

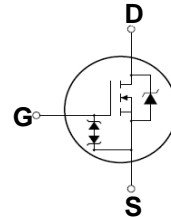
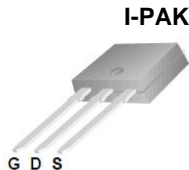
### Features

- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- Halogen free package
- JEDEC Qualification
- Improved ESD performance

$$V_{DSS} = 440 \text{ V @ } T_{jmax}$$

$$I_D = 3.4 \text{ A}$$

$$R_{DS(on)} = 1.6 \Omega(\text{max}) @ V_{GS} = 10 \text{ V}$$



Device	Package	Marking	Remark
GP1M005A040CG	D-PAK	GP1M005A040CG	RoHS
GP1M005A040PG	I-PAK	GP1M005A040PG	RoHS

### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	400	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	$T_C = 25 \text{ }^\circ\text{C}$	3.4*
		$T_C = 100 \text{ }^\circ\text{C}$	2.15*
Pulsed Drain Current (Note 1)	$I_{DM}$	13.6*	A
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	165	mJ
Repetitive Avalanche Current (Note 1)	$I_{AR}$	3.4	A
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	5.0	mJ
Power Dissipation	$P_D$	$T_C = 25 \text{ }^\circ\text{C}$	50
		Derate above 25 $^\circ\text{C}$	0.4
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~150	$^\circ\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	$T_L$	300	$^\circ\text{C}$

