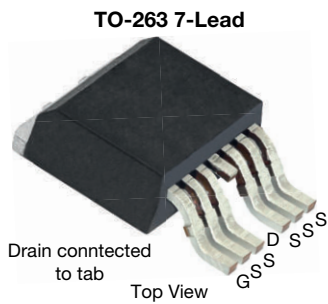


Automotive N-Channel 40 V (D-S) 175 °C MOSFET

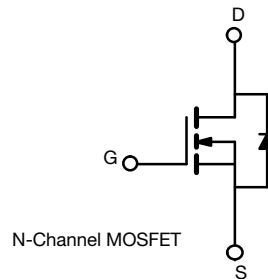


FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 % R_g and UIS tested
- AEC-Q101 qualified
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE



PRODUCT SUMMARY	
V _{DS} (V)	40
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.00100
I _D (A)	250
Configuration	Single
Package	TO-263-7L

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V _{DS}	40	V
Gate-source voltage	V _{GS}	± 20	
Continuous drain current	I _D	T _C = 25 °C ^a	250
		T _C = 125 °C	229
Continuous source current (diode conduction) ^a	I _S	250	A
Pulsed drain current ^b	I _{DM}	420	
Single pulse avalanche current	I _{AS}	78	
Single pulse avalanche energy	E _{AS}	304	mJ
Maximum power dissipation ^b	P _D	T _C = 25 °C	
		T _C = 125 °C	100
Operating junction and storage temperature range	T _J , T _{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-ambient	R _{thJA}	40	°C/W
Junction-to-case (drain)	R _{thJC}	0.5	

Notes

- Package limited
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)



SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		2.5	3.0	3.5	
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$	-	-	500	μA
On-state drain current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	100	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$	-	0.00081	0.00100	Ω
		$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	0.00152	
		$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$, $T_J = 175\text{ }^\circ\text{C}$	-	-	0.00184	
Forward transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 40\text{ A}$		-	181	-	S
Dynamic ^b							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	-	10 841	15 000	μF
Output capacitance	C_{oss}			-	2928	4000	
Reverse transfer capacitance	C_{rss}			-	198	270	
Total gate charge ^c	Q_g	$V_{GS} = 10\text{ V}$	$V_{DS} = 20\text{ V}$, $I_D = 100\text{ A}$	-	163	245	nC
Gate-source charge ^c	Q_{gs}			-	46	-	
Gate-drain charge ^c	Q_{gd}			-	36	-	
Gate resistance	R_g	$f = 1\text{ MHz}$		1	2.2	3.4	Ω
Turn-on delay time ^c	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 0.2\text{ }\Omega$ $I_D \cong 100\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		-	24	40	ns
Rise time ^c	t_r			-	215	330	
Turn-off delay time ^c	$t_{d(off)}$			-	59	90	
Fall time ^c	t_f			-	35	55	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I_{SM}			-	-	420	A
Forward voltage	V_{SD}	$I_F = 60\text{ A}$, $V_{GS} = 0\text{ V}$		-	0.8	1.5	V
Body diode reverse recovery time	t_{rr}	$I_F = 40\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		-	92	185	ns
Body diode reverse recovery charge	Q_{rr}			-	198	400	nC
Reverse recovery fall time	t_a			-	47	-	ns
Reverse recovery rise time	t_b			-	45	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-4.4	-	A

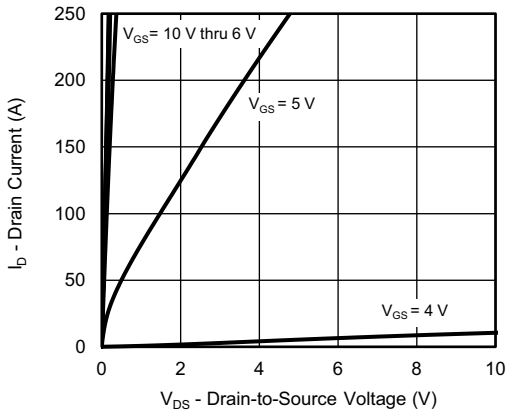
Notes

- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
- Guaranteed by design, not subject to production testing
- Independent of operating temperature

