

Description

The PNMTO650V12 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

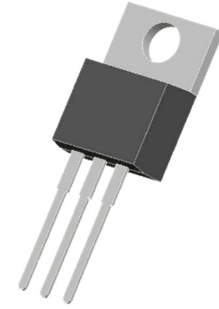
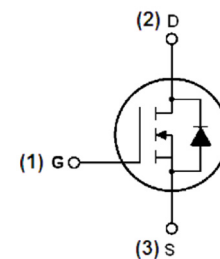
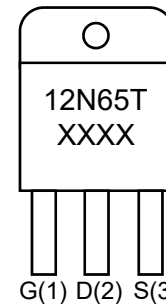
MOSFET Product Summary		
$V_{DS}(V)$	$R_{DS(on)}(\Omega)$	$I_D(A)$
650	0.65 @ $V_{GS} = 10V$	12

Feature

- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation

Applications

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


TO-220 (Top View)

Schematic diagram

Marking (Top View)

Absolute maximum rating@25°C

Rating	Symbol	Value	Units
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 30	V
Drain Current-Continuous	I_D	12	A
Pulsed Drain Current	I_{DP}	48	A
Maximum Power Dissipation	P_D	225	W
Operating Junction Temperature Range	T_J	125	°C
Storage Temperature Range	T_{STG}	-45 to 125	°C

Electrical characteristics per line@25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	-	650	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	± 0.08	μA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	-	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 6A$	-	0.65	1	Ω
Diode Forward Voltage	V_{SD}	$V_{GS} = 0V, I_D = 12A$	-	-	1.5	V
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 25V, V_{GS} = 0V,$ $F = 1.0MHz$	-	1480	1900	pF
Output Capacitance	C_{oss}		-	200	270	pF
Reverse Transfer Capacitance	C_{rss}		-	25	35	pF
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 325V, I_D = 12.0A,$ $R_G = 25\Omega$	-	30	70	ns
Turn-on Rise Time	t_r		-	115	240	ns
Turn-Off Delay Time	$t_{d(off)}$		-	95	200	ns
Turn-Off Fall Time	t_f		-	85	180	ns
Total Gate Charge	Q_g	$V_{DS} = 520V, I_D = 12.0A,$ $V_{GS} = 10V$	-	42	54	nC
Gate-Source Charge	Q_{gs}		-	8.6	-	nC
Gate-Drain Charge	Q_{gd}		-	21	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS} = 0V, I_{SD} = 12.0A$	-	-	1.4	V
Diode Forward Current	I_{SD}		-	-	12	A
Pulsed Drain-Source Current	I_{SM}		-	-	48	A
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V, I_{SD} = 12.0A,$ $di/dt = 100A/\mu s$	-	380	-	nS
Reverse Recovery Charge	Q_{rr}		-	3.5	-	μC

