

## STD5NM50/STD5NM50-1

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1.25	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	100	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)	2.5	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	300	mJ

### ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> = 25 °C UNLESS OTHERWISE SPECIFIED) OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 µA, V <sub>GS</sub> = 0	500			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating, T <sub>C</sub> = 125 °C			1 10	µA µA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±30V			±100	nA

### ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA	3	4	5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.5A		0.7	0.8	Ω

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 25V <sub>x</sub> , I <sub>D</sub> = 2.5A		3.5		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		415		pF
C <sub>oss</sub>	Output Capacitance			88		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			12		pF
C <sub>oss</sub> eq. (2)	Equivalent Output Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 400V		50		pF
R <sub>G</sub>	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		3		Ω

1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.

2. C<sub>oss</sub> eq. is defined as a constant equivalent capacitance giving the same charging time as C<sub>oss</sub> when V<sub>DS</sub> increases from 0 to 80% V<sub>DSS</sub>.

**ELECTRICAL CHARACTERISTICS (CONTINUED)**  
**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 250V$ , $I_D = 2.5A$		16		ns
$t_r$	Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see test circuit, Figure 3)		8		ns
$Q_g$	Total Gate Charge	$V_{DD} = 400V$ , $I_D = 7.5A$		13		nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = 10V$		5		nC
$Q_{gd}$	Gate-Drain Charge			6		nC

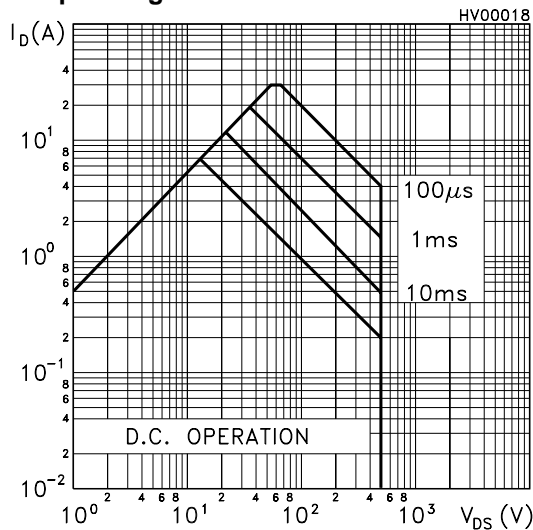
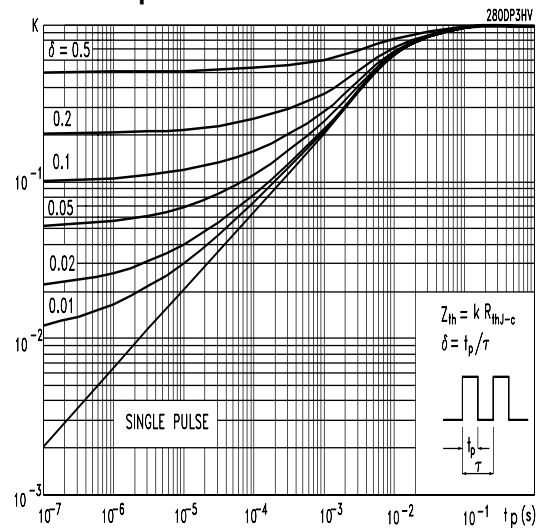
**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 400V$ , $I_D = 5A$ ,		14		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see test circuit, Figure 5)		6		ns
$t_c$	Cross-over Time			13		ns

