



STB9NC60 STB9NC60-1

N-CHANNEL 600V - 0.6Ω - 9A - D²PAK/I²PAK
PowerMesh™II MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STB9NC60	600 V	< 0.75 Ω	9.0 A
STB9NC60-1	600 V	< 0.75 Ω	9.0 A

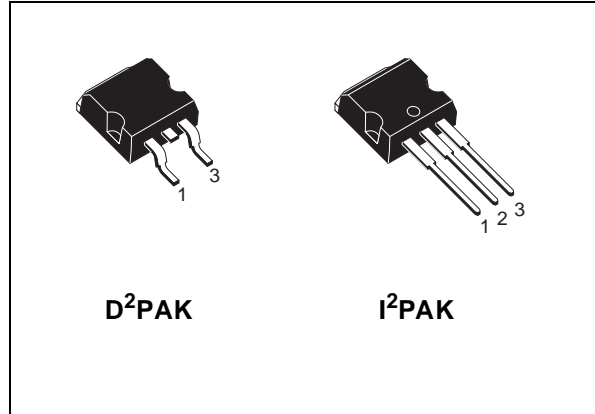
- TYPICAL R_{DS(on)} = 0.6 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED

DESCRIPTION

The PowerMESH™II is the evolution of the first generation of MESH OVERLAY™. The layout refinements introduced greatly improve the Ron*area figure of merit while keeping the device at the leading edge for what concerns switching speed, gate charge and ruggedness.

APPLICATIONS

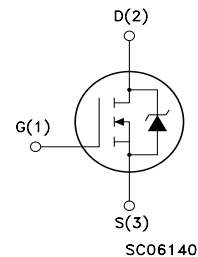
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVER



D²PAK

I²PAK

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	600	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	600	V
V _{GS}	Gate- source Voltage	±30	V
I _D	Drain Current (continuous) at T _C = 25°C	9	A
I _D	Drain Current (continuous) at T _C = 100°C	5.7	A
I _{DM} (1)	Drain Current (pulsed)	36	A
P _{TOT}	Total Dissipation at T _C = 25°C	125	W
	Derating Factor	1.0	W/°C
dv/dt	Peak Diode Recovery voltage slope	3.5	V/ns
T _{stg}	Storage Temperature	- 55 to 150	°C
T _j	Max. Operating Junction Temperature		

(*)Pulse width limited by safe operating area

(1)I_{SD} ≤ 9A, di/dt ≤ 100A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STB9NC60 / STPBNC60-1

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.0	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
T _I	Maximum Lead Temperature For Soldering Purpose	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	9	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	850	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C			1 50	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ±30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2	3	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 4.5 A		0.6	0.75	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} = 20 V, I _D = 4.5A		9		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		1420		pF
C _{oss}	Output Capacitance			205		pF
C _{rss}	Reverse Transfer Capacitance			35		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 300V, I_D = 4.5 A$ $R_G = 4.7\Omega, V_{GS} = 10V$		20		ns
t_r	Rise Time	(see test circuit, Figure 3)		16		ns
Q_g	Total Gate Charge	$V_{DD} = 480V, I_D = 9.0 A,$ $V_{GS} = 10V$		55	77	nC
Q_{gs}	Gate-Source Charge			4.5		nC
Q_{gd}	Gate-Drain Charge			31		nC

SWITCHING OFF

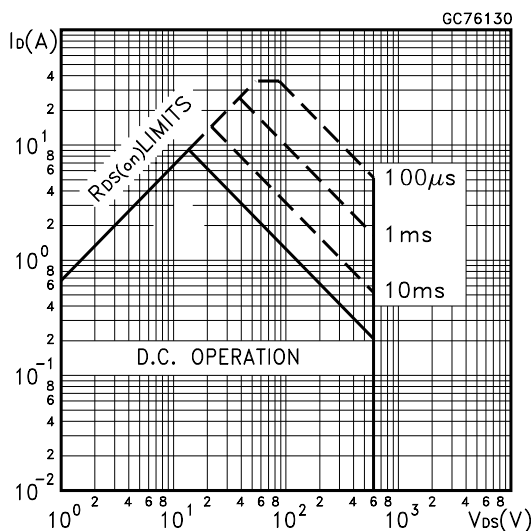
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off Delay Time	$V_{DD} = 300 V, I_D = 4.5 A$ $R_G = 4.7\Omega, V_{GS} = 10 V$		64		ns
t_f	Fall Time	(Resistive Load see, Figure 3)		32		ns
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 480V, I_D = 9.0 A,$ $R_G = 4.7\Omega, V_{GS} = 10V$		19		ns
t_f	Fall Time	(Inductive Load see, Figure 5)		13		ns
t_c	Cross-over Time			32		ns

