N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, e]	Q_g (Typ)
60	0.0029 at V_{GS} = 10 V	130	65 nC
	0.0039 at V_{GS} = 4.5 V	110	

FEATURES

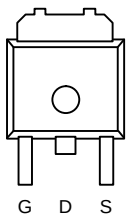
- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

RoHS COMPLIANT

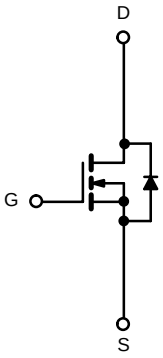
APPLICATIONS

- OR-ing
- Server
- DC/DC

TO-252



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	130[a, e]	A
	T_C = 70 °C		112[e]	
	T_A = 25 °C		33.2[b, c]	
	T_A = 70 °C		29.3[b, c]	
Pulsed Drain Current		I_{DM}	480	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	46	
Single Pulse Avalanche Energy		E_{AS}	240	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	130[a, e]	A
	T_A = 25 °C		4.12[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	180[a]	W
	T_C = 70 °C		130	
	T_A = 25 °C		3.78[b, c]	
	T_A = 70 °C		2.72[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typ.**	**Max.**	**Unit**
Maximum Junction-to-Ambient[b, d]	t ≤ 10 sec	R_{thJA}	14	20	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.5	0.6	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 sec.
d. Maximum under steady state conditions is 90 °C/W.
e. Calculated based on maximum junction temperature. Package limitation current is 85 A.

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	60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		35		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 7.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	1.2		2.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 32 V, V_{GS} = 0 V			1	µA
		V_{DS} = 32 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	130			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A		0.0029	0.0040	Ω
		V_{GS} = 4.5 V, I_D = 20 A		0.0039	0.0050	
Forward Transconductance[a]	g_{fs}	V_{DS} = 32V, I_D = 30 A		50		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		3945		pF
Output Capacitance	C_{oss}			712		
Reverse Transfer Capacitance	C_{rss}			30		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 30 A		65	79	nC
		V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 30 A		50.2	100	
Gate-Source Charge	Q_{gs}			11		
Gate-Drain Charge	Q_{gd}			9		
Gate Resistance	R_g	f = 1 MHz		1.2	1.8	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 0.625 Ω I_D ≅ 30 A, V_{GEN} = 10 V, R_g = 1 Ω		10	18	ns
Rise Time	t_r			5	10	
Turn-Off Delay Time	$t_{d(off)}$			35	65	
Fall Time	t_f			6	11	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 0.67 Ω I_D ≅ 20 A, V_{GEN} = 4.5 V, R_g = 1 Ω		32	46	
Rise Time	t_r			102	186	
Turn-Off Delay Time	$t_{d(off)}$			33	55	
Fall Time	t_f			10	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			130	A
Pulse Diode Forward Current[a]	I_{SM}				480	
Body Diode Voltage	V_{SD}	I_S = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, di/dt = 100 A/µs, T_J = 25 °C		22	28	ns
Body Diode Reverse Recovery Charge	Q_{rr}			52	66	nC
Reverse Recovery Fall Time	t_a			26		ns
Reverse Recovery Rise Time	t_b			25		

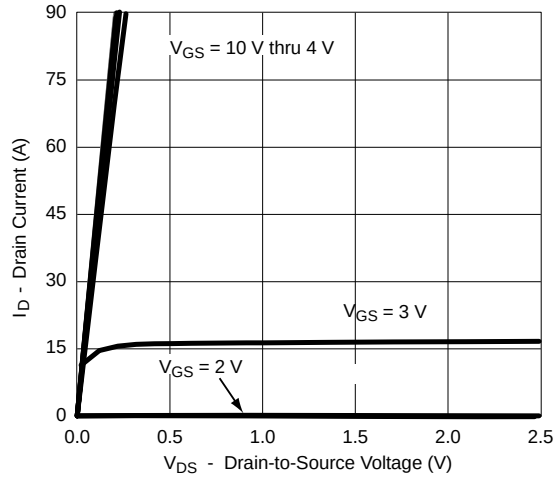
Notes:

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

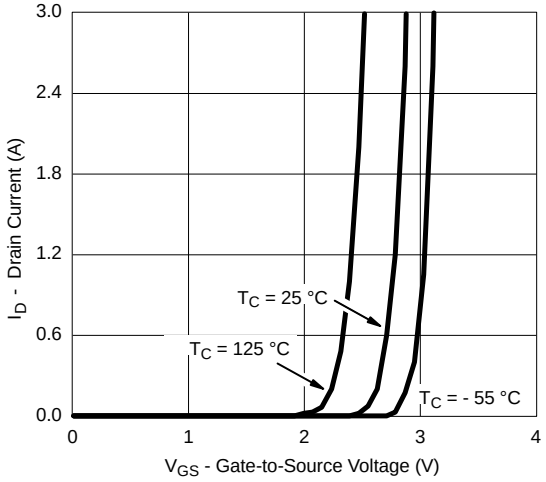
b. Guaranteed by design, not subject to production testing.

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.

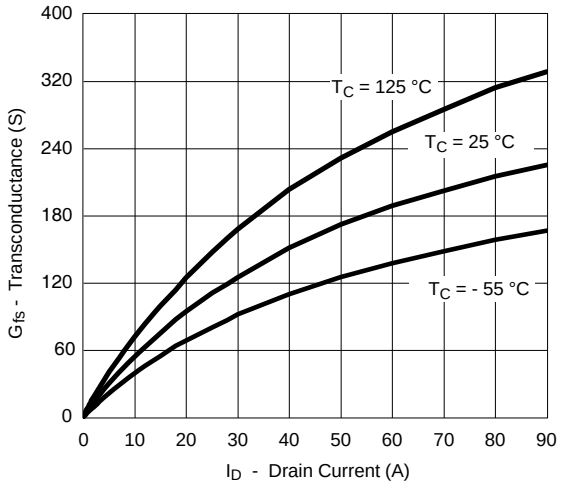
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



