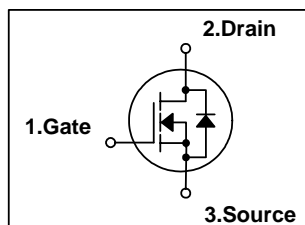


## N-Channel MOSFET

### Features

- $R_{DS(on)}$  (Max 0.4 )@ $V_{GS}=10V$
- Gate Charge (Typical 44nC)
- Improved dv/dt Capability
- High ruggedness
- 100% Avalanche Tested



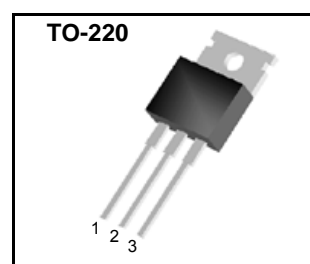
$BV_{DSS} = 200V$

$R_{DS(ON)} = 0.4 \text{ ohm}$

$I_D = 9A$

### General Description

This N-channel enhancement mode field-effect power transistor using DI semiconductor's advanced planar stripe, DMOS technology intended for off-line switch mode power supply. Also, especially designed to minimize  $r_{ds(on)}$ , low gate charge and high rugged avalanche characteristics. The TO-220 pkg is well suited for DC-DC converter and S-Correction in color-monitor system.



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain to Source Voltage	200	V
$I_D$	Continuous Drain Current(@ $T_C = 25^\circ C$ )	9	A
	Continuous Drain Current(@ $T_C = 100^\circ C$ )	5.8	A
$I_{DM}$	Drain Current Pulsed (Note 1)	36	A
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	180	mJ
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	7.8	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
$P_D$	Total Power Dissipation(@ $T_C = 25^\circ C$ )	78	W
	Derating Factor above $25^\circ C$	0.62	W/ $^\circ C$
$T_{STG}, T_J$	Operating Junction Temperature & Storage Temperature	- 55 ~ 150	$^\circ C$
$T_L$	Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	300	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Value			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	-	1.61	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	-	0.5	-	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	62.5	$^\circ C/W$

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## Electrical Characteristics (T<sub>C</sub> = 25 °C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250uA	200	-	-	V
BV <sub>DSS</sub> / T <sub>J</sub>	Breakdown Voltage Temperature coefficient	I <sub>D</sub> = 250uA, referenced to 25 °C	-	0.20	-	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V	-	-	1	uA
		V <sub>DS</sub> = 160V, T <sub>C</sub> = 125 °C	-	-	10	uA
I <sub>GSS</sub>	Gate-Source Leakage, Forward	V <sub>GS</sub> = 25V, V <sub>DS</sub> = 0V	-	-	100	nA
	Gate-source Leakage, Reverse	V <sub>GS</sub> = -25V, V <sub>DS</sub> = 0V	-	-	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA	2.0	-	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-state Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.5A	-	0.34	0.4	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25V, f = 1MHz	-	450	560	pF
C <sub>oss</sub>	Output Capacitance		-	95	150	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	55	90	
<b>Dynamic Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 100V, I <sub>D</sub> = 9A, R <sub>G</sub> = 25 <b>see fig. 13.</b> (Note 4, 5)	-	15	30	ns
t <sub>r</sub>	Rise Time		-	70	140	
t <sub>d(off)</sub>	Turn-off Delay Time		-	50	90	
t <sub>f</sub>	Fall Time		-	60	120	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 160V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A <b>see fig. 12.</b> (Note 4, 5)	-	20	30	nC
Q <sub>gs</sub>	Gate-Source Charge		-	4	-	
Q <sub>gd</sub>	Gate-Drain Charge(Miller Charge)		-	8	-	

## Source-Drain Diode Ratings and Characteristics

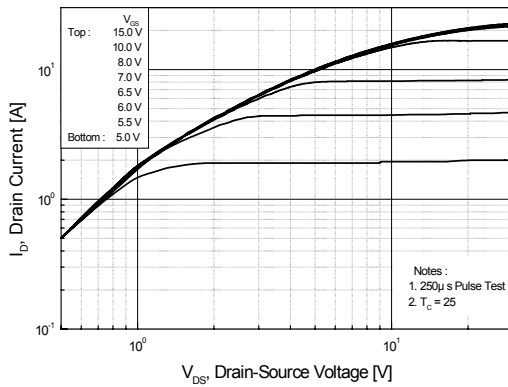
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I <sub>S</sub>	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	9	A
I <sub>SM</sub>	Pulsed Source Current		-	-	36	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 9A, V <sub>GS</sub> = 0V	-	-	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = 9A, V <sub>GS</sub> = 0V, di/dt = 100A/us	-	170	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	0.9	-	uC

