

## NCE N-Channel Enhancement Mode Power MOSFET

### General Description

The NCE7578 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

### Features

- $V_{DS}=75V$ ;  $I_D=78A@V_{GS}=10V$ ;  
 $R_{DS(ON)}<8.5m\Omega @V_{GS}=10V$
- Special process technology for high ESD capability
- Special designed for Convertors and power controls
- 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

### Application

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

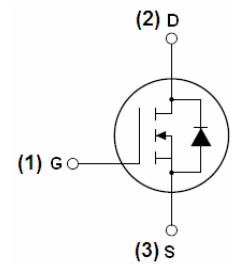
### Product Summary

$BV_{DSS}$	typ.	84	V
$R_{DS(ON)}$	typ.	7.0	m $\Omega$
	max.	8.5	m $\Omega$
$I_D$		78	A

**100% UIS TESTED!**



TO-220-3L top view



Schematic diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE7578	NCE7578	TO-220-3L	-	-	-

**Table 1. Absolute Maximum Ratings ( $T_C=25^\circ C$ )**

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	75	V
Gate-Source Voltage ( $V_{DS}=0V$ )	$V_{GS}$	$\pm 20$	V
Drain Current (DC) at $T_C=25^\circ C$	$I_{D(DC)}$	78	A
Drain Current (DC) at $T_C=100^\circ C$	$I_{D(DC)}$	55	A
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_{DM(pluse)}$	300	A
Peak diode recovery voltage	$dv/dt$	30	V/ns
Maximum Power Dissipation( $T_C=25^\circ C$ )	$P_D$	160	W
Derating factor		1.07	W/ $^\circ C$
Single pulse avalanche energy (Note 2)	$E_{AS}$	550	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

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

2.EAS condition:  $T_J=25^\circ C, V_{DD}=37.5V, V_G=10V, L=0.5mH$

**Table 2. Thermal Characteristic**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	0.94	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	63	$^{\circ}C/W$

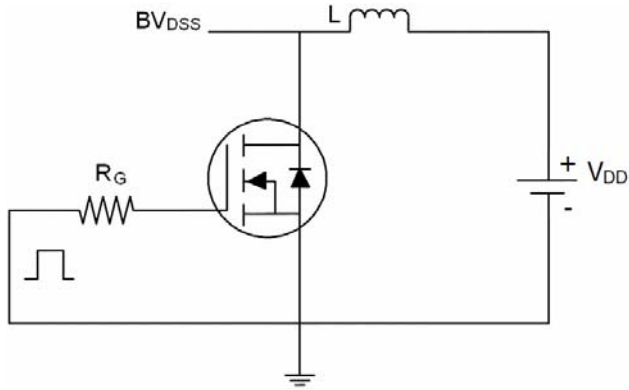
**Table 3. Electrical Characteristics ( $T_C=25^{\circ}C$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	75	84	-	V
Zero Gate Voltage Drain Current( $T_C=25^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$	-	-	1	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$	-	-	10	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	2.85	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$	-	7	8.5	m $\Omega$
<b>Dynamic Characteristics</b>						
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=30A$	-	60	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$	-	3400	-	PF
Output Capacitance	$C_{oss}$		-	290	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	221	-	PF
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=30A,$ $V_{GS}=10V$	-	94	-	nC
Gate-Source Charge	$Q_{gs}$		-	16	-	nC
Gate-Drain Charge	$Q_{gd}$		-	24	-	nC
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$	-	15	-	nS
Turn-on Rise Time	$t_r$		-	11	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	52	-	nS
Turn-Off Fall Time	$t_f$		-	13	-	nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$		-	-	78	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$		-	-	312	A
Forward on voltage <sup>(Note 1)</sup>	$V_{SD}$	$T_J=25^{\circ}C, I_{SD}=40A, V_{GS}=0V$	-	-	1.2	V
Reverse Recovery Time <sup>(Note 1)</sup>	$t_{rr}$	$T_J=25^{\circ}C, I_F=75A, di/dt=100A/\mu s$	-	-	33	nS
Reverse Recovery Charge <sup>(Note 1)</sup>	$Q_{rr}$		-	-	54	nC
Forward Turn-on Time	$t_{on}$	Intrinsic turn-on time is negligible(turn-on is dominated by $L_S+L_D$ )				

