

NCE Automotive N-Channel Super Trench Power MOSFET

Description

The series of devices uses **Super Trench** 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.

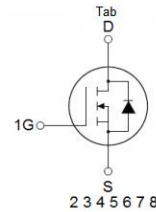
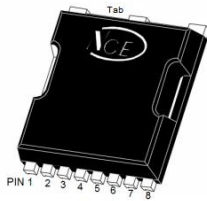
Application

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

General Features

- $V_{DS} = 40V, I_D = 360A$ (Silicon Limited)
 $R_{DS(ON)} = 1.1m\Omega$, 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
AP40T20ALL	NCEAP40T20ALL	TOLL-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous(Silicon Limited) ^(Note1)	I_D	360	A
	$I_D(100^\circ C)$	255	A
Drain Current-Continuous(Package Limited)	I_D	250	A
Pulsed Drain Current	I_{DM}	1000	A
Maximum Power Dissipation	P_D	300	W
Derating factor		2.0	W/°C
Single pulse avalanche energy ^(Note 2)	E_{AS}	1692	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	$R_{\theta JC}$	0.32	0.5	°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	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
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	-	1.1	1.35	mΩ
Gate resistance	R _G	F=1.0MHz	0.2	3.5	6.0	Ω
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =100A	-	90	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	5834.6	-	pF
Output Capacitance	C _{oss}		-	2320.5	-	pF
Reverse Transfer Capacitance	C _{rss}		-	70	-	pF
Switching Characteristics (Note 1)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, I _D =20A V _{GS} =10V, R _G =1.6Ω	-	14.5	-	nS
Turn-on Rise Time	t _r		-	8	-	nS
Turn-Off Delay Time	t _{d(off)}		-	58	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	91	-	nC
Gate-Source Charge	Q _{gs}		-	29.4	-	nC
Gate-Drain Charge	Q _{gd}		-	19	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current	I _S		-	-	250	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	38	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	125	-	nC

Notes:

1. Defined by design. Not Subject to production test
2. EAS condition : T_J=25°C, V_{DD}=20V, V_G=10V, L=0.5mH, R_G=25Ω
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

