

# N-Channel Enhancement Mode MOSFET

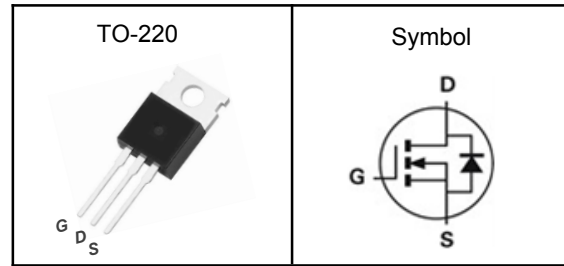
## Features

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant
- 100% UIS and Rg Tested

## Applications

- Power Management in Desktop Computer
- DC/DC Converters

## Pin Description



$V_{DSS}$	40	V
$R_{DS(ON)-Typ}$	3.6	m $\Omega$
$I_D$	120	A

## Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ , Unless Otherwise Noted)

Symbol	Parameter	N-Channel	Unit
$V_{DSS}$	Drain-Source Voltage	40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$T_J$	Maximum Junction Temperature	-55 to 150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
EAS	Single Pulse Avalanche Energy <sup>③</sup>	1080	mJ
$I_{DM}^{①}$	Pulse Drain Current Tested	330	A
$I_D$	Continuous Drain Current	$T_A=25^\circ\text{C}$	A
$P_D$	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	W

## Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	---	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>①</sup>	1.25	$^\circ\text{C}/\text{W}$

Note ① : Max. current is limited by bonding wire.

Note ② : UIS tested and pulse width are limited by maximum junction temperature  $150^\circ\text{C}$ .

Note ③ : Surface Mounted on  $1\text{in}^2$  FR-4 board with 1oz.