### NOTES

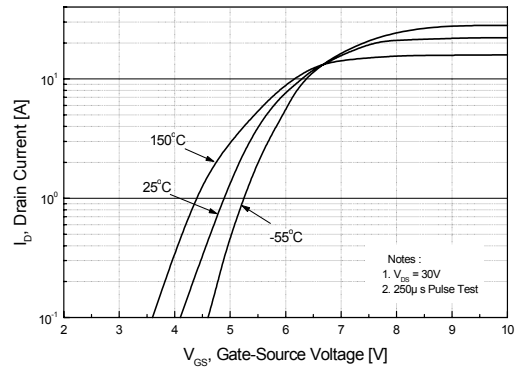
1. Repeatability rating : pulse width limited by junction temperature
2. L = 3.3mH, I<sub>AS</sub> = 9A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 50 Ω, Starting T<sub>J</sub> = 25 °C
3. I<sub>SD</sub> = 9A, di/dt = 300A/us, V<sub>DD</sub> = BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25 °C
4. Pulse Test : Pulse Width = 300us, Duty Cycle = 2%
5. Essentially independent of operating temperature.

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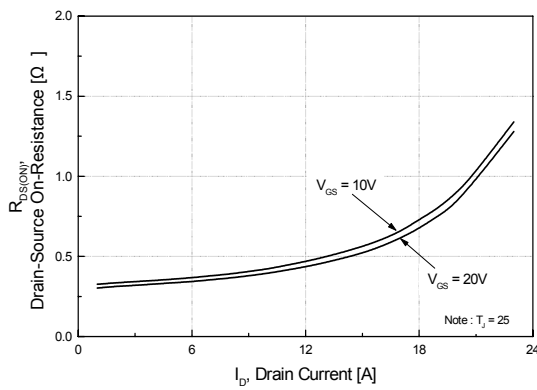
**Fig 1. On-State Characteristics**



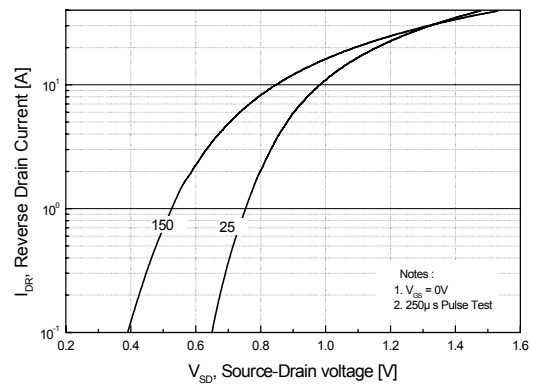
**Fig 2. Transfer Characteristics**



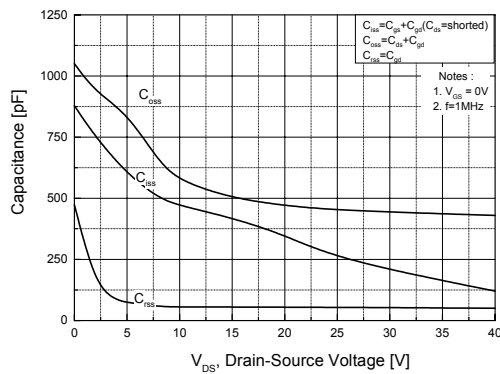
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



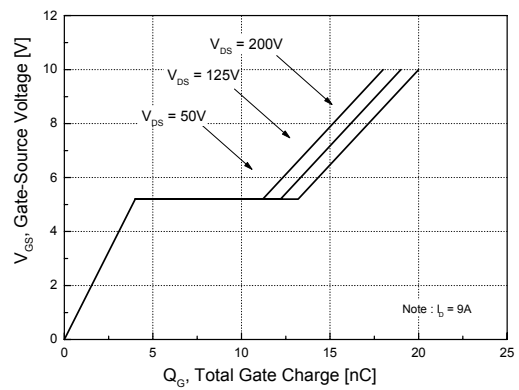
**Fig 4. On State Current vs. Allowable Case Temperature**