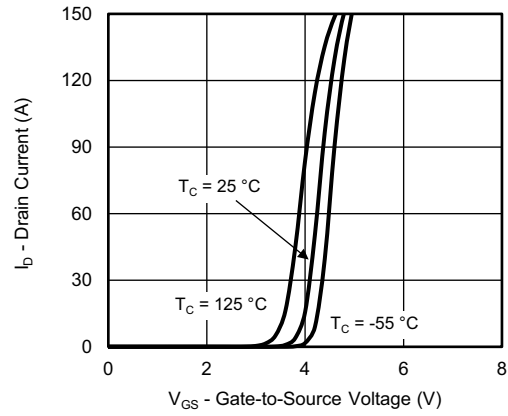
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



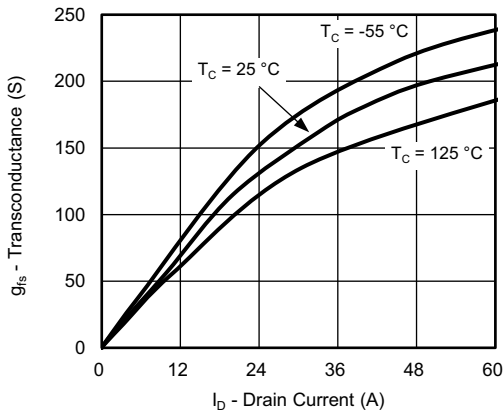
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