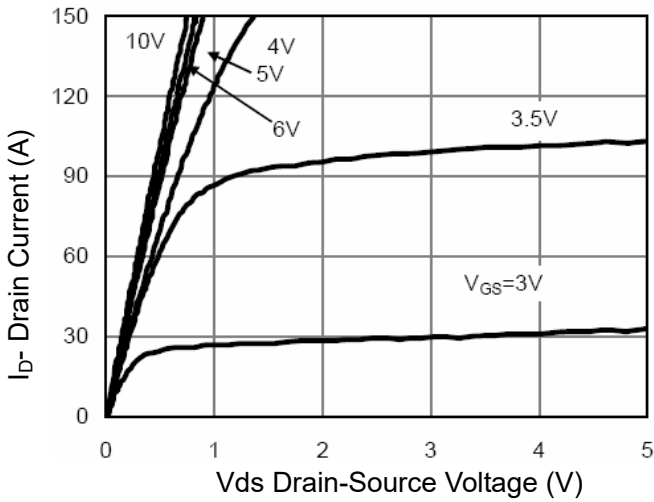
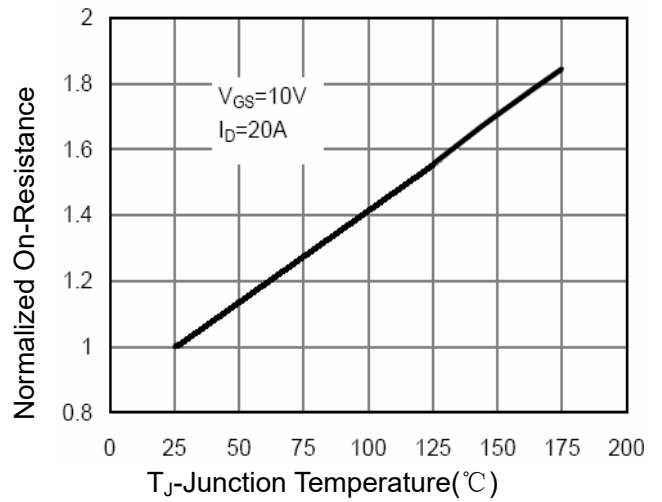
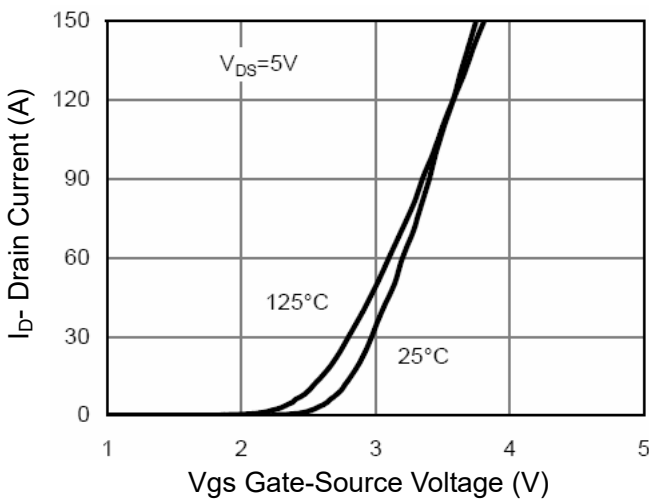
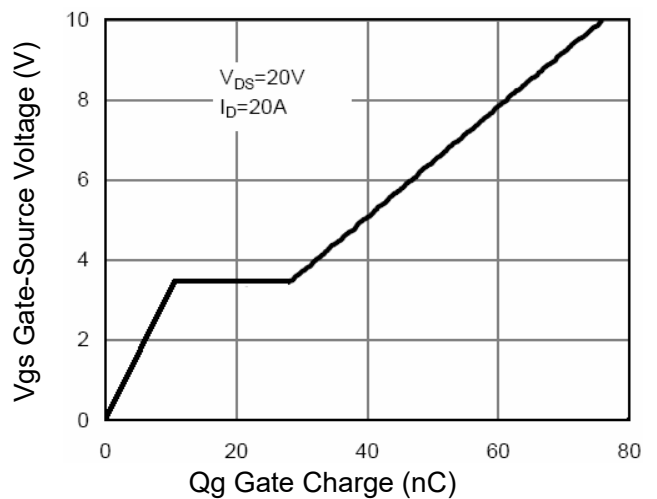
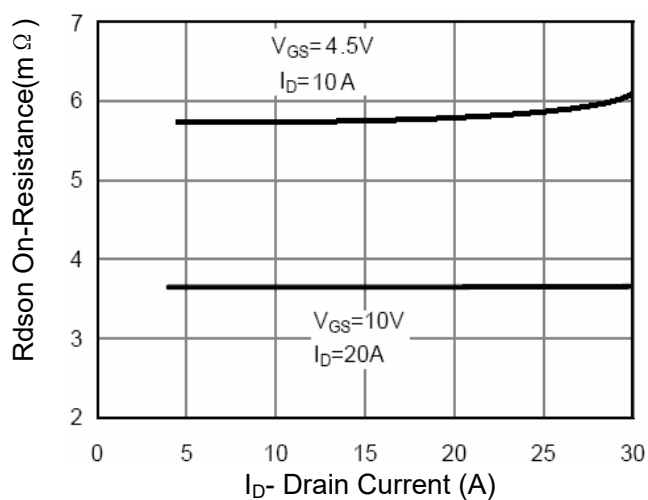
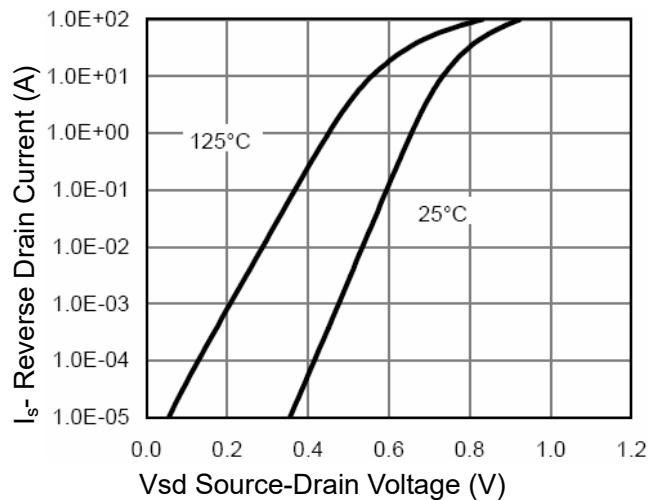
**N-Channel Enhancement Mode MOSFET**

