

## NCE P-Channel Enhancement Mode Power MOSFET

### Description

The NCE20P85GU 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.

### Application

- Load switch
- Battery protection

**100% UIS TESTED!**

**100%  $\Delta V_{ds}$  TESTED!**

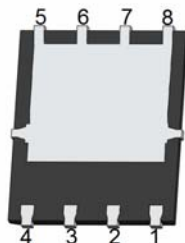
### General Features

- $V_{DS} = -20V, I_D = -85A$   
 $R_{DS(ON)} < 1.9m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 2.4m\Omega @ V_{GS} = -2.5V$   
 $R_{DS(ON)} < 3.8m\Omega @ V_{GS} = -1.8V$
- 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

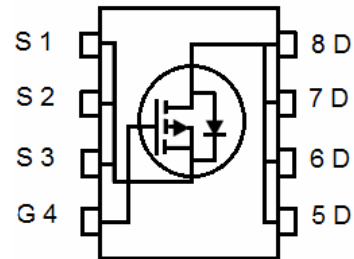
### DFN 5X6



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
20P85GU	NCE20P85GU	DFN 5x6 -8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 10$	V
Drain Current-Continuous	$I_D$	-85	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-60.1	A
Pulsed Drain Current	$I_{DM}$	-340	A
Maximum Power Dissipation	$P_D$	150	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	420	mJ
Derating factor		1.2	W/ $^\circ C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.83	$^\circ C/W$
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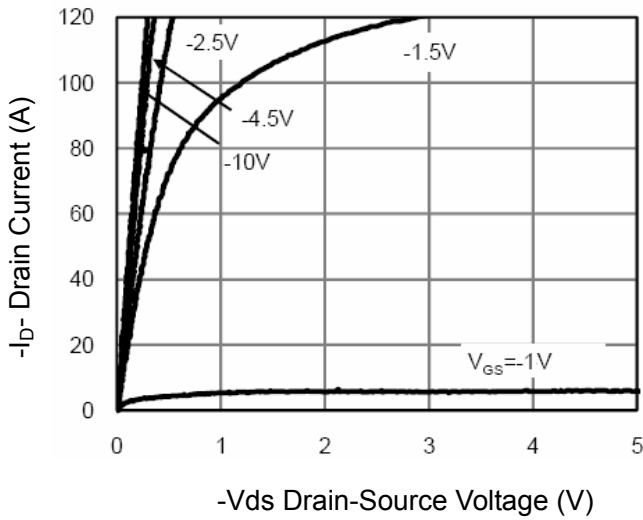
## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4	-0.6	-1.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-20A$	-	1.4	1.9	m $\Omega$
		$V_{GS}=-2.5V, I_D=-20A$	-	1.9	2.4	
		$V_{GS}=-1.8V, I_D=-20A$	-	2.6	3.8	
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-20A$	105	-	-	S
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-10V, V_{GS}=0V,$ $F=1.0MHz$	-	12670	-	PF
Output Capacitance	$C_{oss}$		-	1695	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	1485	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, R_{GEN}=3\Omega$ $V_{GS}=-4.5V, R_L=0.5\Omega$	-	16	-	nS
Turn-on Rise Time	$t_r$		-	38	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	360	-	nS
Turn-Off Fall Time	$t_f$		-	210	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-10V, I_D=-20A,$ $V_{GS}=-4.5V$	-	114.7	-	nC
Gate-Source Charge	$Q_{gs}$		-	22.4	-	nC
Gate-Drain Charge	$Q_{gd}$		-	23.4	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-85	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = -10A$ $di/dt = 100A/\mu s$ (Note3)	-	150	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	240	-	nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