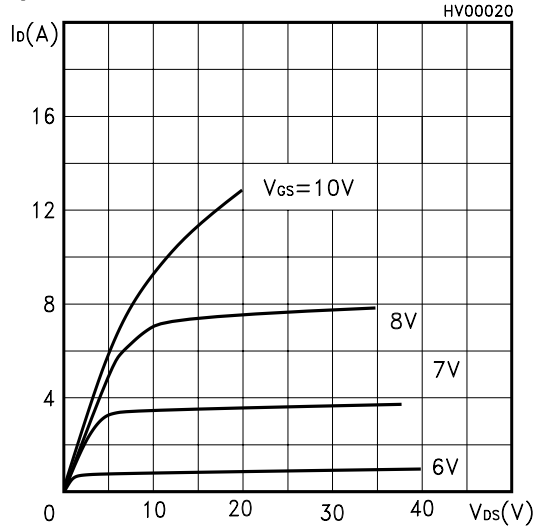
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				7.5	A
$I_{SDM(2)}$	Source-drain Current (pulsed)				30	A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 7.5A$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 5A$ , $di/dt = 100A/\mu s$ ,		185		ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 100V$ , $T_j = 25^\circ C$ (see test circuit, Figure 5)		1.1		$\mu C$
$I_{RRM}$	Reverse Recovery Current			11.5		A
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 5A$ , $di/dt = 100A/\mu s$ ,		270		ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 100V$ , $T_j = 150^\circ C$ (see test circuit, Figure 5)		1.6		$\mu C$
$I_{RRM}$	Reverse Recovery Current			12		A

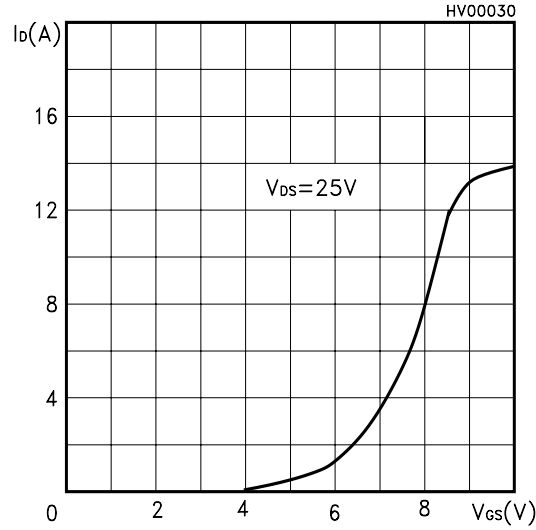
Note: 1. Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.  
 2. Pulse width limited by safe operating area.

