

N-CHANNEL ENHANCEMENT MODE POWER MOSFET

Description

The MS20N03 TO-252 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

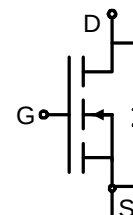
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

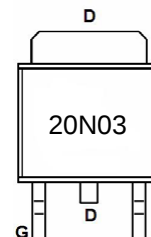
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

General Features

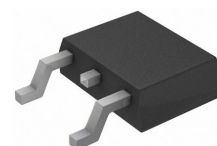
VDSS	RDS(ON) @10V (typ)	ID
30V	15 mΩ	20A



Schematic diagram



Marking and pin Assignment



TO-252

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30 V	
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	20	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	50	A
Maximum Power Dissipation	P_D	30	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	3.5	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	32	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=28V, V_{GS}=0V$	-	-	500	nA

Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
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On Characteristics (Note 3)

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.45	2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=15A$		15	19	m Ω
		$V_{GS}=4.5V, I_D=10A$		19	27	
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=10A$		11		S

Dynamic Characteristics (Note 4)

Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$	-	1165	-	PF
Output Capacitance	C_{OSS}		-	142	-	PF
Reverse Transfer Capacitance	C_{RSS}		-	99	-	PF

Switching Characteristics (Note 4)

Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, I_D=1.0A$ $V_{GS}=10V, R_G=6.0\Omega$	-	11.7	-	nS
Turn-on Rise Time	t_r		-	5.2	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	t_f		-	6.0	-	nS
Total Gate Charge	Q_g	$V_{DS}=20V, I_D=5A,$ $V_{GS}=10V$	-	11	-	nC
Gate-Source Charge	Q_{gs}		-	2.2	-	nC
Gate-Drain Charge	Q_{gd}		-	4.2	-	nC

Drain-Source Diode Characteristics

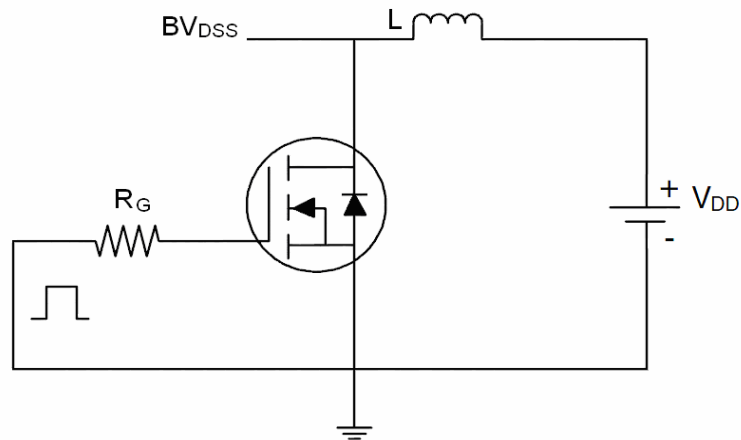
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	12	V
Diode Forward Current (Note 2)	I_S		-	-	10	A

Notes:

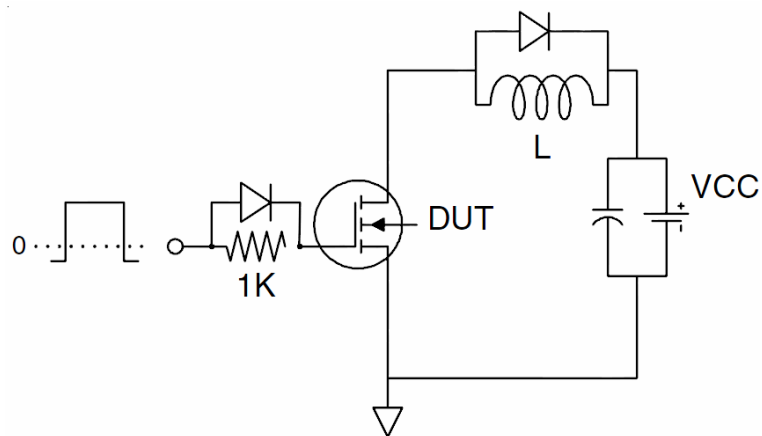
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Test circuit