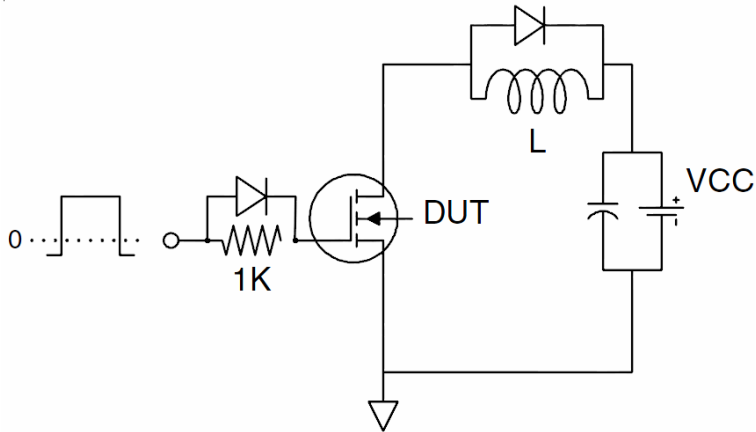
Notes 1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1.5\%$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}C$

**Test Circuit**

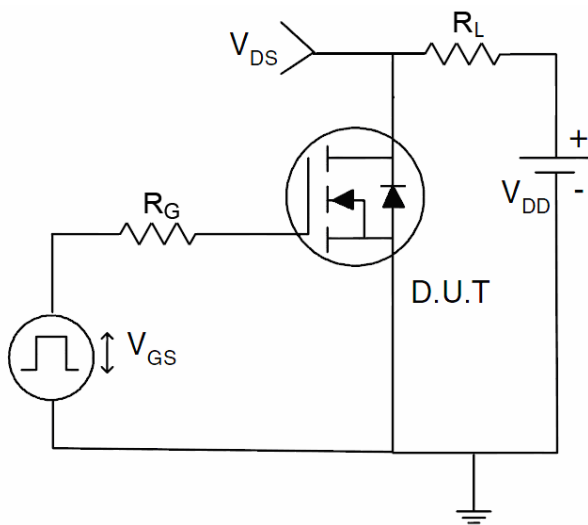
**1) E<sub>AS</sub> test circuit**



**2) Gate charge test circuit**



**3) Switch Time Test Circuit**



Typical Electrical and Thermal Characteristics (curves)

