

NCE Automotive N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

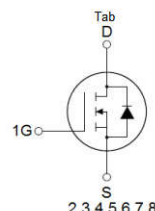
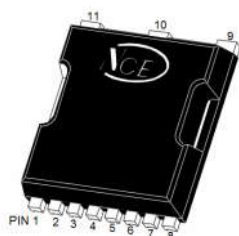
Application

- Automotive application
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 100V, I_D = 330A$
 $R_{DS(ON)} = 1.5m\Omega$, typical @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- 100% ΔV_{ds} tested
- **AEC-Q101 qualified**

TOLL-8L



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP020N10LL	NCEAP020N10LL	TOLL-8L	Ø330mm	24mm	2000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	330	A
	$I_D (T_c = 100^\circ\text{C})$	240	A
Pulsed Drain Current (Note 1)	I_{DM}	1320	A
Maximum Power Dissipation	P_D	400	W
Derating factor		2.67	W/°C
Single pulse avalanche energy (Note 4)	E_{AS}	2975	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

Thermal Characteristic

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.2	0.38	°C/W

Electrical Characteristics (T_c=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	100	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =100V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics <small>(Note 2)</small>						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	1.5	2.0	mΩ
Gate resistance	R _G	F=1.0MHz	0.2	2.8	4.0	Ω
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =165A		200	-	S
Dynamic Characteristics <small>(Note3)</small>						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	17000	22100	PF
Output Capacitance	C _{oss}		-	1500	1950	PF
Reverse Transfer Capacitance	C _{rss}		-	77	155	PF
Switching Characteristics <small>(Note 3)</small>						
Turn-on Delay Time	t _{d(on)}	V _{DD} =50V, I _D =20A V _{GS} =10V, R _G =1.6Ω	-	37	-	nS
Turn-on Rise Time	t _r		-	29	-	nS
Turn-Off Delay Time	t _{d(off)}		-	82	-	nS
Turn-Off Fall Time	t _f		-	34	-	nS
Total Gate Charge	Q _g	V _{DS} =50V, I _D =20A, V _{GS} =10V	-	252	327.5	nC
Gate-Source Charge	Q _{gs}		-	72	93.5	nC
Gate-Drain Charge	Q _{gd}		-	63	82	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <small>(Note 3)</small>	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current <small>(Note 2)</small>	I _S		-	-	330	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 20A	-	105	210	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs <small>(Note2)</small>	-	290	580	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of R_{θJA} is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
3. Guaranteed by design, not subject to production
4. EAS condition : T_J=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω

Typical Electrical and Thermal Characteristics

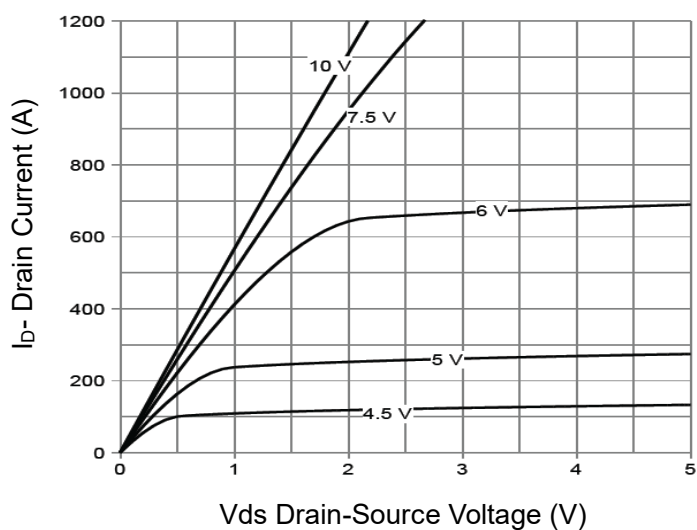


Figure 1 Output Characteristics

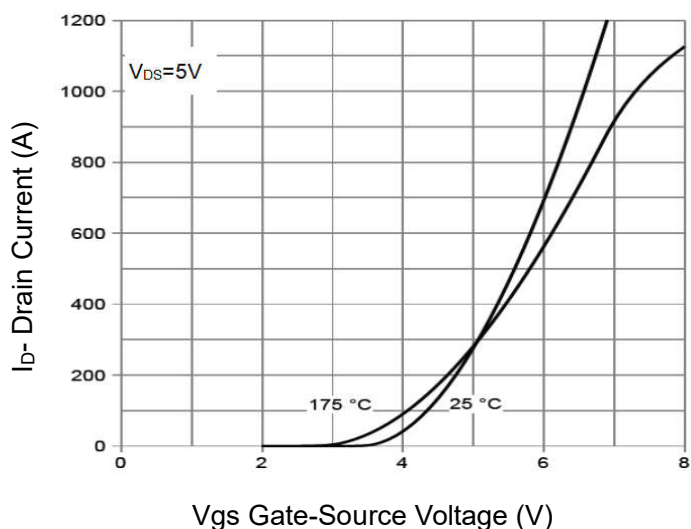


Figure 2 Transfer Characteristics

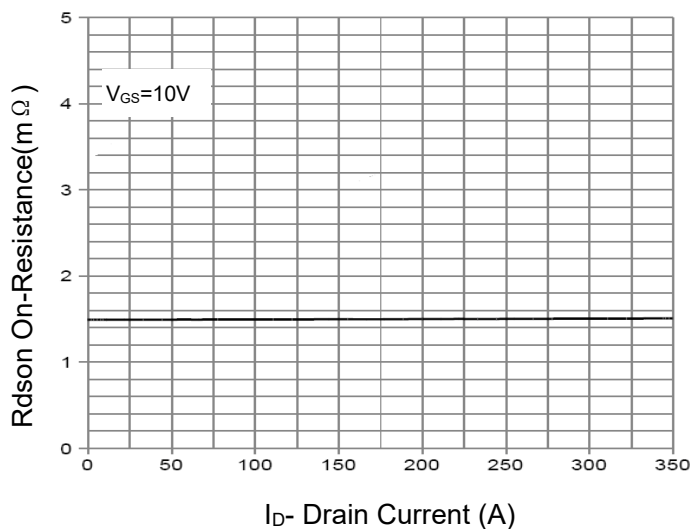


Figure 3 Rdson- Drain Current

