

NCE N-Channel Enhancement Mode Power MOSFET

Description

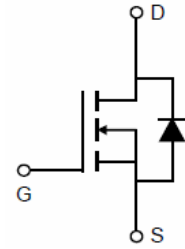
The NCE6005AR uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- $V_{DS}=60V, I_D=5A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS}=10V$ (Typ.26m Ω)
 $R_{DS(ON)} < 45m\Omega @ V_{GS}=4.5V$ (Typ.32m Ω)
- High density cell design for ultra low R_{dson}
- 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

Application

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



Schematic diagram



SOT-223-3L view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE6005AR	NCE6005AR	SOT-223-3L	Ø330mm	12mm	2500 units

Absolute Maximum Ratings ($T_A=25^\circ C$ 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	5	A
Drain Current-Continuous($T_C=100^\circ C$)	$I_D(100^\circ C)$	3.5	A
Pulsed Drain Current	I_{DM}	24	A
Maximum Power Dissipation	P_D	2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	62.5	$^\circ C/W$
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Electrical Characteristics (T_A=25°C unless otherwise noted)

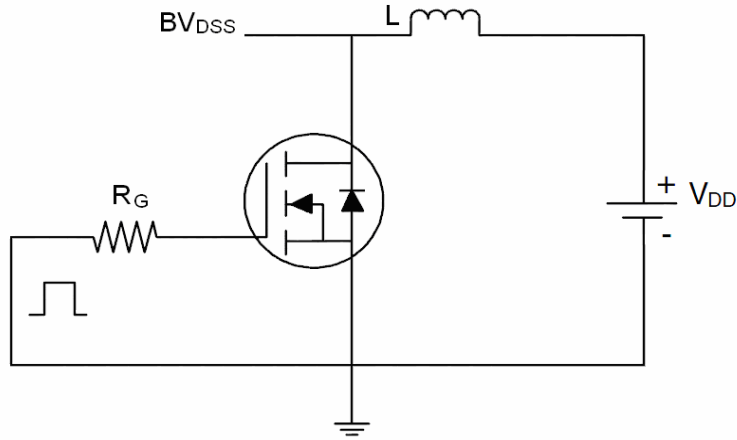
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (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 =5A	-	26	35	mΩ
	R _{DS(ON)}	V _{GS} =4.5V, I _D =5A	-	32	45	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =5A	11	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	979	-	PF
Output Capacitance	C _{oss}		-	120	-	PF
Reverse Transfer Capacitance	C _{rss}		-	100	-	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	-	5.2	-	nS
Turn-on Rise Time	t _r		-	3	-	nS
Turn-Off Delay Time	t _{d(off)}		-	17	-	nS
Turn-Off Fall Time	t _f		-	2.5	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =5A, V _{GS} =10V	-	22	-	nC
Gate-Source Charge	Q _{gs}		-	3.3	-	nC
Gate-Drain Charge	Q _{gd}		-	5.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =5A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	5	A
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

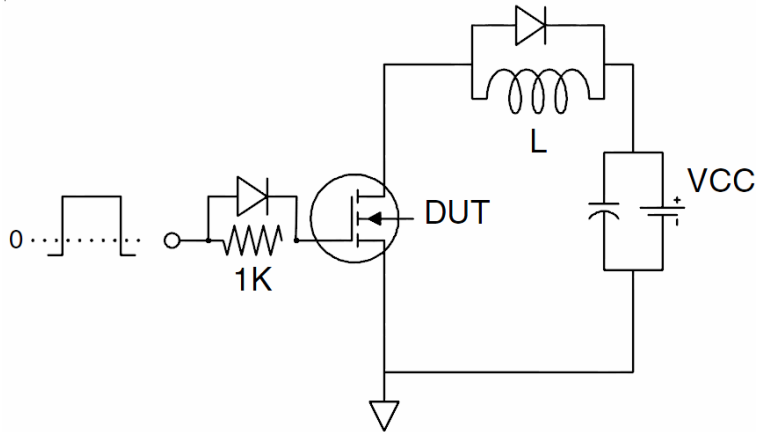
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25Ω

