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

PRODUCT SUMMARY				
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) [a]	Q_g (TYP.)
N-Channel	20	0.076 at V_{GS} = 4.5 V	2.7	0.55
		0.096 at V_{GS} = 2.7 V	2.5	
		0.128 at V_{GS} = 2.5 V	2.5	
P-Channel	-20	0.143 at V_{GS} = -4.5 V	-1.5	0.95
		0.182 at V_{GS} = -2.7 V	-1.5	
		0.230 at V_{GS} = -2.5 V	-1.3	

FEATURES

- DT-Trench Power MOSFET
- 100 % R_g tested

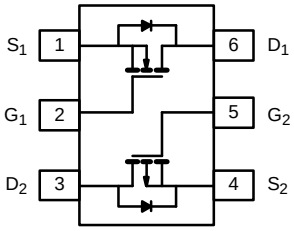
Pb-free

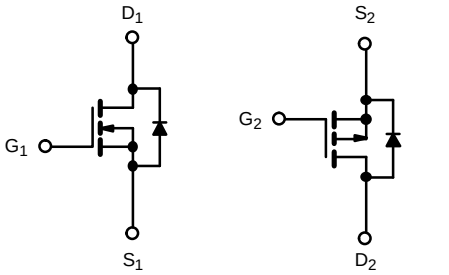
RoHS COMPLIANT

APPLICATIONS

- Load switch
- DC/DC converter

SOT-323-6





N-Channel MOSFET P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Drain-Source Voltage		V_{DS}	20	-20	V
Gate-Source Voltage		V_{GS}	± 12		
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	2.7	-1.5	A
	T_C = 70 °C		2.6	-1.4	
	T_A = 25 °C		2.7 [b, c]	-1.4 [b, c]	
	T_A = 70 °C		2.5 [b, c]	-1.4 [b, c]	
Source-Drain Current Diode Current	T_C = 25 °C	I_S	2.3	-1.3	
	T_A = 25 °C		2.2 [b, c]	-1.2 [b, c]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	8	-5	
Maximum Power Dissipation	T_C = 25 °C	P_D	0.34	0.34	W
	T_C = 70 °C		0.22	0.22	
	T_A = 25 °C		0.29 [b, c]	0.29 [b, c]	
	T_A = 70 °C		0.18 [b, c]	0.18 [b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C

THERMAL RESISTANCE RATINGS							
PARAMETER		SYMBOL	N-CHANNEL		P-CHANNEL		UNIT
			TYP.	MAX.	TYP.	MAX.	
Maximum Junction-to-Ambient [b, d]	t ≤ 10 s	R_{thJA}	165	238	165	238	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	108	270	108	270	

Notes

a. Based on T_C = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Maximum under steady state condfitfions fis 186 °C/W (N-Channel) and 186 °C/W (P-Channel).

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP. [a]**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	N-Ch	20	-	-	V
		V_{GS} = 0 V, I_D = -250 µA	P-Ch	-20	-	-	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	N-Ch	-	24	-	mV/°C
		I_D = -250 µA	P-Ch	-	-13	-	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	N-Ch	-	-1.8	-	
		I_D = -250 µA	P-Ch	-	2.3	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	N-Ch	0.5	-	1.5	V
		V_{DS} = V_{GS}, I_D = -250 µA	P-Ch	-0.3	-	-1.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V	N-Ch	-	-	± 100	nA
			P-Ch	-	-	± 100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	N-Ch	-	-	1	µA
		V_{DS} = -20 V, V_{GS} = 0 V	P-Ch	-	-	-1	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55 °C	N-Ch	-	-	10	
		V_{DS} = -20 V, V_{GS} = 0 V, T_J = 55 °C	P-Ch	-	-	-10	
On-State Drain Current [b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 5 V	N-Ch	2	-	-	A
		V_{DS} = -5 V, V_{GS} = -5 V	P-Ch	-1	-	-	
Drain-Source On-State Resistance [b]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 0.7 A	N-Ch	-	0.076	0.084	Ω
		V_{GS} = -4.5 V, I_D = -0.4 A	P-Ch	-	0.143	0.157	
		V_{GS} = 2.7 V, I_D = 0.4 A	N-Ch	-	0.096	0.106	
		V_{GS} = -2.7 V, I_D = -0.2 A	P-Ch	-	0.182	0.201	
		V_{GS} = 2.5 V, I_D = 0.4 A	N-Ch	-	0.128	0.150	
		V_{GS} = -2.5V, I_D = -0.2 A	P-Ch	-	0.230	0.253	
Forward Transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 0.7 A	N-Ch	-	1.5	-	S
		V_{DS} = -15 V, I_D = -0.5 A	P-Ch	-	0.8	-	
Dynamic [a]							
Input Capacitance	C_{iss}	N-Channel V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz P-Channel V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	N-Ch	-	221	-	pF
			P-Ch	-	228	-	
Output Capacitance	C_{oss}		N-Ch	-	14	-	
			P-Ch	-	16	-	
Reverse Transfer Capacitance	C_{rss}		N-Ch	-	6	-	
			P-Ch	-	10	-	
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 10 V, I_D = 0.7 A	N-Ch	-	1.2	1.8	nC
		V_{DS} = -10 V, V_{GS} = -10 V, I_D = -0.5 A	P-Ch	-	1.9	3	
		N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V I_D = 0.5 A P-Channel V_{DS} = -10 V, V_{GS} = -4.5 V, I_D = -0.4 A	N-Ch	-	0.55	1.1	
			P-Ch	-	0.95	1.5	
Gate-Source Charge	Q_{gs}		N-Ch	-	0.15	-	
			P-Ch	-	0.25	-	
Gate-Drain Charge	Q_{gd}		N-Ch	-	0.15	-	
			P-Ch	-	0.25	-	
Gate Resistance	R_g	f = 1 MHz	N-Ch	1.5	7.2	14.4	Ω
			P-Ch	2.1	10.3	20.6	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP. [a]**	**MAX.**	**UNIT**
Dynamic [a]							
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 10 V, R_L = 20 Ω, I_D ≅ 0.5 A, V_{GEN} = 10 V, R_g = 1 Ω; P-Channel V_{DD} = -10 V, R_L = 25 Ω, I_D ≅ -0.4 A, V_{GEN} = -10 V, R_g = 1 Ω	N-Ch	-	2	4	ns
			P-Ch	-	2	4	
Rise Time	t_r		N-Ch	-	14	21	
			P-Ch	-	9	18	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch	-	11	20	
			P-Ch	-	10	20	
Fall Time	t_f		N-Ch	-	7	14	
			P-Ch	-	7	14	
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 10 V, R_L = 20 Ω, I_D ≅ 0.5 A, V_{GEN} = 4.5 V, R_g = 1 Ω; P-Channel V_{DD} = -10 V, R_L = 25 Ω, I_D ≅ -0.4 A, V_{GEN} = -4.5 V, R_g = 1 Ω	N-Ch	-	16	24	
			P-Ch	-	15	23	
Rise Time	t_r		N-Ch	-	22	33	
			P-Ch	-	15	23	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch	-	22	33	
			P-Ch	-	12	20	
Fall Time	t_f		N-Ch	-	13	20	
			P-Ch	-	8	16	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C	N-Ch	-	-	2.7	A
			P-Ch	-	-	-1.5	
Pulse Diode Forward Current [a]	I_{SM}		N-Ch	-	-	8	
			P-Ch	-	-	-5	
Body Diode Voltage	V_{SD}	I_S = 0.5 A	N-Ch	-	0.8	1.2	V
		I_S = -0.4 A	P-Ch	-	-0.8	-1.2	
Body Diode Reverse Recovery Time	t_{rr}	N-Channel I_F = 0.5 A, dI/dt = 100 A/µs, T_J = 25 °C; P-Channel I_F = -0.4 A, dI/dt = -100 A/µs, T_J = 25 °C	N-Ch	-	8	15	ns
			P-Ch	-	12	20	
Body Diode Reverse Recovery Charge	Q_{rr}		N-Ch	-	1	2	nC
			P-Ch	-	5	10	
Reverse Recovery Fall Time	t_a		N-Ch	-	4	-	ns
			P-Ch	-	9	-	
Reverse Recovery Rise Time	t_b		N-Ch	-	4	-	
			P-Ch	-	3	-	

