

**Features**

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

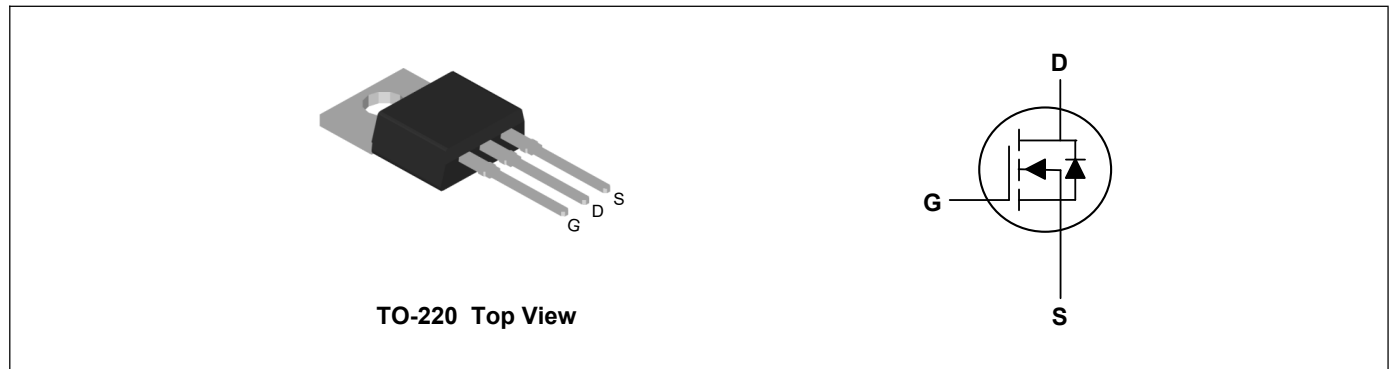
**Applications**

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch, Uninterruptible power supply

**Product Summary**



$V_{DS}$	40	V
$I_D$	120	A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	4.2	m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=4.5V$ )	7	m $\Omega$



**Absolute Maximum Ratings( $T_C=25^{\circ}C$ , unless otherwise noted)**

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D@T_C=25^{\circ}C$	120	A
Continuous Drain Current	$I_D@T_C=100^{\circ}C$	85	A
Pulsed Drain Current	$I_{DM}$	330	A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	1080	mJ
Total Power Dissipation	$P_D@T_C=25^{\circ}C$	120	W
Derating factor		0.8	W/ $^{\circ}C$
Storage Temperature Range	$T_{STG}$	-55 to 175	$^{\circ}C$
Operating Junction Temperature Range	$T_J$	-55 to 175	$^{\circ}C$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	---	1.25	$^{\circ}C/W$

**Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise noted)**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40		---	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	---	3.6	4.2	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	---	5.8	7	$m\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	1.6	2.2	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
Forward Transconductance	$g_{fs}$	$V_{DS}=10V, I_D=20A$	25	---	---	S
Total Gate Charge	$Q_g$	$V_{DS}=20V, V_{GS}=10V, I_D=20A$	---	75	---	nC
Gate-Source Charge	$Q_{gs}$		---	10.5	---	
Gate-Drain Charge	$Q_{gd}$		---	17	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=20V, I_D=2A, V_{GS}=10V, R_G=3\Omega, R_L=1\Omega$	---	15	---	ns
Rise Time	$T_r$		---	18	---	
Turn-Off Delay Time	$T_{d(off)}$		---	52	---	
Fall Time	$T_f$		---	23	---	
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V, f=1\text{MHz}$	---	5200	---	pF
Output Capacitance	$C_{oss}$		---	950	---	
Reverse Transfer Capacitance	$C_{rss}$		---	365	---	