\* Limited only by maximum junction temperature

### Thermal Characteristics

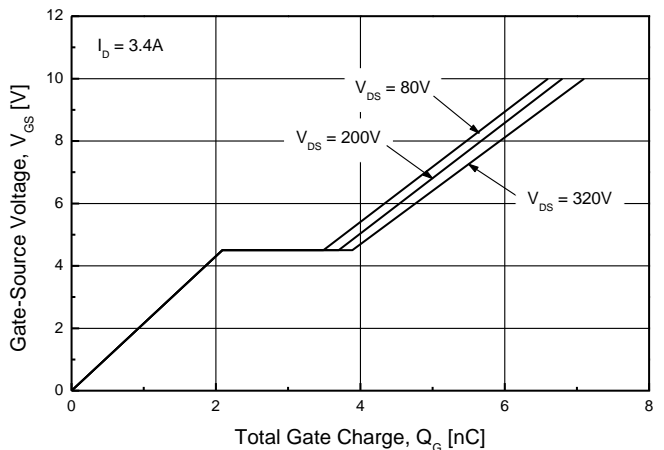
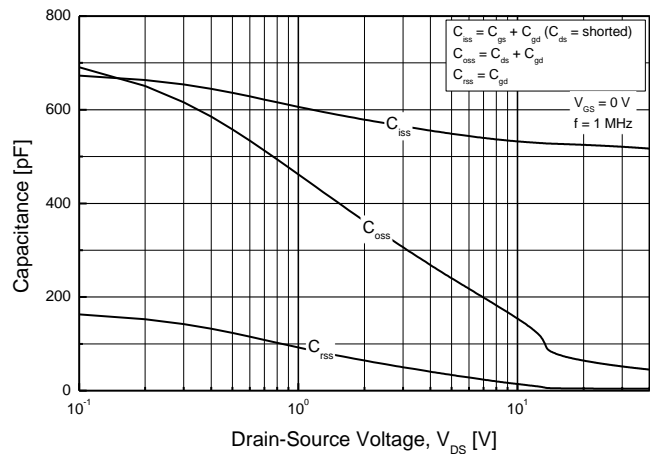
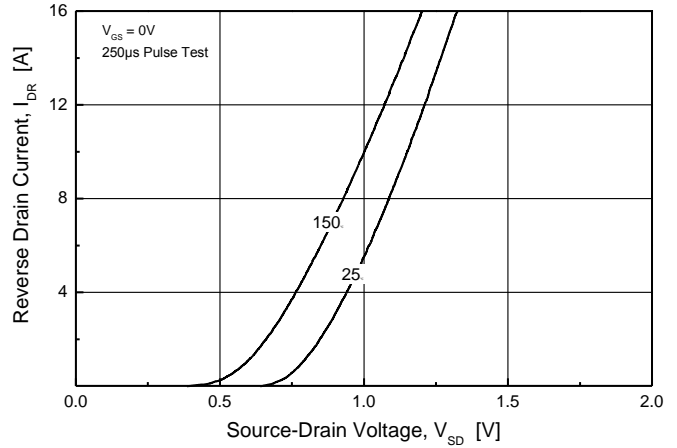
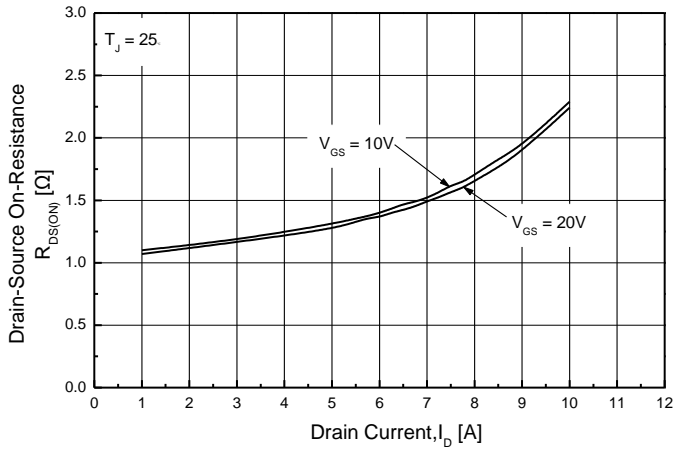
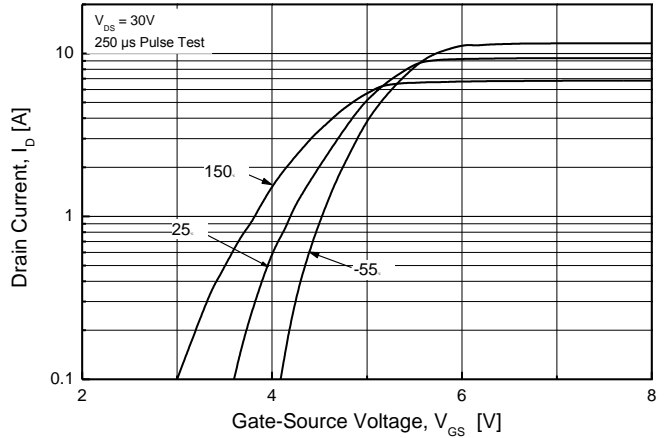
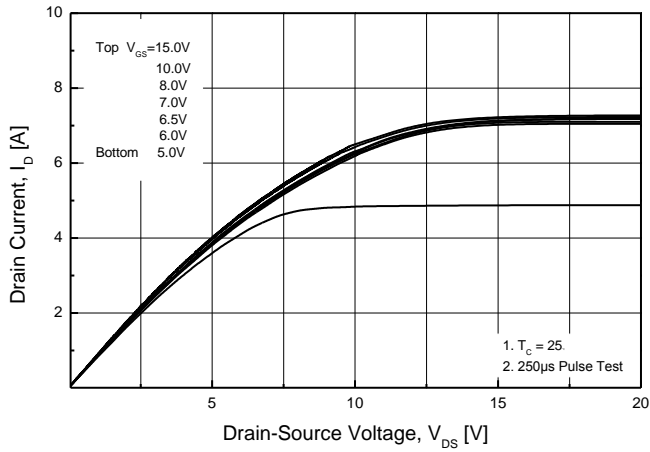
Parameter	Symbol	Value	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	110	$^\circ\text{C/W}$