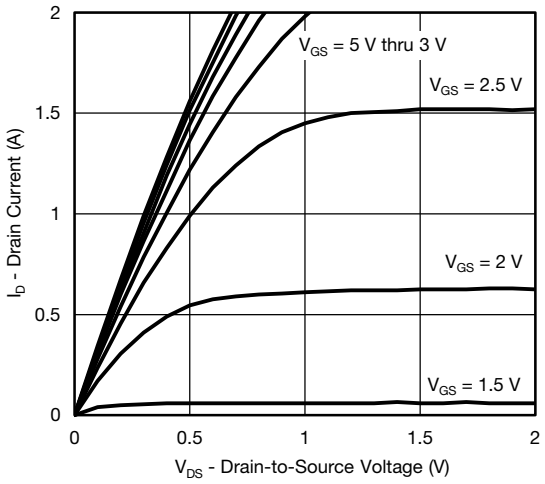
Notes

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

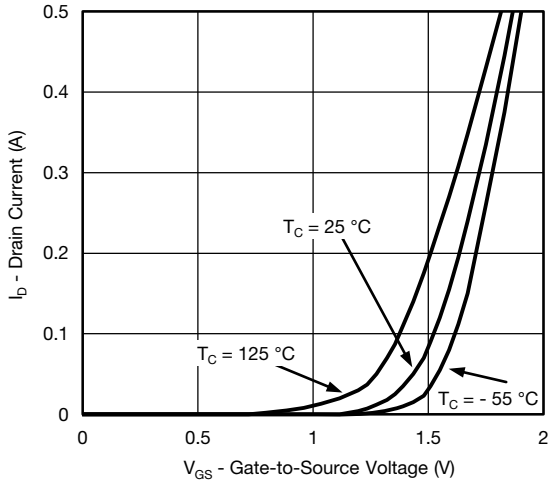
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

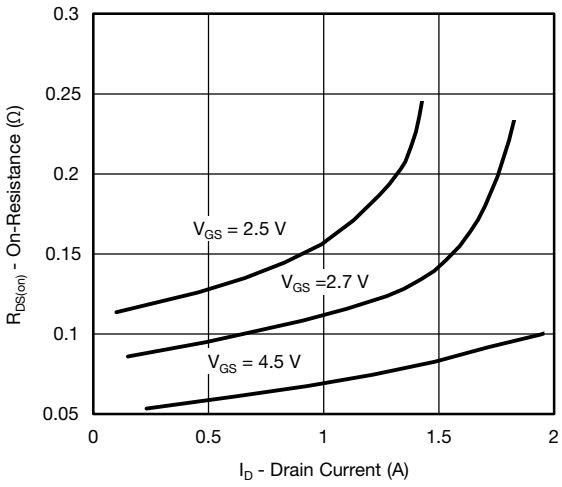
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