SOURCE DRAIN DIODE

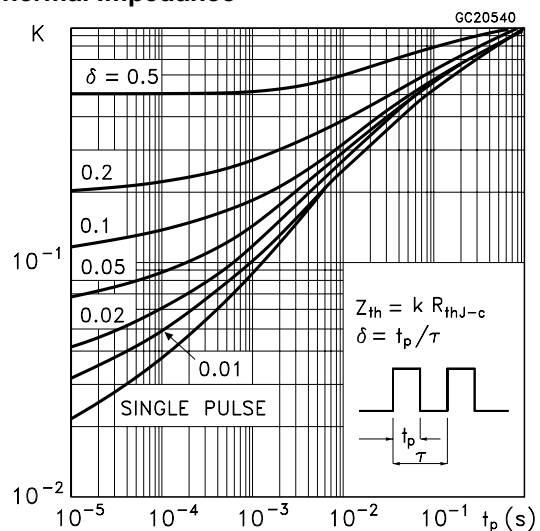
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				9.0	A
$I_{SDM} (2)$	Source-drain Current (pulsed)				36	A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 9 A, V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 9 A, di/dt = 100A/\mu s,$ $V_{DD} = 100V, T_j = 150^\circ C$		600		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, Figure 5)		4.7		μC
I_{RRM}	Reverse Recovery Current			15.5		A