**Safe Operating Area**

**Thermal Impedance**


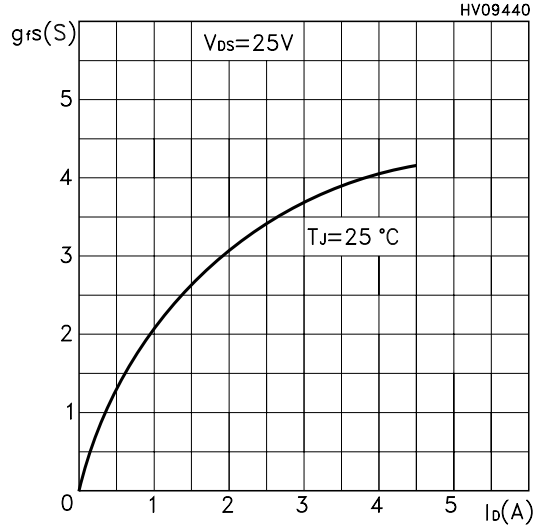
Output Characteristics



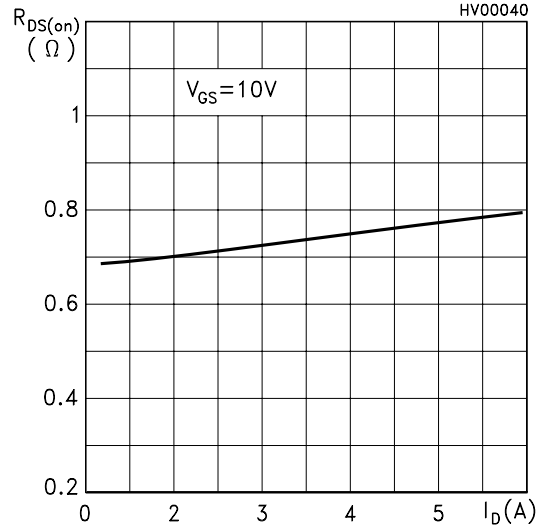
Transfer Characteristics



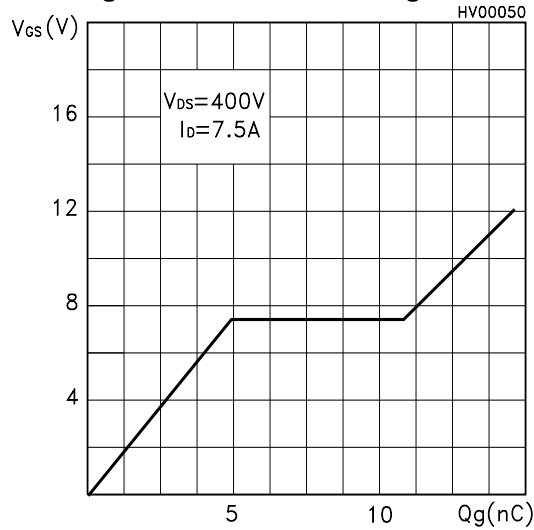
Transconductance



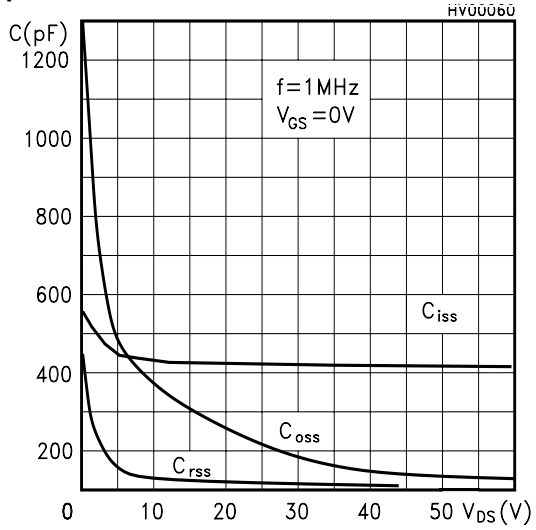
Static Drain-source On Resistance



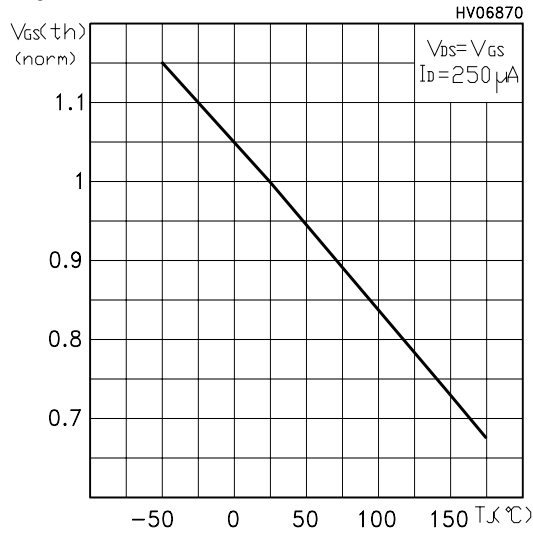