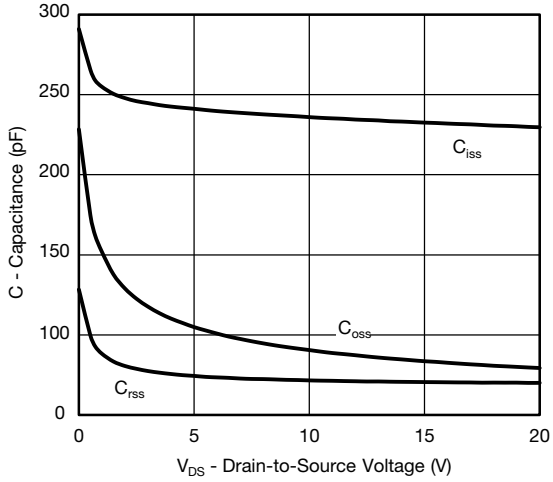
Output Characteristics



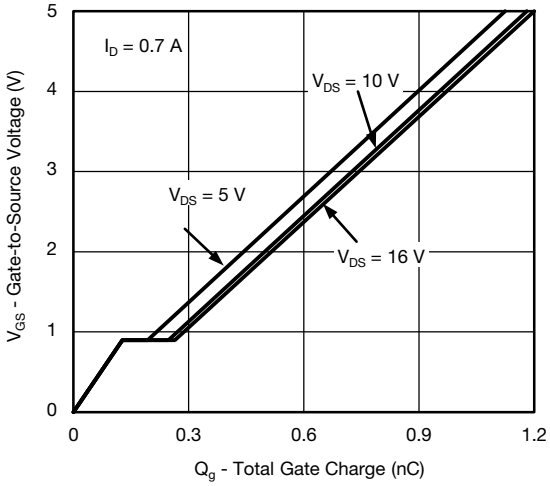
Transfer Characteristics



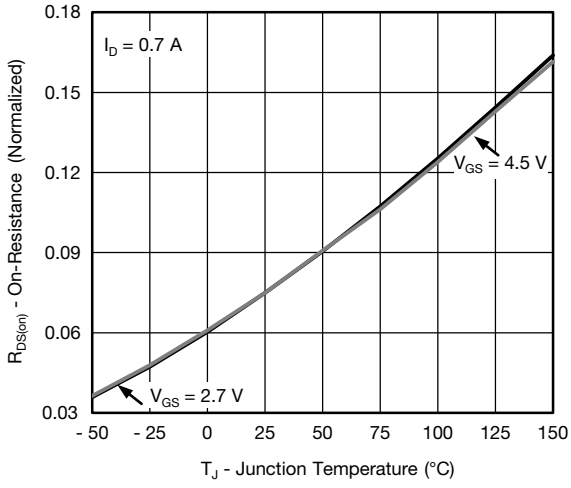
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

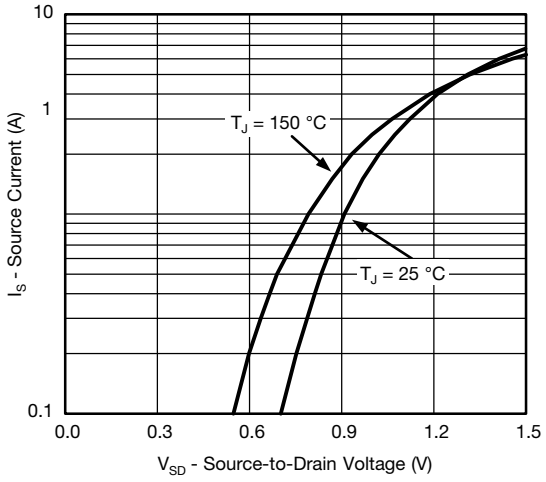


Gate Charge

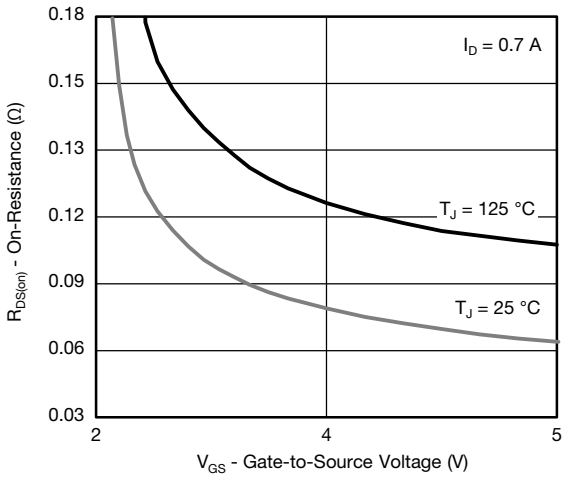


On-Resistance vs. Junction Temperature

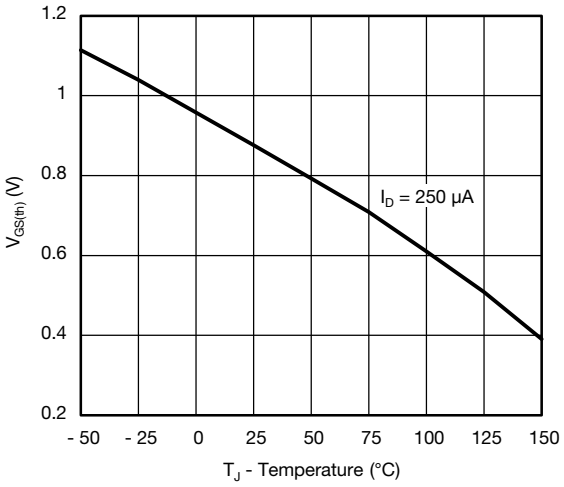
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