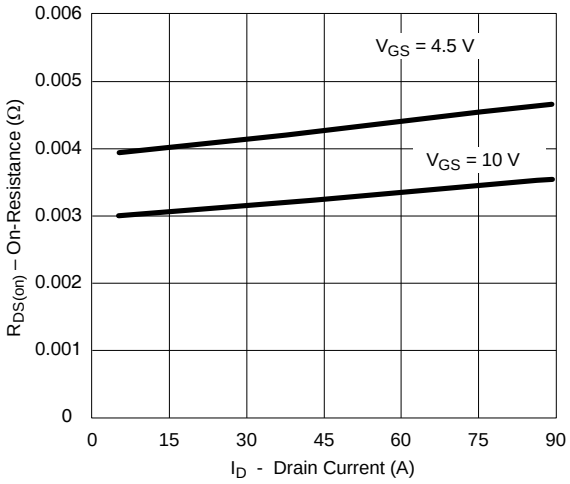
Output Characteristics



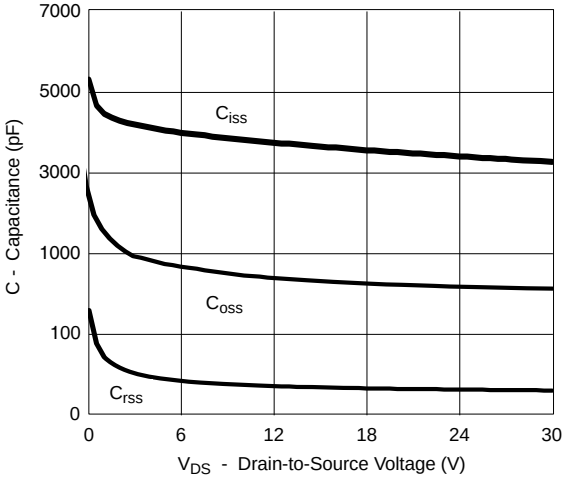
Transfer Characteristics



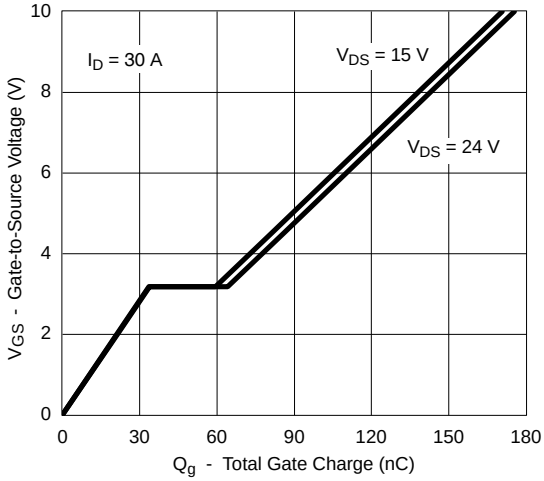
Transconductance



$R_{DS(on)}$ vs. Drain Current

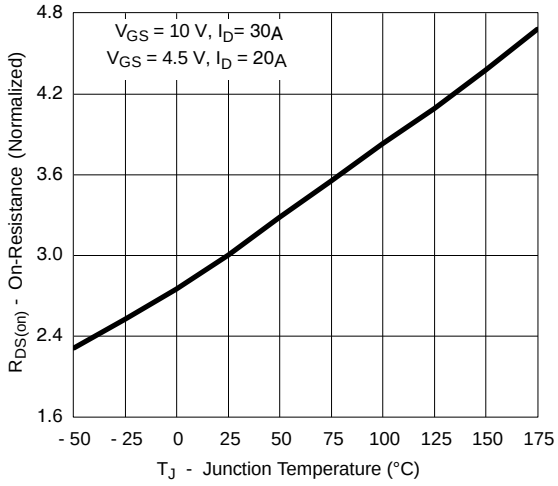


Capacitance

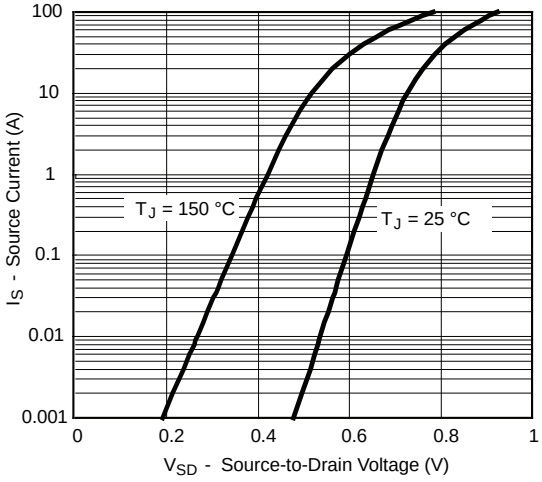


Gate Charge

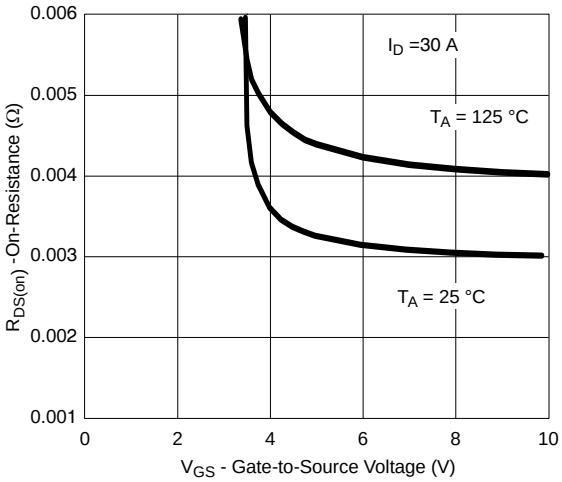
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