Test Circuit

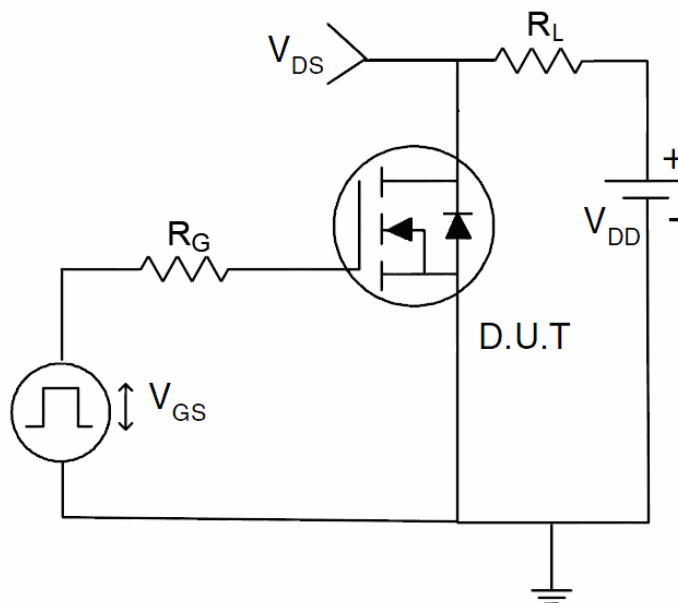
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