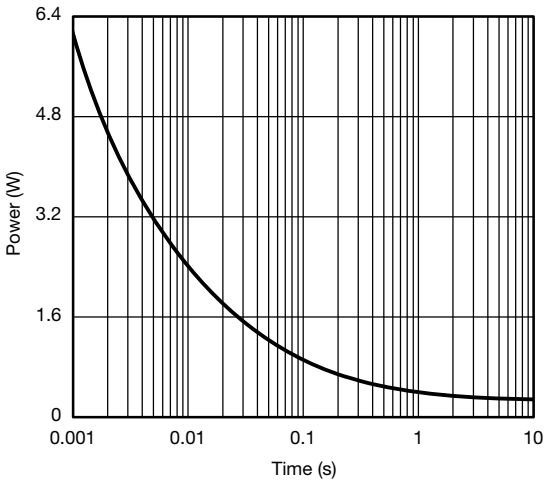
Source-Drain Diode Forward Voltage



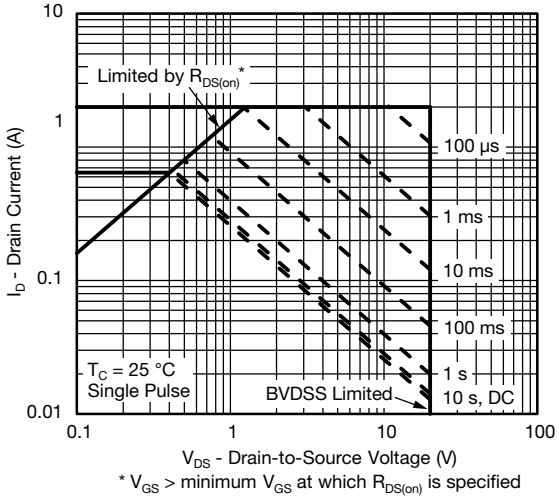
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

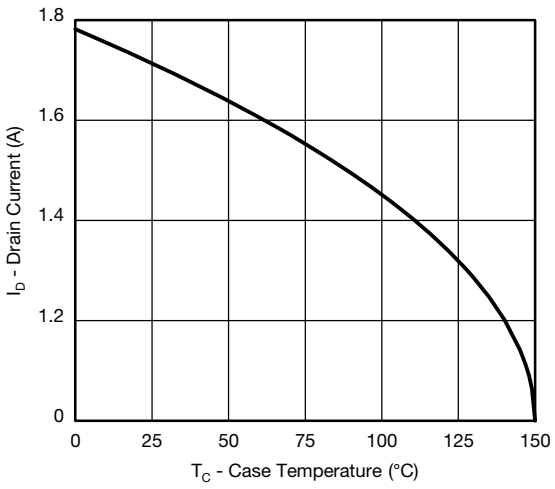


Single Pulse Power, Junction-to-Ambient

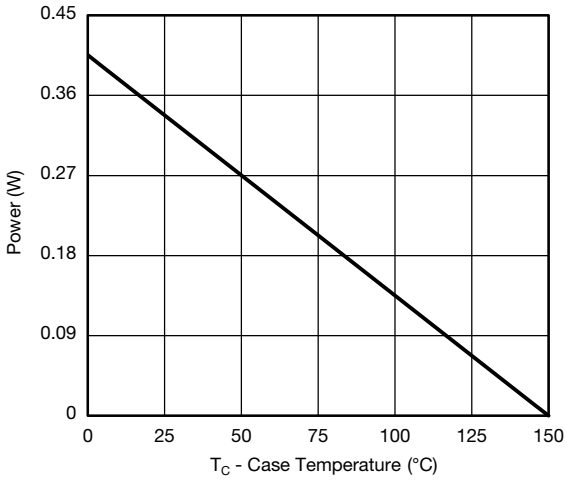


Safe Operating Area, Junction-to-Ambient

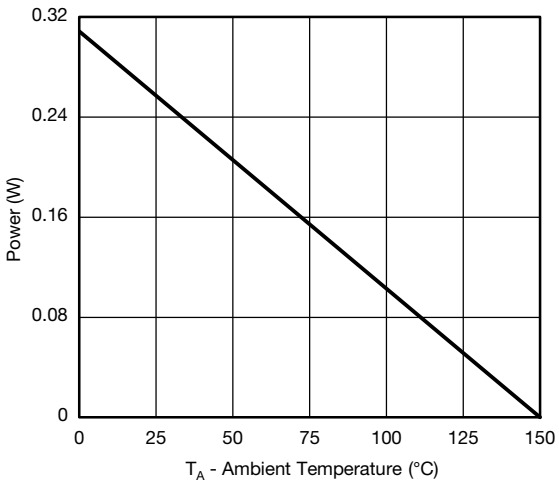
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