Typical Characteristics

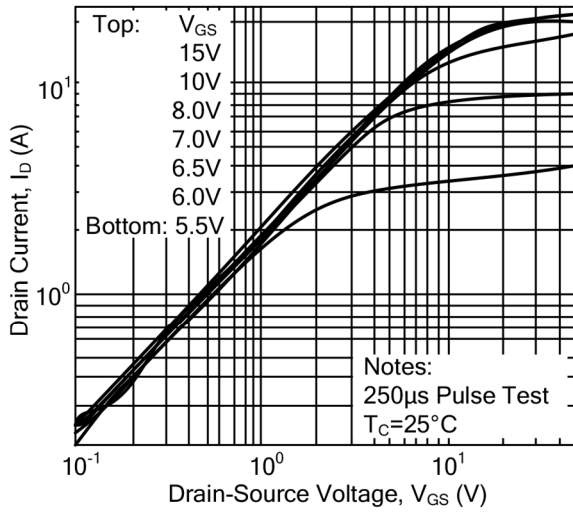


Fig 1. On-Resign Characteristics

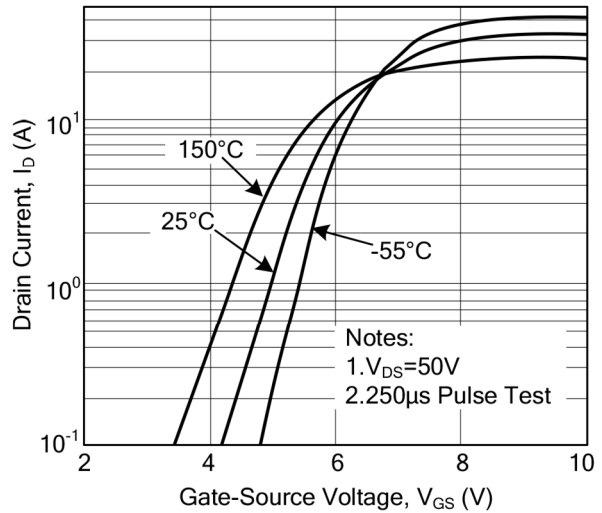


Fig 2. Transfer Characteristics

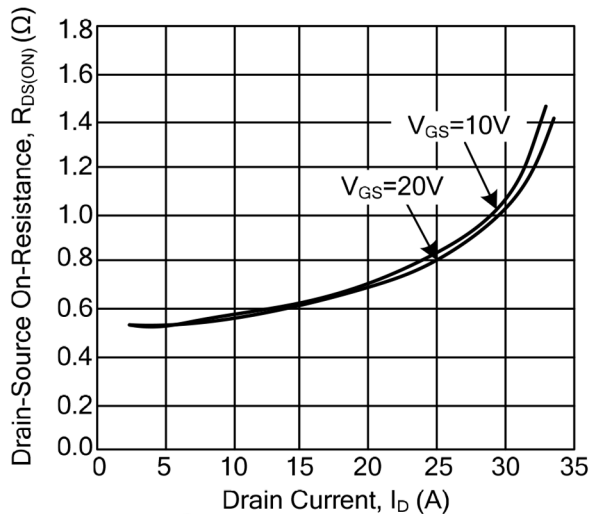


Fig 3. On-Resistance Variation vs. Drain Current and Gate Voltage

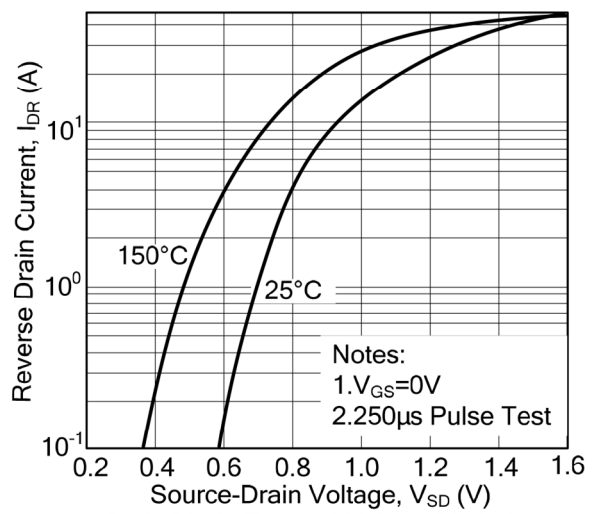


Fig 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

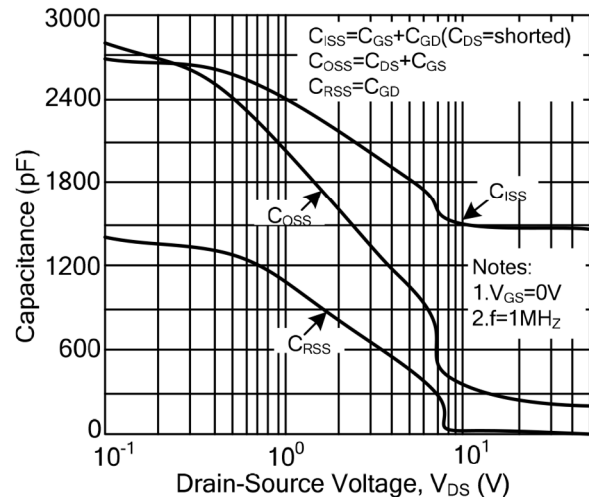


Fig 5. Capacitance Characteristics

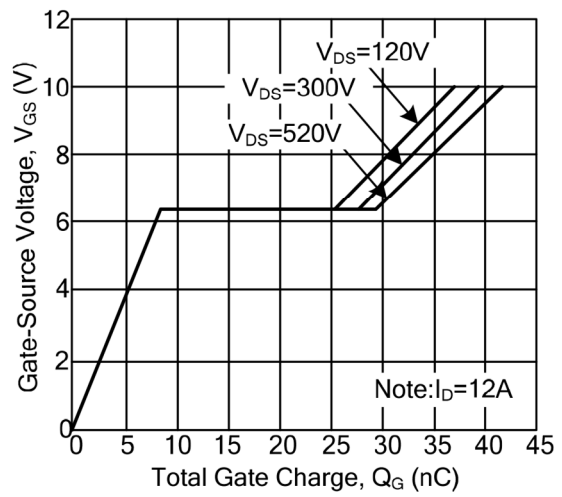


Fig 6. Gate Charge Characteristics

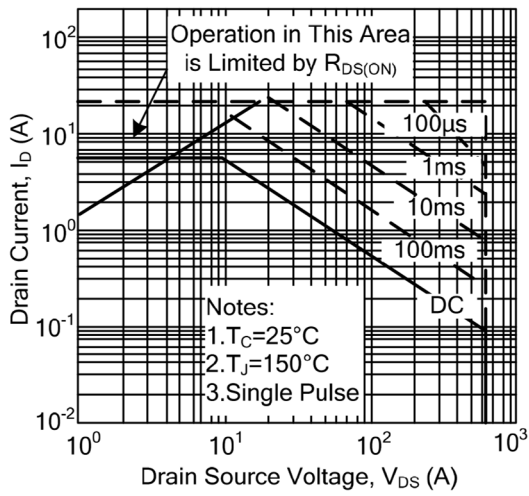


Fig 7. Maximum Safe Operating Area

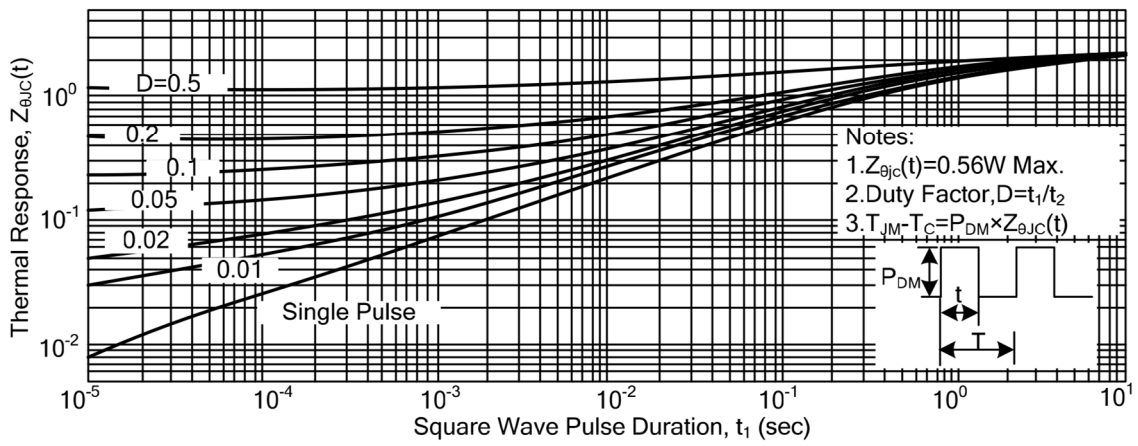