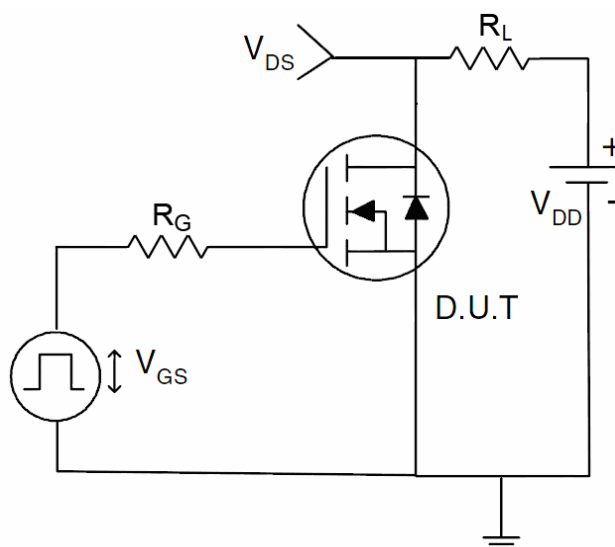
1) E_{AS} test Circuits



2) Gate charge test Circuit:



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

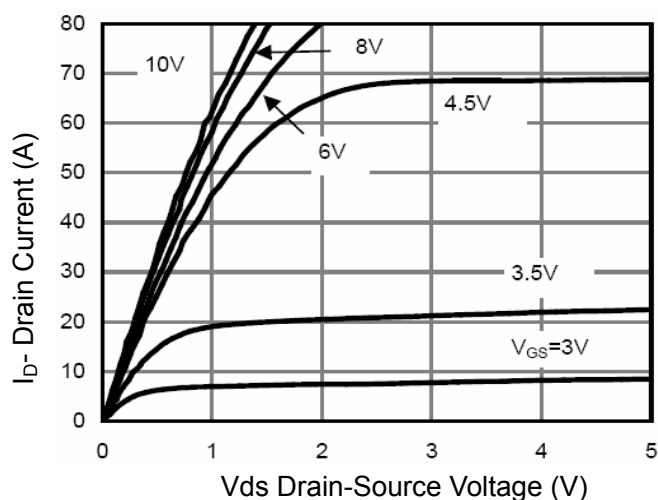


Figure 1 Output Characteristics

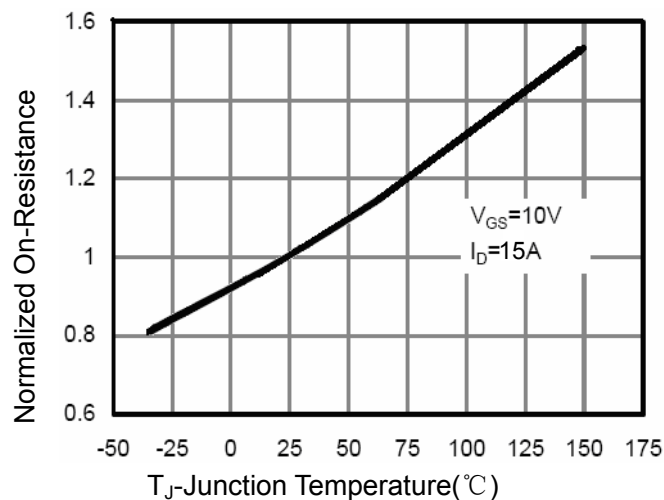


Figure 4 Rdson-Junction Temperature

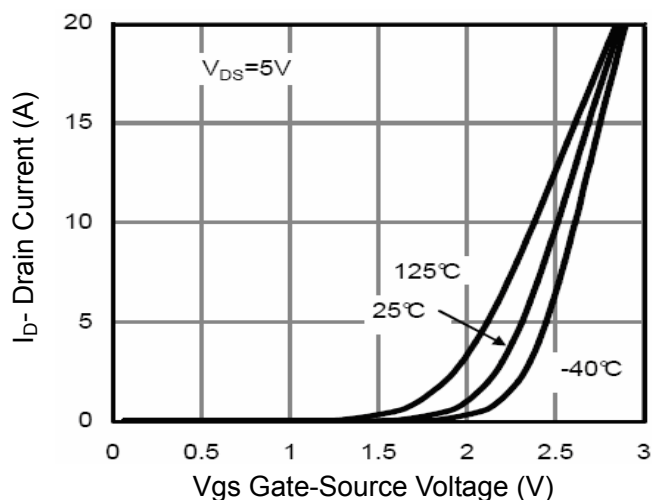