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

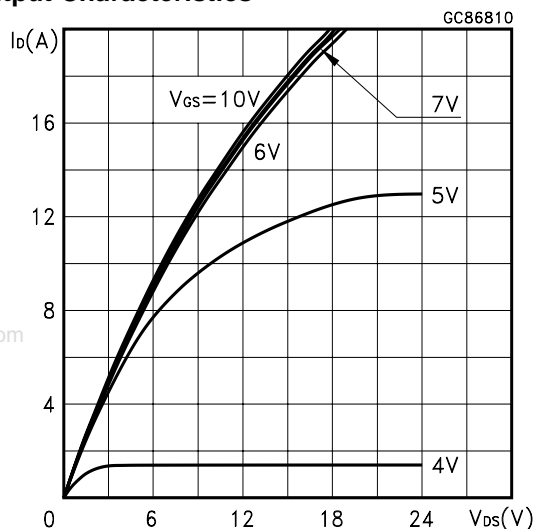
Safe Operating Area



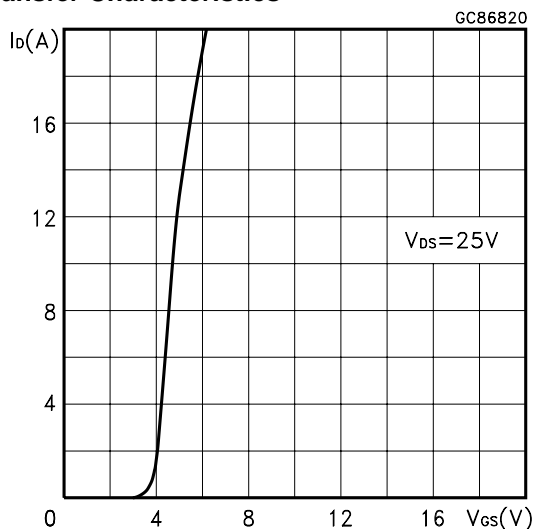
Thermal Impedance



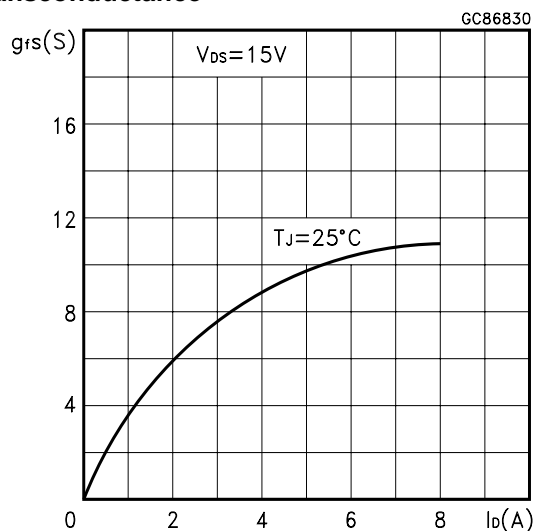
Output Characteristics



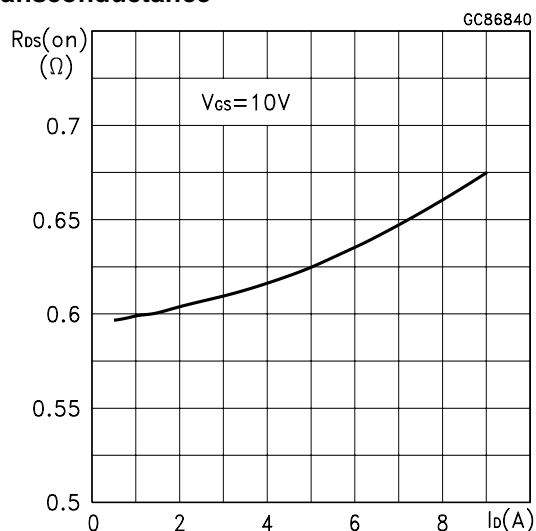
Transfer Characteristics