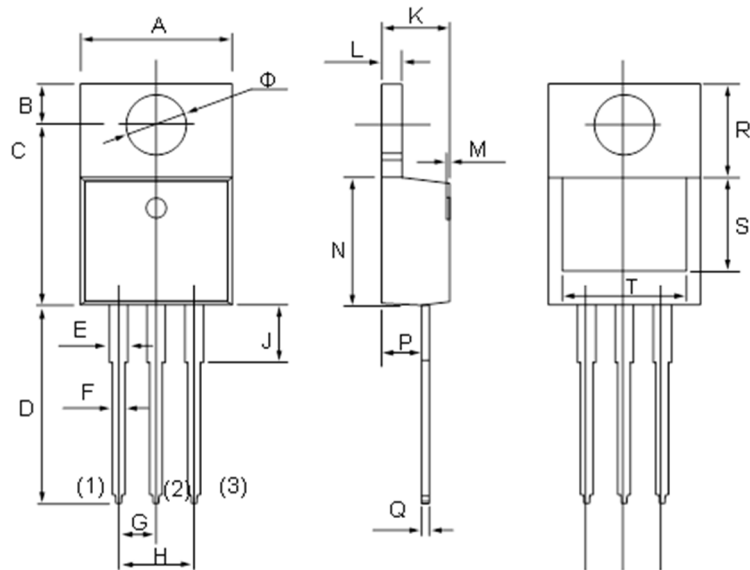



Fig 8. Transient Thermal Response Curve

Product dimension (TO-220)



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	10.01	10.35	0.394	0.407
B	2.59	2.89	0.102	0.114
C	12.06	12.46	0.475	0.491
D	13.40	13.80	0.528	0.543
E	1.17	1.37	0.046	0.054
F	0.71	0.91	0.028	0.036
G	2.54 Typ.		0.100 Typ.	
H	4.98	5.18	0.196	0.204
J	3.56	3.96	0.140	0.156
K	4.47	4.67	0.176	0.184
L	1.20	1.40	0.047	0.055
M	0.00	0.30	0.000	0.012
N	8.50	8.90	0.335	0.350
P	2.52	2.82	0.099	0.111
Q	0.38	0.52	0.014	0.020
R	6.60 Ref.		0.260 Ref.	
S	6.06 Ref.		0.239 Ref.	
T	8.44 Ref.		0.332 Ref.	
φ	3.735	3.935	0.147	0.155


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