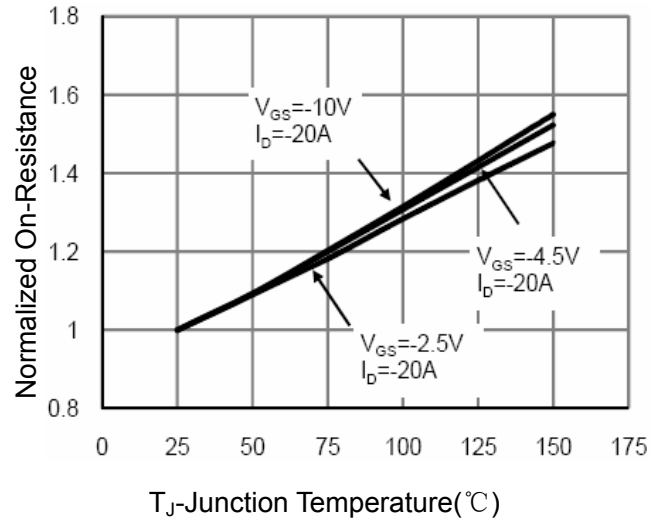
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. 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
5. EAS condition:  $T_J=25^\circ\text{C}, V_{DB}=-10V, V_G=-10V, L=0.5mH, R_g=25\Omega$

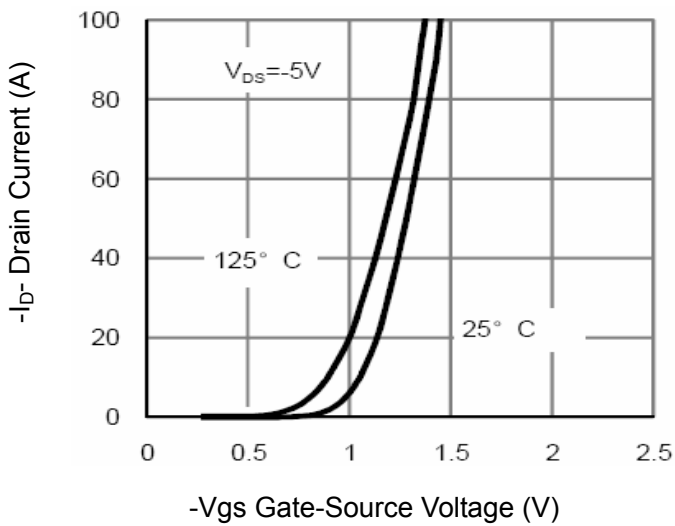
## Typical Electrical and Thermal Characteristics (Curves)



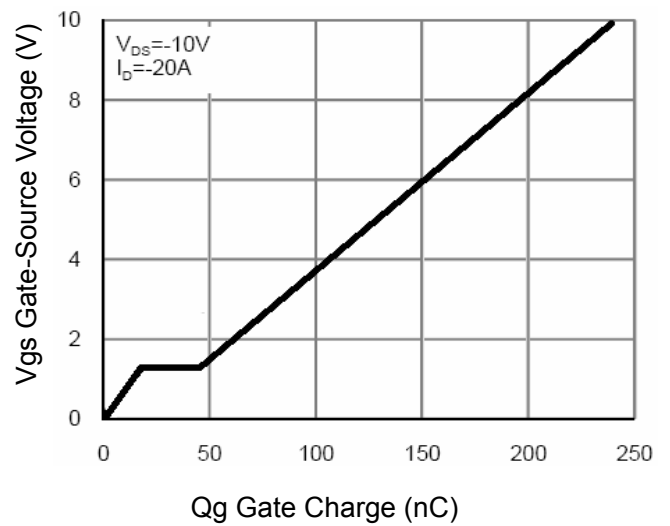
**Figure 1 Output Characteristics**



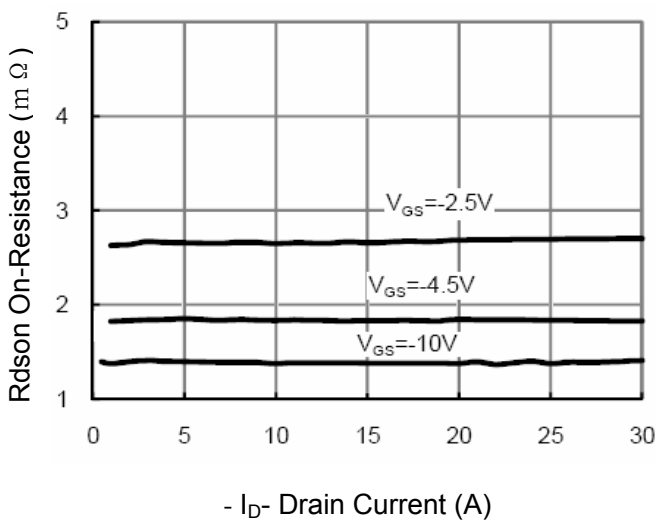
**Figure 4  $R_{dson}$ -Junction Temperature**