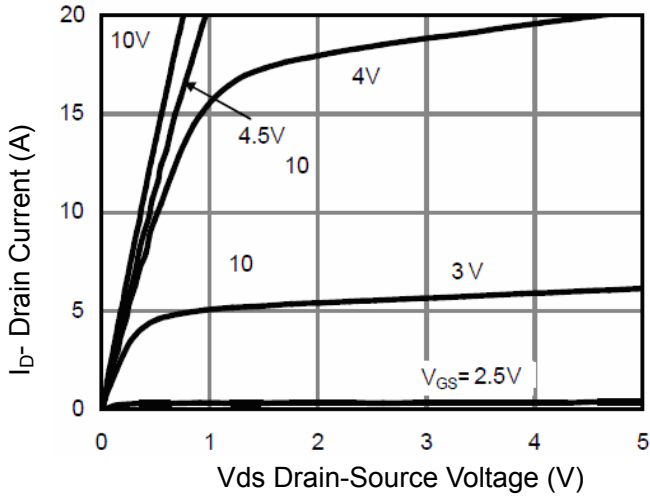


Figure 1 Output Characteristics

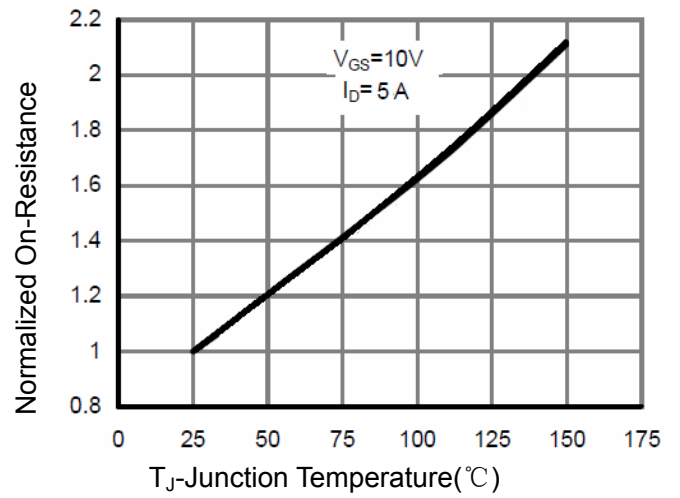


Figure 4 Rds(on)-Junction Temperature

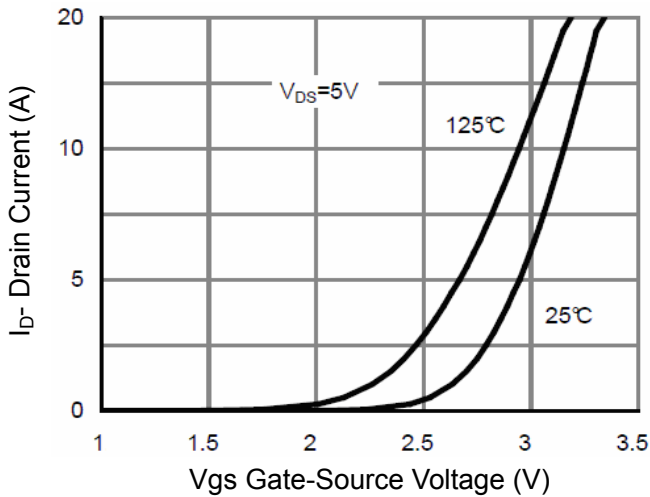


Figure 2 Transfer Characteristics

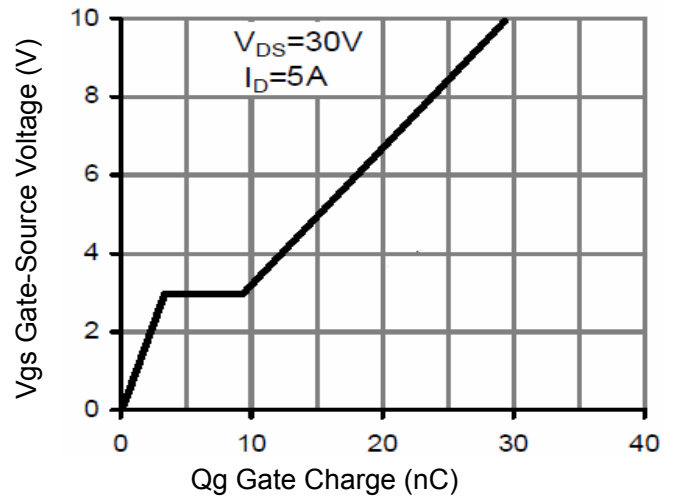


Figure 5 Gate Charge

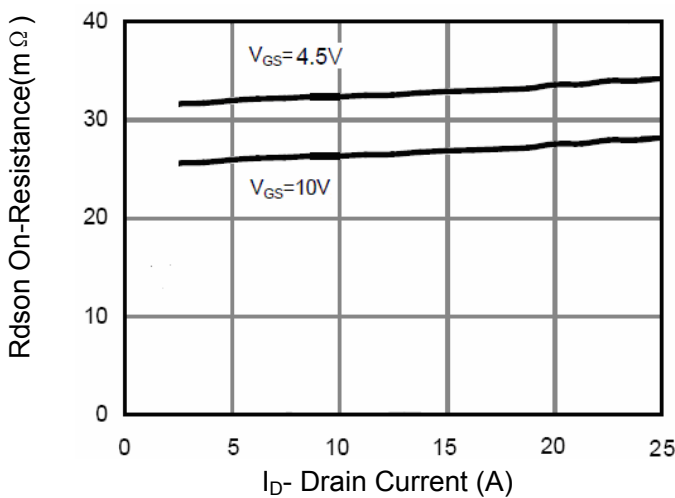