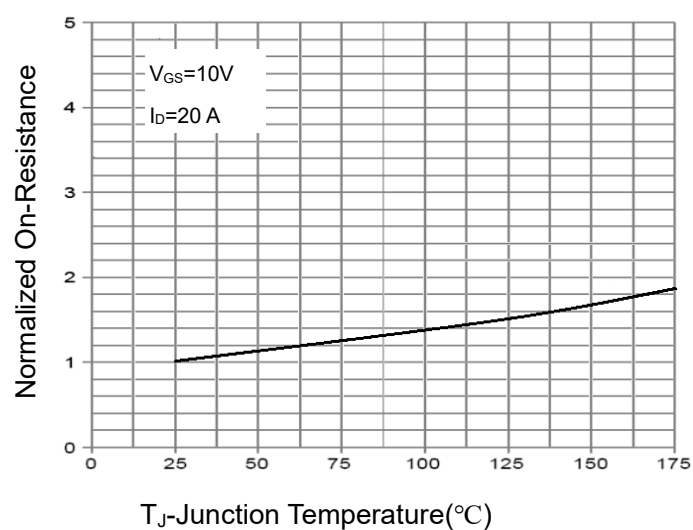


Figure 4 Rdson-Junction Temperature

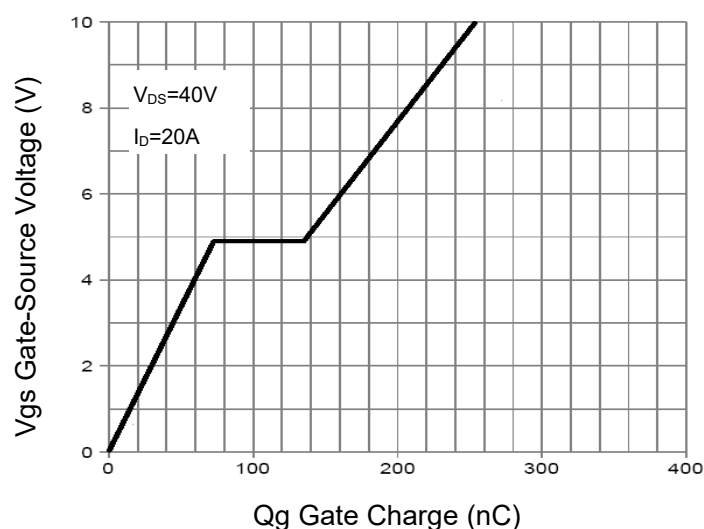


Figure 5 Gate Charge

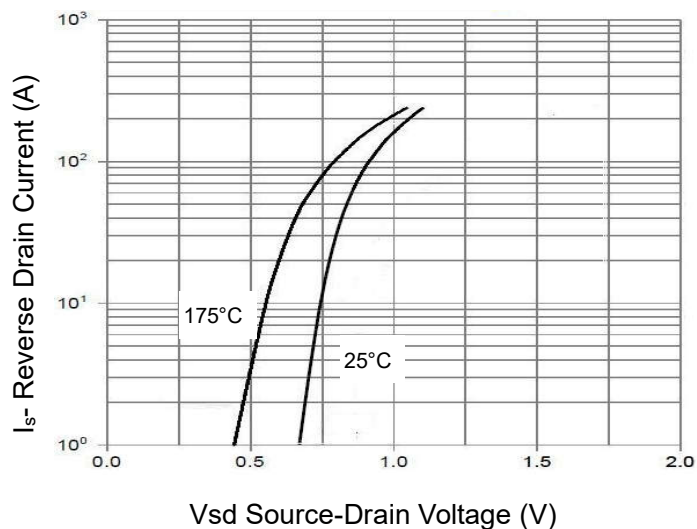
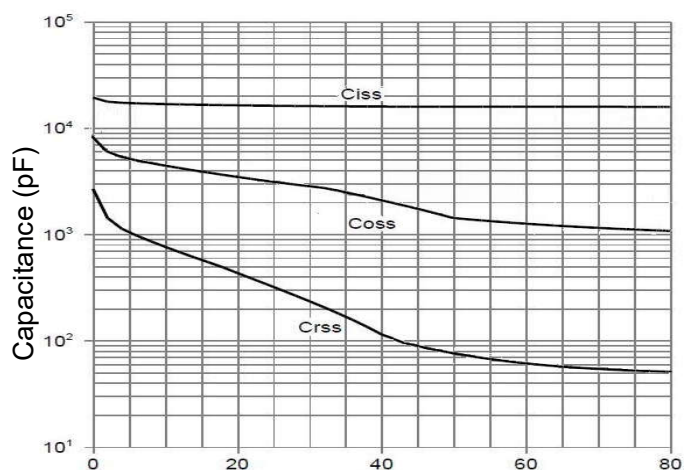
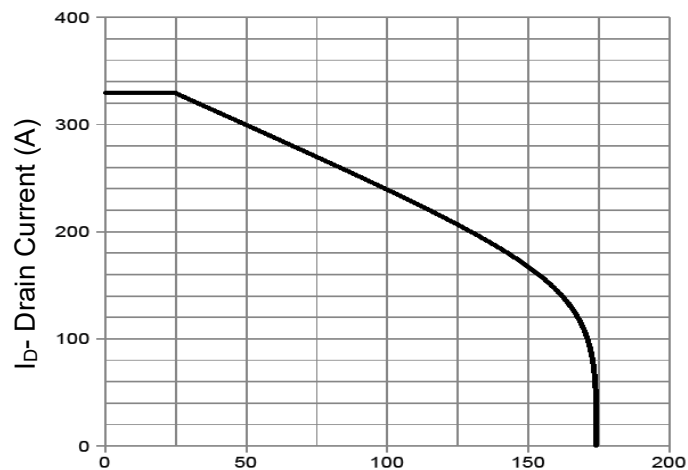