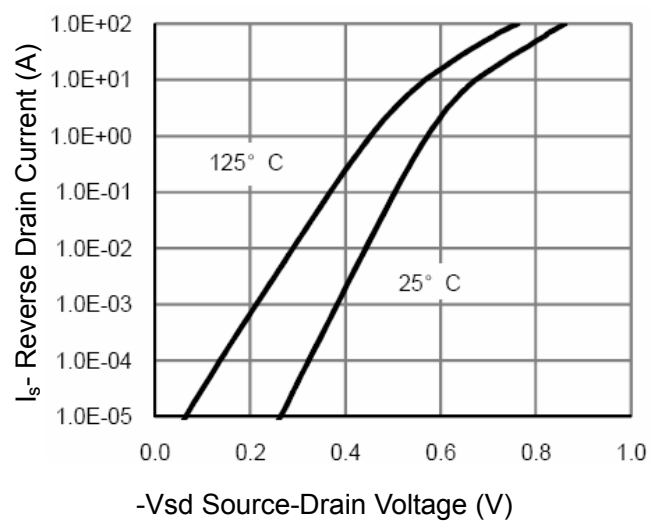
**Figure 2 Transfer Characteristics**



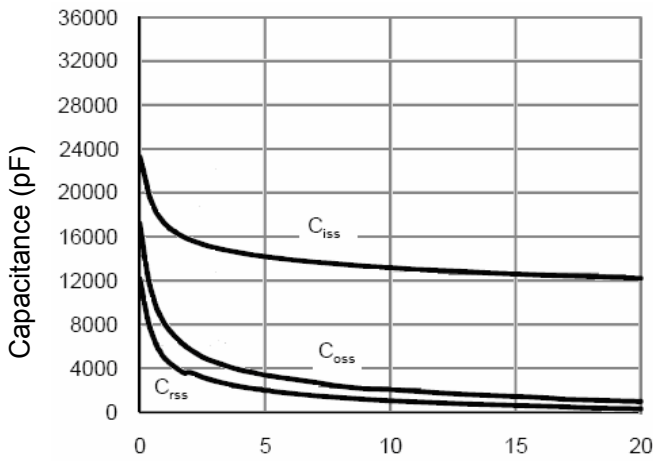
**Figure 5 Gate Charge**



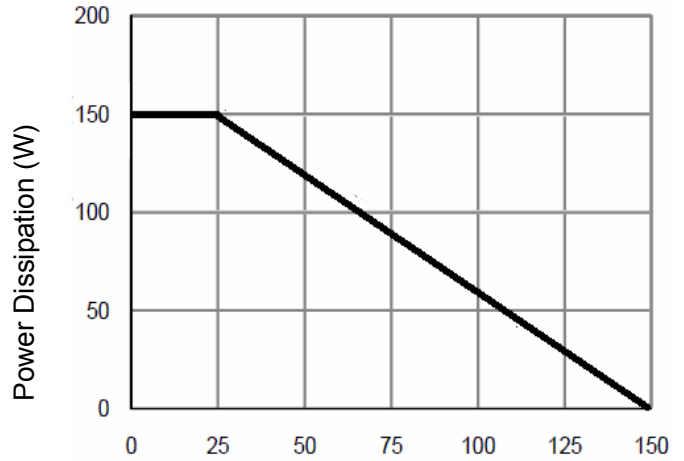
**Figure 3  $R_{dson}$ - Drain Current**