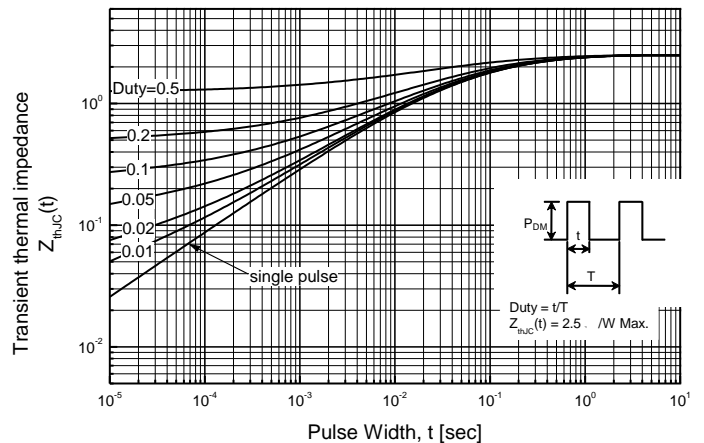
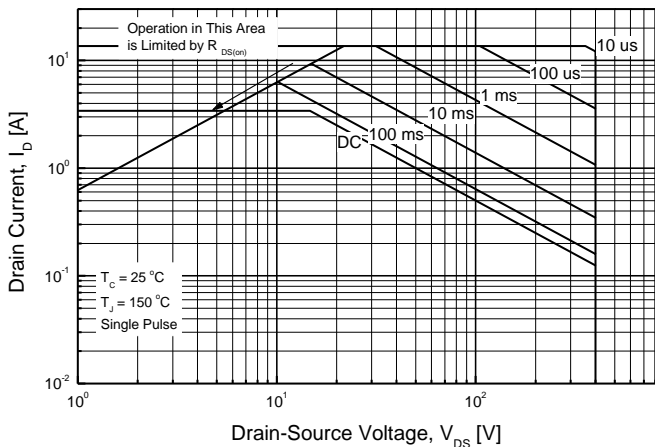
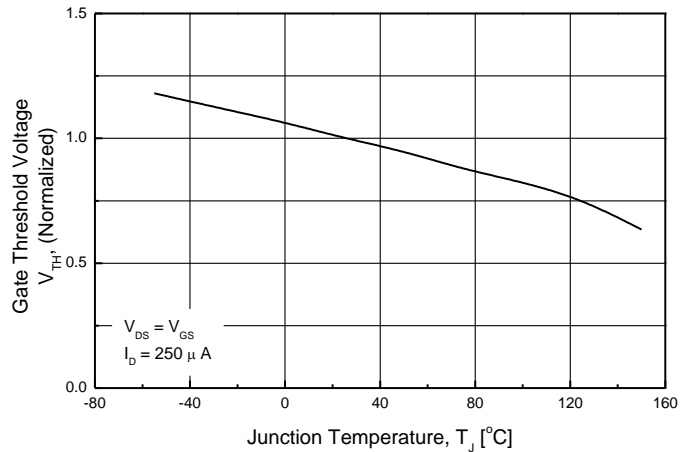
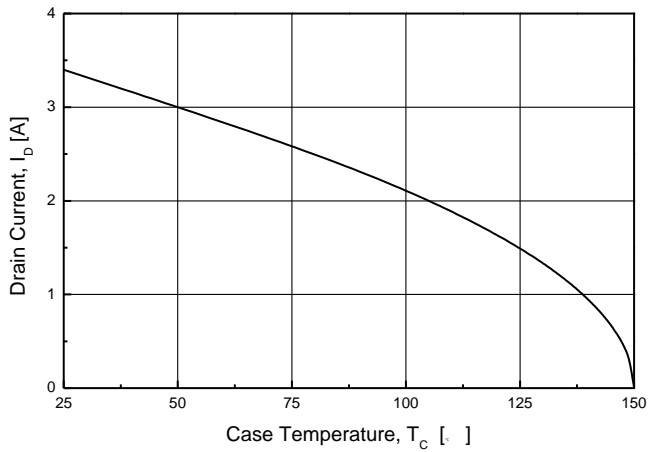
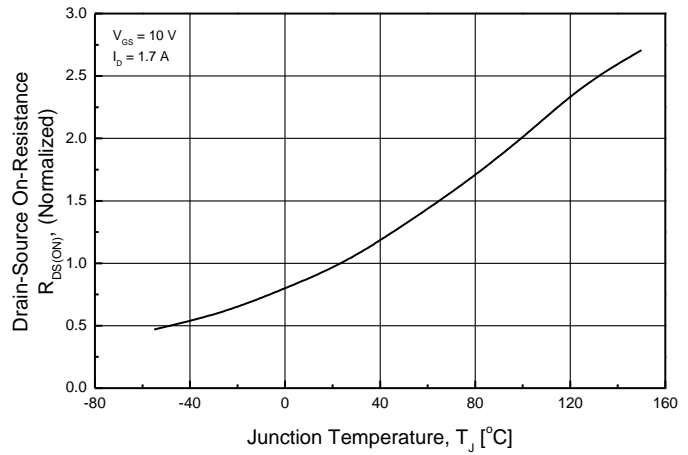
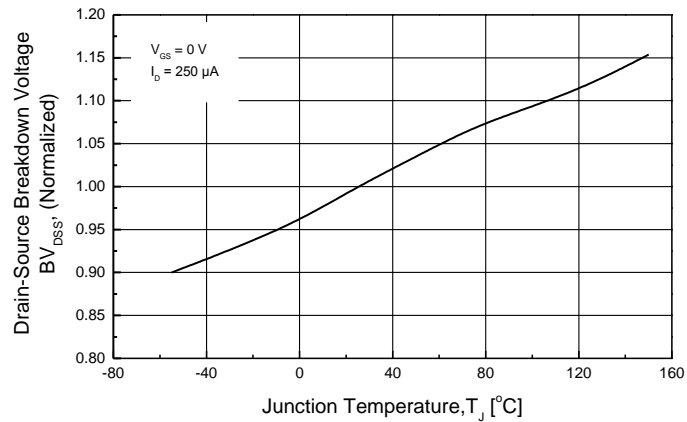
**Electrical Characteristics :  $T_C=25^\circ\text{C}$ , unless otherwise noted**

