

2SK3977-TL-E-VB Datasheet

N-Channel 100 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
100	0.055 at V _{GS} = 10 V	25	21nC
	0.057 at V _{GS} = 4.5 V	25	

FEATURES

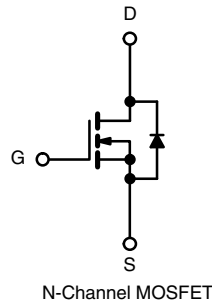
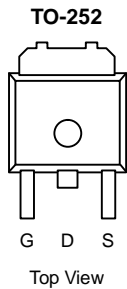
- TrenchFET® power MOSFET
- 100 % UIS tested



RoHS
COMPLIANT

APPLICATIONS

- Primary side switch



ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	100	V
Gate-Source Voltage	V _{GS}	± 20	
Continuous Drain Current (T _J = 175 °C)	I _D	T _C = 25 °C	25
		T _C = 70 °C	20
		T _A = 25 °C	12 ^{b, c}
		T _A = 70 °C	10 ^{b, c}
Pulsed Drain Current	I _{DM}	75	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	6.9 ^{b, c}
Avalanche Current Pulse	I _{AS} E _{AS}	L = 0.1 mH	33
Single Pulse Avalanche Energy			55
Maximum Power Dissipation	P _D	T _C = 25 °C	83
		T _C = 70 °C	58
		T _A = 25 °C	8.3 ^{b, c}
		T _A = 70 °C	5.8 ^{b, c}
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	15	18	°C/W	
Maximum Junction-to-Case	R _{thJC}	1.5	1.8		

Notes

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under steady state conditions is 50 °C/W.
- Calculated based on maximum junction temperature. Package limitation current is 50 A.

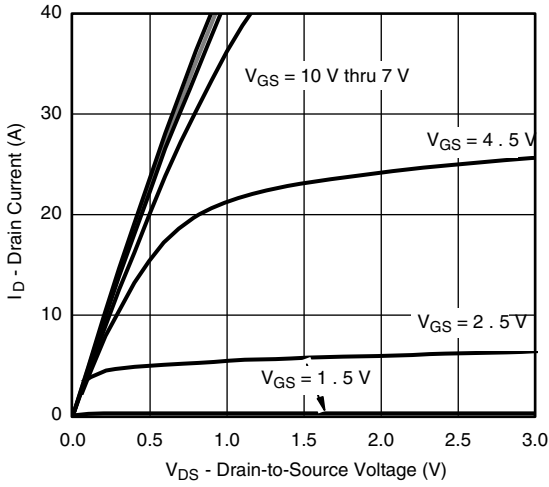
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	165	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-11	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		3.5	V
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}	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	25	-	-	A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 12\text{ A}$	-	0.055		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$		0.057		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 12\text{ A}$	-	25	-	S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = 12\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	1800	-	pF
Output Capacitance	C_{oss}		-	180	-	
Reverse Transfer Capacitance	C_{rss}		-	60	-	
Total Gate Charge	Q_g	$V_{DS} = 50\text{ V}, V_{GS} = 10\text{ V}, I_D = 12\text{ A}$	-	21	32	nC
Gate-Source Charge	Q_{gs}		-	10	-	
Gate-Drain Charge	Q_{gd}		-	9	-	
Gate Resistance	R_g	$f = 1\text{ MHz}$	-	1.5	-	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50\text{ V}, R_L = 5\text{ }\Omega$ $I_D \equiv 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	10	15	ns
Rise Time	t_r		-	10	15	
Turn-Off Delay Time	$t_{d(off)}$		-	15	25	
Fall Time	t_f		-	10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	50	A
Pulse Diode Forward Current ^a	I_{SM}		-	-	40	
Body Diode Voltage	V_{SD}	$I_S = 10\text{ A}$	-	0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	50	75	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	100	150	nC
Reverse Recovery Fall Time	t_a		-	38	-	ns
Reverse Recovery Rise Time	t_b		-	12	-	

Note

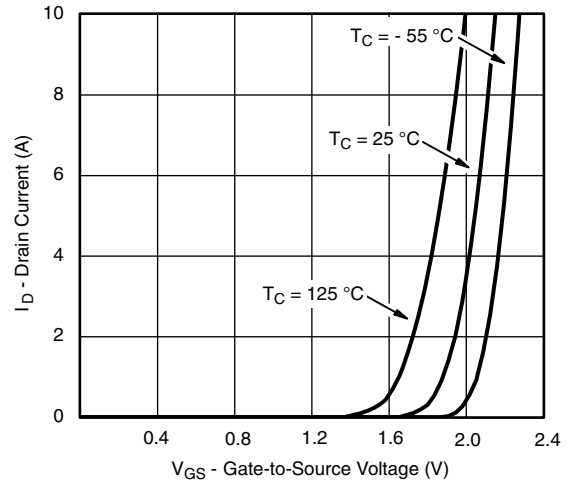
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