**Fig 5. Capacitance Characteristics ( Non-Repetitive )**

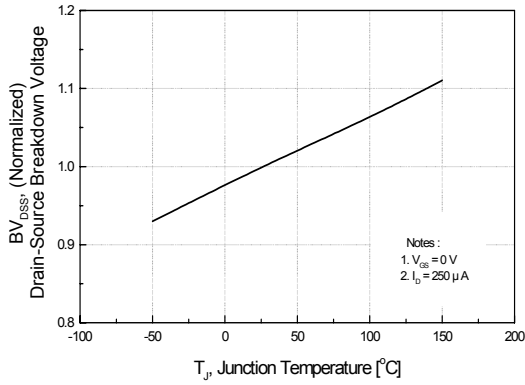


**Fig 6. Gate Charge Characteristics**

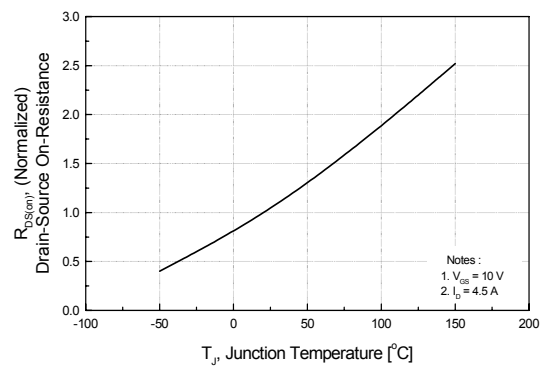


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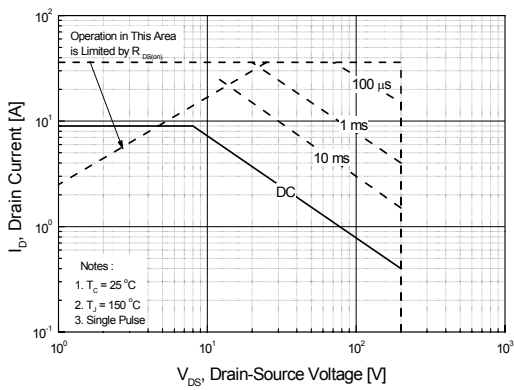
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



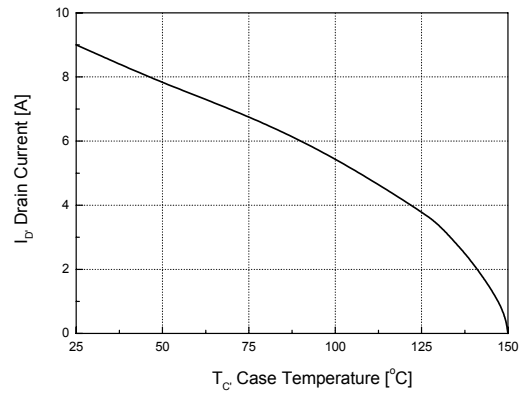
**Fig 8. On-Resistance Variation vs. Junction Temperature**



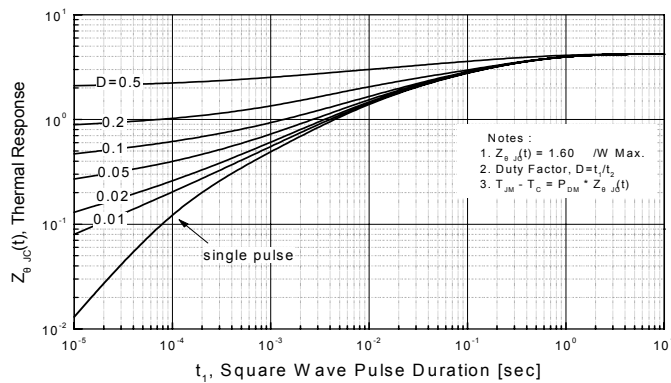
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Maximum Drain Current vs. Case Temperature**



**Fig 11. Transient Thermal Response Curve**



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Fig. 12. Gate Charge Test Circuit & Waveforms