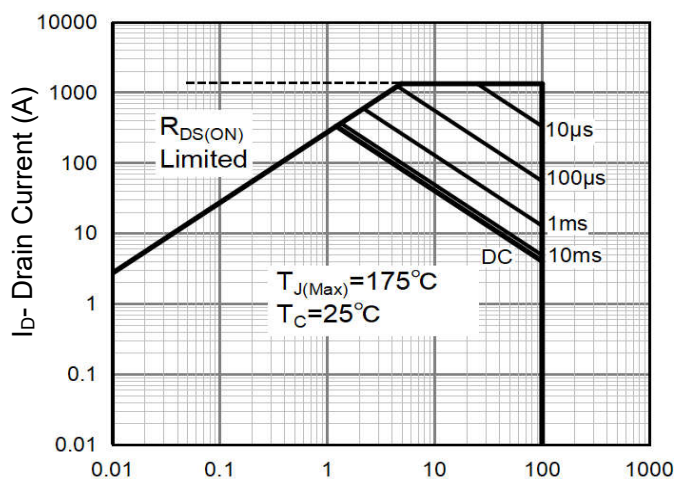
Figure 6 Source- Drain Diode Forward



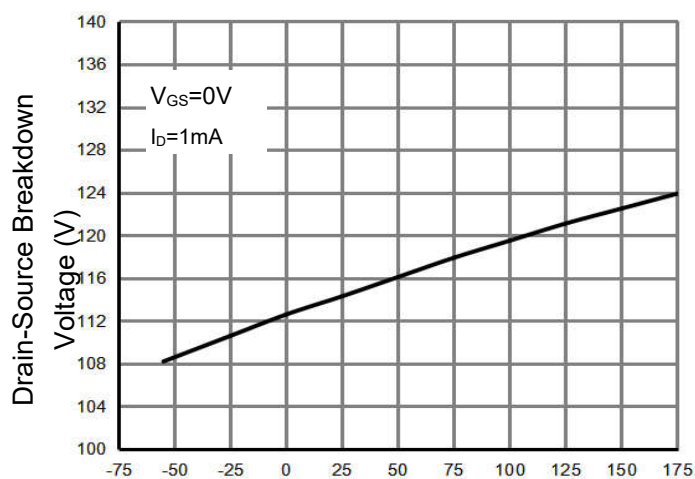
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



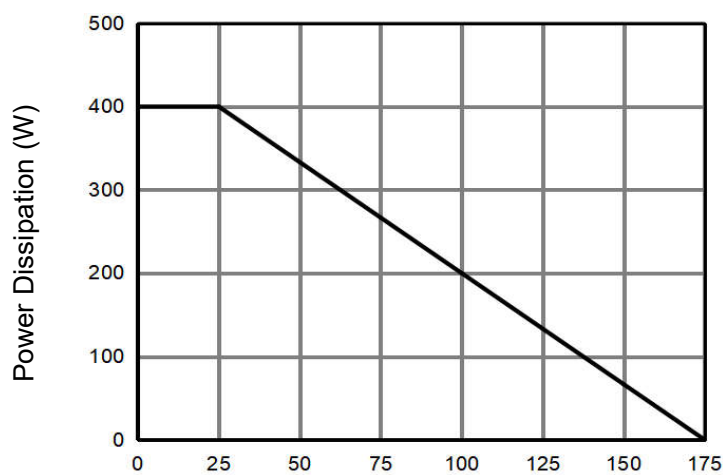
Tc-Case Temperature (°C)
Figure 10 Current De-rating



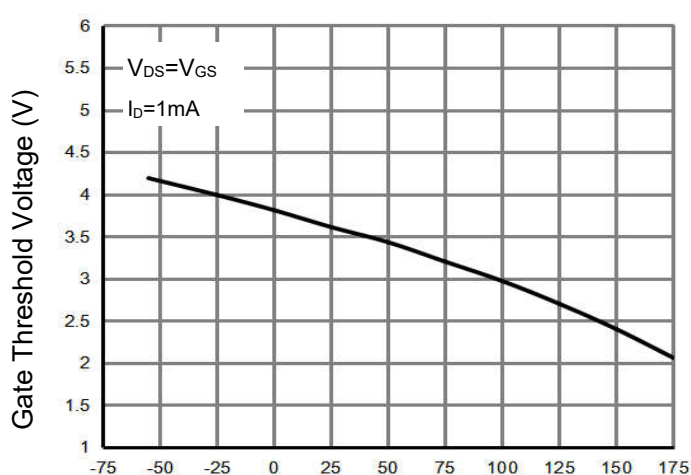
Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area (Note 3)



