NCE Automotive N-Channel Enhancement Mode Power MOSFET

Description

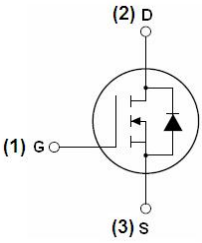
The NCEA6050KA uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- V_{DS} =60V,I_D =50A
  $R_{DS(ON)}$ <13.8mΩ @ V_{GS}=10V
  $R_{DS(ON)}$ <19.2mΩ @ V_{GS}=4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability
- 100% UIS tested
- 100% ΔVds tested
- **AEC-Q101 qualified**

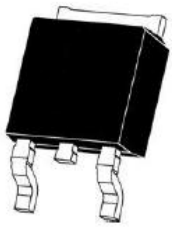
Application

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



Schematic diagram

Marking and pin assignment



TO-252-2L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
A6050KA	NCEA6050KA	TO-252-2L	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	50	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	35.4	A
Pulsed Drain Current (Note 1)	I_{DM}	200	A
Maximum Power Dissipation	P_D	85	W
Derating factor		0.57	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	200	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	1.76	℃/W
Thermal Resistance,Junction-to-Ambient(Note 2)	$R_{\theta JA}$	60	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.2	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	12	13.8	mΩ
		V_{GS}=4.5V, I_D=20A	-	16	19.2	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	18	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=30V,V_{GS}=0V, F=1.0MHz	-	1630	-	pF
Output Capacitance	C_{oss}		-	113	-	pF
Reverse Transfer Capacitance	C_{rss}		-	97	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V, R_L=6.7Ω V_{GS}=10V,R_G=3Ω	-	7.4	-	nS
Turn-on Rise Time	t_r		-	5.1	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	28.2	-	nS
Turn-Off Fall Time	t_f		-	5.5	-	nS
Total Gate Charge	Q_g	V_{DS}=30V,I_D=20A, V_{GS}=10V	-	39		nC
Gate-Source Charge	Q_{gs}		-	7	-	nC
Gate-Drain Charge	Q_{gd}		-	8.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=20A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	50	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF =20A di/dt = 100A/μs(Note3)	-	28	-	nS
Reverse Recovery Charge	Qrr		-	40	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 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.The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