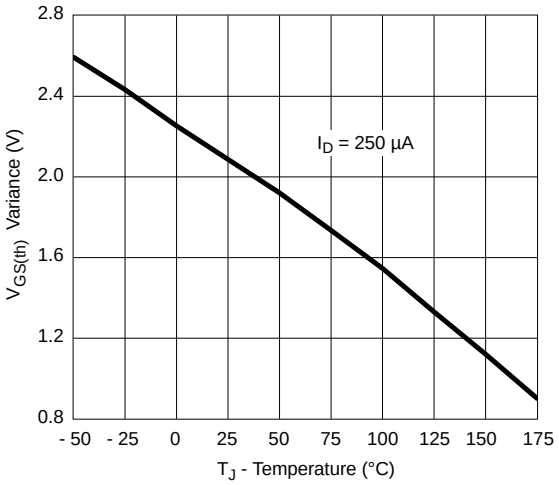
On-Resistance vs. Junction Temperature



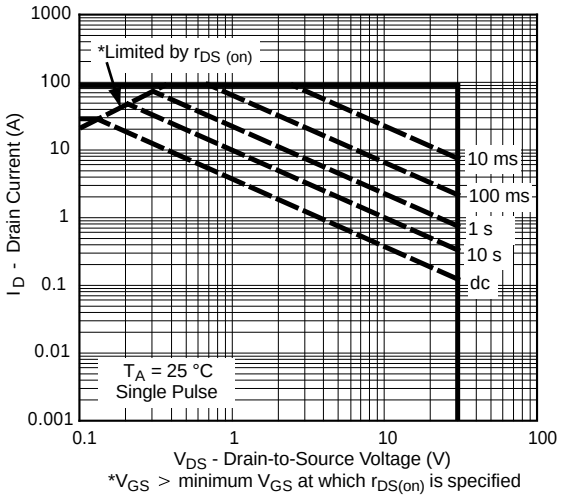
Forward Diode Voltage vs. Temperature



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

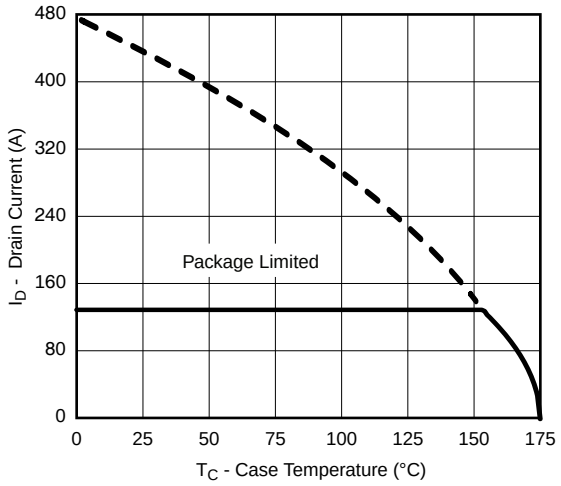


Threshold Voltage

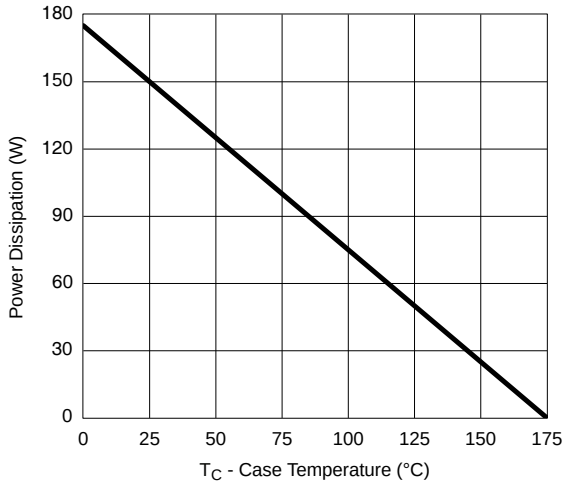


Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

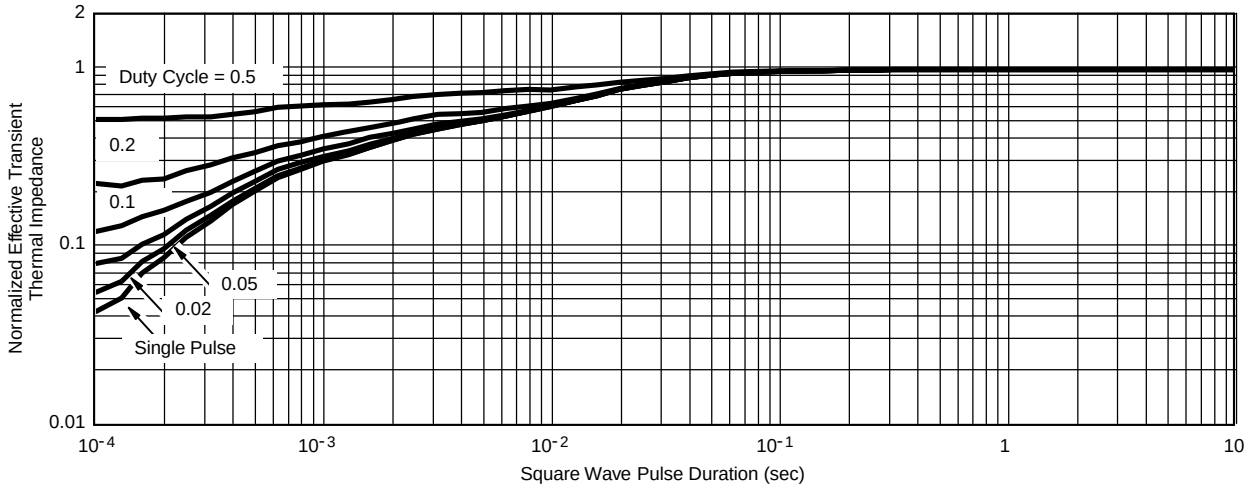


Current Derating*



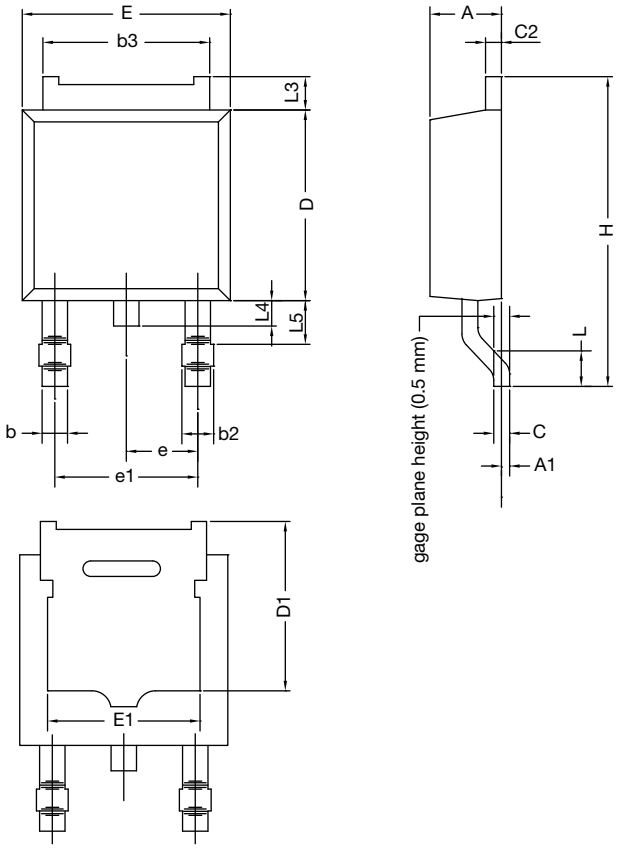
Power Derating