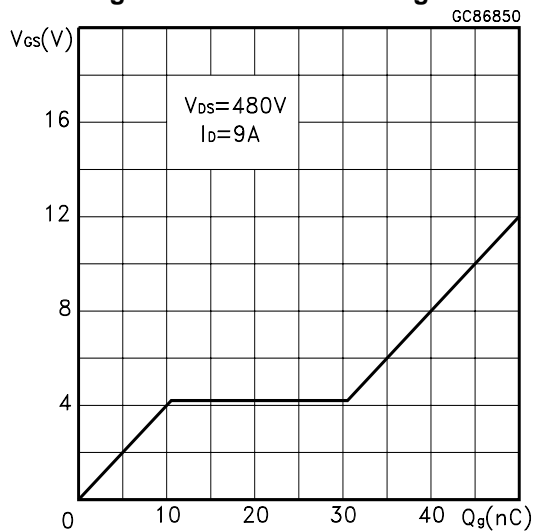
Transconductance



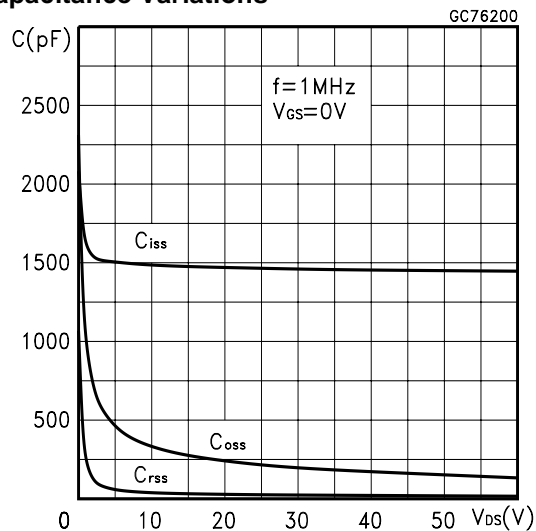
Transconductance



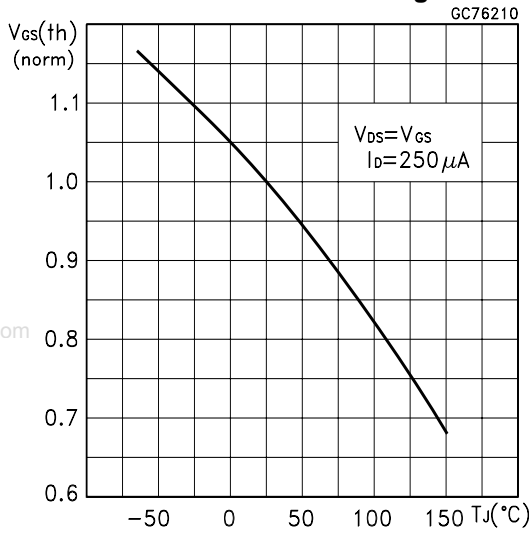
Gate Charge vs Gate-source Voltage



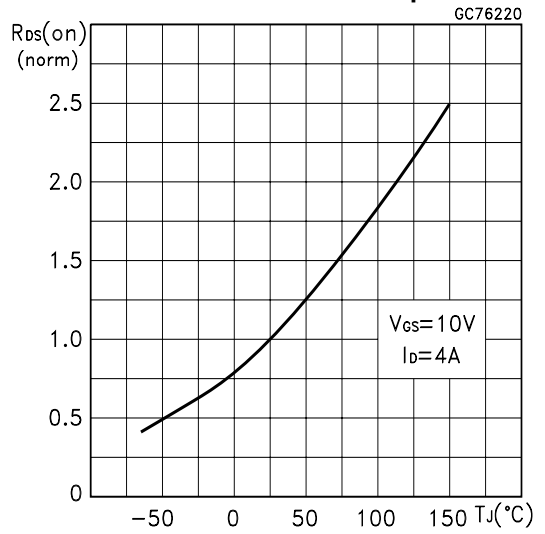
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