Gate Charge vs Gate-source Voltage



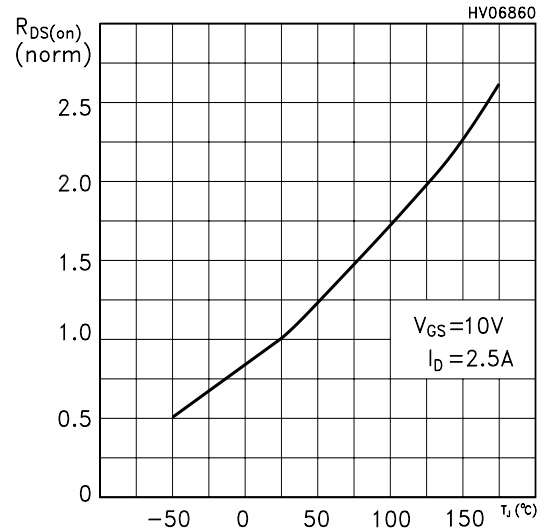
Capacitance Variations



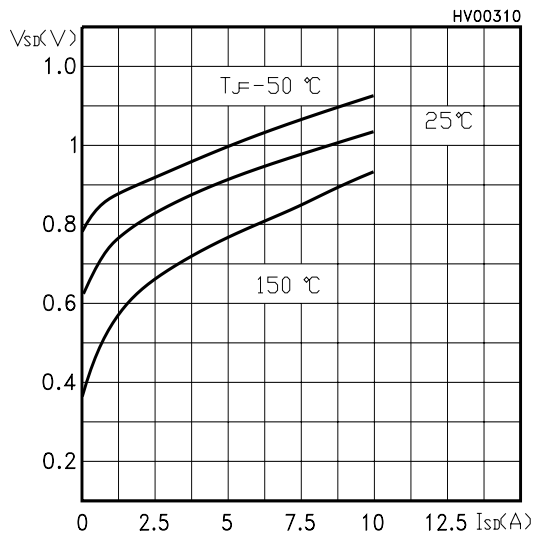
**Normalized Gate Threshold Voltage vs Temperature**



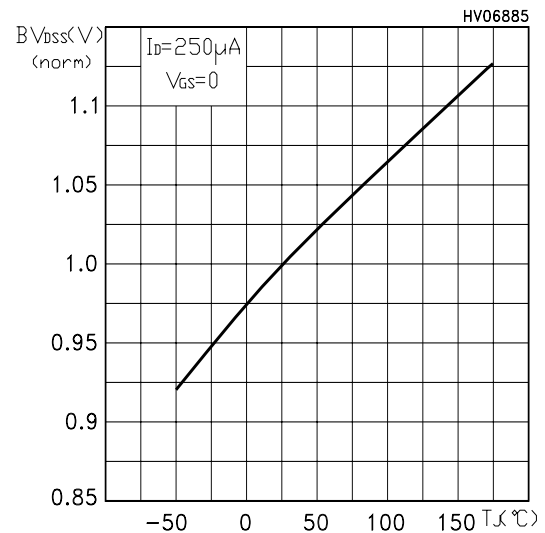
**Normalized On Resistance vs Temperature**



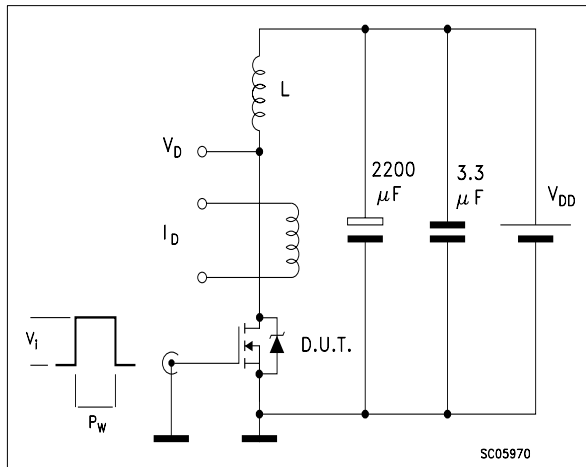
**Source-drain Diode Forward Characteristics**



