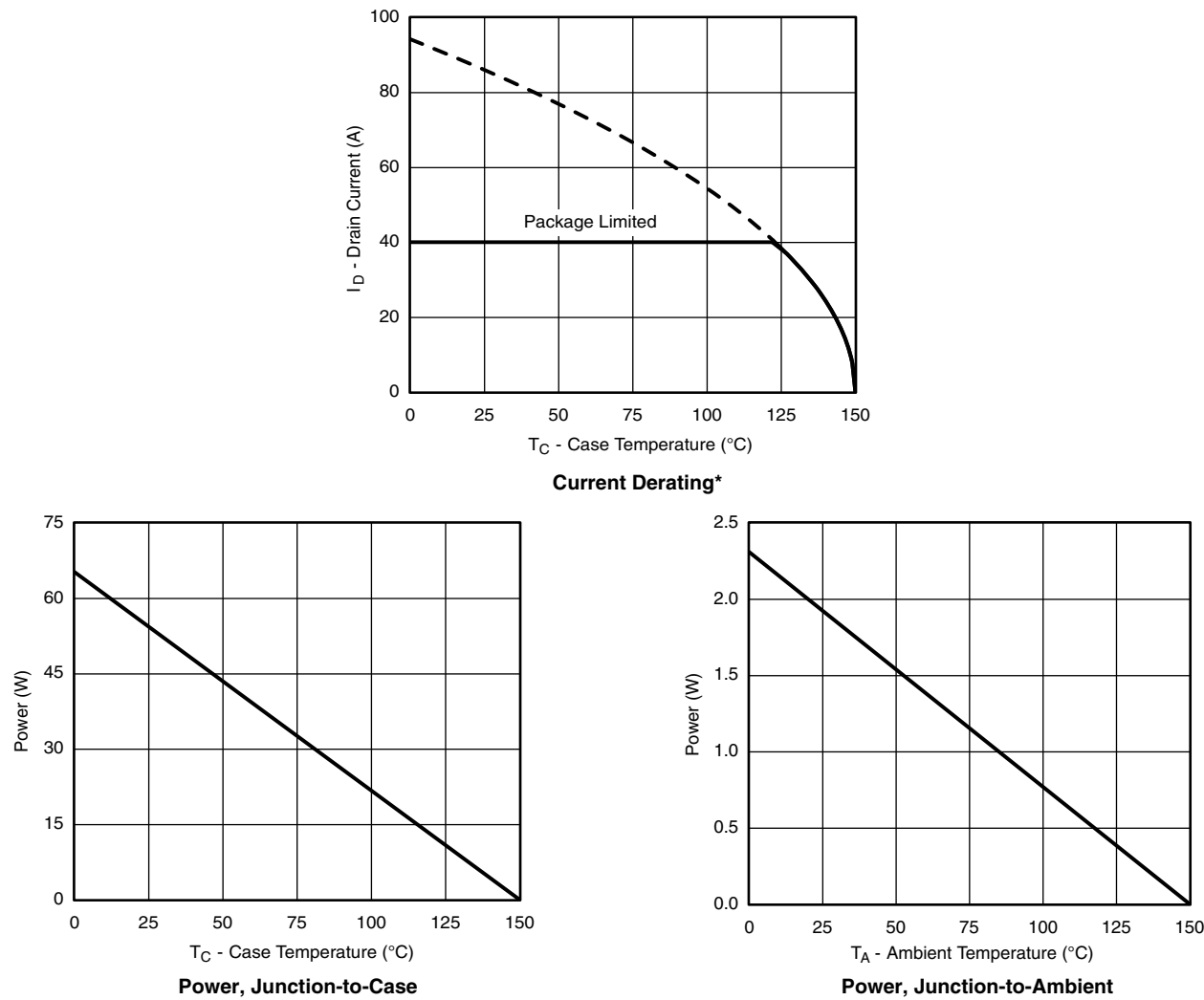
Single Pulse Power, Junction-to-Ambient



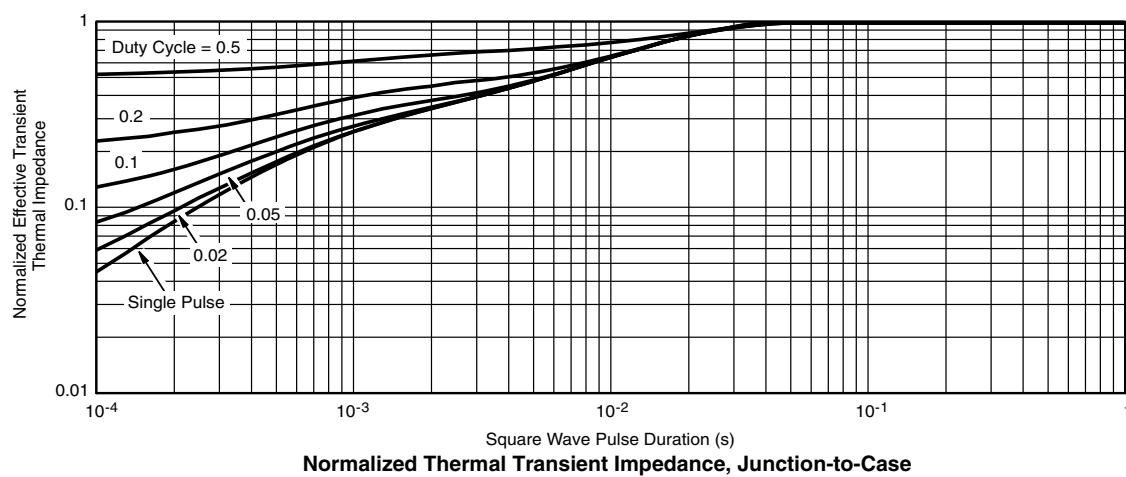
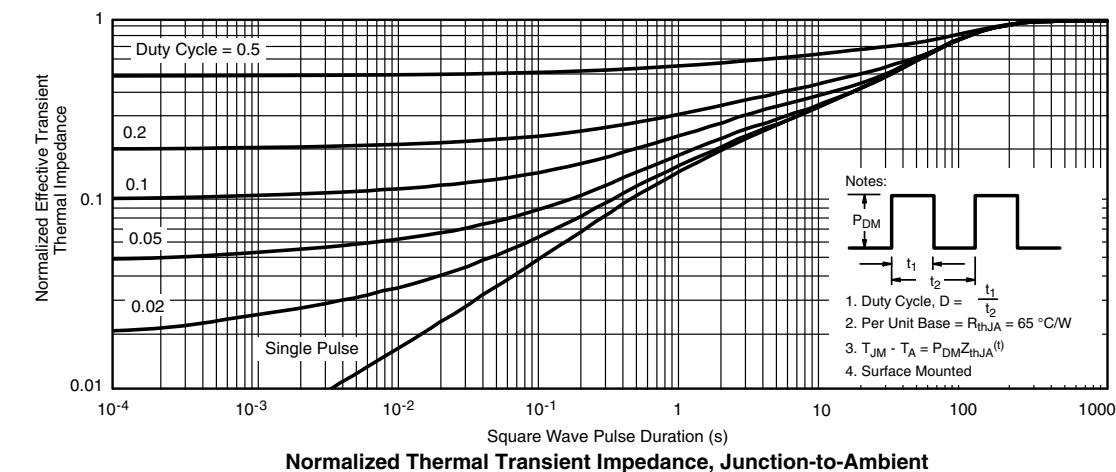
Safe Operating Area, Junction-to-Ambient

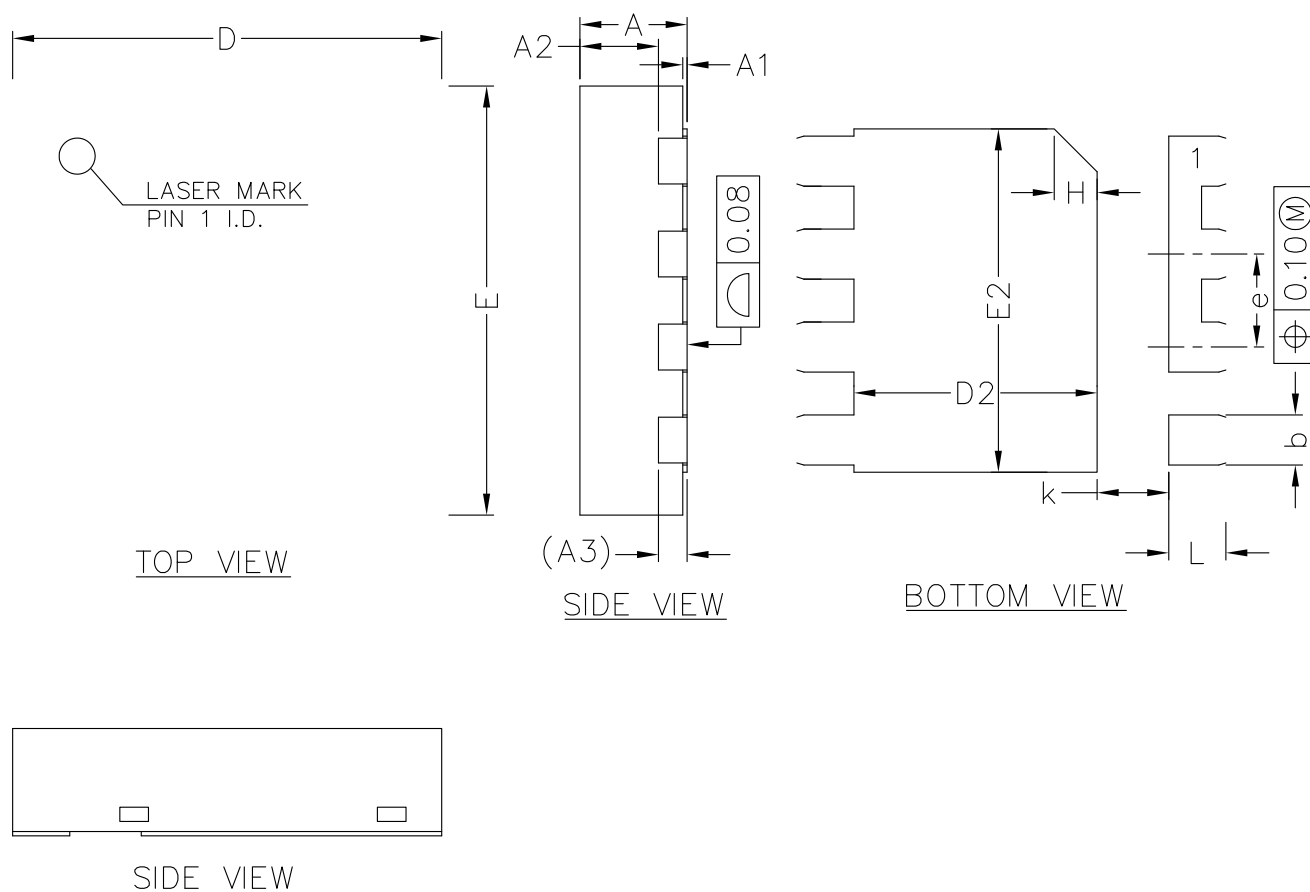
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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




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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