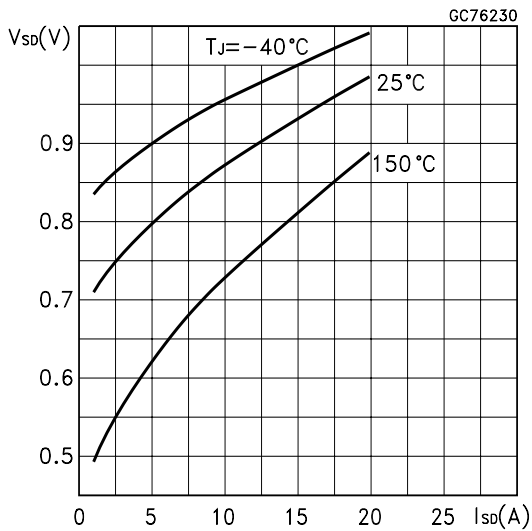


Fig. 1: Unclamped Inductive Load Test Circuit

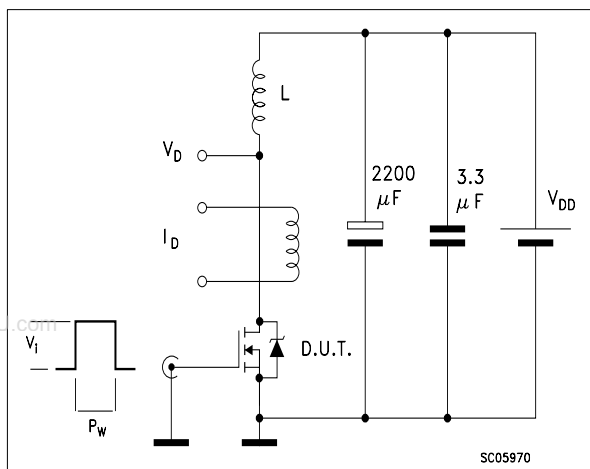


Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuit For Resistive Load

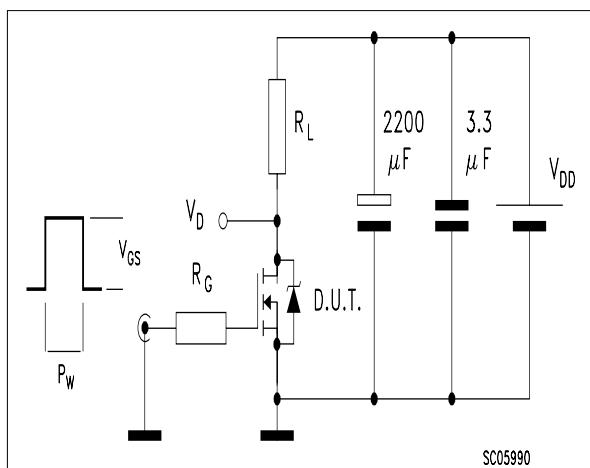
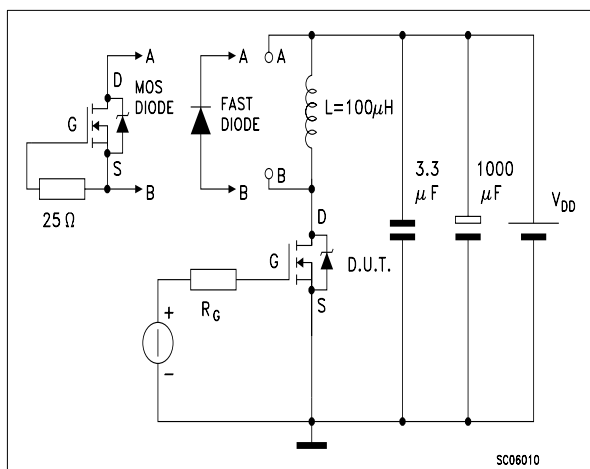


Fig. 4: Gate Charge test Circuit

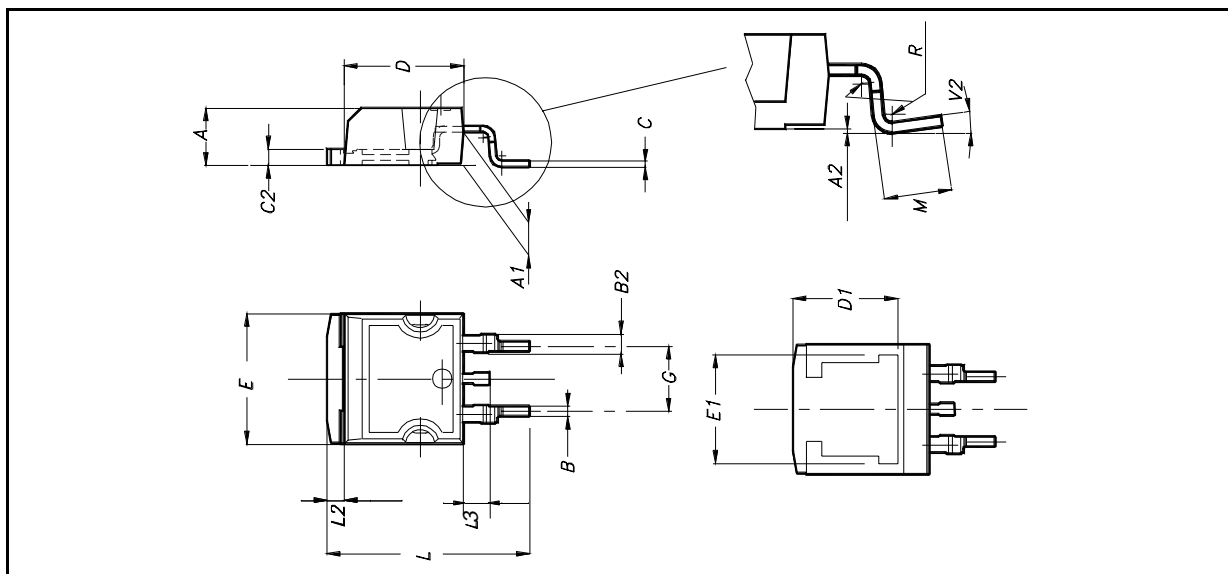


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



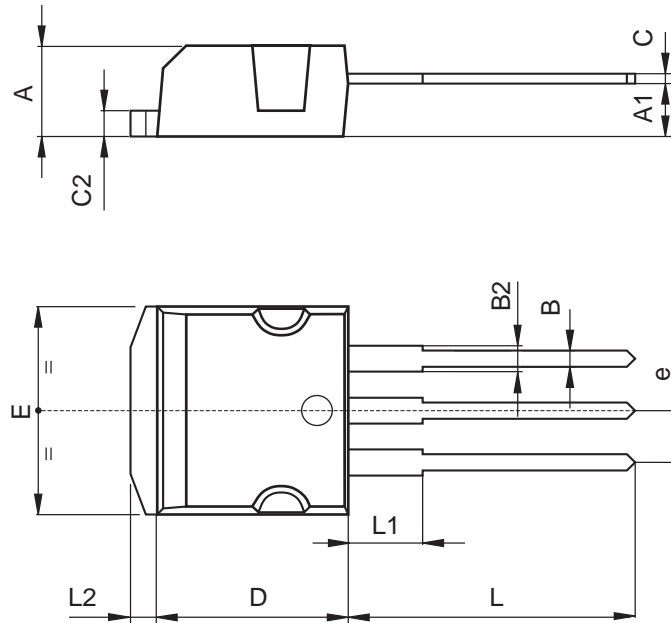
D²PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°			