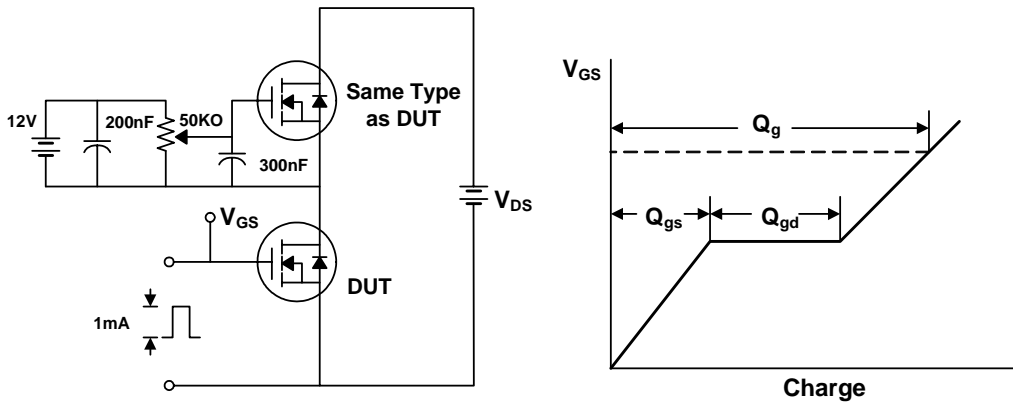


Fig 13. Switching Time Test Circuit & Waveforms

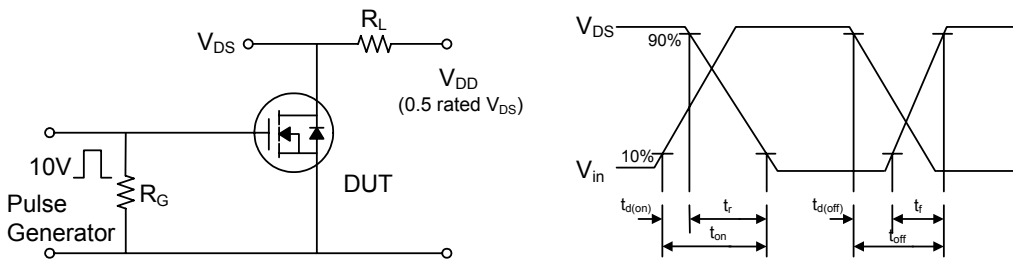
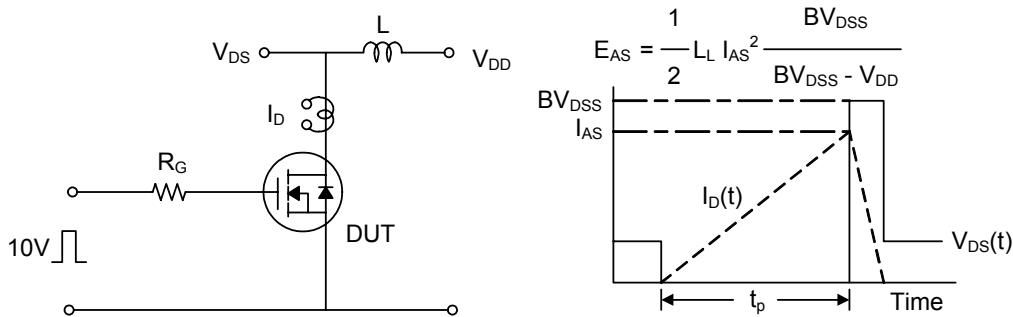
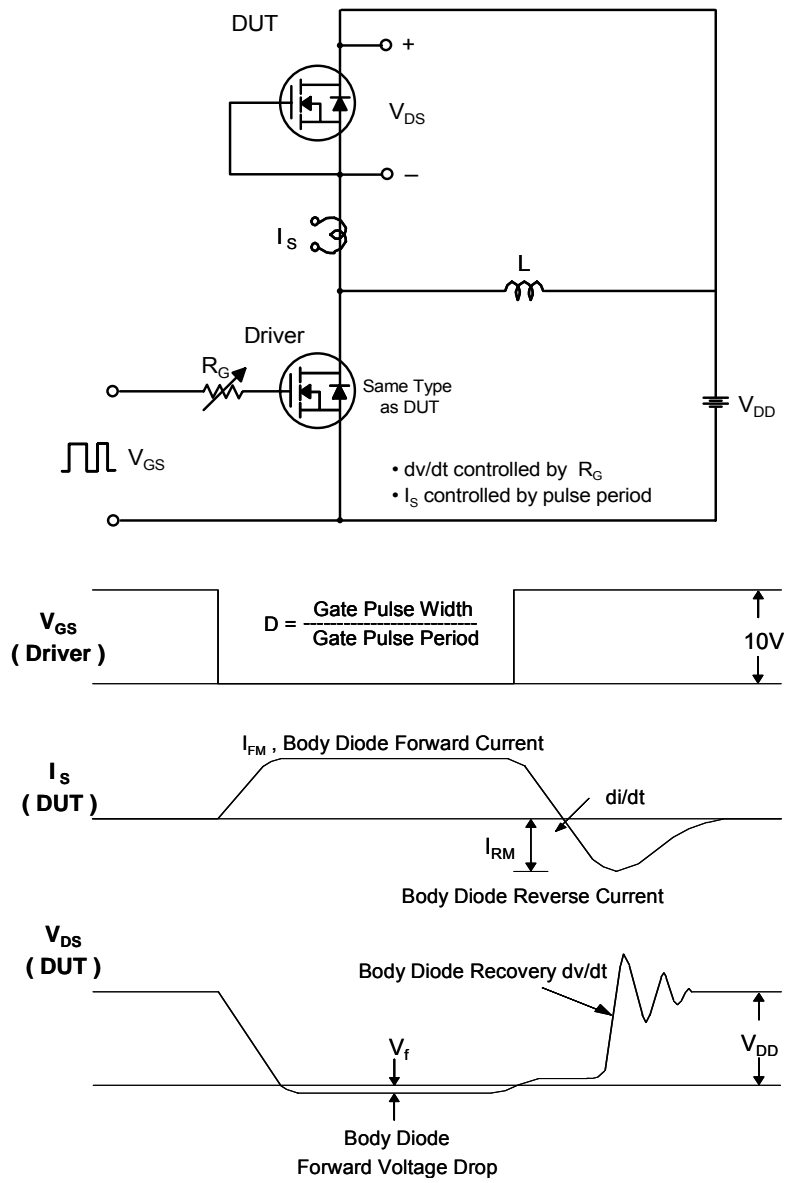