Figure1. Safe operating area

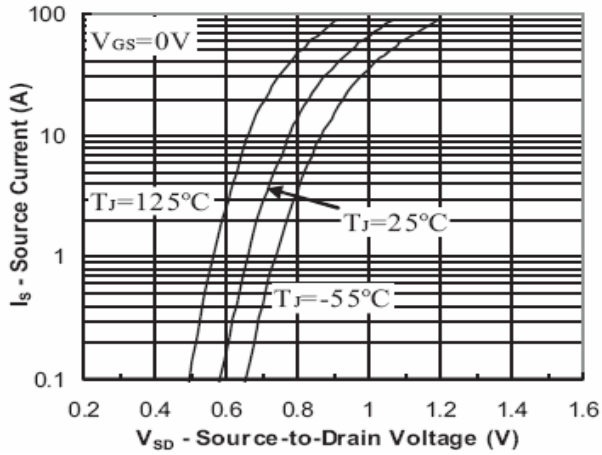


Figure2. Source-Drain Diode Forward Voltage

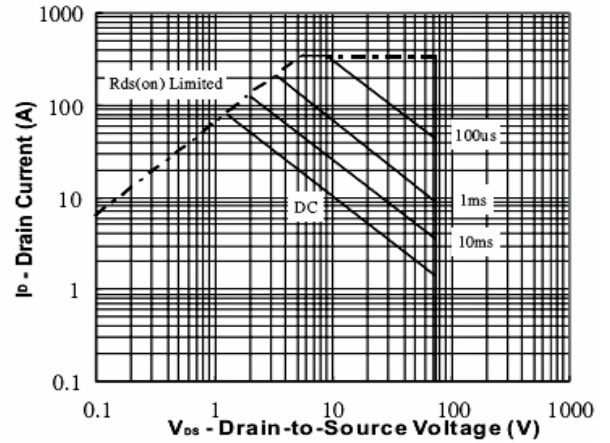


Figure3. Output characteristics

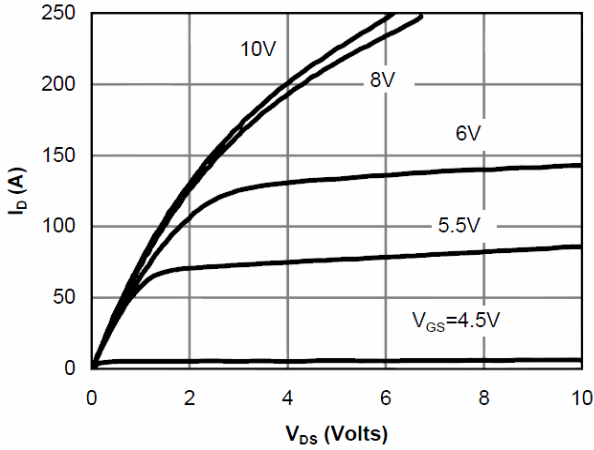


Figure4. Transfer characteristics

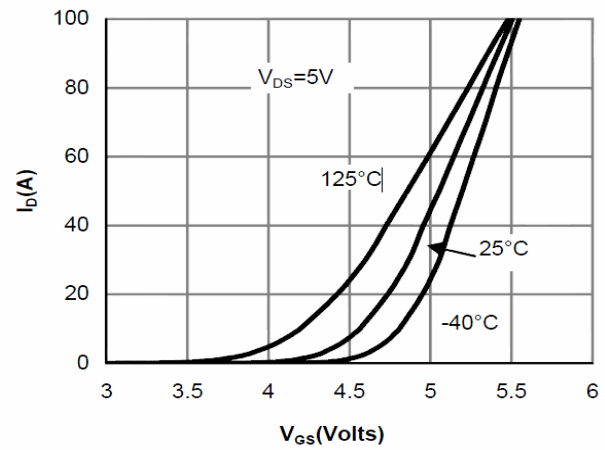


Figure5. Static drain-source on resistance