*The power dissipation P_D is based on $T_{J(max)}$ = 175 °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.



Normalized Thermal Transient Impedance, Junction-to-Case

TO-252AA CASE OUTLINE

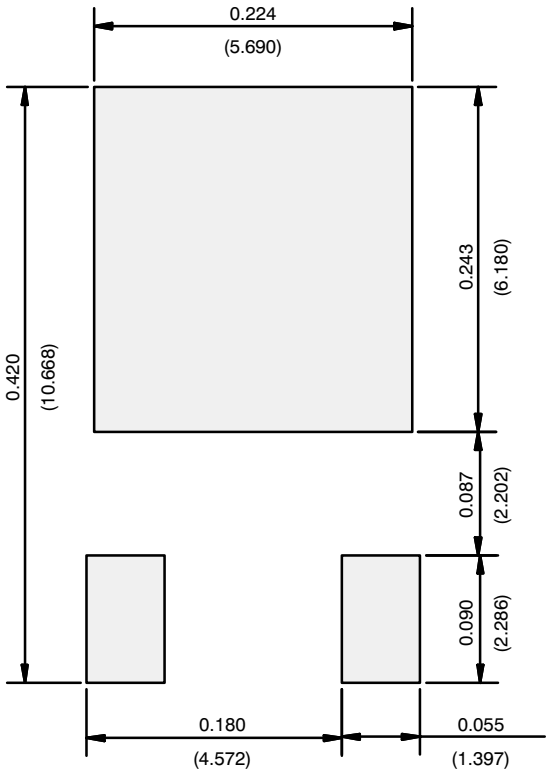


	MILLIMETERS		INCHES	
DIM.	**MIN.**	**MAX.**	**MIN.**	**MAX.**
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	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	1.14	1.52	0.045	0.060
ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347				

Note

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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