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

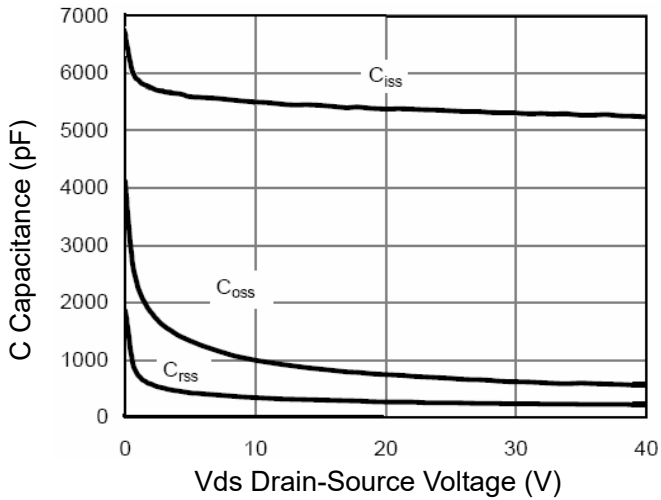
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V$	---	---	1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	---	2.2	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=20A$	---	3.6	4.2	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	---	5.8	7.0	$m\Omega$
<b>Dynamic Characteristics<sup>⑤</sup></b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=20V, \text{Freq.}=1\text{MHz}$	---	5200	---	pF
$C_{oss}$	Output Capacitance		---	950	---	
$C_{rss}$	Reverse Transfer Capacitance		---	365	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, I_D=2A, V_{GS}=10V, R_G=3\Omega, R_L=1\Omega$	---	15	---	nS
$T_r$	Turn-on Rise Time		---	18	---	
$T_{d(off)}$	Turn-off Delay Time		---	52	---	
$T_f$	Turn-off Fall Time		---	23	---	
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=20A$	25	---	---	S
$Q_g$	Total Gate Charge	$V_{DS}=20V, V_{GS}=10V, I_D=20A$	---	75	---	nC
$Q_{gs}$	Gate-Source Charge		---	10.5	---	
$Q_{gd}$	Gate-Drain Charge		---	17	---	
<b>Source-Drain Characteristics</b>						
$V_{SD}^{④}$	Diode Forward Voltage	$I_S=40A, V_{GS}=0V$	---	---	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F=20A, V_R=30V, di/dt=100A/\mu s, T_J=25^{\circ}\text{C}$	---	42	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	45	---	nC

Note ④ : Pulse test (pulse width $\leq$ 300us, duty cycle $\leq$ 2%).

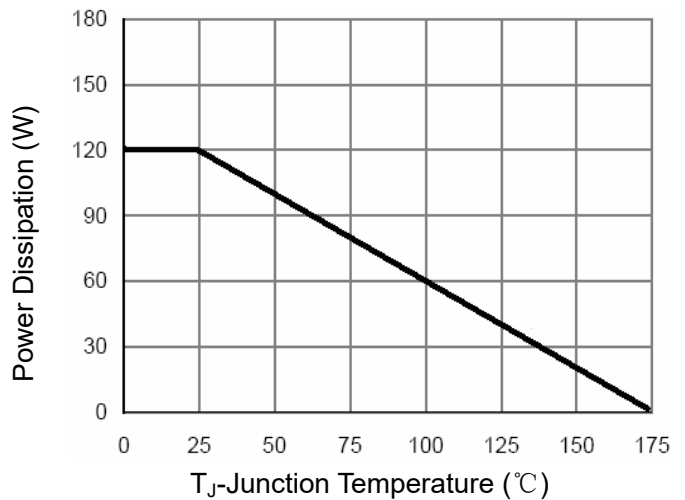
Note ⑤ : Guaranteed by design, not subject to production testing.