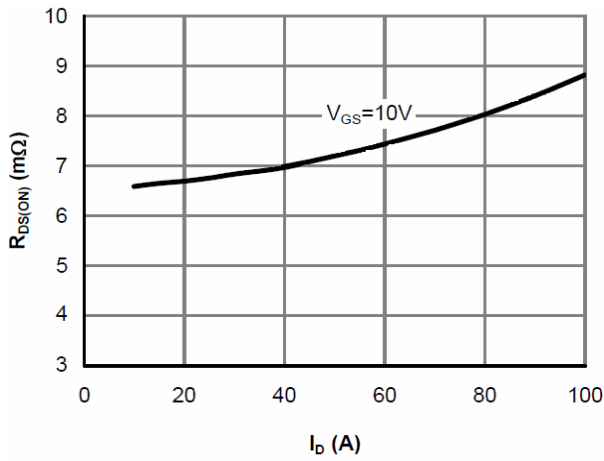


Figure6. RDS(ON) vs Junction Temperature

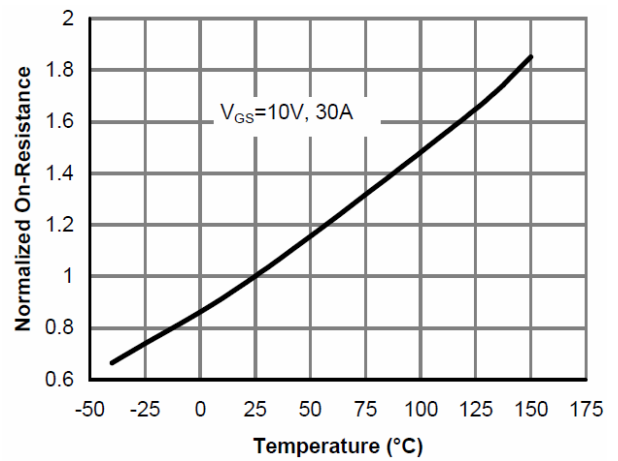


Figure7.  $BV_{DSS}$  vs Junction Temperature

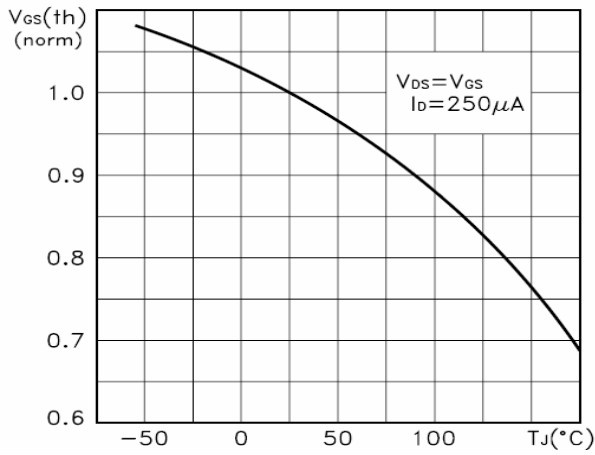


Figure8.  $V_{GS(th)}$  vs Junction Temperature

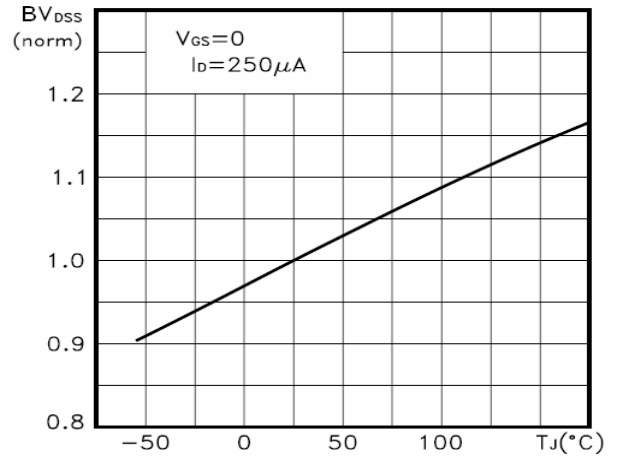


Figure9. Capacitance

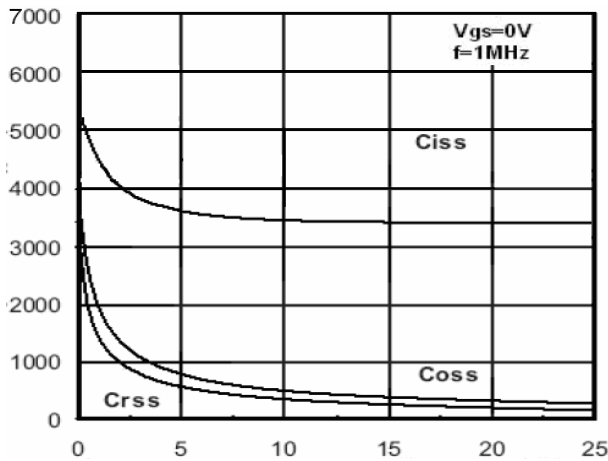