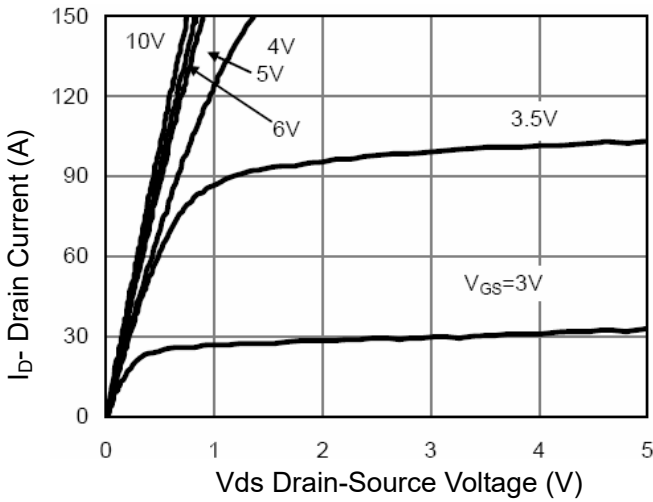
**Drain-Source Diode Characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current <sup>1</sup>	$I_S$		---	---	120	A
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V, I_S=40A, T_J=25^{\circ}\text{C}$	---	---	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F=40A, di/dt=100A/\mu s, T_J=25^{\circ}\text{C}$	---	42	---	nS
Reverse Recovery Charge	$Q_{rr}$		---	45	---	nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

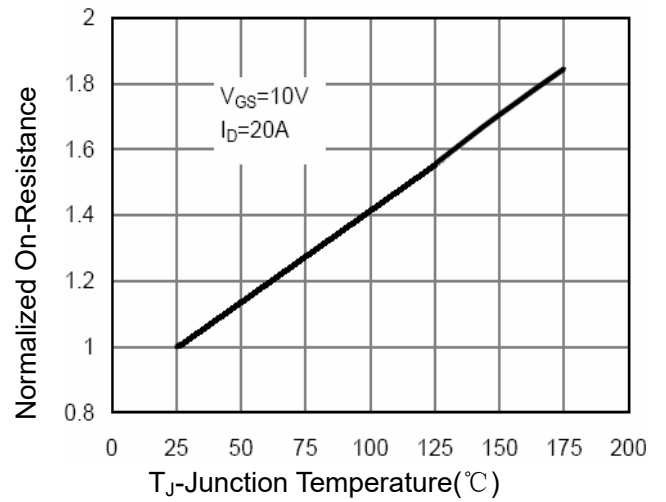
**Note:**

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The EAS data shows Max. rating. The test condition is  $V_{DD}=20V, V_{GS}=10V, L=1mH, R_G=25\Omega$
- The power dissipation is limited by 175 $^{\circ}\text{C}$  junction temperature