Figure 2 Transfer Characteristics

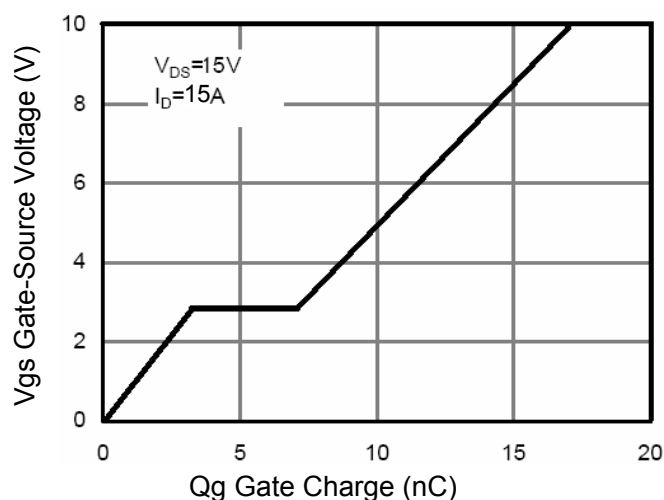


Figure 5 Gate Charge

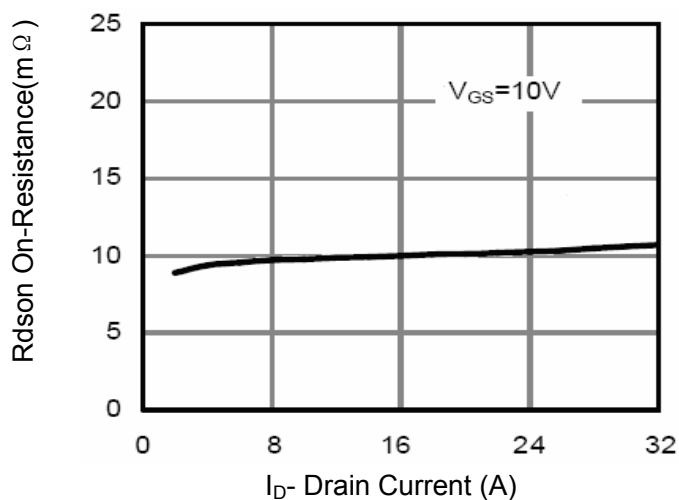


Figure 3 Rdson- Drain Current

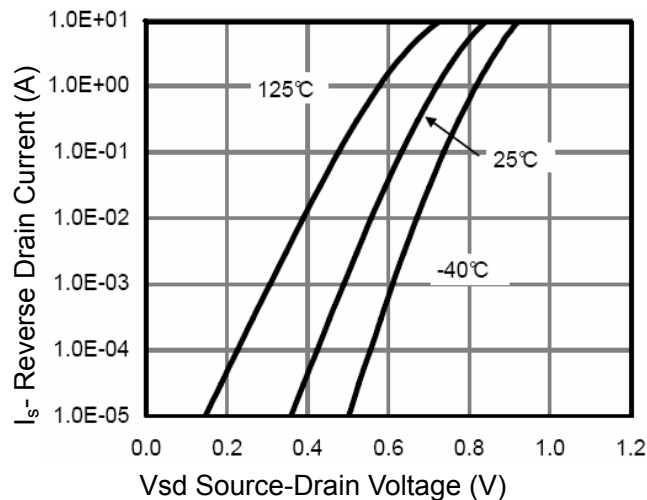


Figure 6 Source- Drain Diode Forward

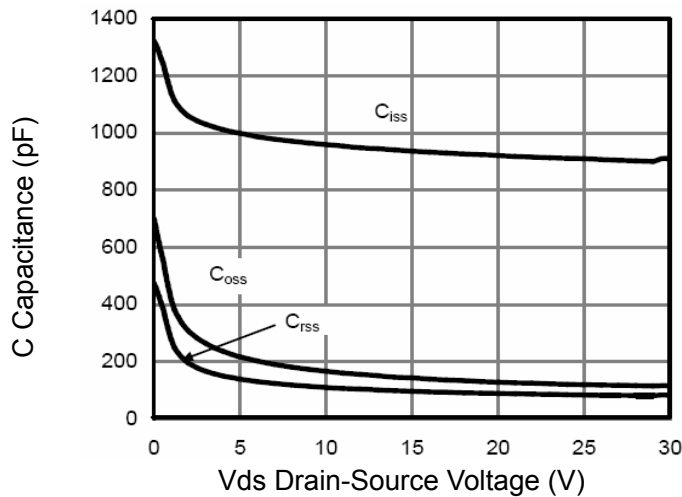