**N-Channel Enhancement Mode MOSFET**
**Typical Characteristics**

**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**

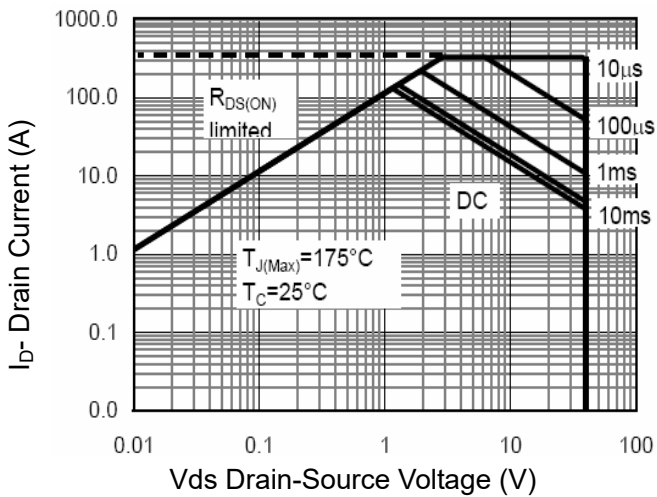
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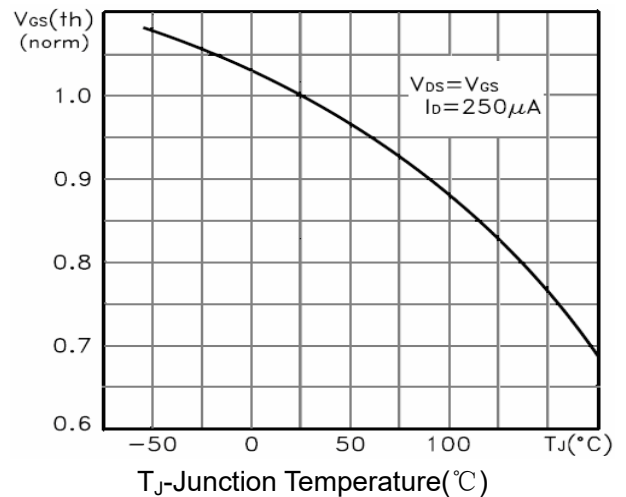
**Figure 7 Capacitance vs Vds**



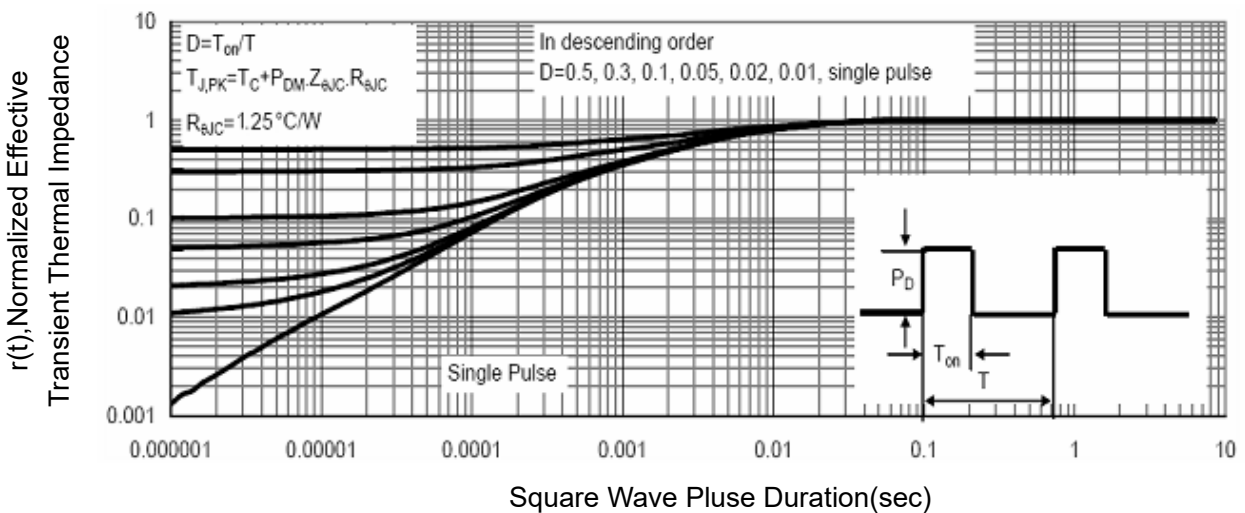
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**



**Figure 10 VGS(th) vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

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**TO-220 Package Outline Data**


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.350	4.650
A1	2.250	2.550
b	0.710	0.910
b1	1.170	1.400
c	0.330	0.650
c1	1.200	1.400
D	9.910	10.250
E	8.9500	9.750
E1	12.650	12.950
e	2.540 TYP.	
e1	4.980	5.180
F	2.650	2.950
H	7.900	8.100
h	0.000	0.300
L	12.700	13.500
L1	2.850	3.250
V	7.500 REF.	
$\Phi$	3.400	3.800