4. Guaranteed by design, not subject to production

5. EAS condition : Tj=25℃,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω

Typical Electrical and Thermal Characteristics

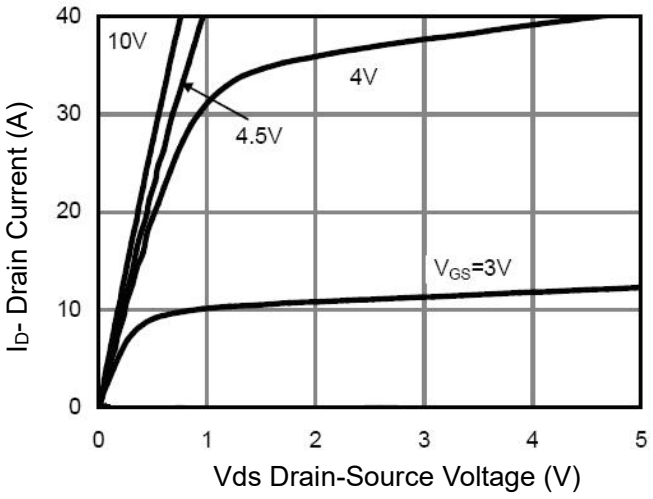


Figure 1 Output Characteristics

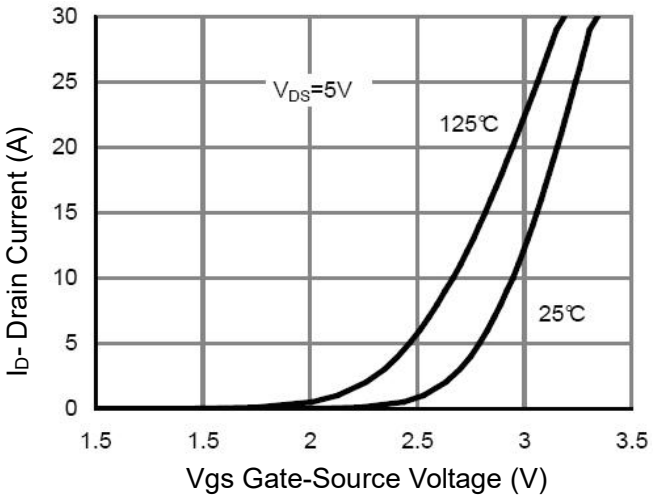


Figure 2 Transfer Characteristics

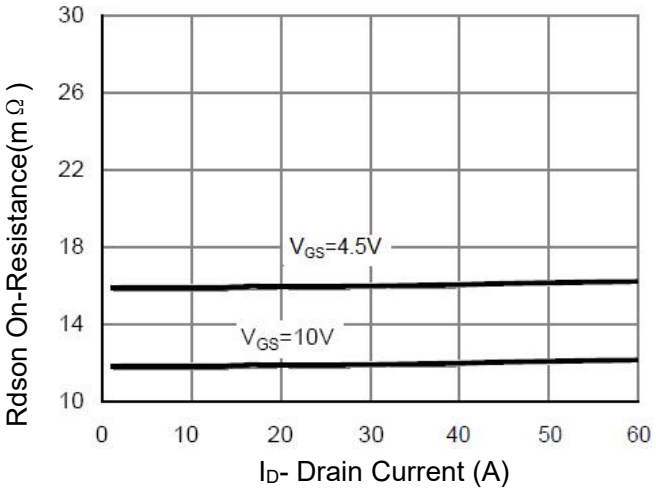


Figure 3 Rdson- Drain Current