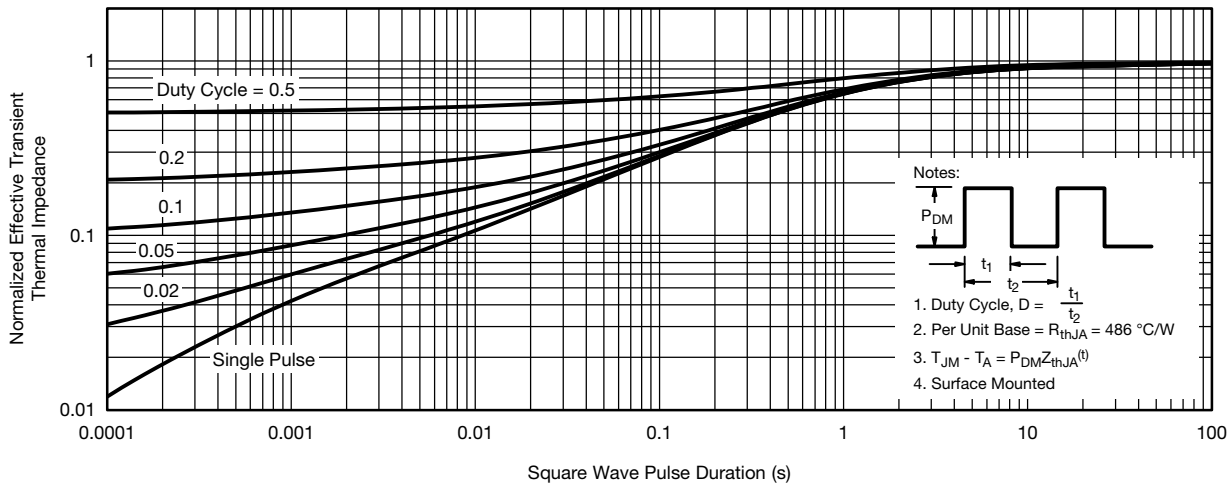
Power Derating, Junction-to-Foot



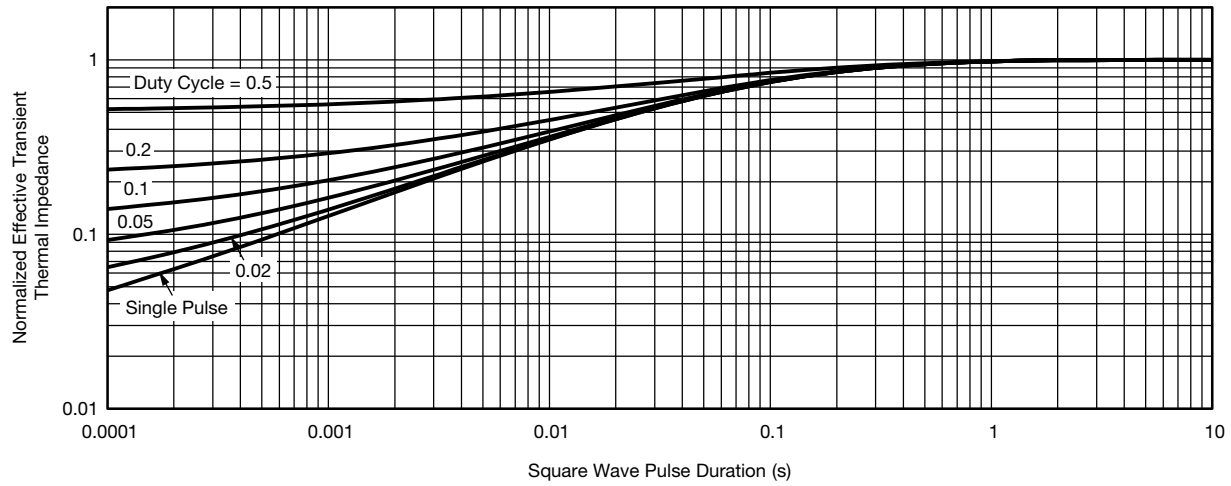
Power Derating, Junction-to-Ambient

* 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)

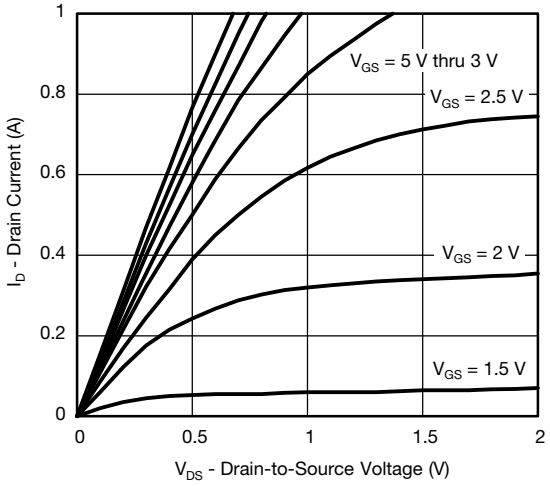


Normalized Thermal Transient Impedance, Junction-to-Ambient

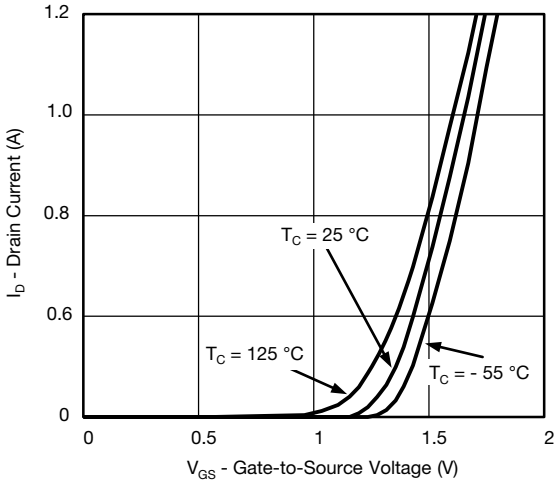


Normalized Thermal Transient Impedance, Junction-to-Foot

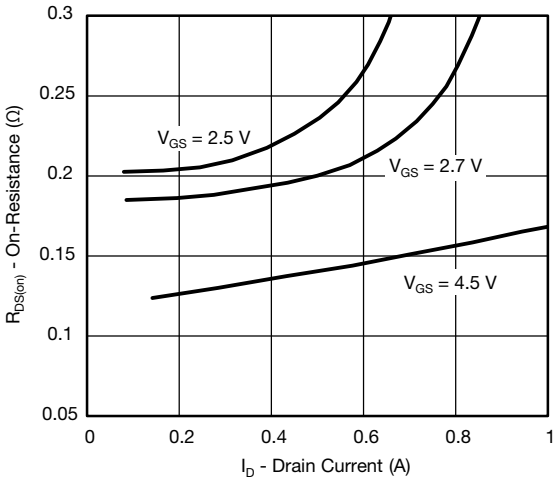
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