Figure 3 Rds(on)- Drain Current

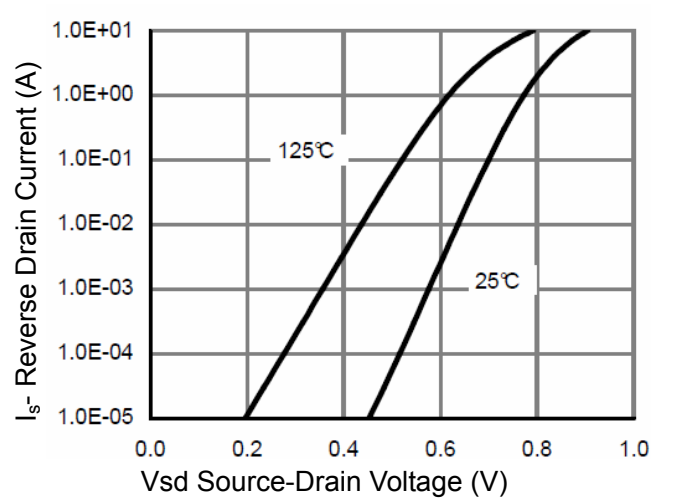


Figure 6 Source- Drain Diode Forward

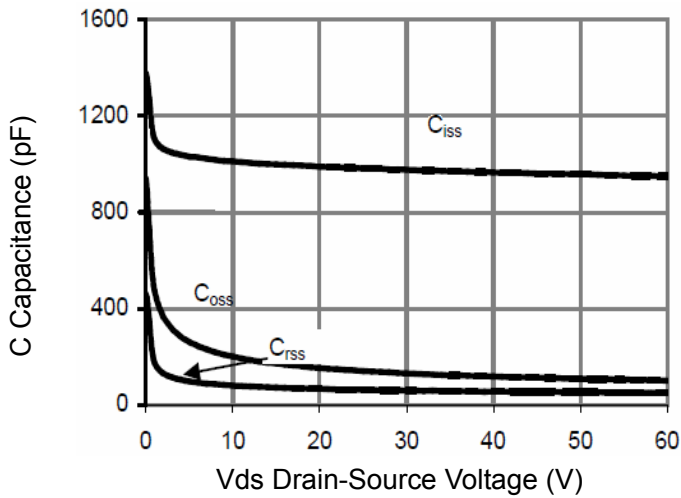


Figure 7 Capacitance vs Vds

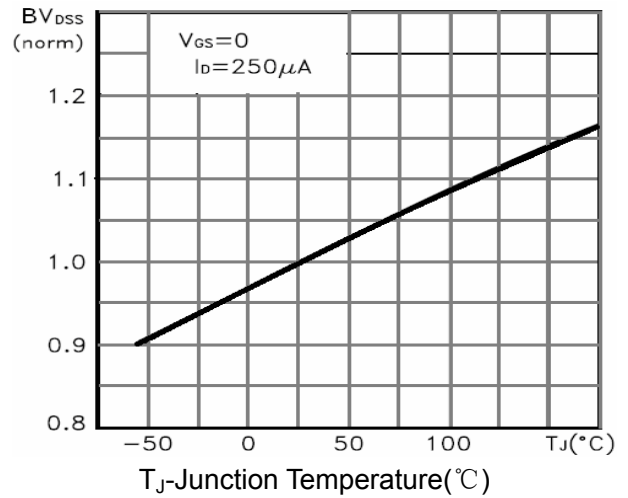


Figure 9 BV_{DSS} vs Junction Temperature

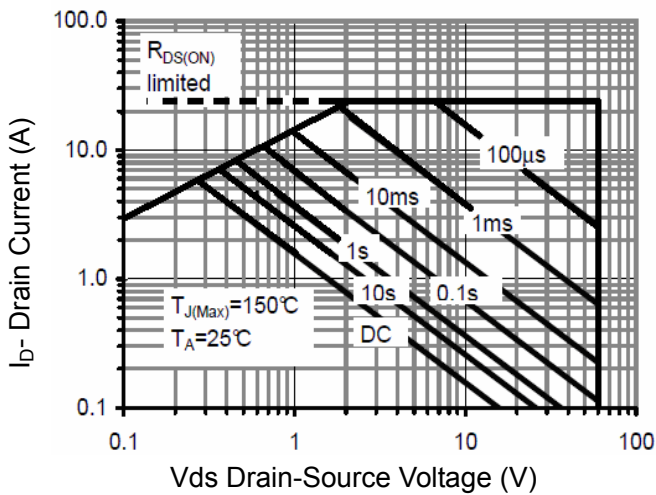


Figure 8 Safe Operation Area