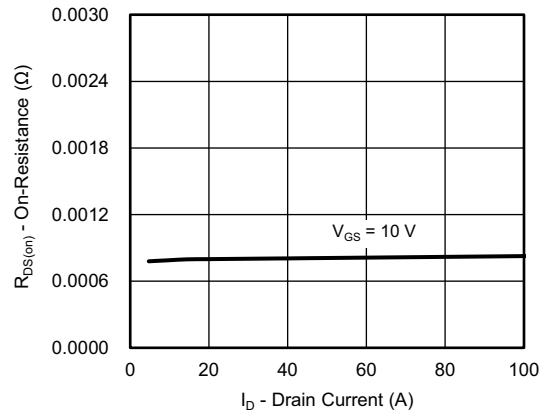
Output Characteristics



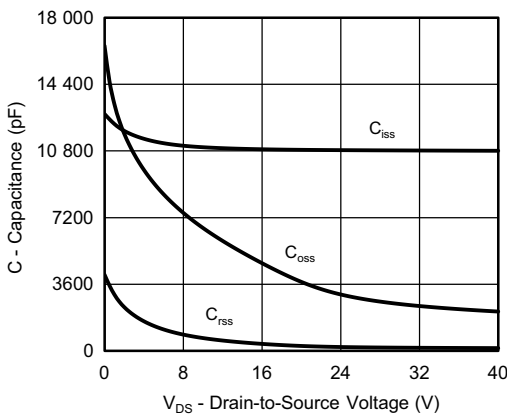
Transfer Characteristics



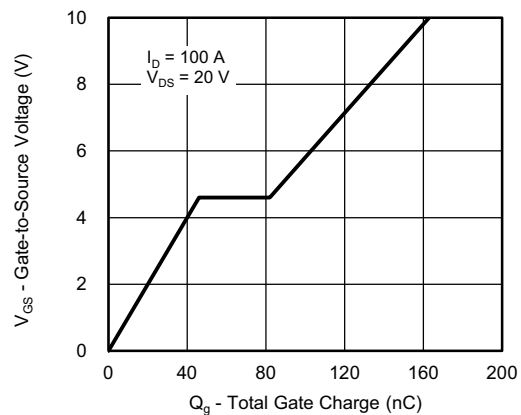
Transconductance



On-Resistance vs. Drain Current



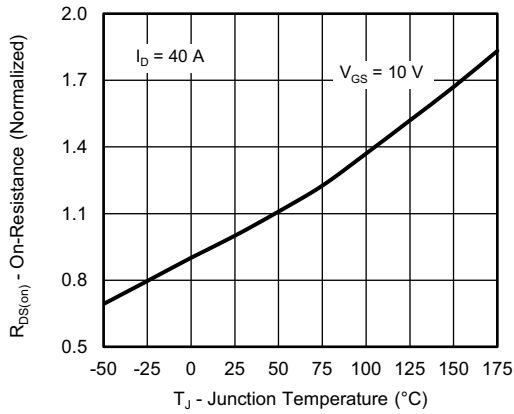
Capacitance



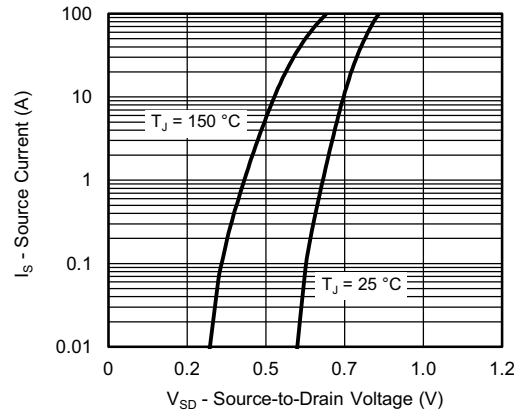
Gate Charge



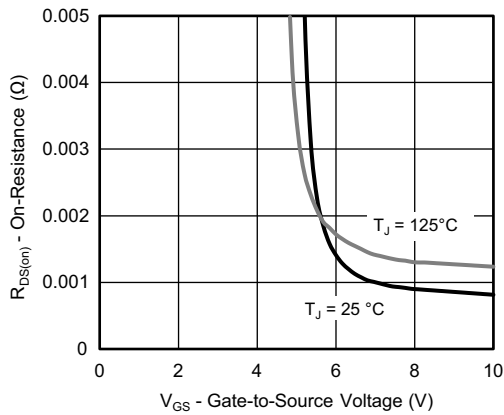
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



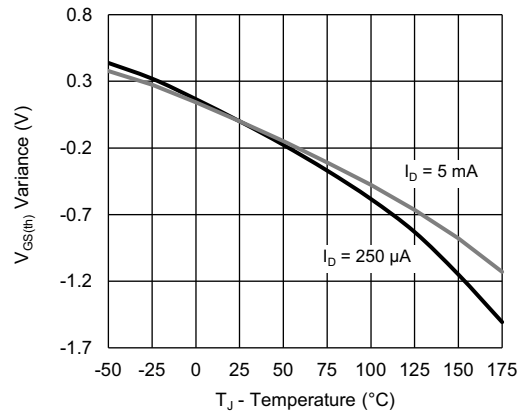
On-Resistance vs. Junction Temperature



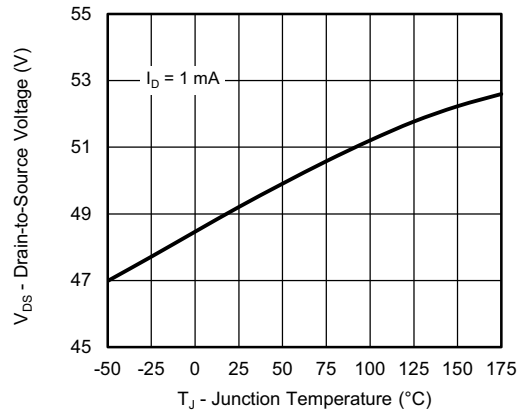
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