Figure 7 Capacitance vs Vds

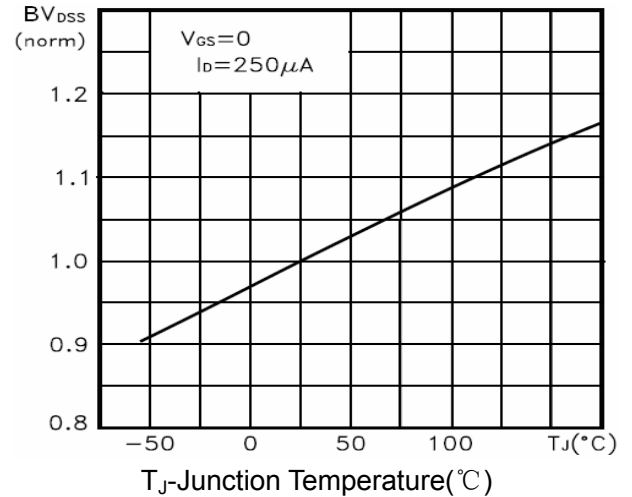


Figure 9 BV_{DSS} vs Junction Temperature

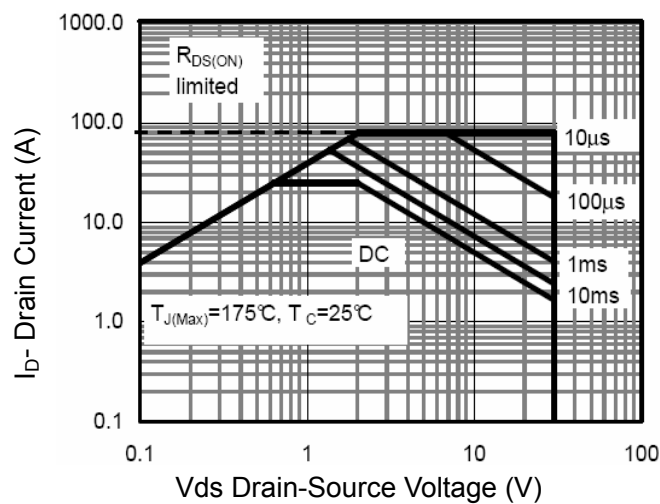


Figure 8 Safe Operation Area

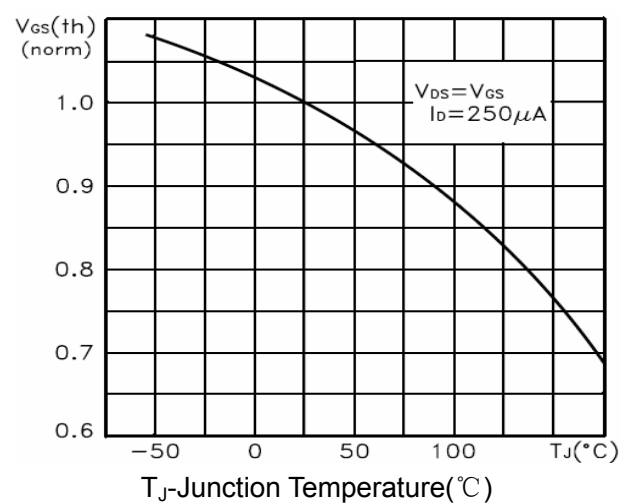


Figure 10 $V_{GS(th)}$ vs Junction Temperature

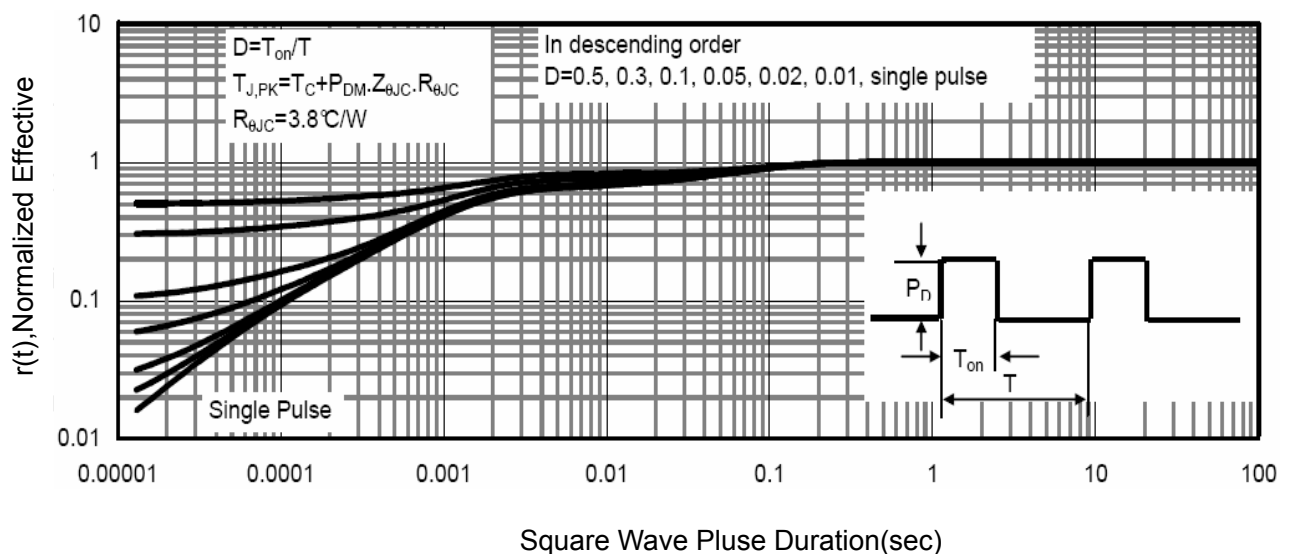
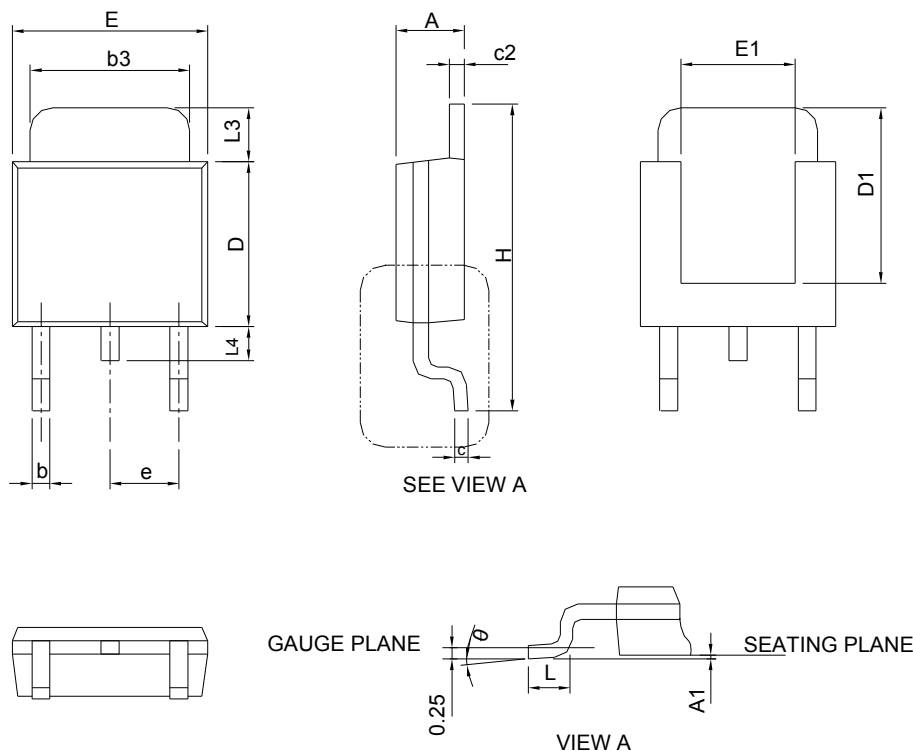


Figure 11 Normalized Maximum Transient Thermal Impedance

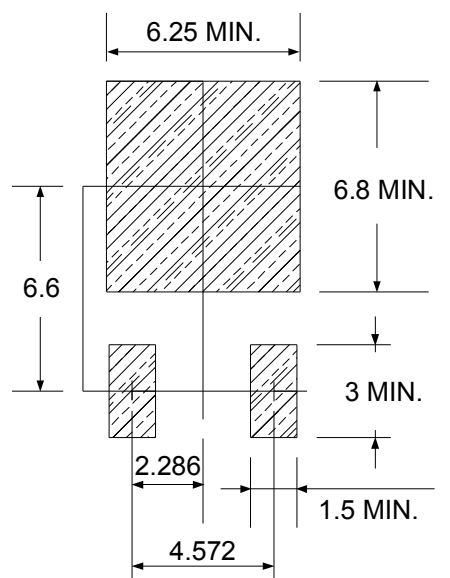
Package Information

TO-252-2L



	TO-252-3			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
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	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



UNIT: mm