

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

- $V_{DS}=75V$; $I_D=78A@V_{GS}=10V$;
 $R_{DS(ON)}<8m\Omega @V_{GS}=10V$
- Special process technology for high ESD capability
- Special designed for Convertors and power controls
- High density cell design for ultra low R_{dson}
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

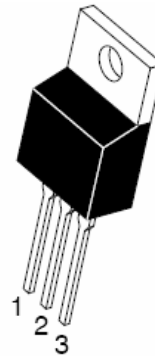
Application

- Power switching application
- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply

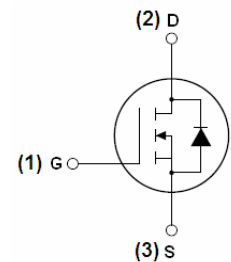
Product Summary

BV_{DSS}	typ.	84	V
$R_{DS(ON)}$	typ.	6.8	m Ω
	max.	8.0	m Ω
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 (TA=25°C)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	75	V
Gate-Source Voltage ($V_{DS}=0V$)	V_{GS}	± 25	V
Drain Current (DC) at $T_c=25^\circ C$	$I_{D(DC)}$	78	A
Drain Current (DC) at $T_c=100^\circ C$	$I_{D(DC)}$	75	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/°C
Single pulse avalanche energy (Note 2)	E_{AS}	550	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C

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

2.EAS condition: $T_j=25^\circ C, V_{DD}=50V, V_G=10V, L=0.5mH$

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	$^{\circ}C/W$

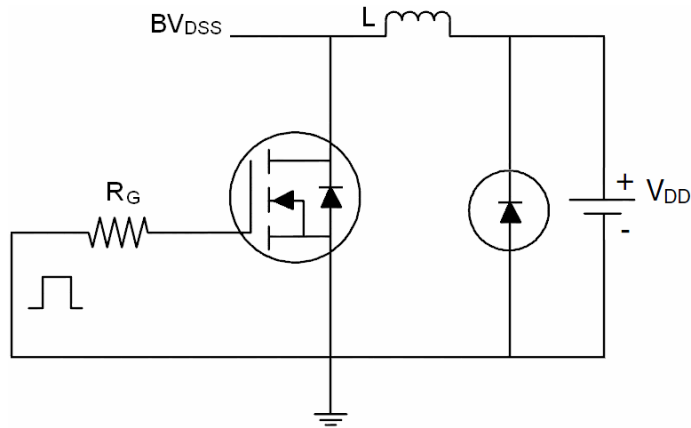
Table 3. Electrical Characteristics (TA=25 $^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	75			V
Zero Gate Voltage Drain Current(Tc=25 $^{\circ}C$)	I_{DSS}	$V_{DS}=75V, V_{GS}=0V$			1	μA
Zero Gate Voltage Drain Current(Tc=125 $^{\circ}C$)	I_{DSS}	$V_{DS}=75V, V_{GS}=0V$			10	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2		4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=40A$		6.8	8	m Ω
Dynamic Characteristics						
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=30A$		60		S
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$		3100		PF
Output Capacitance	C_{oss}			310		PF
Reverse Transfer Capacitance	C_{rss}			260		PF
Total Gate Charge	Q_g	$V_{DS}=30V, I_D=30A,$ $V_{GS}=10V$		100		nC
Gate-Source Charge	Q_{gs}			18		nC
Gate-Drain Charge	Q_{gd}			27		nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$		18.2		nS
Turn-on Rise Time	t_r			15.6		nS
Turn-Off Delay Time	$t_{d(off)}$			70.5		nS
Turn-Off Fall Time	t_f			13.8		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I_{SD}				80	A
Pulsed Source-drain current(Body Diode)	I_{SDM}				320	A
Forward on voltage ^(Note 1)	V_{SD}	$T_j=25^{\circ}C, I_{SD}=40A, V_{GS}=0V$			1.2	V
Reverse Recovery Time ^(Note 1)	t_{rr}	$T_j=25^{\circ}C, I_F=75A, di/dt=100A/\mu s$			53	nS
Reverse Recovery Charge ^(Note 1)	Q_{rr}				105	nC
Forward Turn-on Time	t_{on}	Intrinsic turn-on time is negligible(turn-on is dominated by L_S+L_D)				