Parameter	Symbol	Test condition	Min	Typ	Max	Units
<b>OFF</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	400	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 320\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
Forward Gate-Source Leakage Current	$I_{GSSF}$	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	$\mu\text{A}$
Reverse Gate-Source Leakage Current	$I_{GSSR}$	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	$\mu\text{A}$
<b>ON</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2	--	4	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 1.7\text{ A}$	--	1.2	1.6	$\Omega$
Forward Transconductance <sup>(Note 4)</sup>	$g_{FS}$	$V_{DS} = 30\text{ V}, I_D = 1.7\text{ A}$	--	7	--	S
<b>DYNAMIC</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	522	--	pF
Output Capacitance	$C_{oss}$		--	56	--	pF
Reverse Transfer Capacitance	$C_{rss}$		--	4.3	--	pF
<b>SWITCHING</b>						
Turn-On Delay Time <sup>(Note 4,5)</sup>	$t_{d(on)}$	$V_{DD} = 200\text{ V}, I_D = 3.4\text{ A},$ $R_G = 25\ \Omega$	--	12	--	ns
Turn-On Rise Time <sup>(Note 4,5)</sup>	$t_r$		--	10	--	ns
Turn-Off Delay Time <sup>(Note 4,5)</sup>	$t_{d(off)}$		--	38	--	ns
Turn-Off Fall Time <sup>(Note 4,5)</sup>	$t_f$		--	9	--	ns
Total Gate Charge <sup>(Note 4,5)</sup>	$Q_g$	$V_{DS} = 320\text{ V}, I_D = 3.4\text{ A},$ $V_{GS} = 10\text{ V}$	--	7.1	--	nC
Gate-Source Charge <sup>(Note 4,5)</sup>	$Q_{gs}$		--	2.2	--	nC
Gate-Drain Charge <sup>(Note 4,5)</sup>	$Q_{gd}$		--	1.7	--	nC
<b>SOURCE DRAIN DIODE</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$	---	--	--	3.4	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$	---	--	--	13.6	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 3.4\text{ A}$	--	--	1.5	V
Reverse Recovery Time <sup>(Note 4)</sup>	$t_{rr}$	$V_{GS} = 0\text{ V}, I_S = 3.4\text{ A}$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	185	--	ns
Reverse Recovery Charge <sup>(Note 4)</sup>	$Q_{rr}$		--	0.8	--	$\mu\text{C}$