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



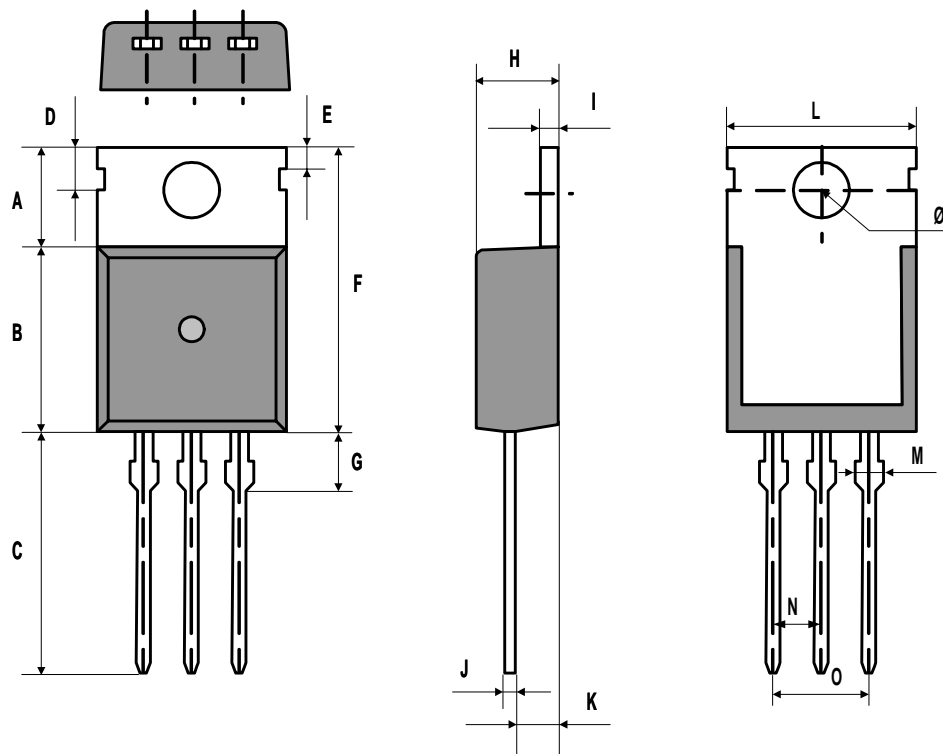
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Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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## TO-220 Package Dimension



DIMENSION		A	B	C	D	E	F	G	H
m m	Min	6.12	9.00	12.88	2.70	1.20	15.12	2.70	4.30
	Typ.	6.32	9.20	13.08	2.80	1.30	15.52	3.00	4.50
	Max	6.52	9.40	13.28	2.90	1.40	15.92	3.30	4.70

DIMENSION		I	J	K	L	M	N	O	Ø
m m	Min	1.25	0.45	2.30		1.42	2.44	4.88	
	Typ.	1.30	0.50	2.40	9.90	1.52	2.54	5.08	3.60
	Max	1.40	0.60	2.50		1.62	2.64	5.28	