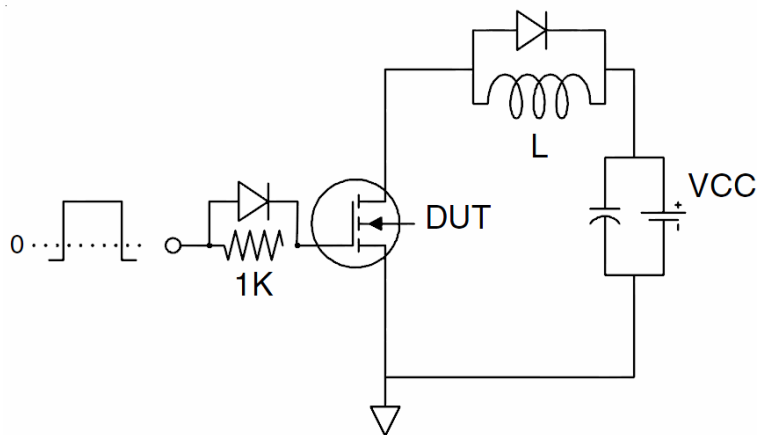
Notes 1. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 1.5\%$, $R_G=25\Omega$, Starting $T_j=25^{\circ}C$

Test circuit

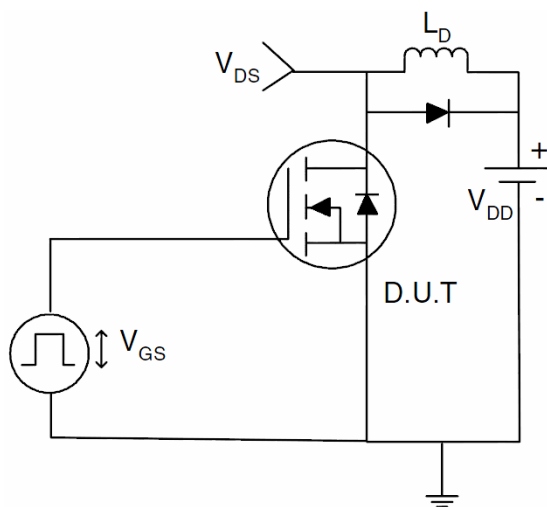
1) E_{AS} test circuits



2) Gate charge test circuit:



3) Switch Time Test Circuit:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