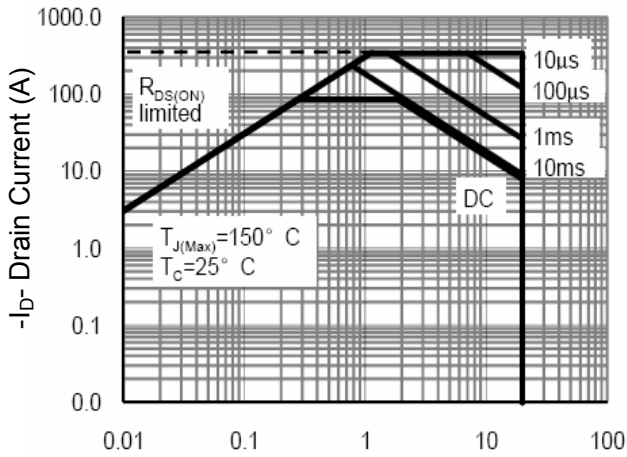
**Figure 6 Source- Drain Diode Forward**



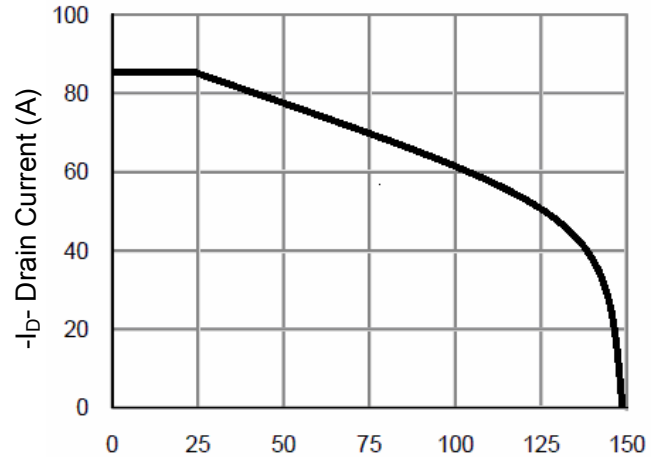
-Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



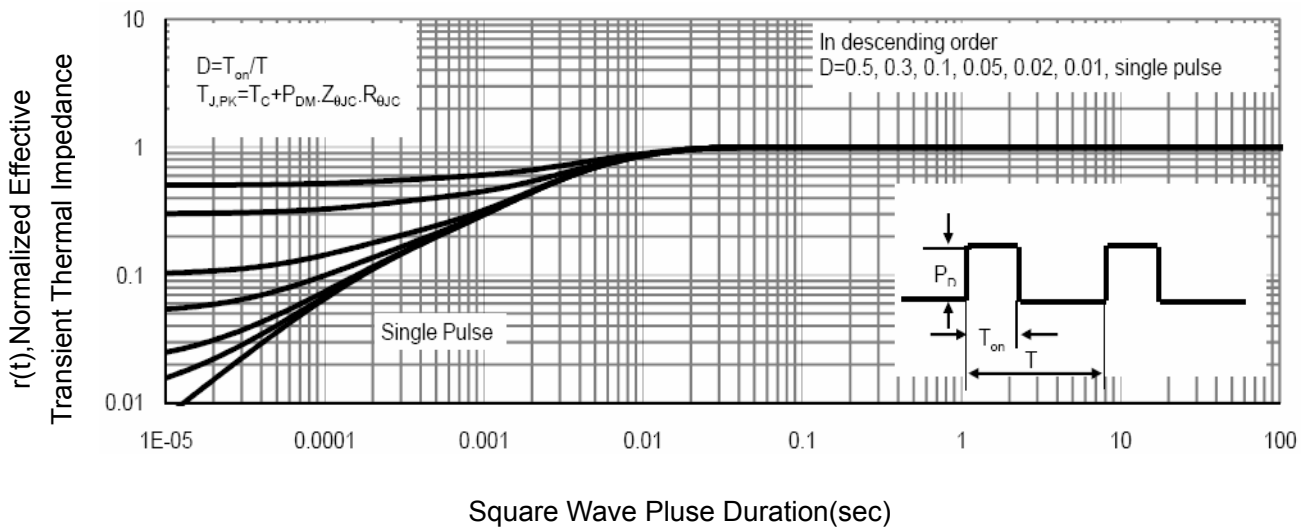
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power De-rating**