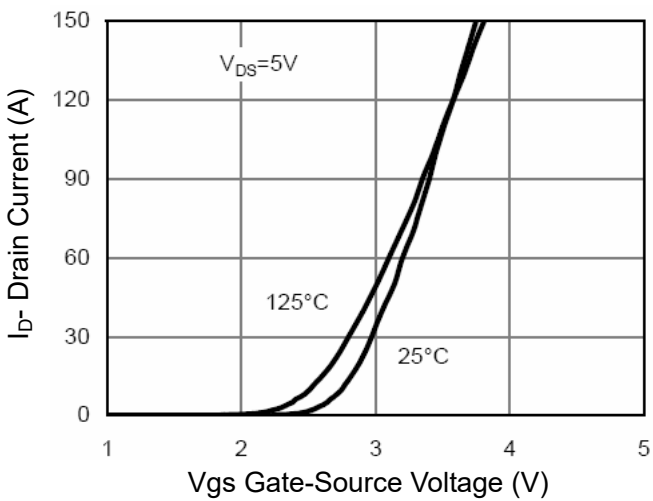
**Typical Characteristics**



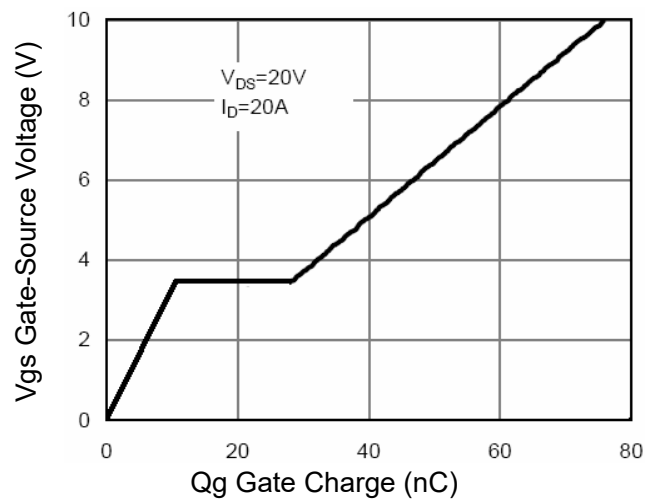
**Figure 1 Output Characteristics**



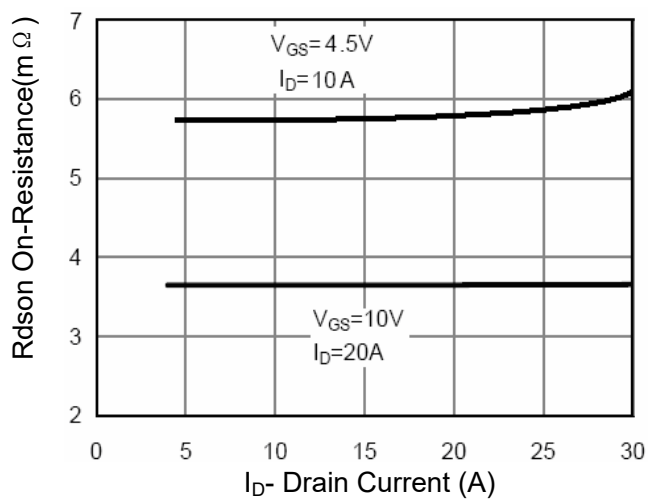
**Figure 4 Rdson-Junction Temperature**



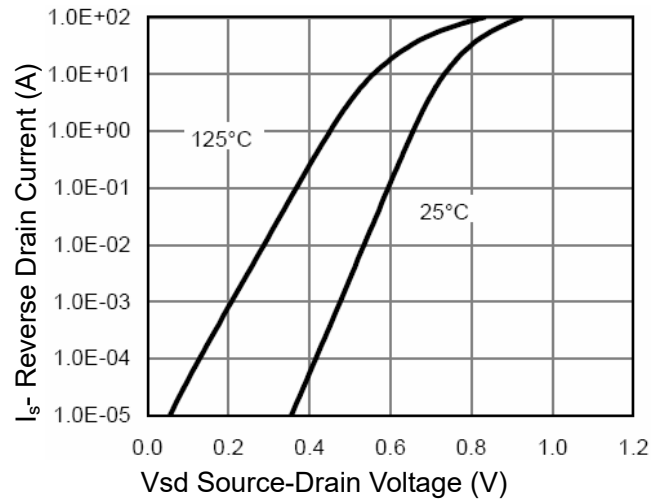
**Figure 2 Transfer Characteristics**



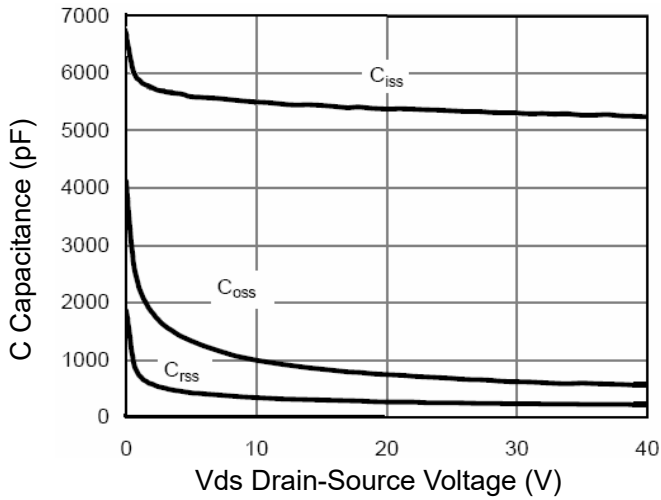