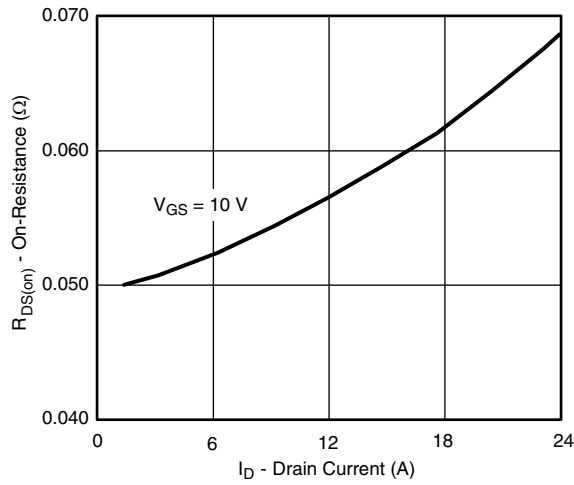
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



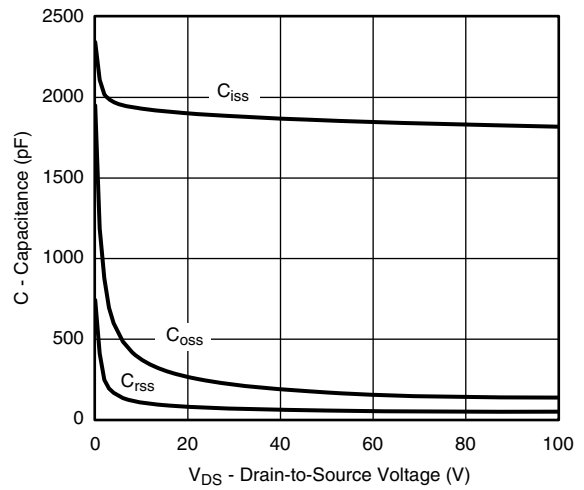
Output Characteristics



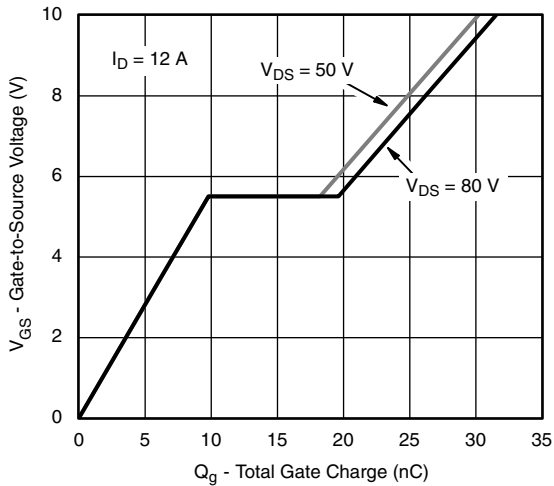
Transfer Characteristics



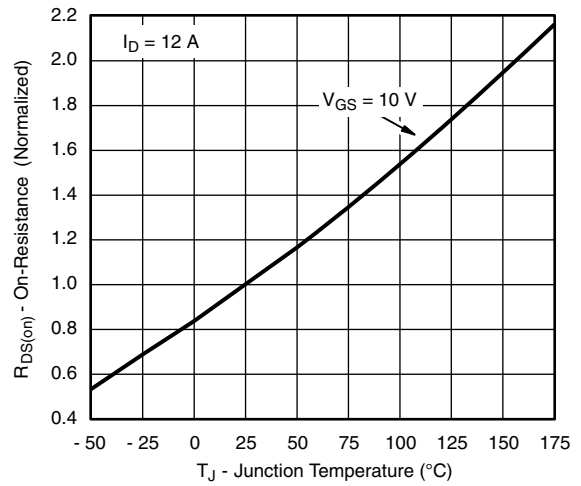
On-Resistance vs. Drain Current