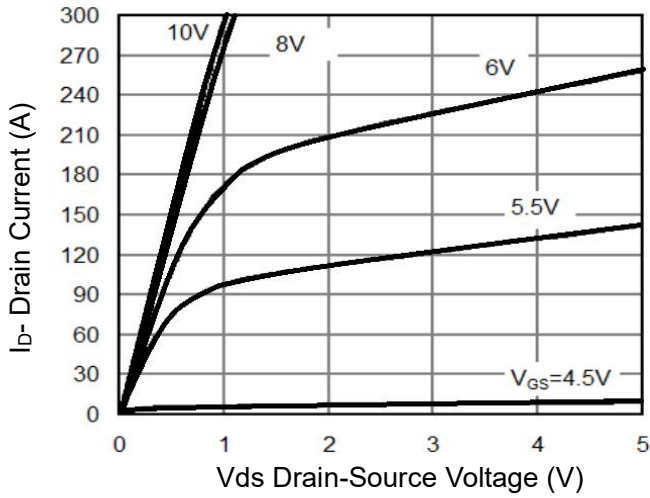


Figure 1 Output Characteristics

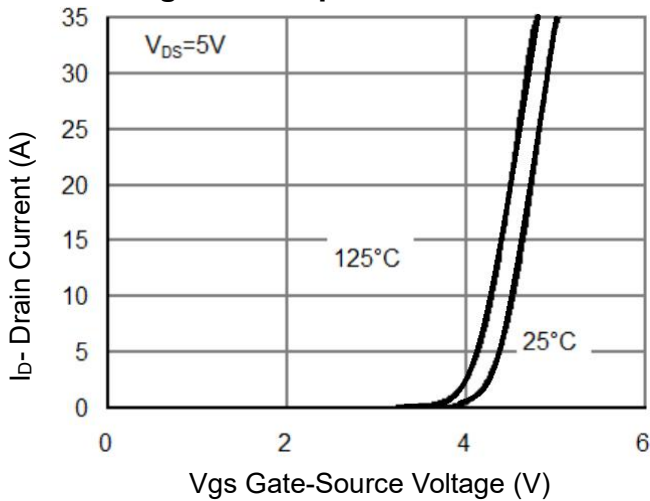


Figure 2 Transfer Characteristics

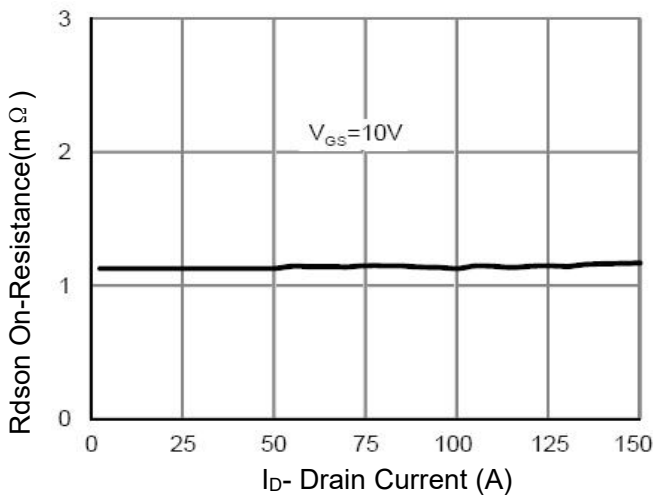


Figure 3 Rdson- Drain Current

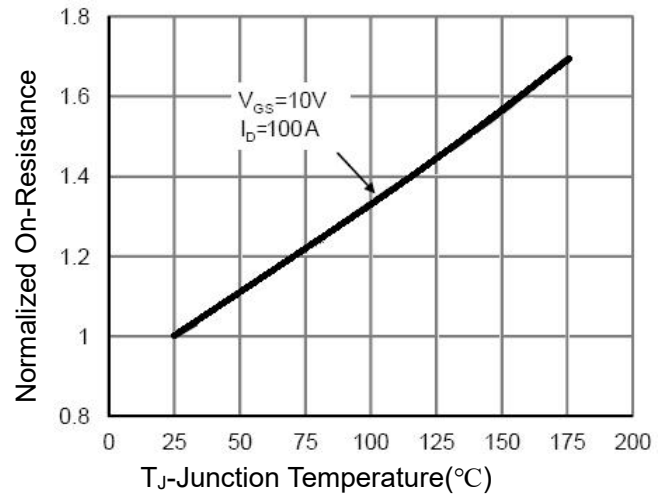


Figure 4 Rdson-Junction Temperature

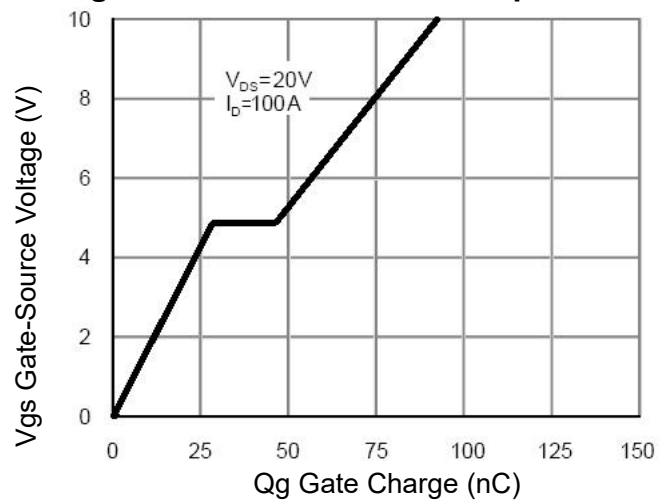