**Figure 5 Gate Charge**



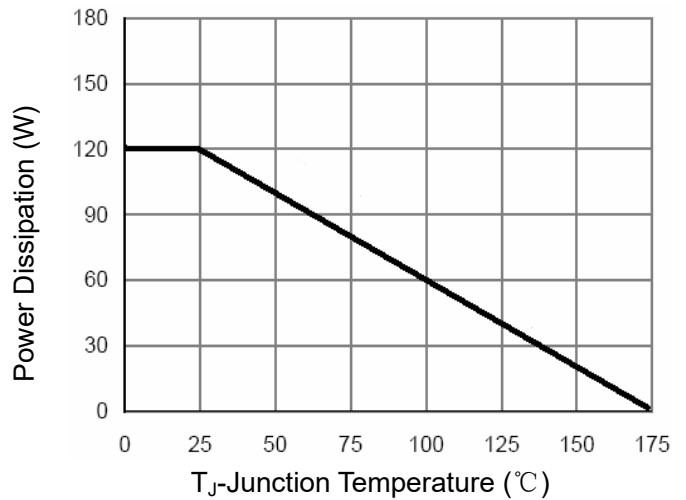
**Figure 3 Rdson- Drain Current**



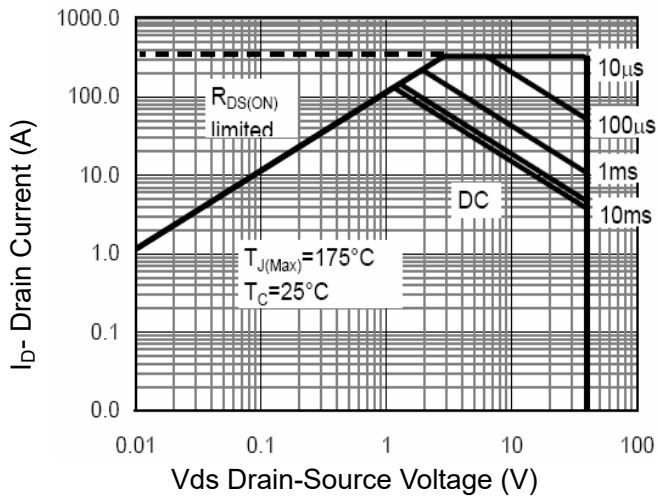
**Figure 6 Source- Drain Diode Forward**



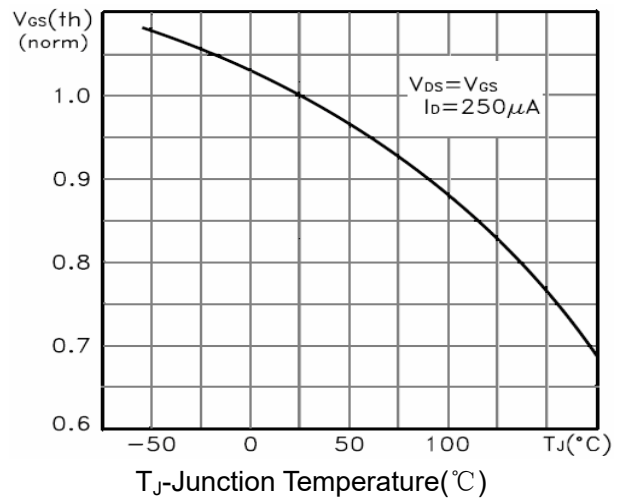
**Figure 7 Capacitance vs Vds**



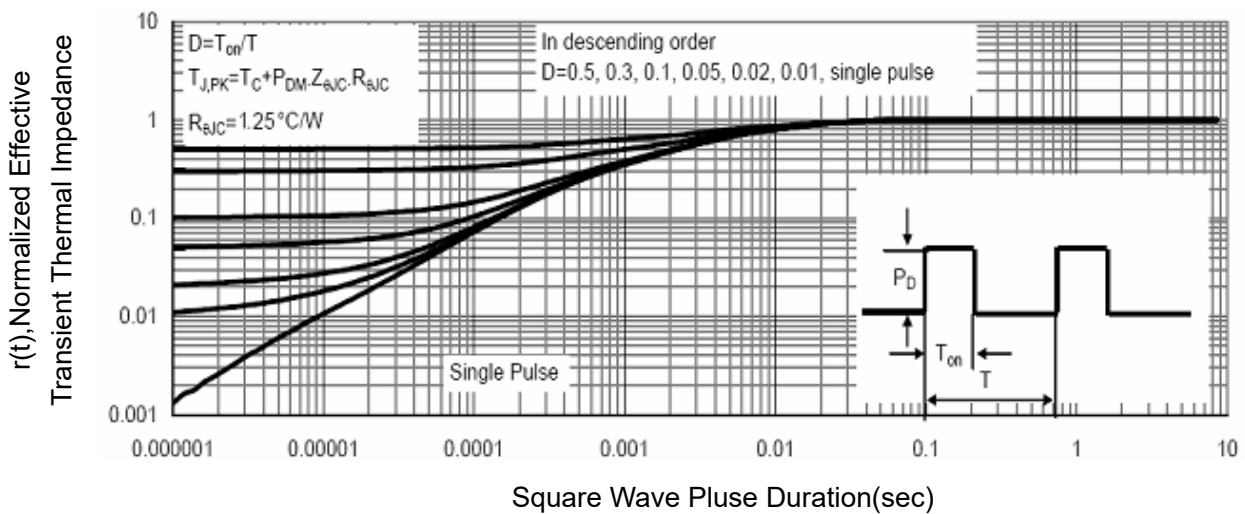
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