Capacitance

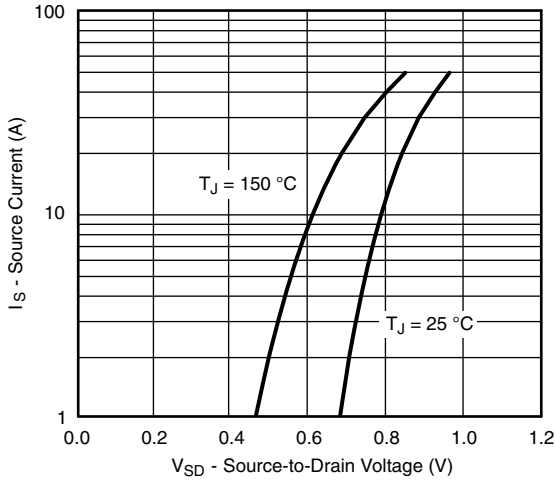


Gate Charge

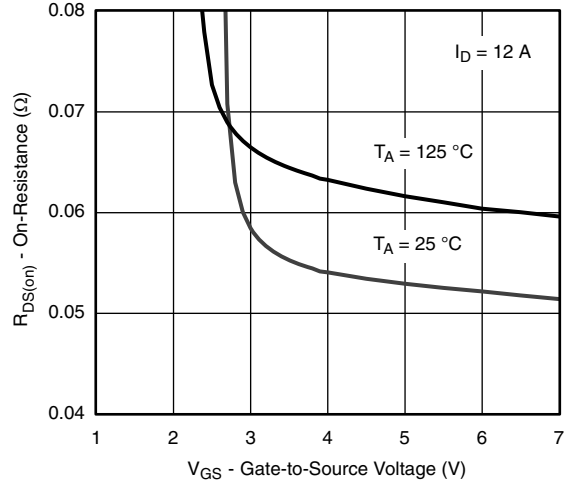


On-Resistance vs. Junction Temperature

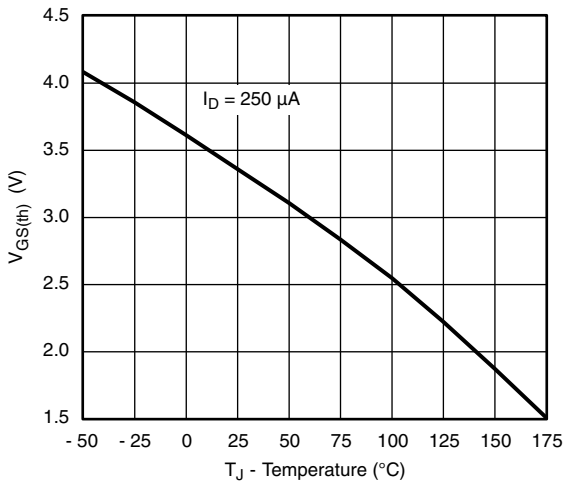
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Source-Drain Diode Forward Voltage