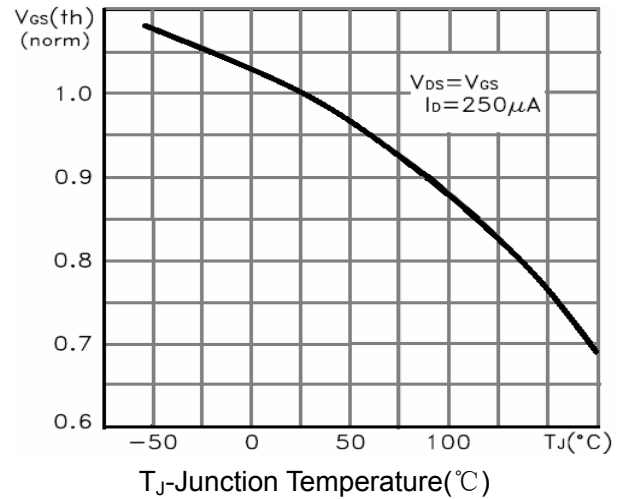


Figure 10 $V_{GS(th)}$ vs Junction Temperature

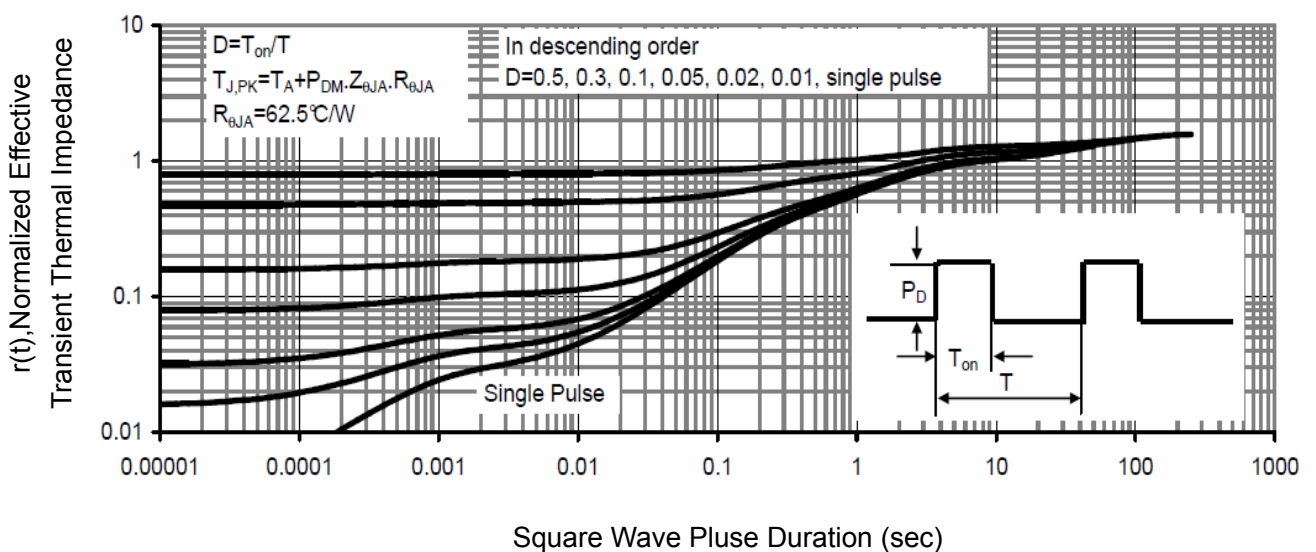


Figure 11 Normalized Maximum Transient Thermal Impedance

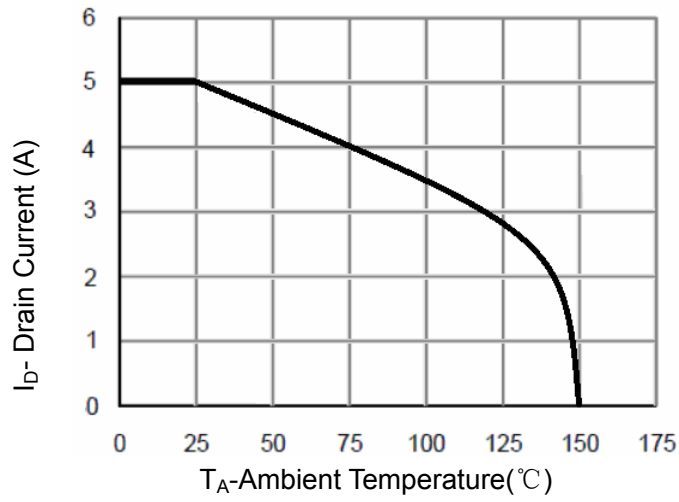
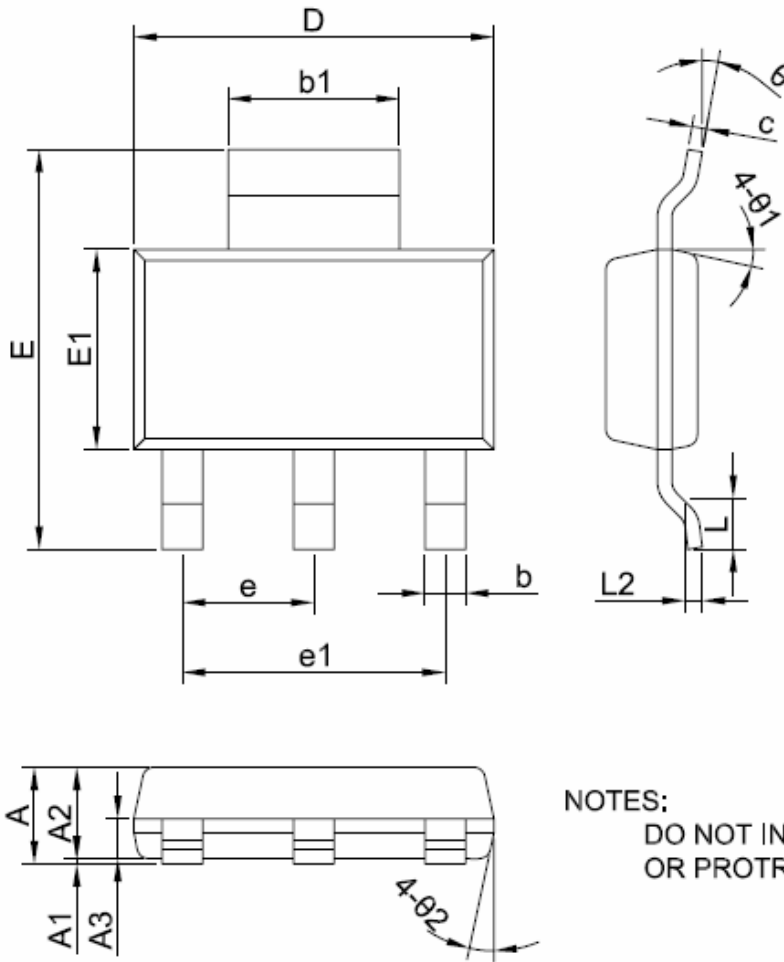


Figure 12 ID Current De-rating

SOT-223-3L Package Information



NOTES:
DO NOT INCLUDE MOLD FLASH
OR PROTRUSIONS

SYMBOL	MIN	NOM	MAX
A	1.55	—	1.80
A1	0.02	—	0.12
A2	1.45	1.60	1.75
A3	0.60	0.70	0.80
b	0.60	—	0.80
b1	2.90	—	3.10
c	0.24	—	0.32
D	6.20	6.30	6.50
E	6.70	7.00	7.30
E1	3.30	3.50	3.70
e	2.299REF		
e1	4.598REF		
L	0.90MIN		
L2	0.30BSC		
θ	0°	—	10°
θ ₁	10°	12°	14°
θ ₂	10°	12°	14°

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