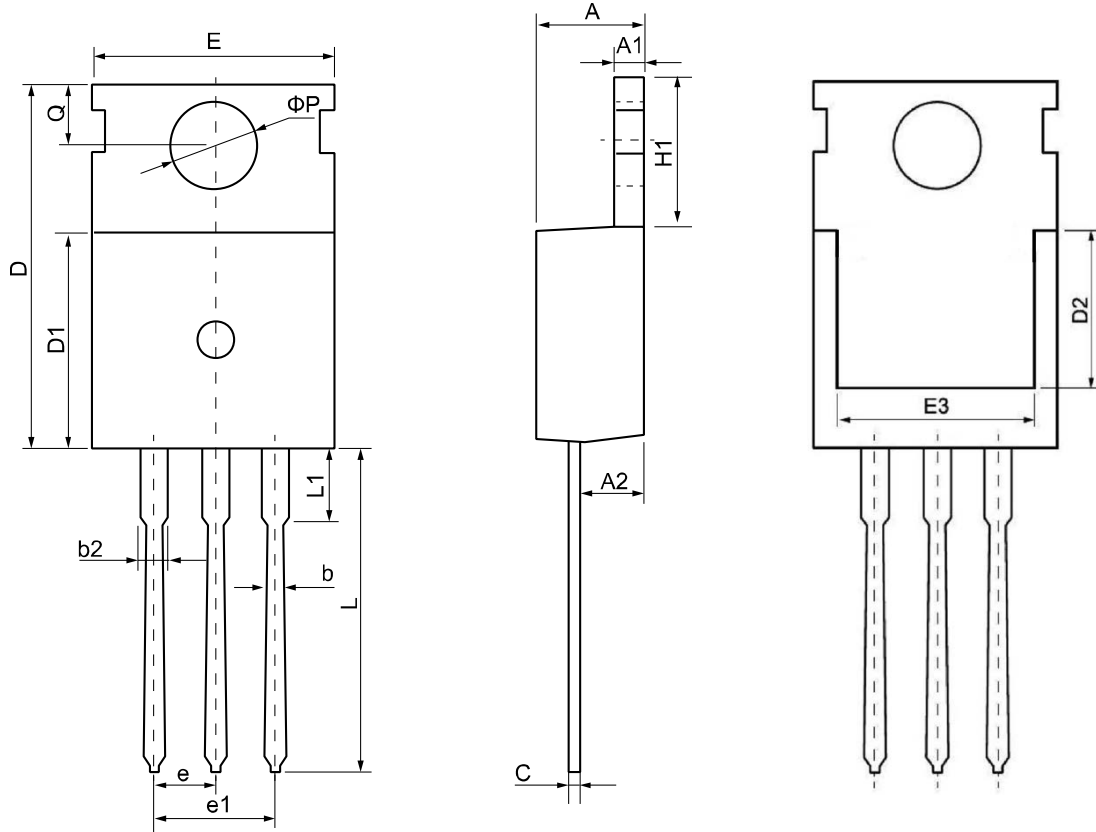


**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

**TO-220 Package Outline Dimensions**



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
<b>A</b>	4.30	4.55	4.75	<b>E</b>	9.65	10.00	10.25
<b>A1</b>	1.15	1.30	1.45	<b>E3</b>	7.00	--	--
<b>A2</b>	2.20	2.40	2.60	<b>e</b>	2.54 BSC		
<b>b</b>	0.70	0.80	0.95	<b>e1</b>	5.08 BSC		
<b>b2</b>	1.17	1.27	1.47	<b>H1</b>	6.30	6.50	6.80
<b>c</b>	0.40	0.50	0.65	<b>L</b>	12.70	13.50	14.10
<b>D</b>	15.30	15.60	15.90	<b>L1</b>	--	3.20	3.95
<b>D1</b>	8.90	9.10	9.35	<b>phi P</b>	3.40	3.60	3.80
<b>D2</b>	5.50	--	--	<b>Q</b>	2.60	2.80	3.00