Figure 5 Gate Charge

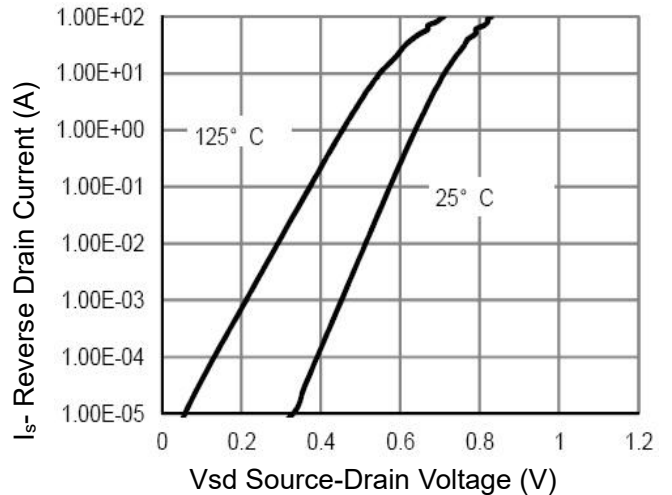


Figure 6 Source- Drain Diode Forward

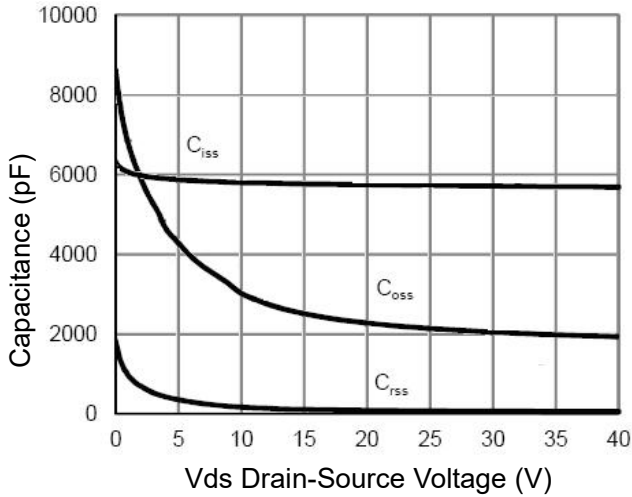


Figure 7 Capacitance vs Vds

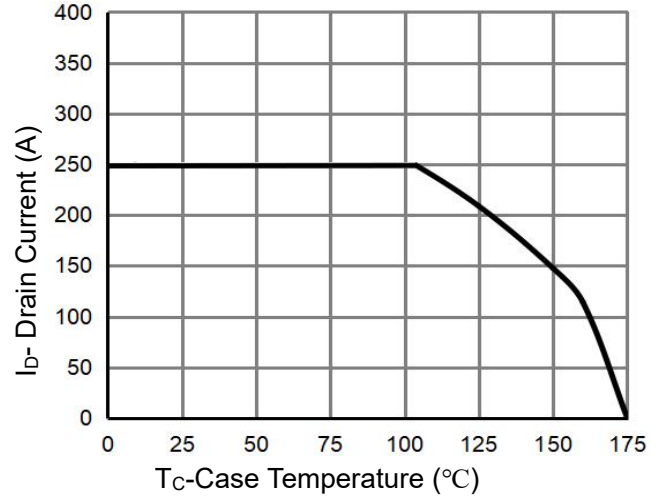


Figure 10 Current De-rating

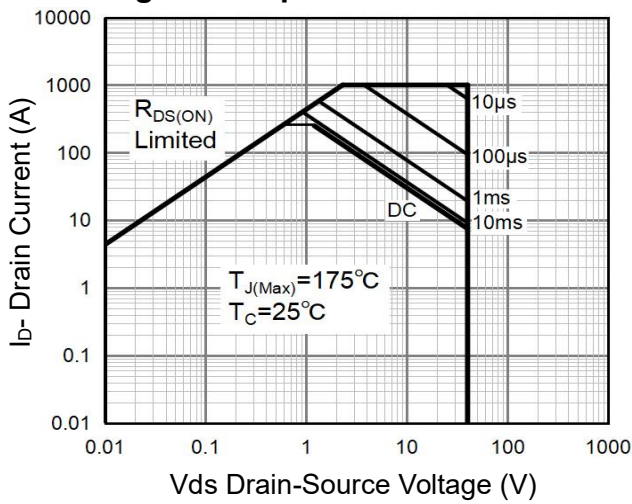


Figure 8 Safe Operation Area (Note 3)