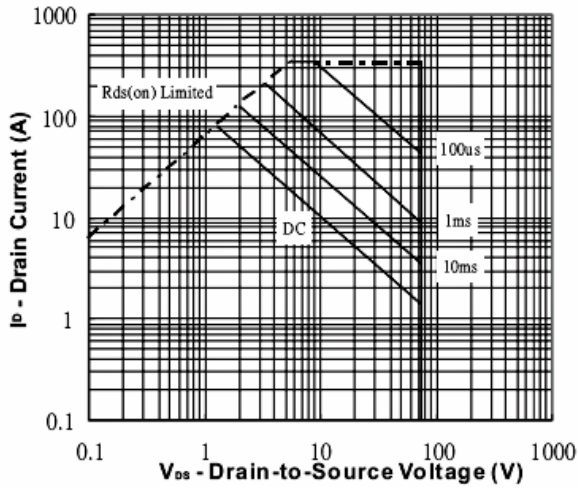


Figure2. Source-Drain Diode Forward Voltage

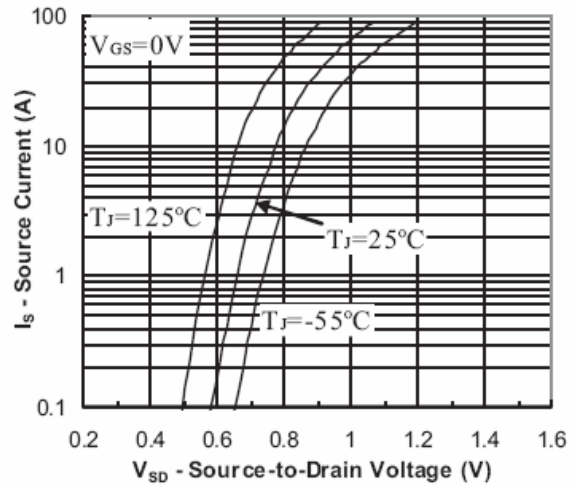


Figure3. Output characteristics

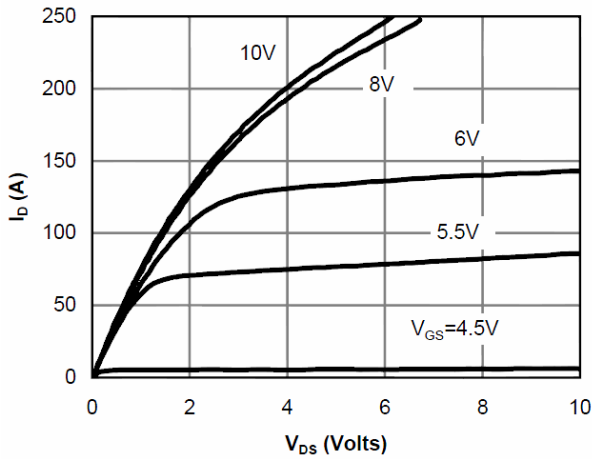


Figure4. Transfer characteristics

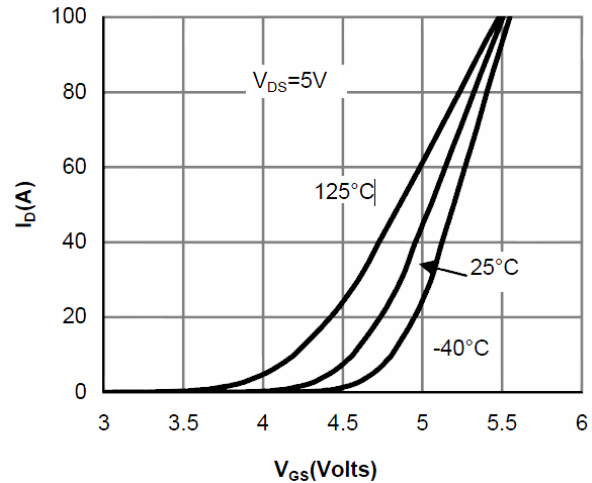


Figure5. Static drain-source on resistance

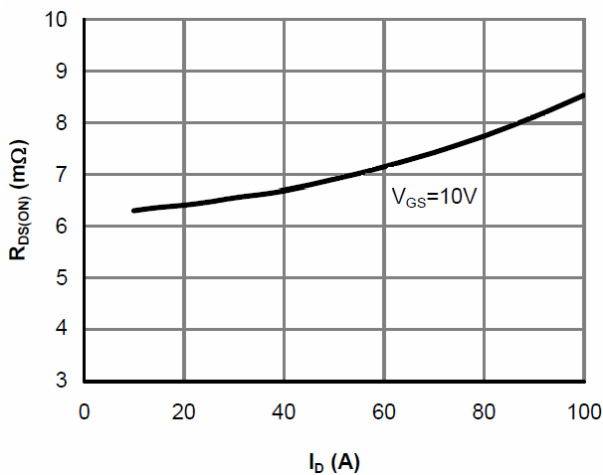


Figure6. R_{DS(ON)} vs Junction Temperature

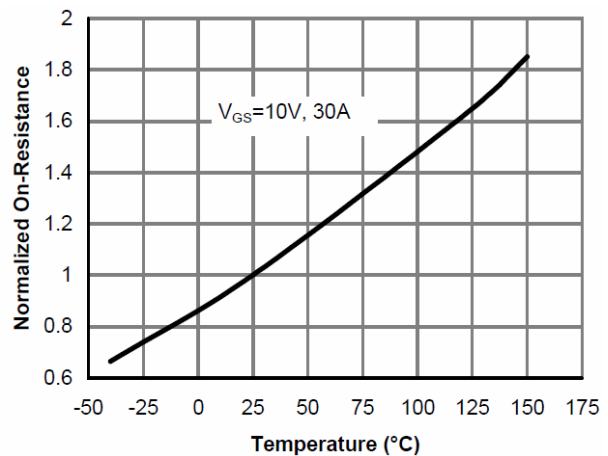