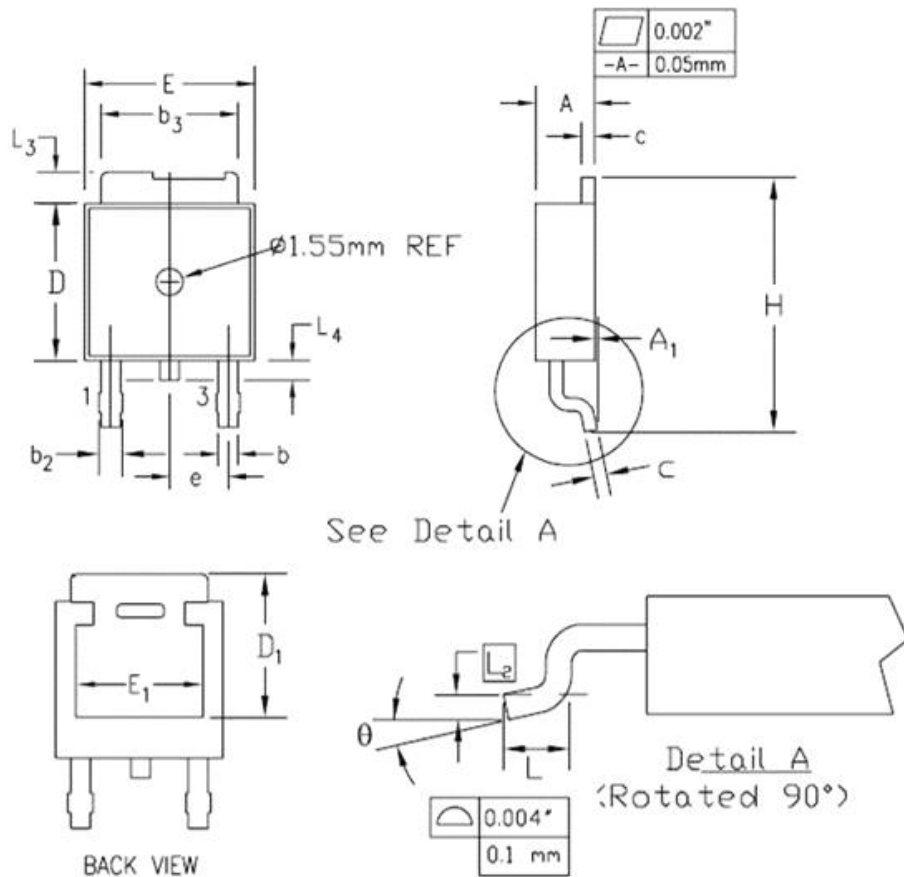
Note :

1. Repeated rating : Pulse width limited by safe operating area
2.  $L=25\text{mH}, I_{AS}=3.4\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
3.  $I_{SD} \leq 3.4\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DS}$ , Starting  $T_J=25^\circ\text{C}$
4. Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics



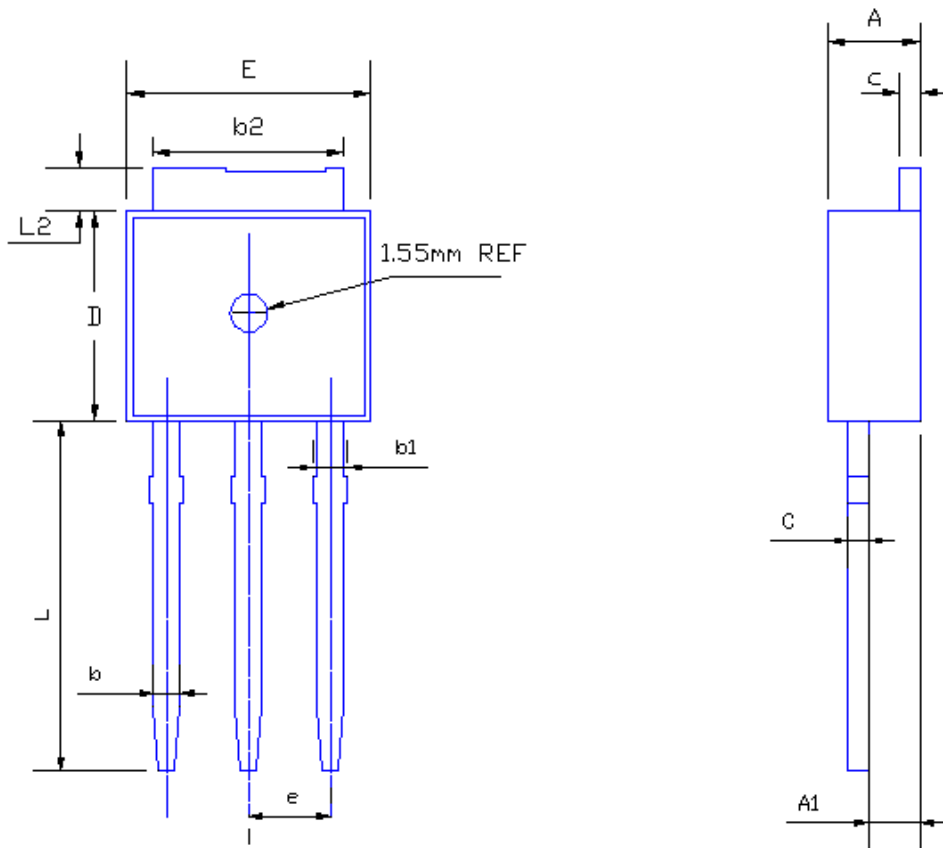


**TO-252 (D-PAK) MECHANICAL DATA**



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	0.086	0.094	2.19	2.38	
A <sub>1</sub>	—	0.005	—	0.13	
b	0.025	0.035	0.64	0.89	
b <sub>2</sub>	0.033	0.045	0.84	1.14	
b <sub>3</sub>	0.205	0.215	5.21	5.46	
c	0.018	0.024	0.46	0.61	
D	0.235	0.245	5.97	6.22	
D <sub>1</sub>	0.205	—	5.21	—	2
E	0.250	0.265	6.35	6.73	
E <sub>1</sub>	0.190	—	4.83	—	2
e	0.090 BSC		2.29 BSC		
H	0.380	0.410	9.65	10.41	
L	0.055	0.070	1.40	1.78	4
L <sub>2</sub>	0.020 BSC		0.51 BSC		
L <sub>3</sub>	0.035	0.050	0.89	1.27	
L <sub>4</sub>	0.025	0.040	0.64	1.01	3
θ	0°	8°	0°	8°	

## TO-251 (I-PAK) MECHANICAL DATA



SYMBOL	MILLIMETERS	
	MIN	MAX
A	2.19	2.38
A1	1.04	1.23
b	0.64	0.89
b1	0.84	1.14
b2	5.23	5.48
c	0.46	0.61
D	5.91	6.28
E	6.21	6.59
e	2.28 TYP	
L	8.89	9.65
L2	0.89	1.27

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