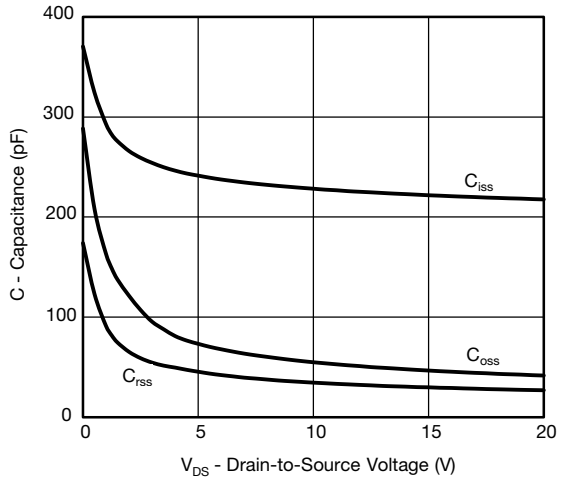
Output Characteristics



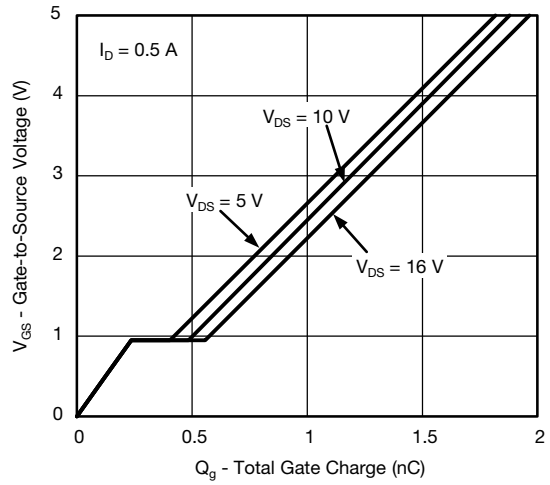
Transfer Characteristics



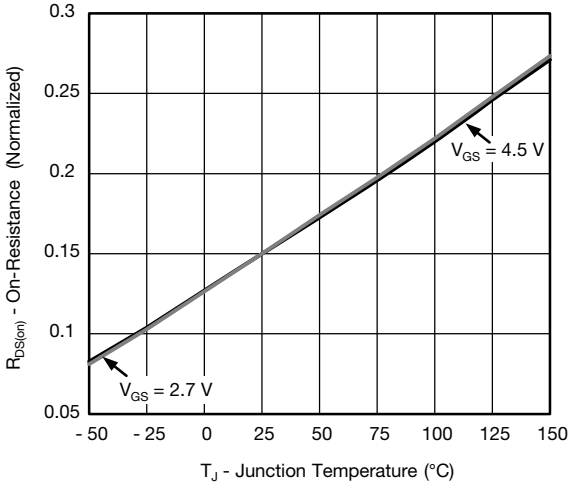
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

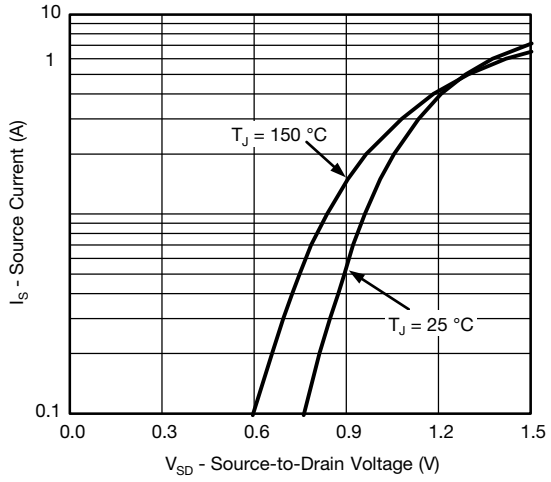


Gate Charge

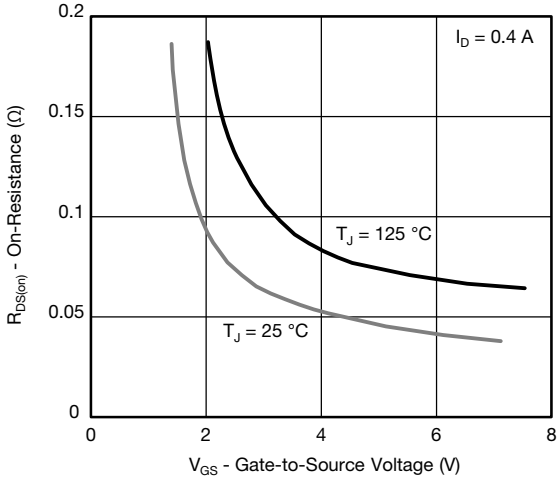


On-Resistance vs. Junction Temperature

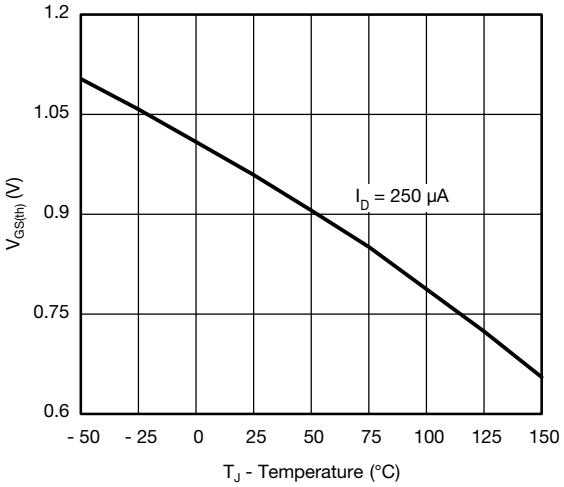
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