Tj-Junction Temperature (°C)
Figure 11 BV_{DSS}-Junction Temperature



Tc-Case Temperature(°C)
Figure 9 Power De-rating



Tj-Junction Temperature (°C)
Figure 12 V_{GS(th)}-Junction Temperature

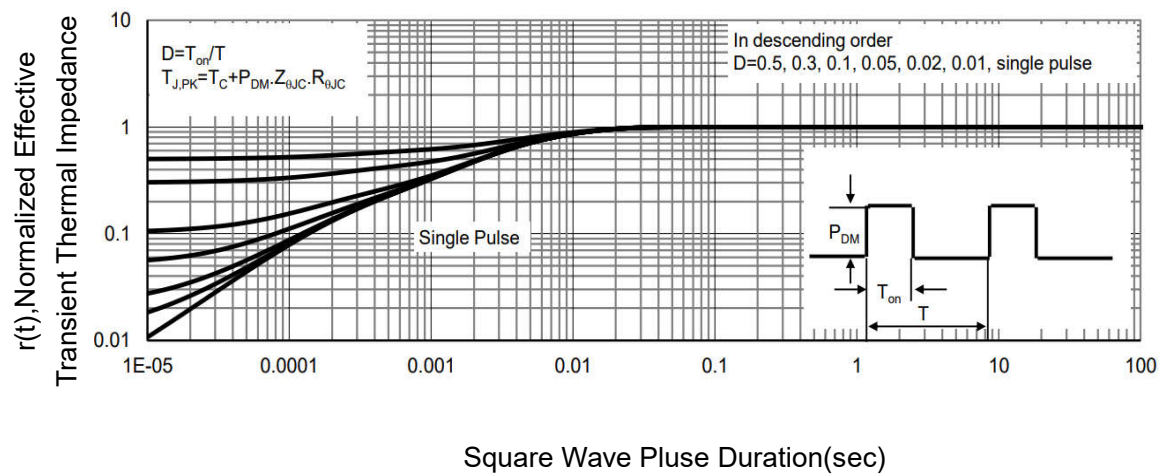
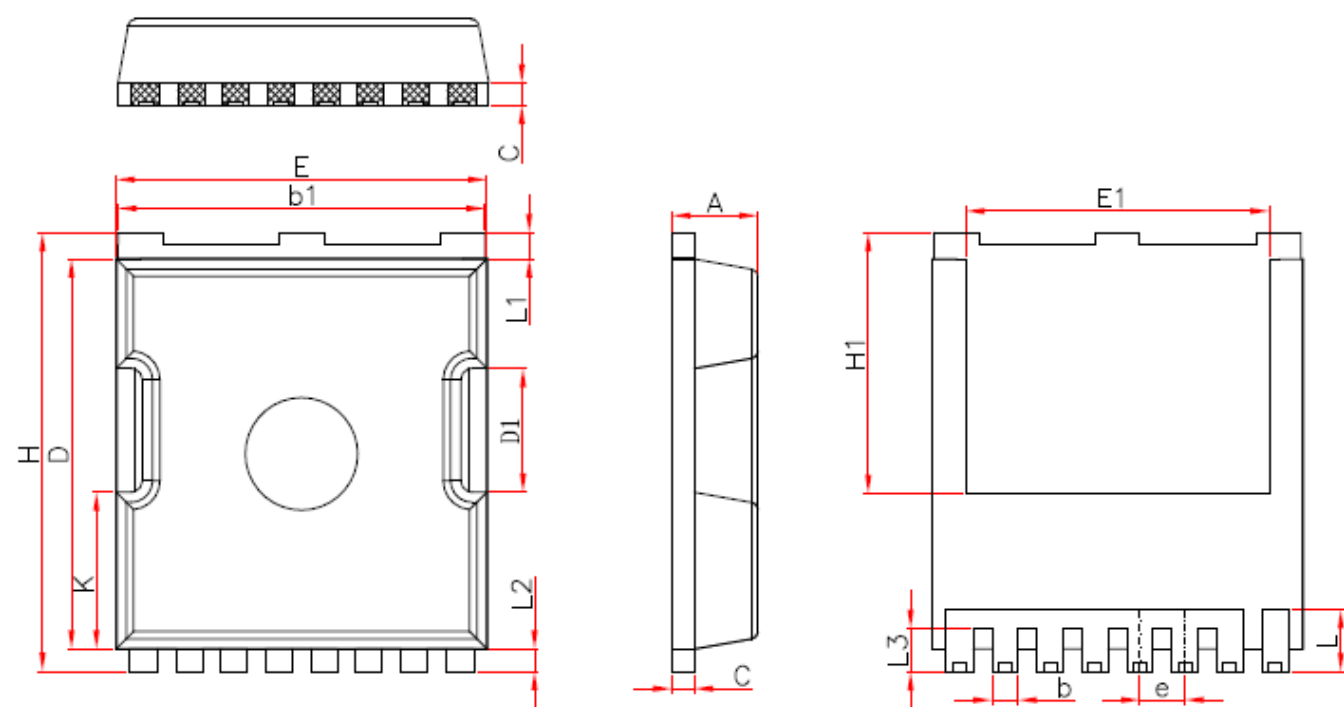