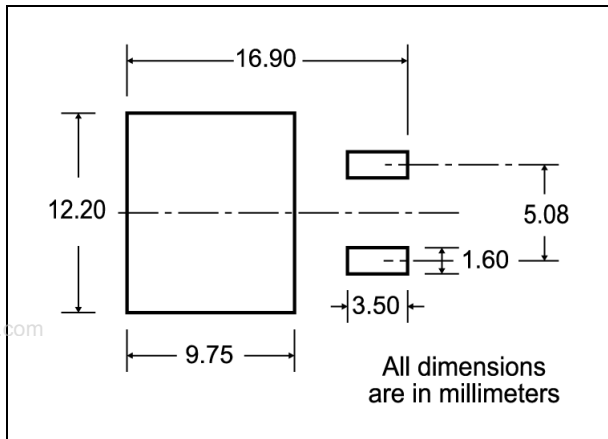
TO-262 (I²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
e	2.4		2.7	0.094		0.106
E	10		10.4	0.393		0.409
L	13.1		13.6	0.515		0.531
L1	3.48		3.78	0.137		0.149
L2	1.27		1.4	0.050		0.055

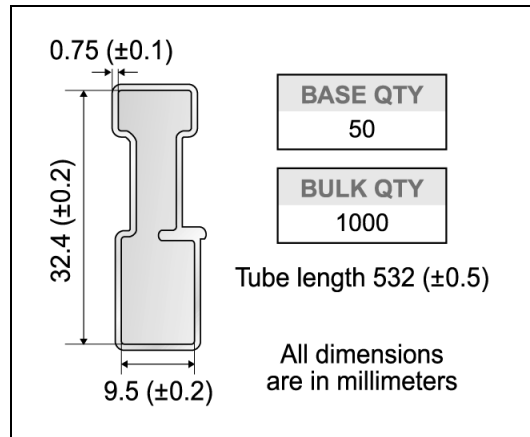


P011P5/E

D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape mechanical data. The tape has a width of 25 mm. The distance from the center of the mounting holes to the edge of the tape is 10.5 mm (A0). The distance between the centers of the mounting holes is 15.7 mm (B0). The distance from the center of the mounting holes to the edge of the tape is 1.5 mm (D). The distance from the center of the mounting holes to the edge of the tape is 1.59 mm (D1). The distance from the center of the mounting holes to the edge of the tape is 1.65 mm (E). The distance from the center of the mounting holes to the edge of the tape is 11.4 mm (F). The distance from the center of the mounting holes to the edge of the tape is 4.8 mm (K0). The distance from the center of the mounting holes to the edge of the tape is 3.9 mm (P0). The distance from the center of the mounting holes to the edge of the tape is 11.9 mm (P1). The distance from the center of the mounting holes to the edge of the tape is 1.9 mm (P2). The distance from the center of the mounting holes to the edge of the tape is 50 (R). The distance from the center of the mounting holes to the edge of the tape is 0.25 mm (T). The distance from the center of the mounting holes to the edge of the tape is 23.7 mm (W). The distance from the center of the mounting holes to the edge of the tape is 10.7 mm (MAX. mm). The distance from the center of the mounting holes to the edge of the tape is 0.421 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.618 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.059 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.063 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.073 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.449 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.456 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.189 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.161 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.468 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.476 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.075 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.082 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 1.574 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.0098 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.0137 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.933 inch (MAX. inch). The distance from the center of the mounting holes to the edge of the tape is 0.956 inch (MAX. inch).

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

* on sales type



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