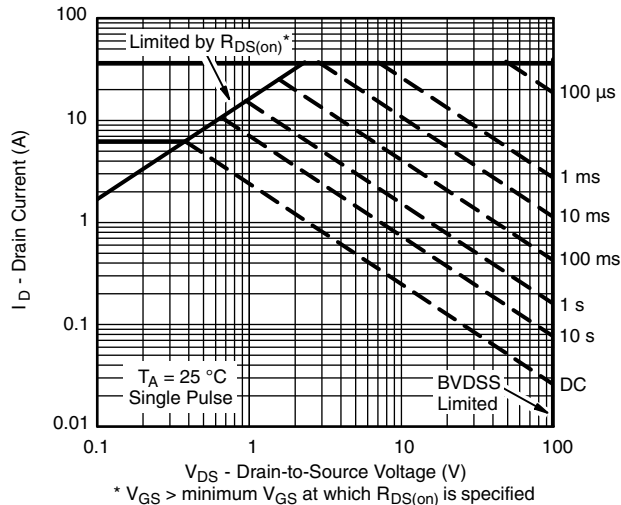
$R_{DS(on)}$ vs. V_{GS} vs. Temperature



Threshold Voltage

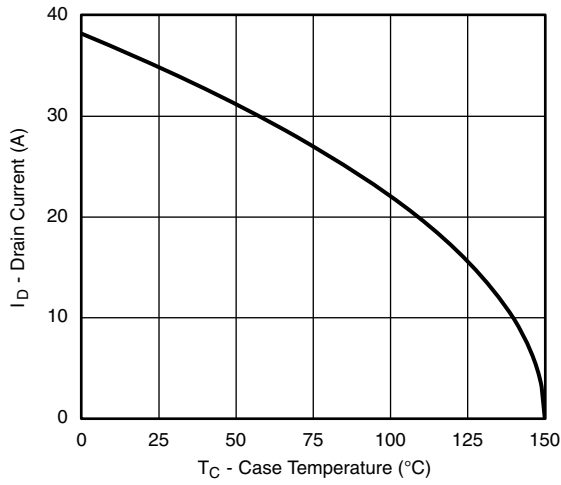


Single Pulse Power, Junction-to-Ambient

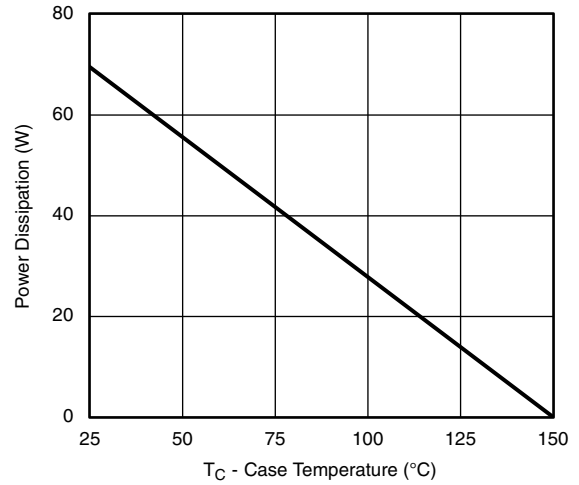


Safe Operating Area

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a

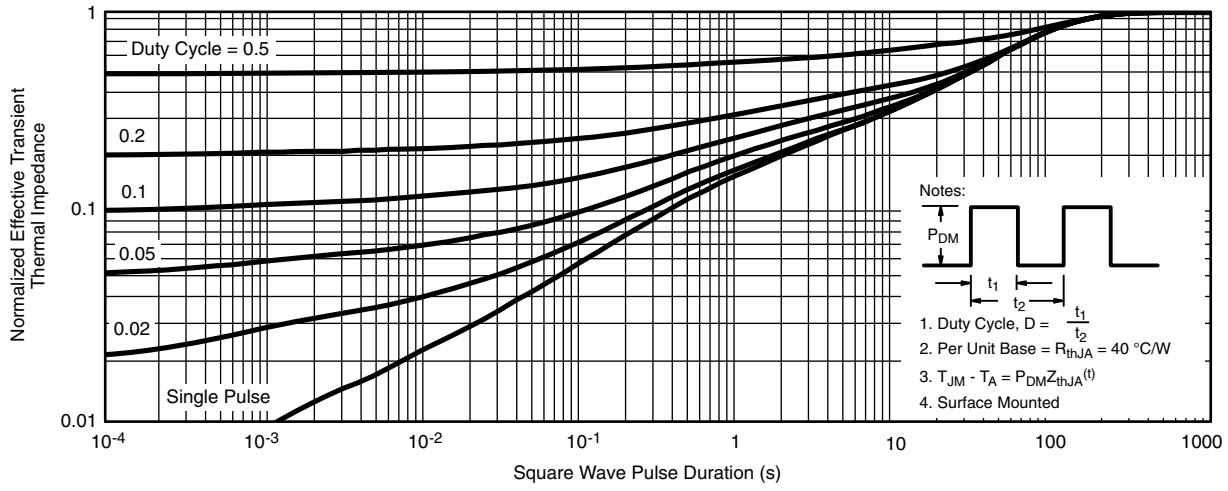


Power Derating

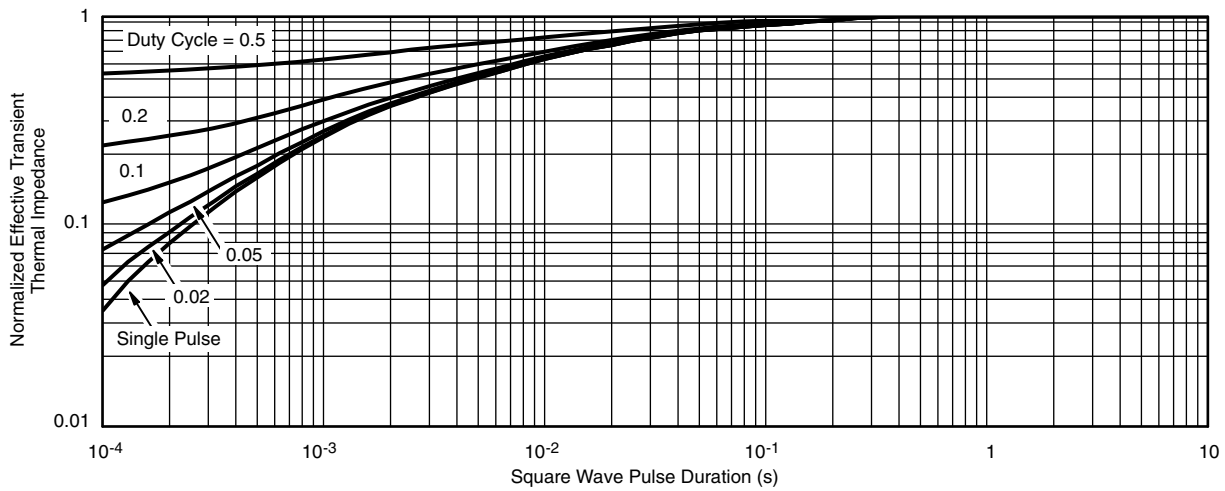
Note