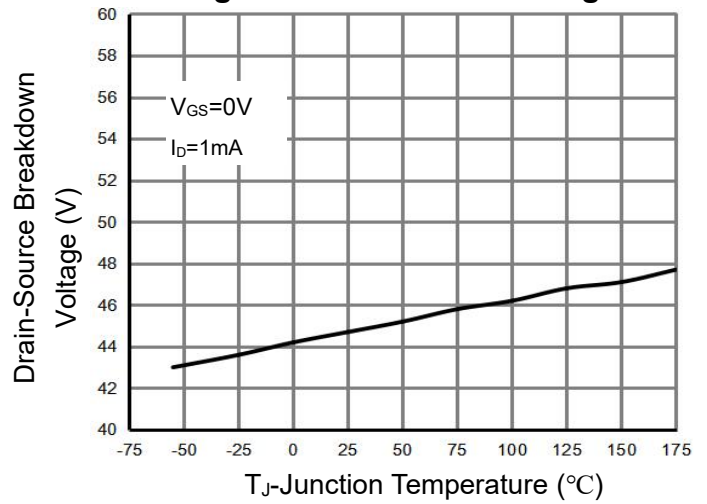


Figure 11 BV_{DSS}-Junction Temperature

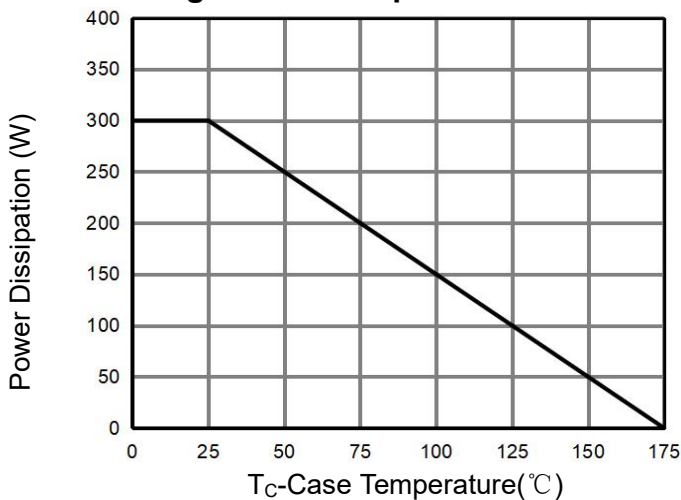


Figure 9 Power De-rating

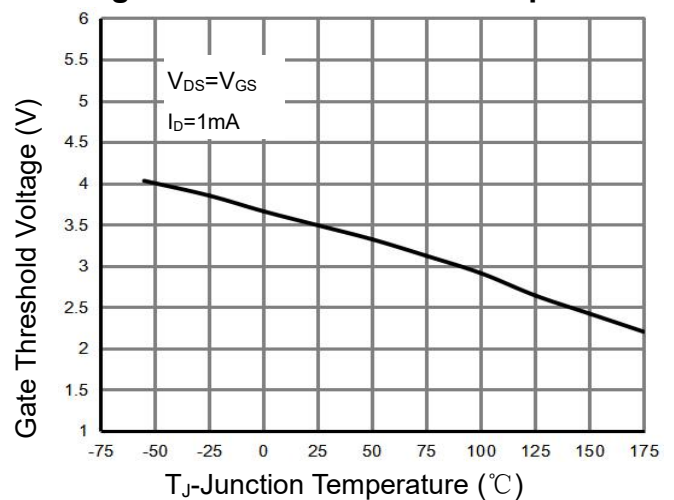


Figure 12 V_{GS(th)}-Junction Temperature

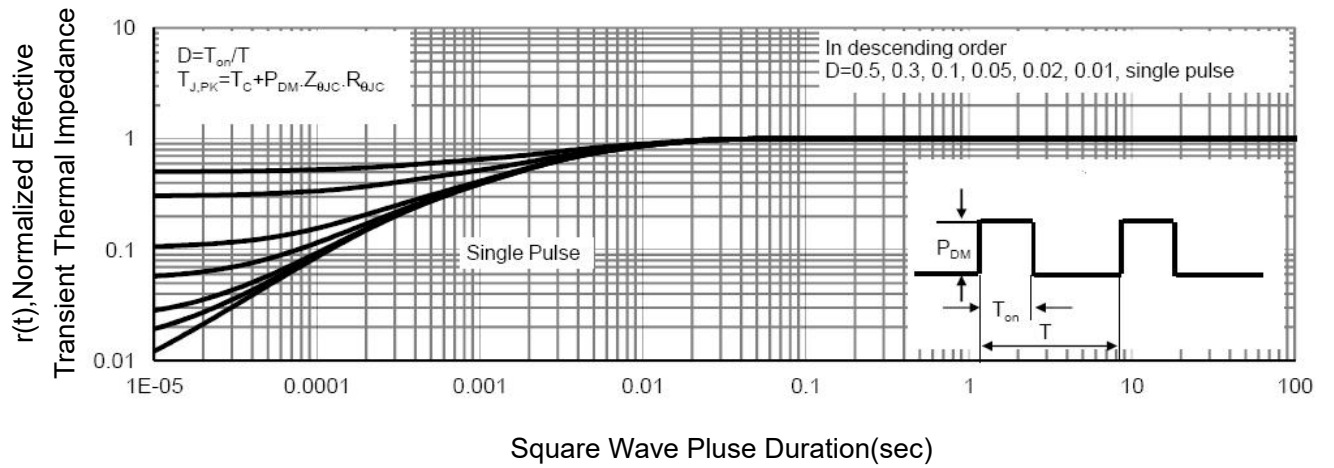
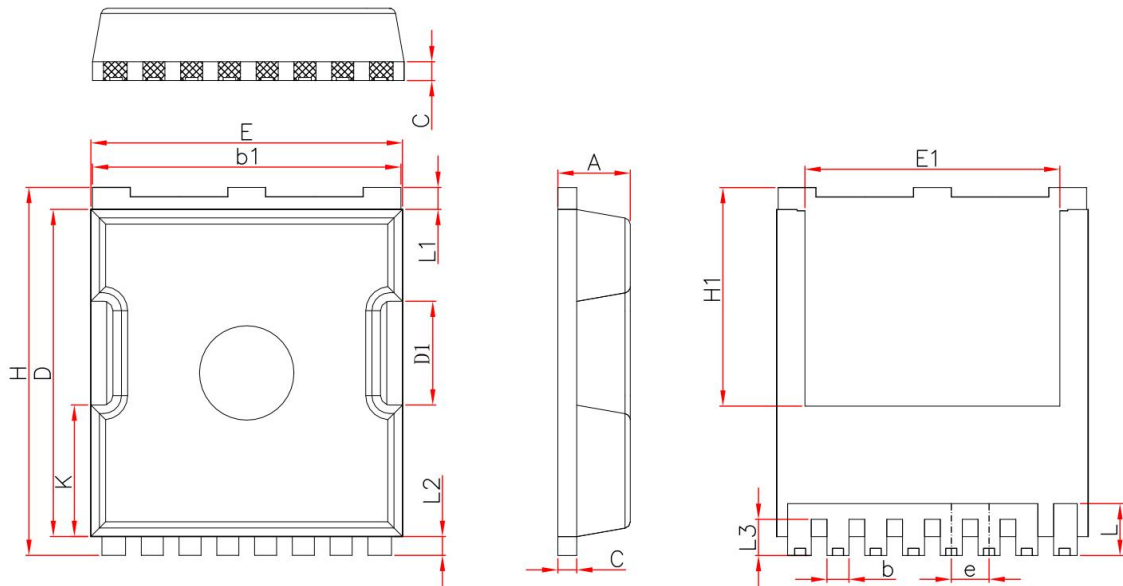