Figure 13 Normalized Maximum Transient Thermal Impedance

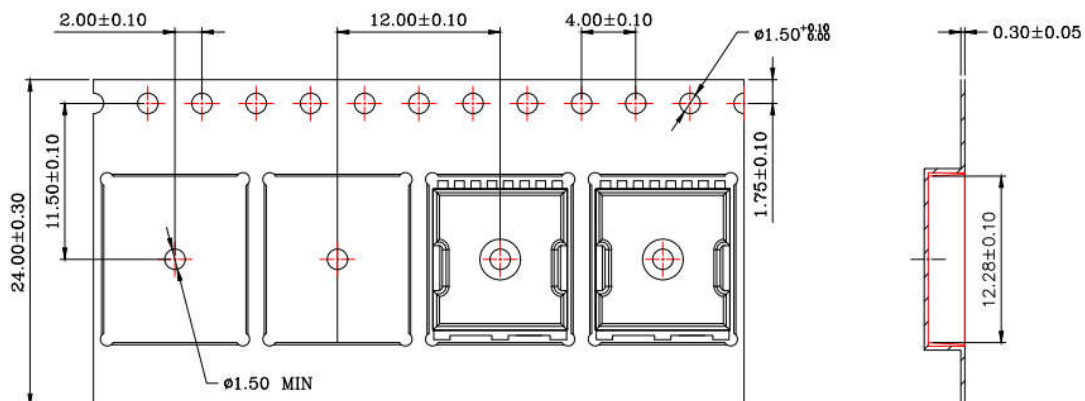
TOLL-8L Package Information



Symbol	Millimeters		
	Min.	Nom.	Max.
A	2.20	2.30	2.40
b	0.65	0.75	0.85
b1	9.70	9.80	9.90
C	0.50	0.60	0.70
D	10.30	10.40	10.50
D1	3.15	3.3	3.45
E	9.70	9.90	10.10
E1	8.00	8.10	8.20
e	1.10	1.20	1.30
H	11.6	11.7	11.8
H1	6.85	6.95	7.05
K	4.08	4.18	4.28
L	1.60	1.65	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	1.05	1.20	1.30

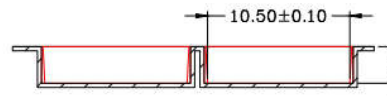
Package information

一、载带图纸:



Notes:

1. All dimensions are in mm.
2. Material: Black Conductive Polystyrene Alloy
3. 10 sprocket hole pitch cumulative tolerance $\pm 0.20\text{mm}$.
4. Carrier camber is within 1 mm in 250 mm.
5. Packing length per 19" reel : 196.0 Meters.
6. There must not be foreign body adhesion and the state of the surface must be excellent.
7. Surface Resistance $1 \times 10^5 \sim 1 \times 10^{11} \text{ OHMS/SQ}$



二、包装信息表（满箱信息）

封装形式	包装方式	盘尺寸	只/盘	盘/内盒	只/内盒	内盒/箱	只/箱
TOLL	编带	13 寸	2000	1	2000	8	16000

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