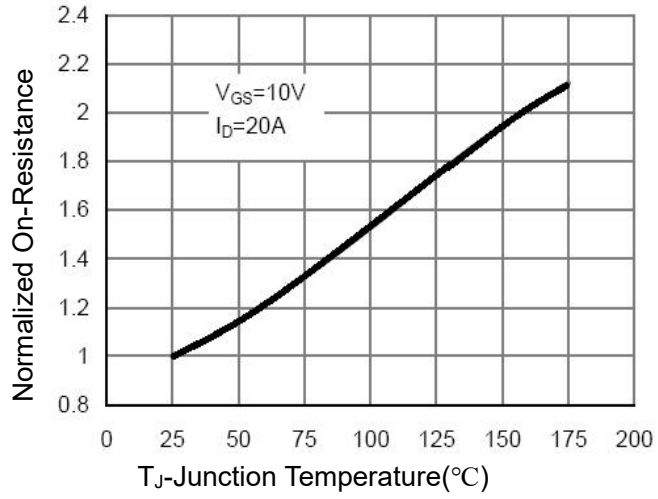


Figure 4 Rdson-Junction Temperature

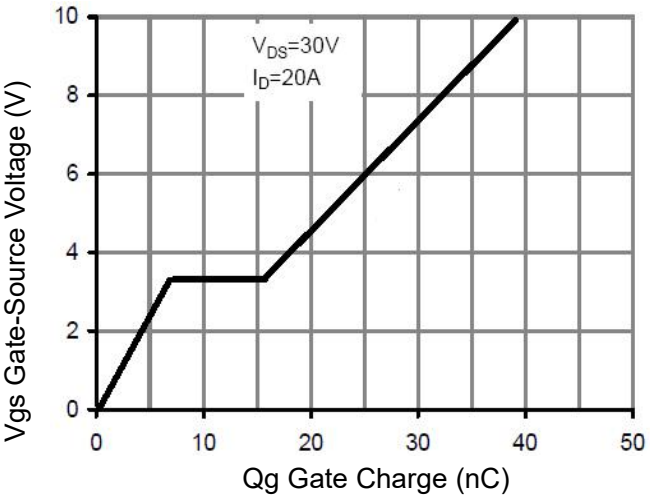


Figure 5 Gate Charge

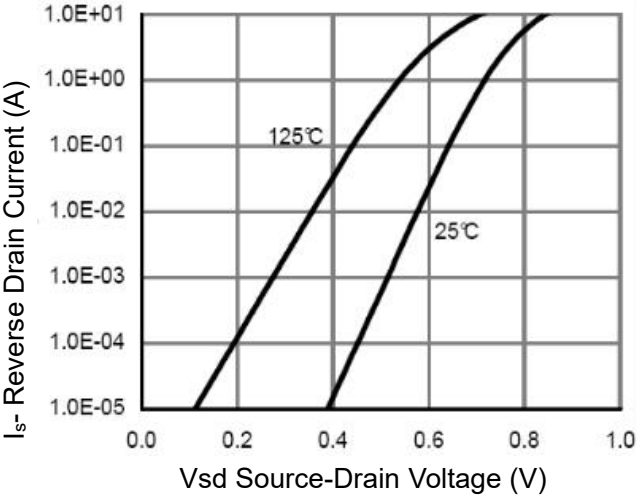


Figure 6 Source- Drain Diode Forward

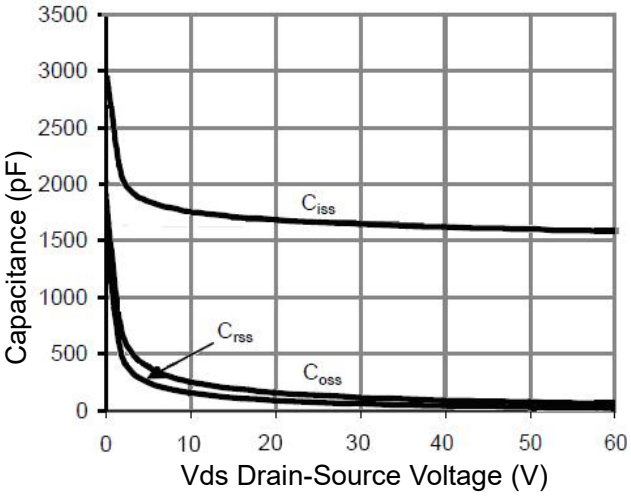


Figure 7 Capacitance vs Vds

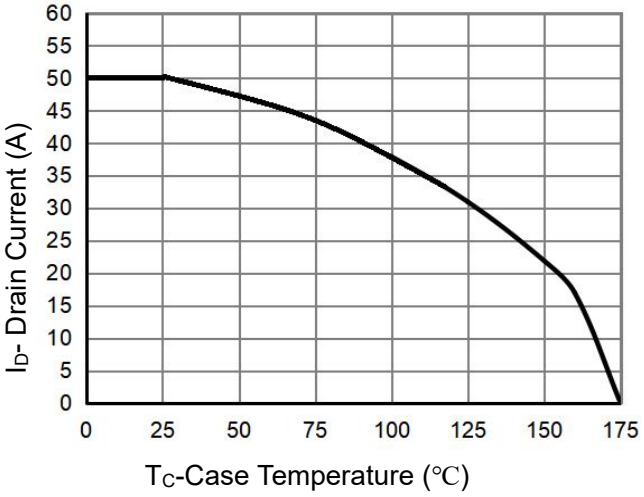


Figure 10 Current De-rating

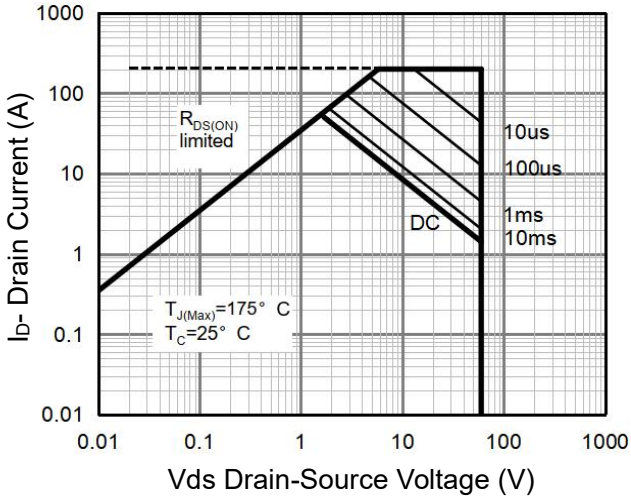


Figure 8 Safe Operation Area(Note 3)