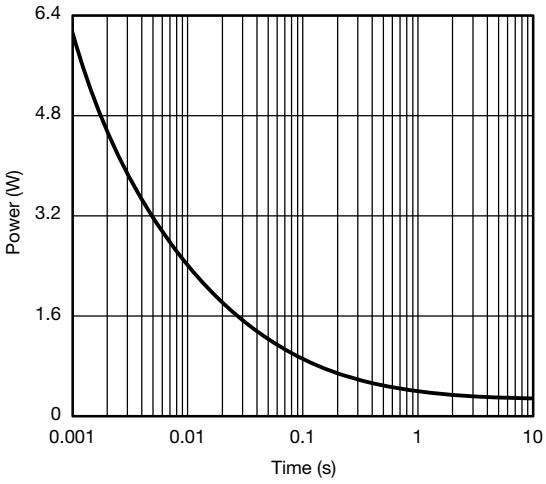
Source-Drain Diode Forward Voltage



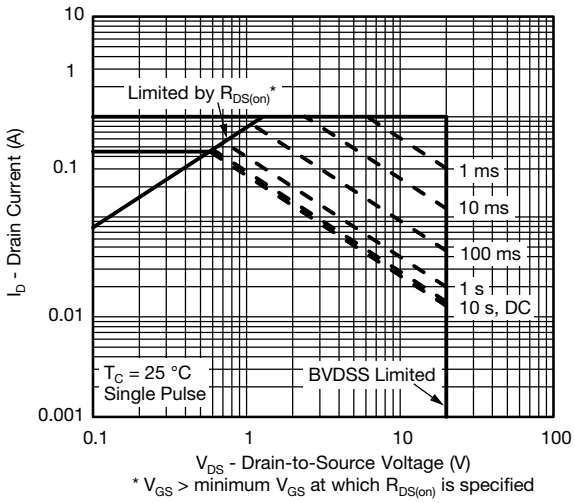
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

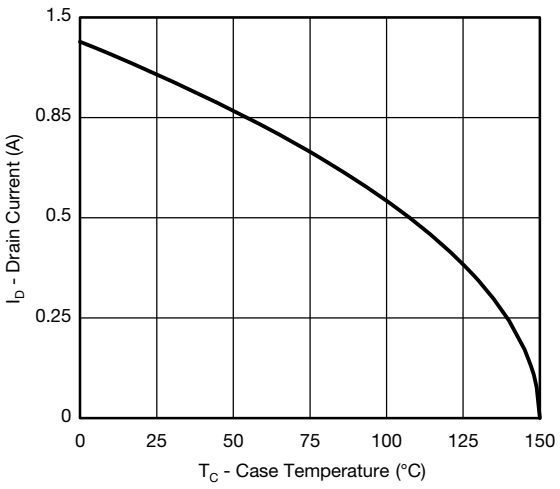


Single Pulse Power, Junction-to-Ambient

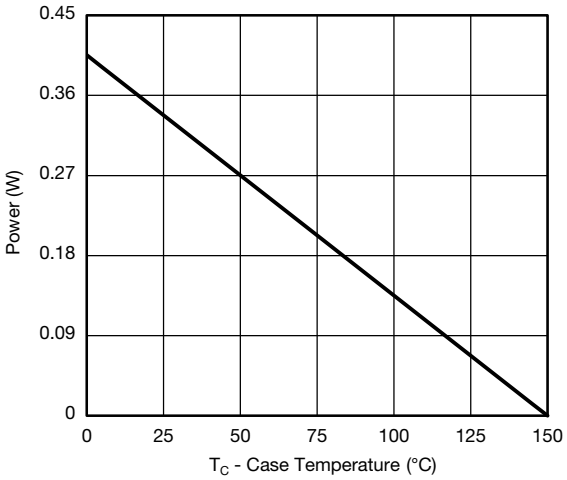


Safe Operating Area, Junction-to-Ambient

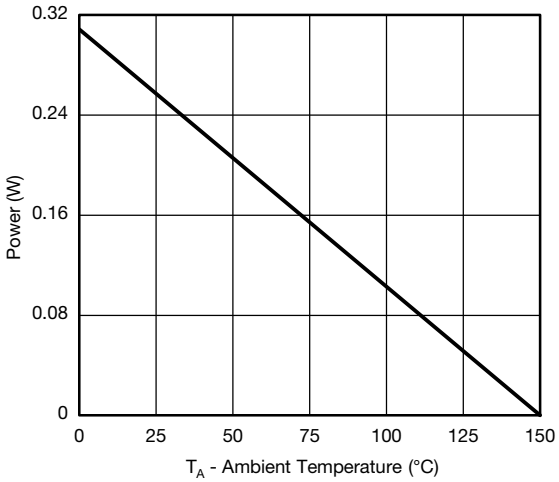
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