- a. 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)

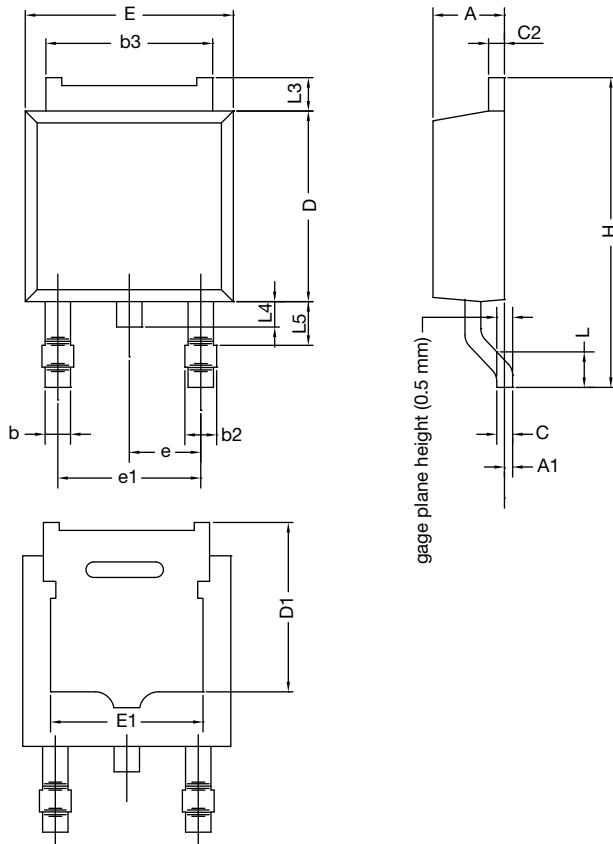


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

TO-252AA Case Outline

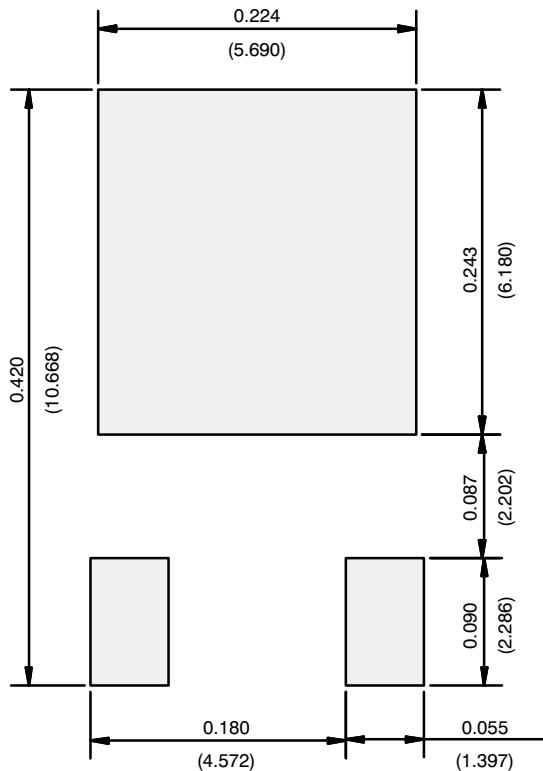


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.01	1.52	0.040	0.060
ECN: T16-0236-Rev. P, 16-May-16 DWG: 5347				

Notes

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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