Figure 13 Normalized Maximum Transient Thermal Impedance

TOLL Package Information



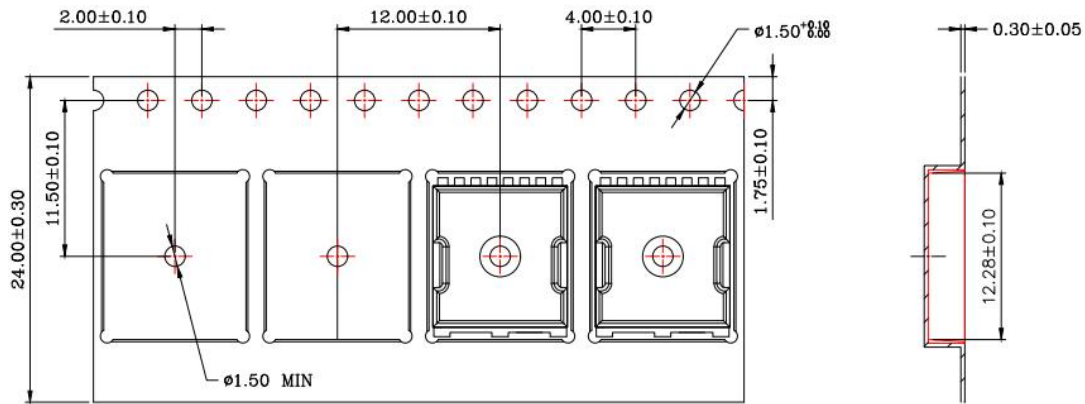
Symbol	Millimeters		
	Min.	Nom.	Max.
A	2.20	2.30	2.40
b	0.65	0.75	0.85
b1	9.70	9.80	9.90
C	0.50	0.60	0.70
D	10.30	10.40	10.50
D1	3.15	3.3	3.45
E	9.70	9.90	10.10
E1	8.00	8.10	8.20
e	1.10	1.20	1.30
H	11.6	11.7	11.8
H1	6.85	6.95	7.05
K	4.08	4.18	4.28
L	1.60	1.65	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70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

NOTES:

- 1.FOLLOW JEDEC STANDARD MO-299B.
- 2.ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSION.
3.  Exposed Cu

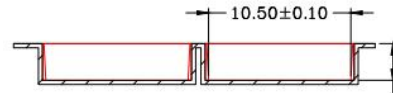
Package information

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 $1 \times 10^5 \sim 1 \times 10^{11}$ 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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