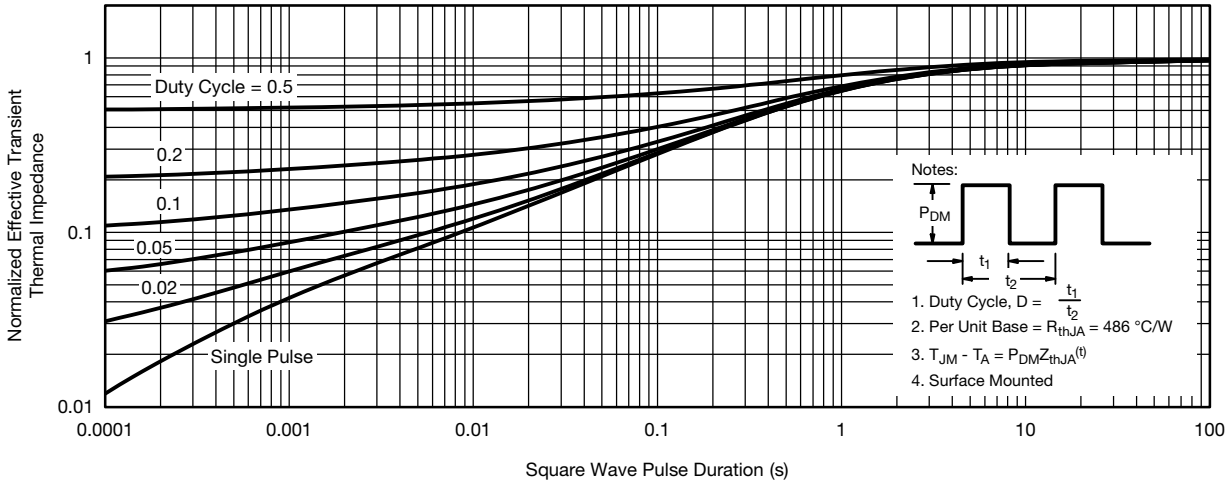
Power Derating, Junction-to-Foot



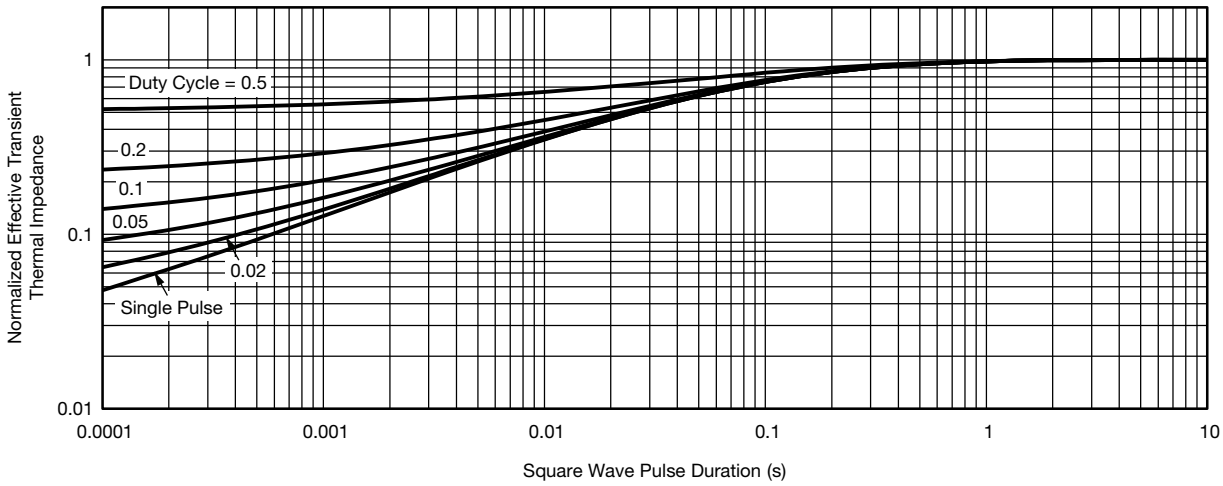
Power Derating, Junction-to-Ambient

* 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)

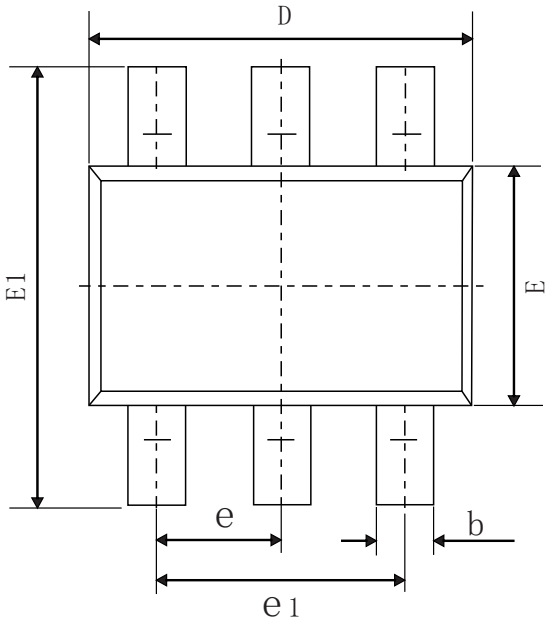


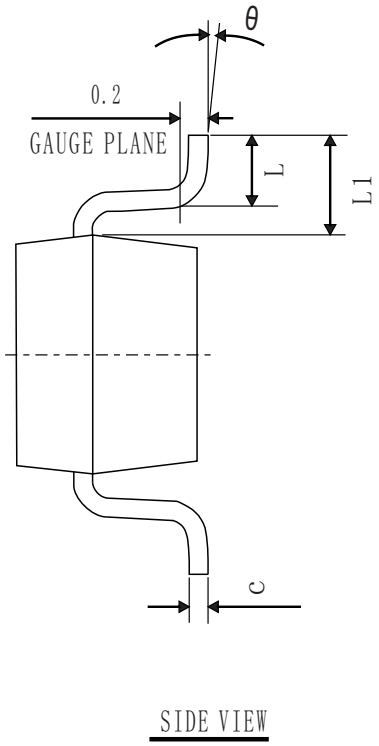
Normalized Thermal Transient Impedance, Junction-to-Ambient

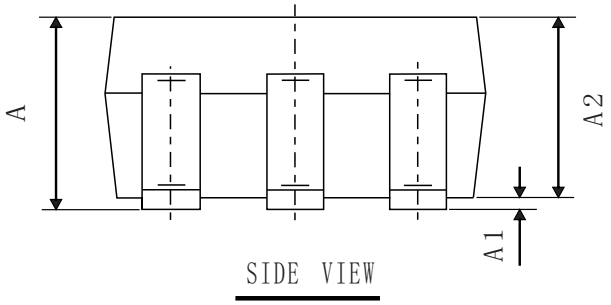


Normalized Thermal Transient Impedance, Junction-to-Foot

SOT-323-6L PACKAGE OUTLINE







COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	0.05	0.10
A2	0.90	0.95	1.00
b	0.20	0.25	0.30
c	0.08	0.10	0.15
e1	1.20	1.30	1.40
D	2.00	2.10	2.20
E	1.15	1.25	1.35
E1	2.15	2.30	2.45
L	0.26	0.36	0.46
θ	0°	4°	8°
L1	0.525 REF		
e	0.65 TYP		

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