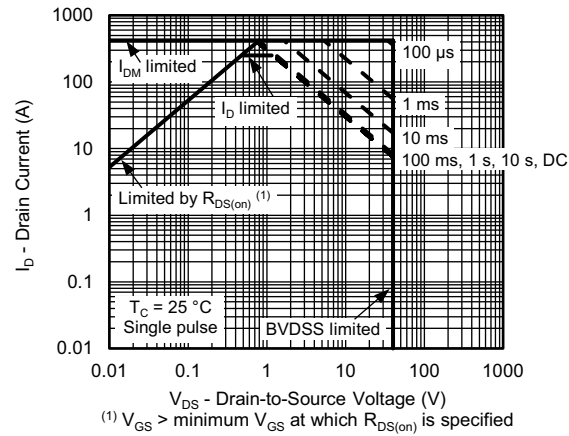
Threshold Voltage



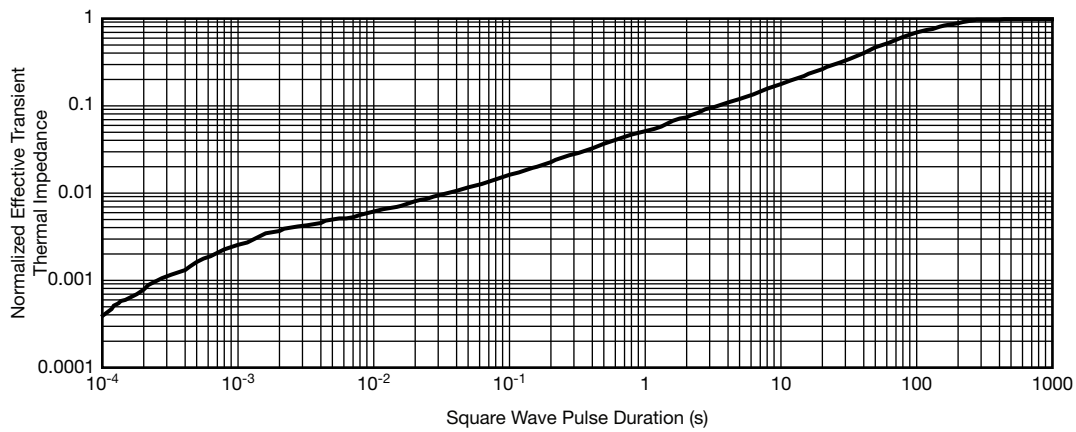
Drain Source Breakdown vs. Junction Temperature



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



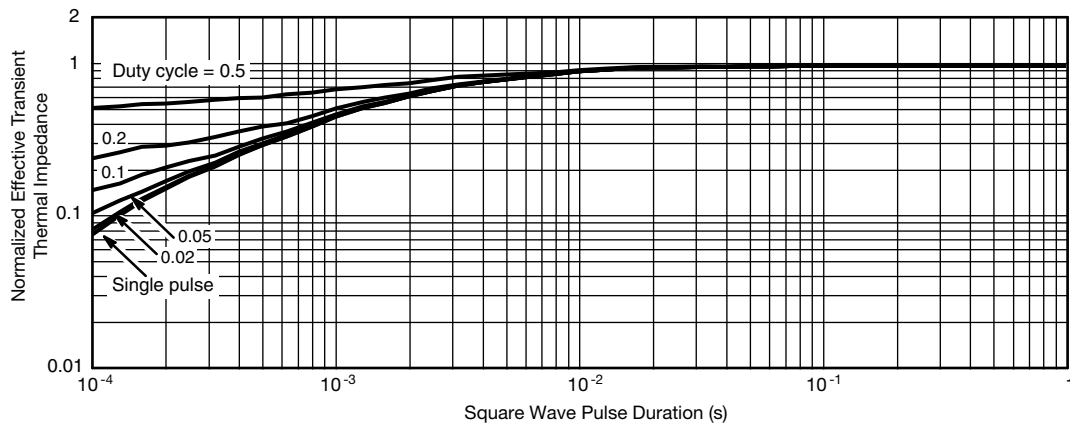
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