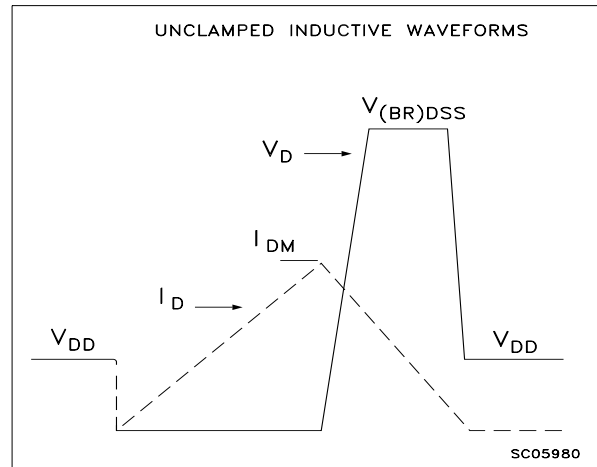
**Normalized BVDSS vs Temperature**



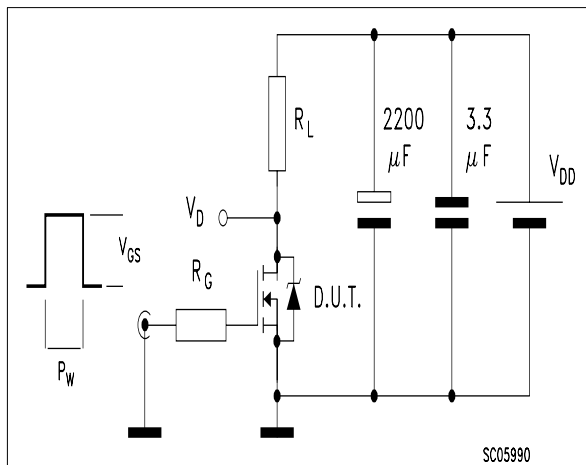
**Fig. 1: Unclamped Inductive Load Test Circuit**



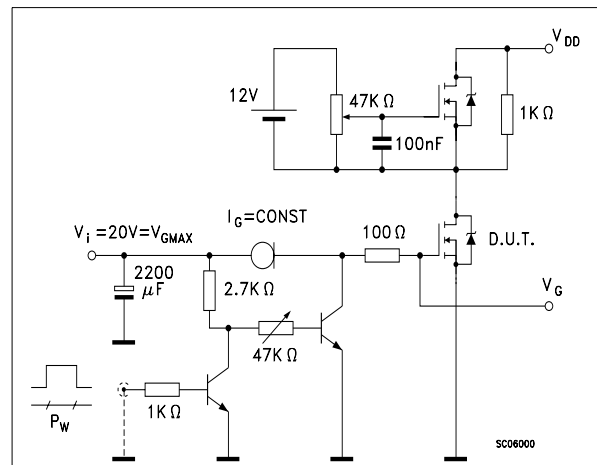
**Fig. 2: Unclamped Inductive Waveform**



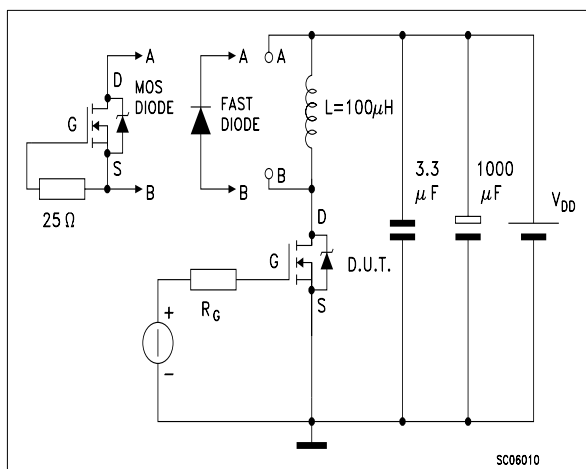
**Fig. 3: Switching Times Test Circuit For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