Figure7. BV_{DSS} vs Junction Temperature

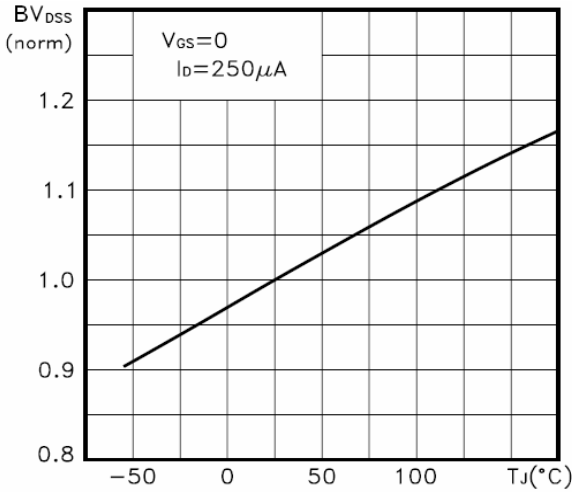


Figure8. $V_{GS(th)}$ vs Junction Temperature

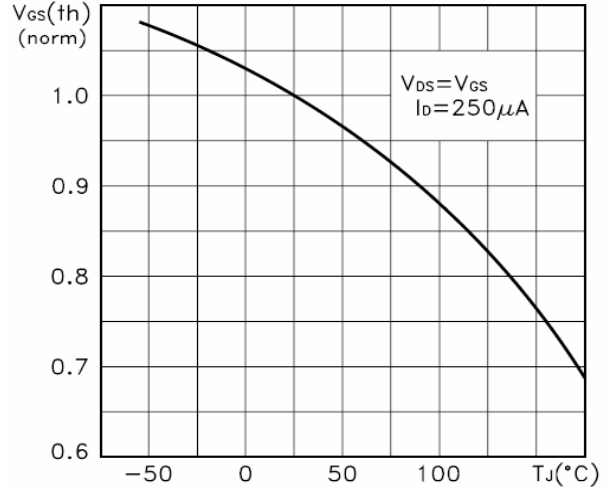


Figure9. Gate charge waveforms

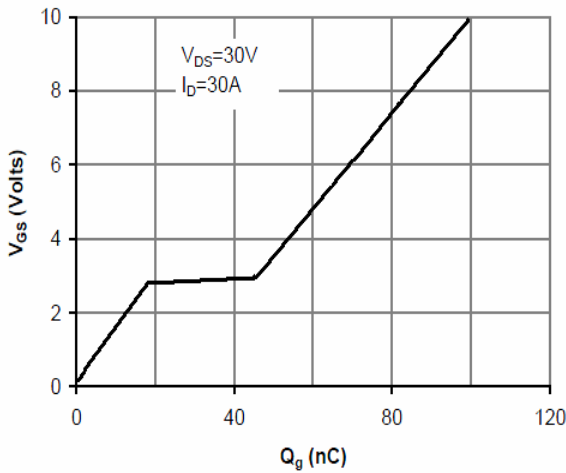


Figure10. Capacitance

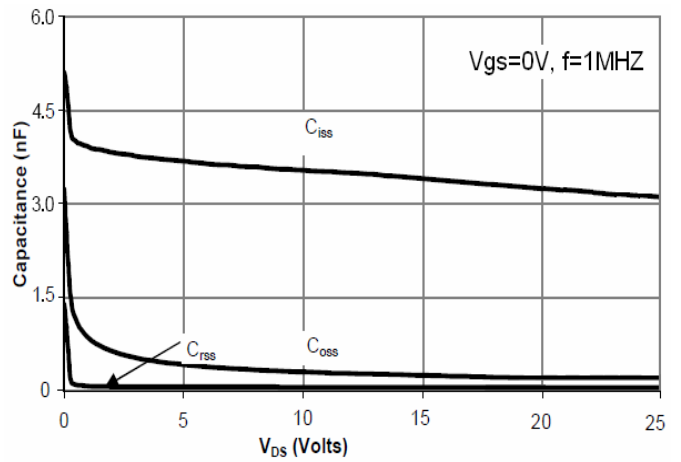
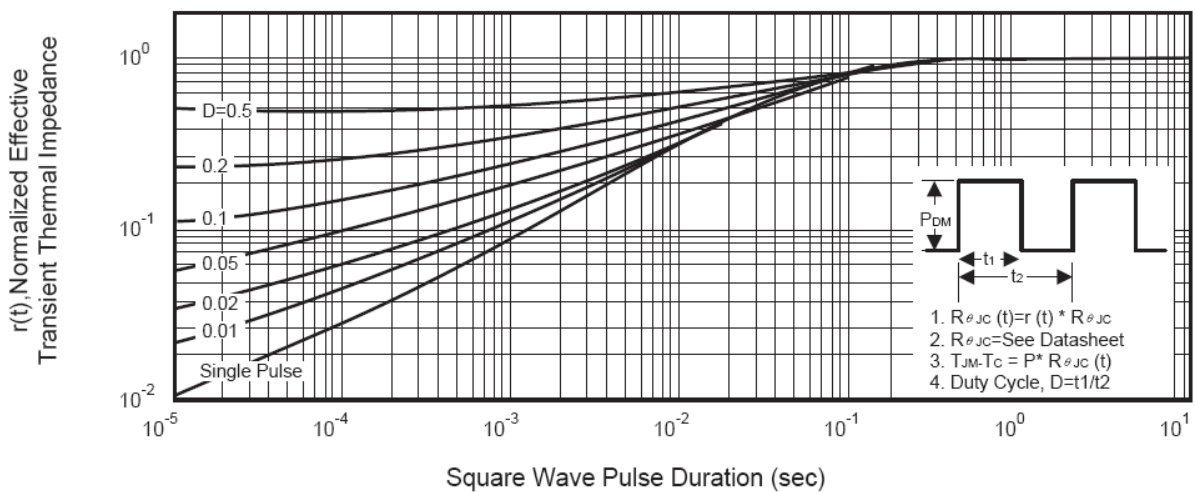
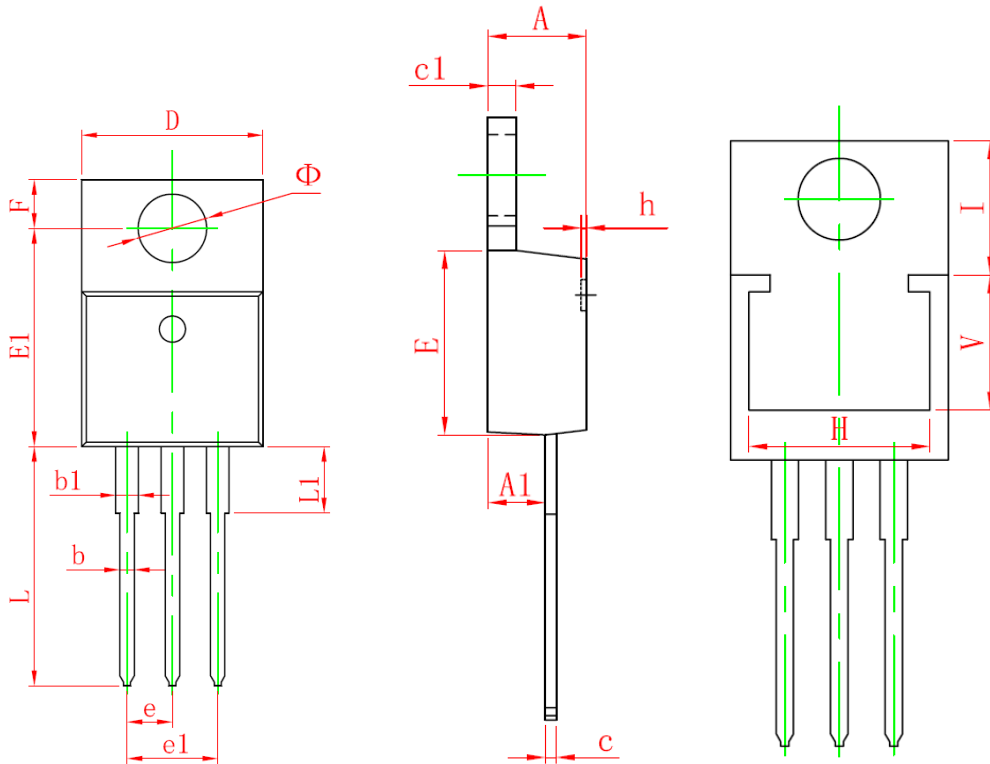


Figure11. Normalized Maximum Transient Thermal Impedance



TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
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	10.010	10.350	0.394	0.407
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 (TYP.)		0.100 (TYP.)	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
H	8.440 REF.		0.332 REF.	
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
V	6.360 REF.		0.250 REF.	
I	6.300 REF.		0.248 REF.	
Φ	3.735	3.935	0.147	0.155

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