Figure10. Gate charge waveforms

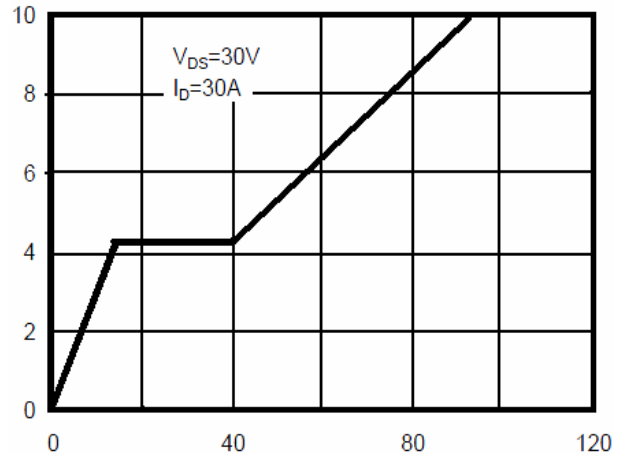
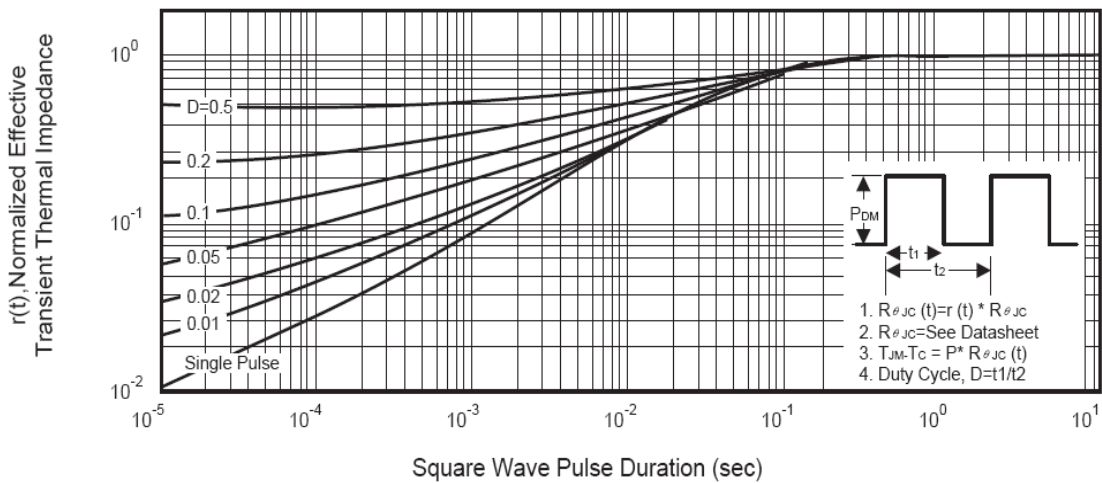
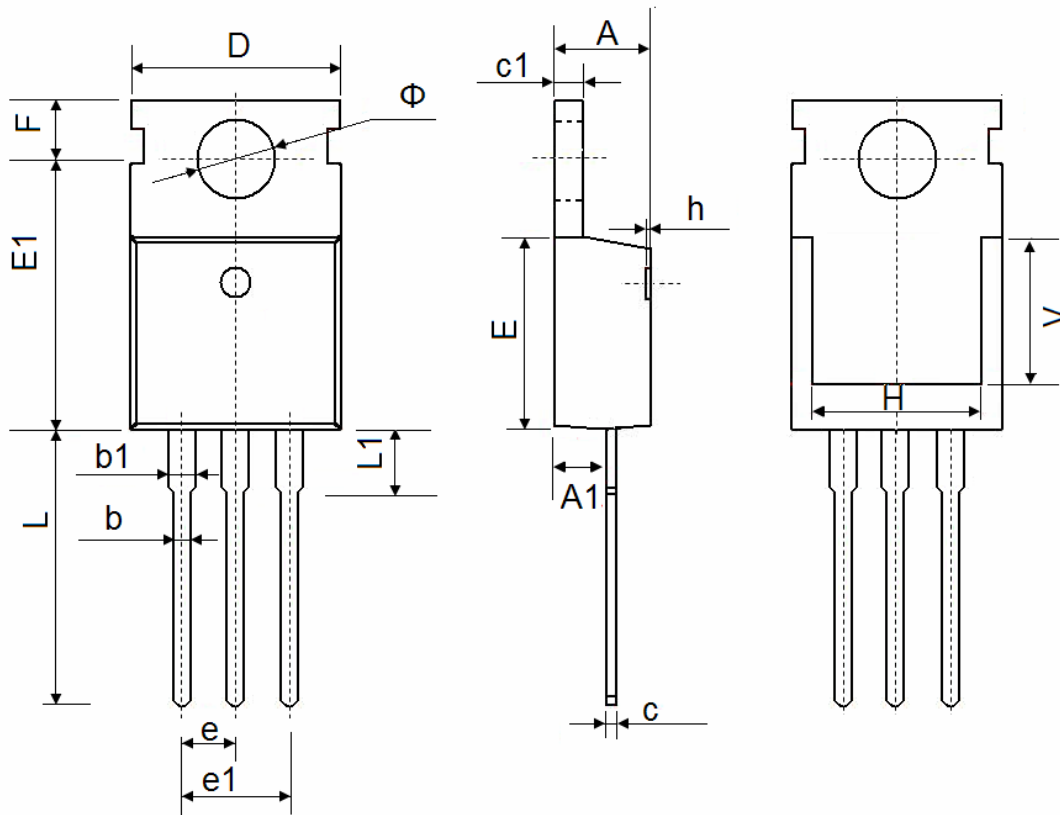


Figure11. Normalized Maximum Transient Thermal Impedance



**TO-220-3L Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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