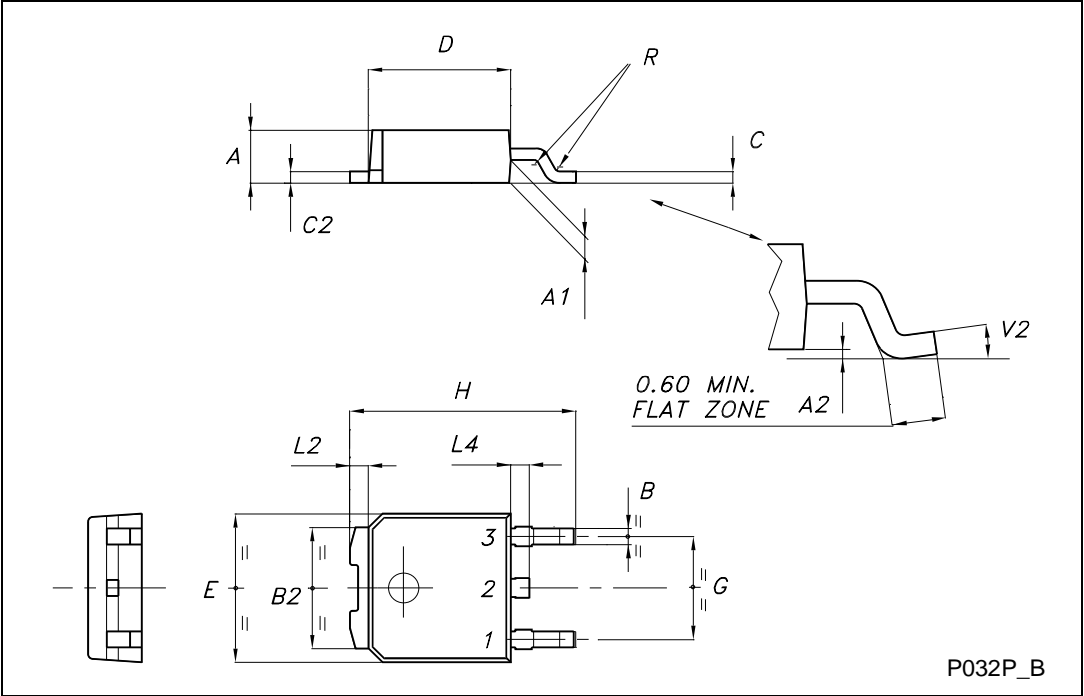


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



TO-252 (DPAK) MECHANICAL DATA

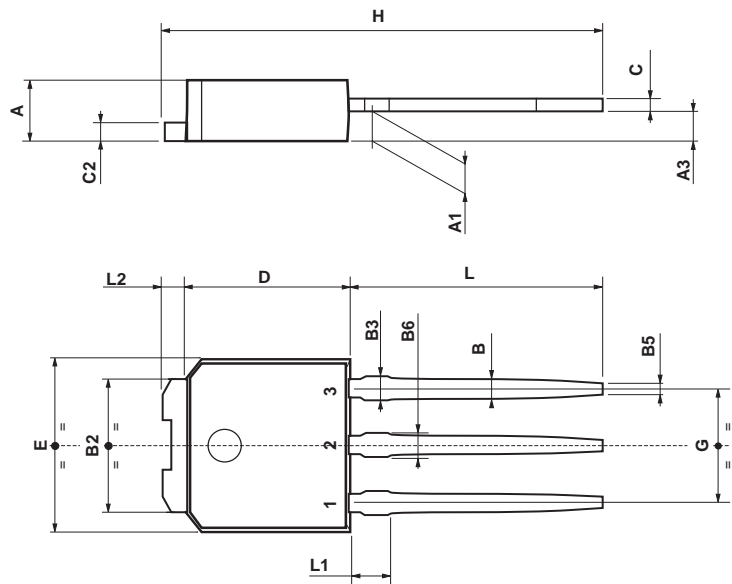
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



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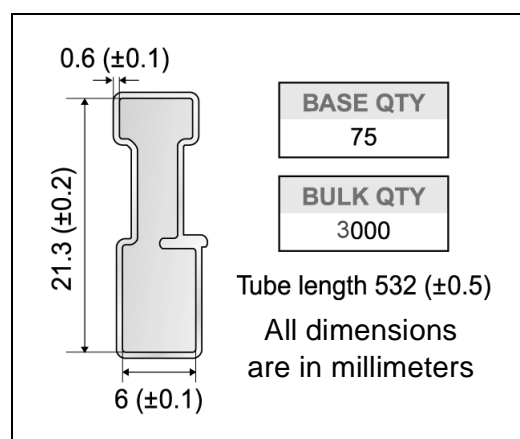
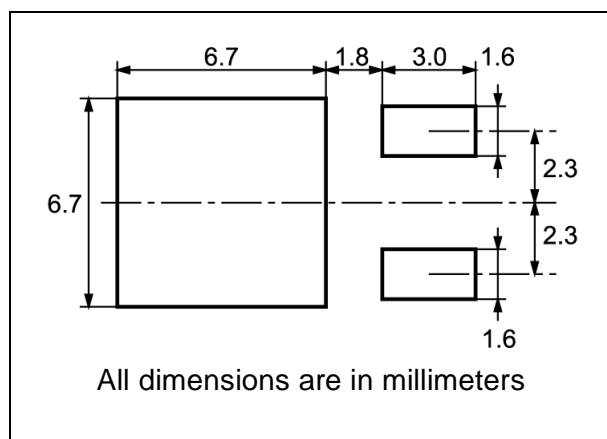
TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039