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

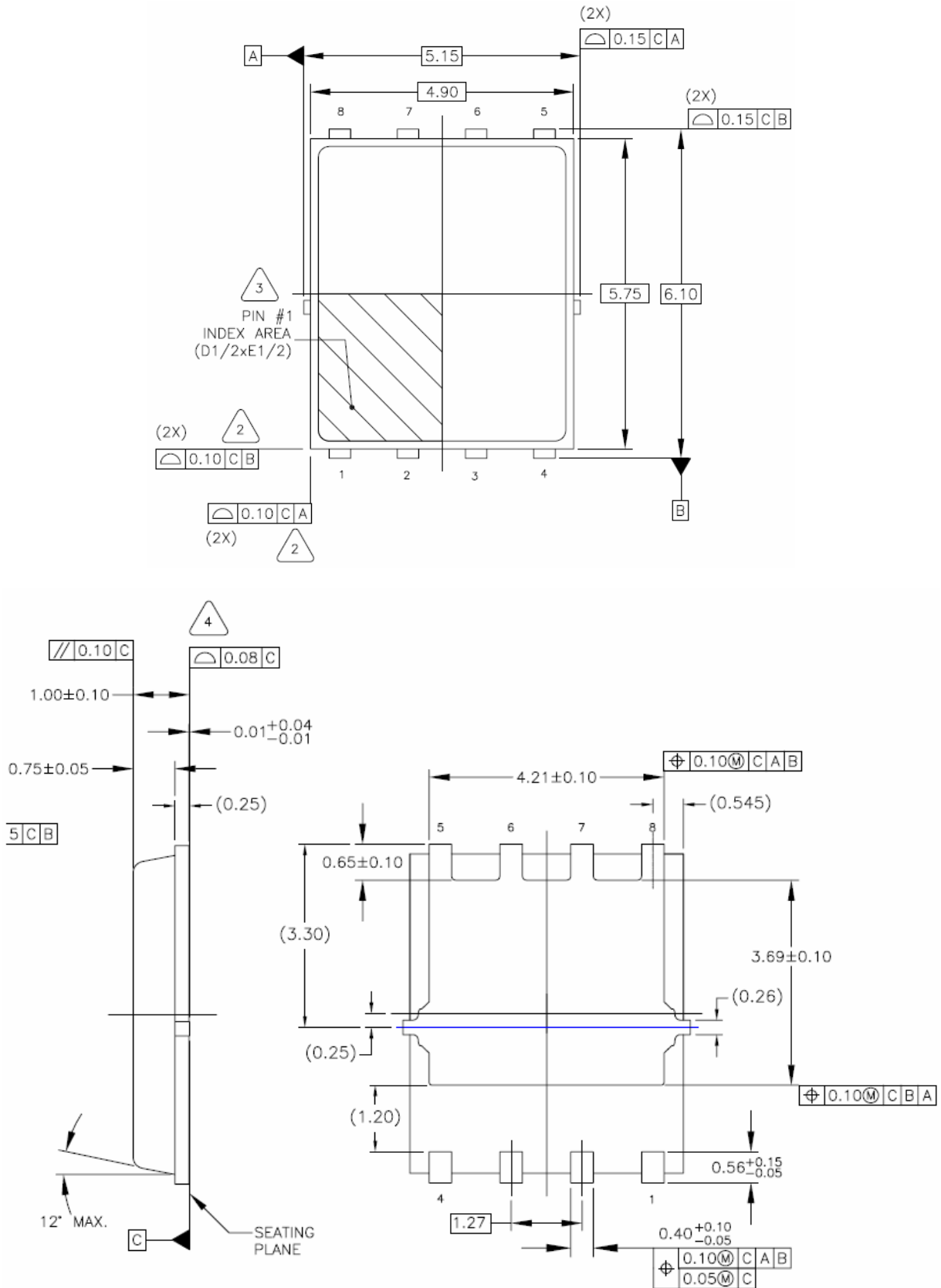


T<sub>J</sub>-Junction Temperature(°C)  
**Figure 10 -Current De-rating**



Square Wave Pluse Duration(sec)  
**Figure 11 Normalized Maximum Transient Thermal Impedance**

## DFN5X6-8L Package Information



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