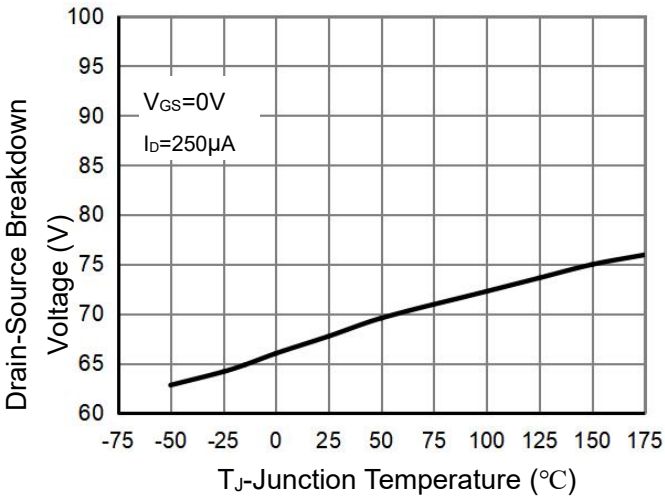


Figure11 BV_{DSS}-Junction Temperature

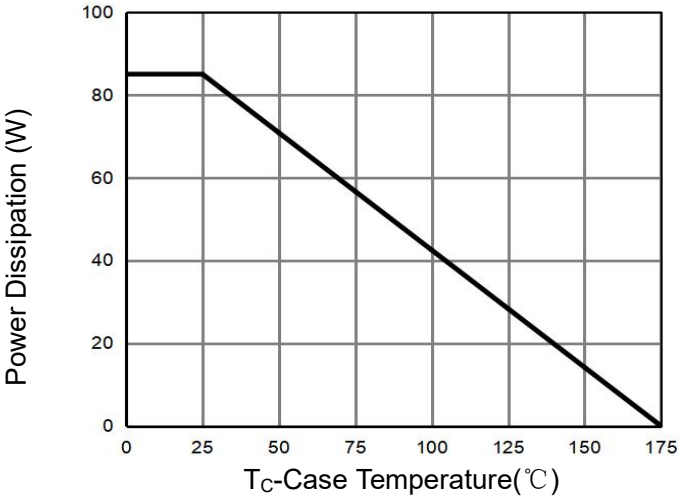


Figure 9 Power De-rating

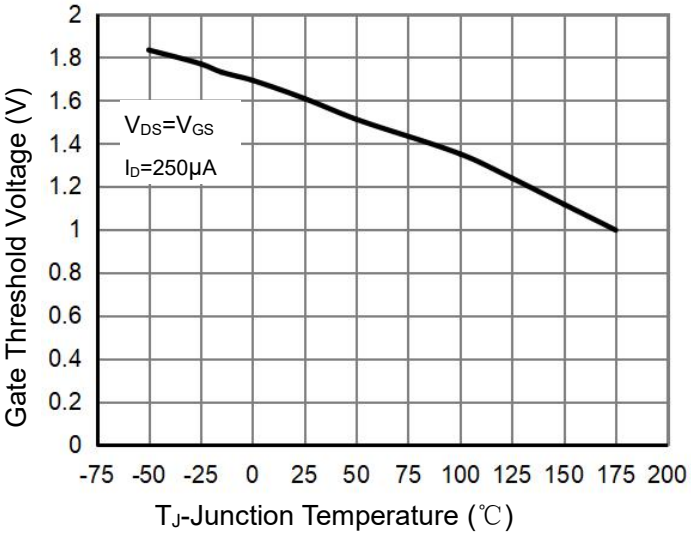


Figure 12 $V_{GS(th)}$-Junction Temperature

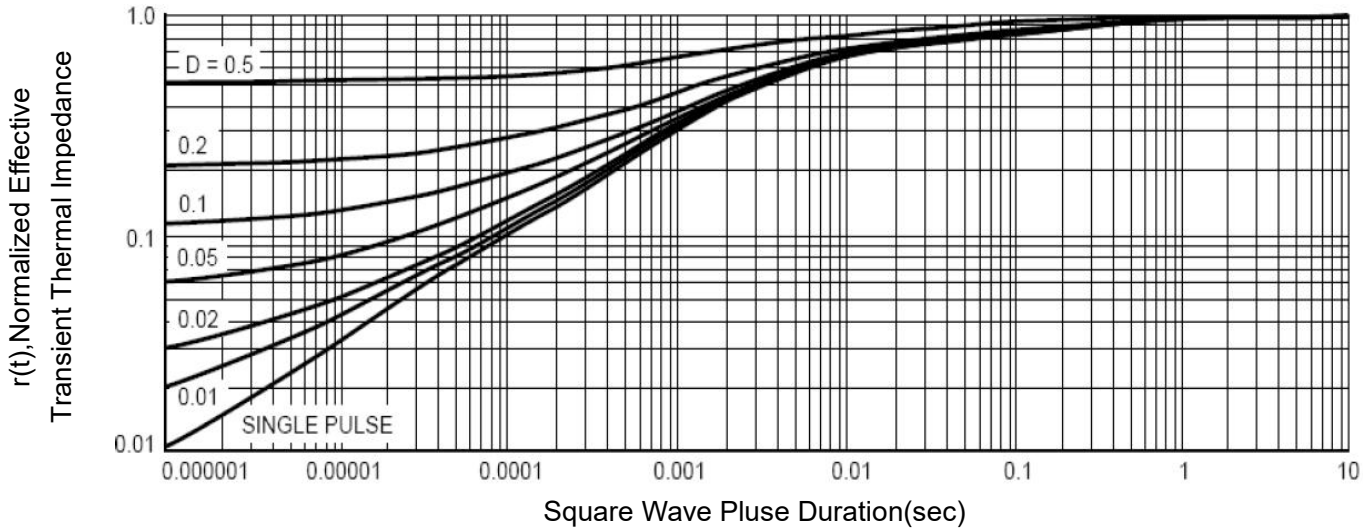
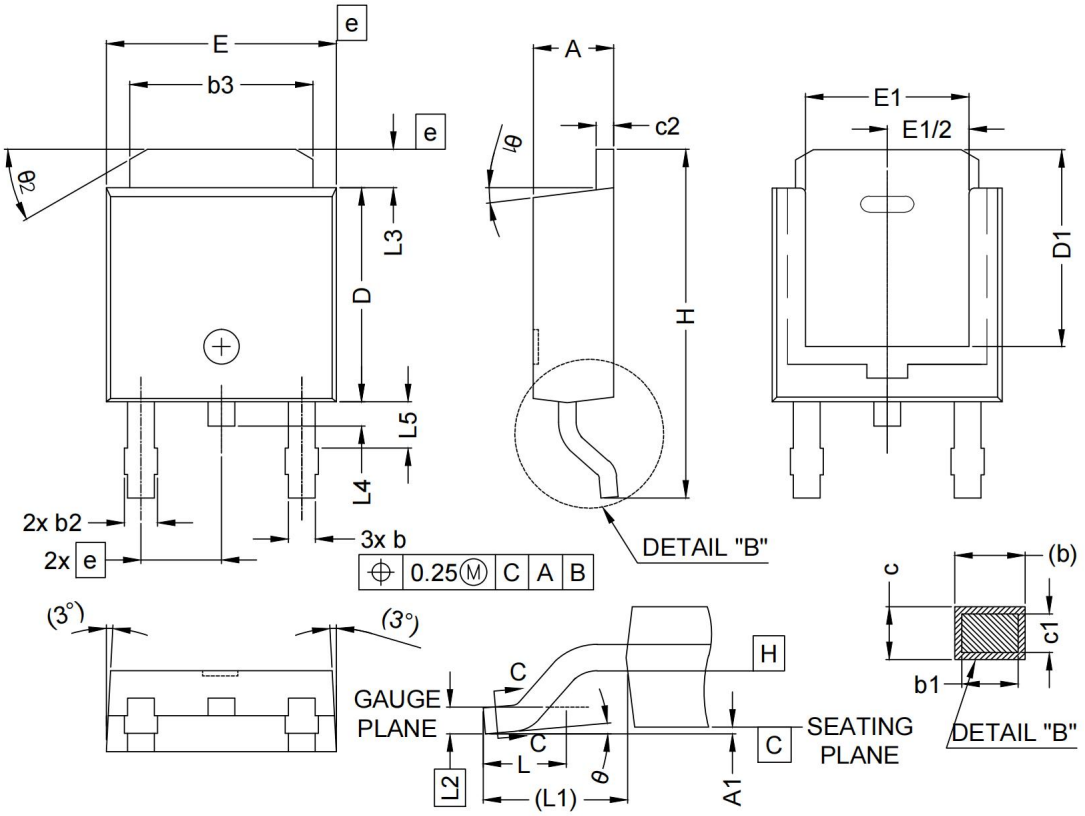


Figure 15 Normalized Maximum Transient Thermal Impedance

TO-252-2L Package Information



SYMBOL	MIN.	MAX.	SYMBOL	MIN.	MAX.	SYMBOL	MIN.	MAX.
A	2.18	2.39	E	6.35	6.73	θ1	0°	15°
A1	-	0.13	E1	4.32	-	θ2	25°	35°
b	0.65	0.89	e	2.29 BSC				
b1	0.64	0.79	H	9.94	10.34			
b2	0.76	1.13	L	1.50	1.78			
b3	4.95	5.46	L1	2.74 REF				
c	0.46	0.61	L2	0.51 BSC				
c1	0.41	0.56	L3	0.89	1.27			
c2	0.46	0.60	L4	-	1.02			
D	5.97	6.22	L5	1.14	1.49			
D1	5.21	-	θ	0°	10°			

NOTE ; 1.0 DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
2.0 ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
3.0 HEAT SINK SIDE FLASH IS MAX. 0.8mm.
4.0 RADIUS ON TERMINAL IS OPTIONAL.

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