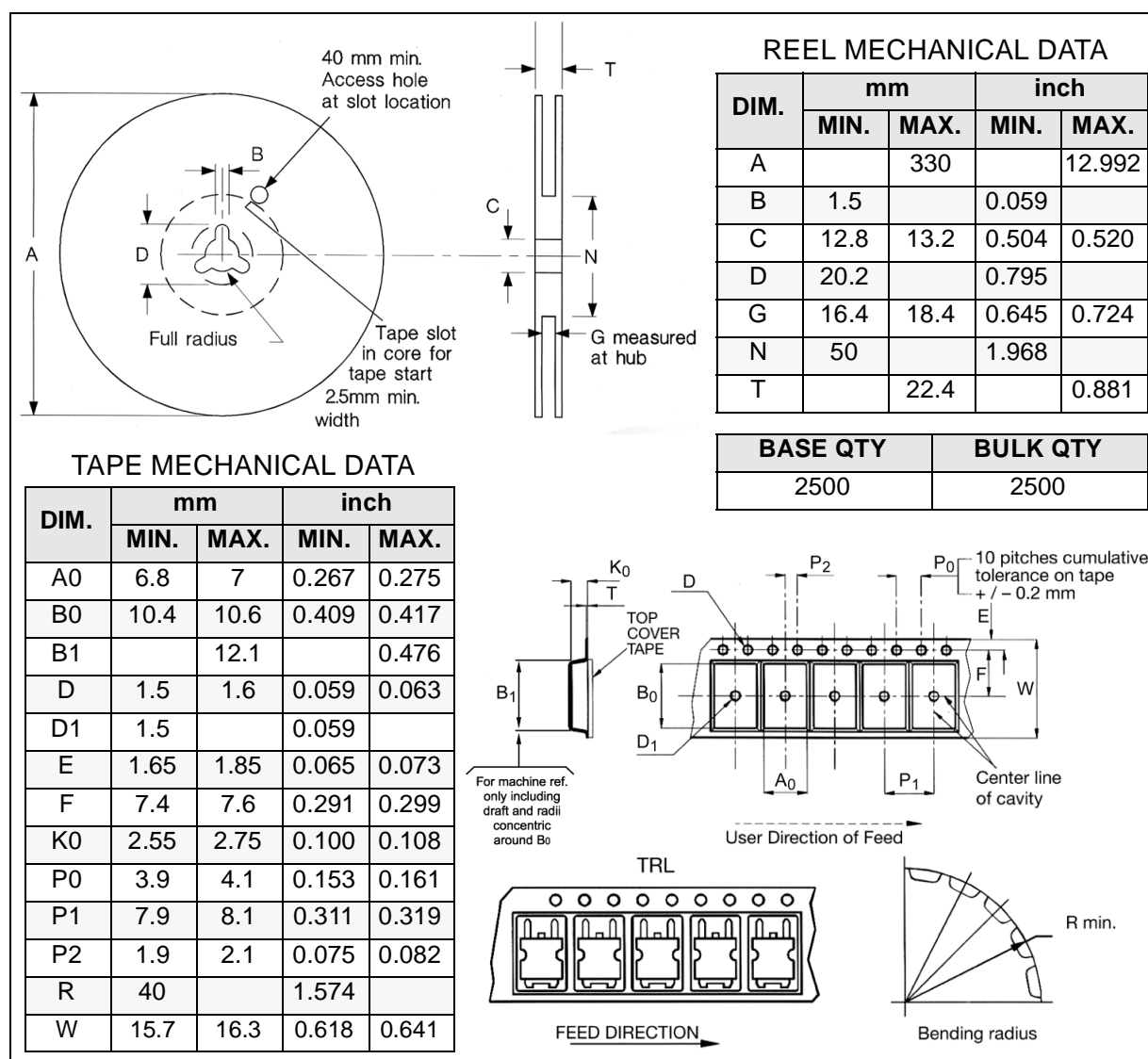


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**TUBE SHIPMENT (no suffix)\***



### TAPE AND REEL SHIPMENT (suffix "T4")\*



\* on sales type



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