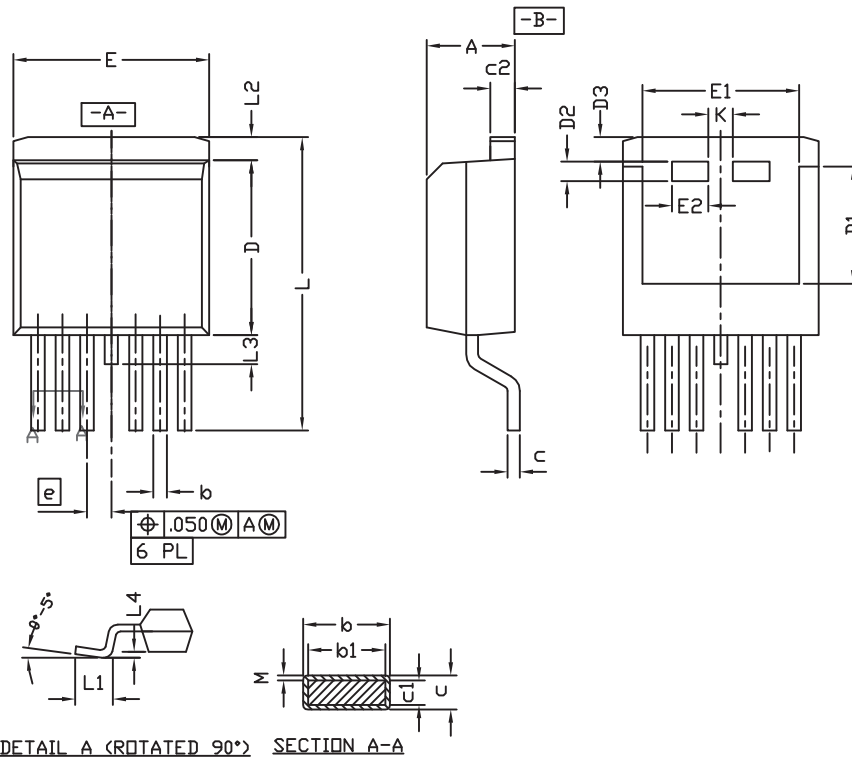
Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
 - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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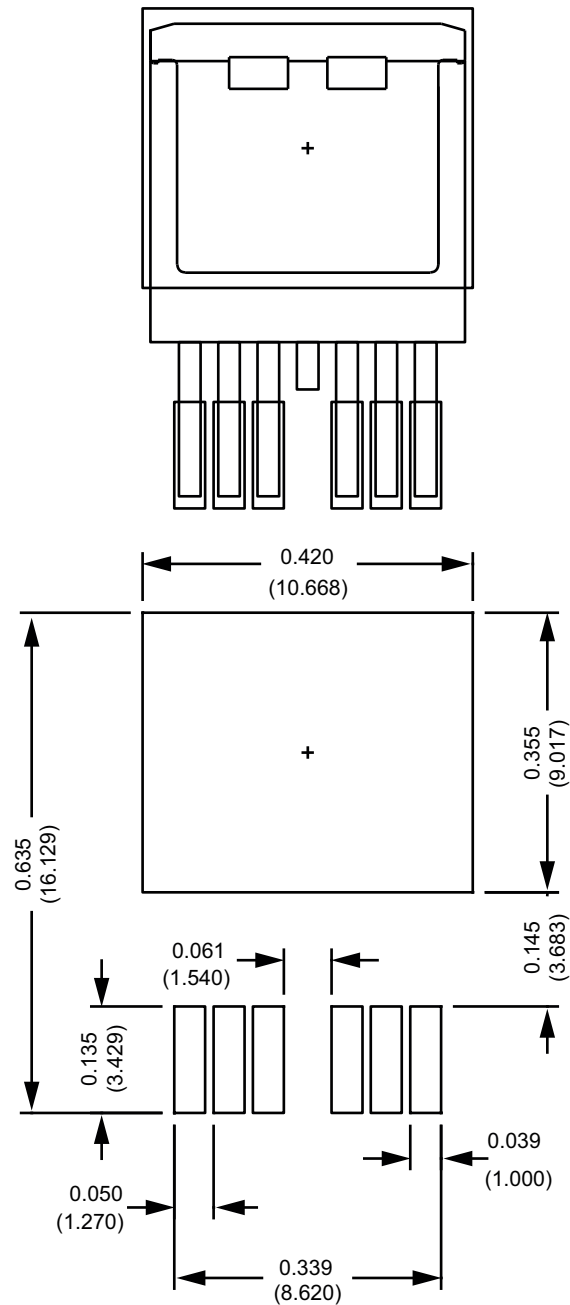
D²PAK (TO-263-7L) Case Outline


Notes

1. Plane B includes maximum features of heat sink tab and plastic
2. No more than 25 % of L1 can fall above seating plane by max. 8 mils
3. Pin to pin coplanarity max. 4 mils
4. Lead thickness 25 mils
5. For SUM part numbers lead thickness is 24 mils to 29 mils
6. For reference only
7. Use inches as the primary measurement
8. This feature is only for SUM

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.064	4.826
b	0.020	0.039	0.508	0.990
b1	0.020	0.035	0.508	0.889
c* SUB	0.012	0.018	0.305	0.457
c* SUM	0.022	0.028	0.559	0.711
c1	0.018	0.025	0.457	0.635
c2	0.045	0.055	1.143	1.397
D	0.340	0.380	8.636	9.652
D1	0.260	0.280	6.604	7.112
D2	0.046	0.050	1.168	1.270
D3	0.045	0.055	1.143	1.397
E	0.380	0.410	9.652	10.414
E1	0.245	-	6.223	-
E2	0.072	0.078	1.829	1.981
e	0.050 BSC		1.27 BSC	
K	0.045	0.055	1.143	1.397
L	0.575	0.625	14.605	15.875
L1	0.090	0.110	2.286	2.794
L2	0.040	0.055	1.016	1.397
L3	0.050	0.070	1.270	1.778
L4	0.010 BSC		0.254 BSC	
M	-	0.002	-	0.050
ECN: T22-0410-Rev. D, 19-Sep-2022				
DWG: 6006				

Recommended Land Pattern D²PAK (TO-263-7L)





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