

### Features

- Low drain-source on-resistance:  $R_{DS(ON)}=0.14\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode:  $V_{th} = 2.5$  to  $3.5\text{V}$
- 100% avalanche tested
- RoHS compliant

### Key Performance Parameters



Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	600	V
$R_{DS(ON),max}$	160	m $\Omega$
$I_D$	20	A
$Q_{g,typ}$	38.5	nC
$I_{DM}$	60	A

### Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger, Lighting



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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	600	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current <sup>1</sup>	$I_D$	20	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	60	A
Single Pulse Avalanche Energy <sup>4</sup>	EAS	480	mJ
Avalanche Current	$I_{AS}$	3.5	A
Repetitive Avalanche energy, $t_{AR}$ limited by $T_{j,max}$	$E_{AR}$	0.7	mJ
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt <sup>3</sup> $V_{DS}=0 \dots 400\text{V}$ , $I_{SD} \leq I_D$		50	
Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	34	W
Storage Temperature Range	$T_{STG}$	-55 to 150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	80	$^\circ\text{C/W}$
Thermal Resistance Junction-Case	$R_{\theta JC}$	4	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	600	---	---	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A	---	140	160	mΩ
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	2.5	---	3.5	V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =600V, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C	---	---	100	
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	---	---	±100	nA
Gate Resistance	R <sub>G</sub>	f = 1.0MHz, open drain	---	8	---	Ω
Total Gate Charge	Q <sub>g</sub>	V <sub>DD</sub> =400V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	38.5	---	nC
Gate-Source Charge	Q <sub>gs</sub>		---	8	---	
Gate-Drain Charge	Q <sub>gd</sub>		---	15	---	
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DD</sub> =400V, V <sub>GS</sub> =10V, R <sub>G</sub> =25Ω, I <sub>D</sub> =20A	---	25	---	ns
Rise Time	T <sub>r</sub>		---	59	---	
Turn-Off Delay Time	T <sub>d(off)</sub>		---	121	---	
Fall Time	T <sub>f</sub>		---	44	---	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, f=1MHz	---	1724	---	pF
Output Capacitance	C <sub>oss</sub>		---	72	---	
Reverse Transfer Capacitance	C <sub>rss</sub>		---	6	---	

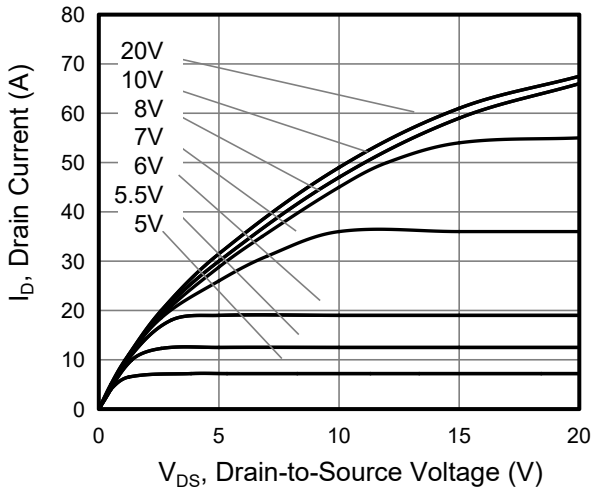
**Drain-Source Diode Characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current	I <sub>S</sub>	T <sub>C</sub> =25°C	---	---	20	A
Pulsed Source Current	I <sub>SM</sub>		---	---	60	A
Diode Forward Voltage	V <sub>SD</sub>	V <sub>G</sub> =0V, I <sub>S</sub> =20A, T <sub>J</sub> =25°C	---	0.9	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	V <sub>R</sub> =400V, I <sub>F</sub> =20 A, di <sub>F</sub> /dt=100A/μs	---	453	---	ns
Reverse Recovery Charge	Q <sub>rr</sub>		---	5.1	---	uC
Peak Reverse Recovery Current	I <sub>rrm</sub>		---	22	---	A

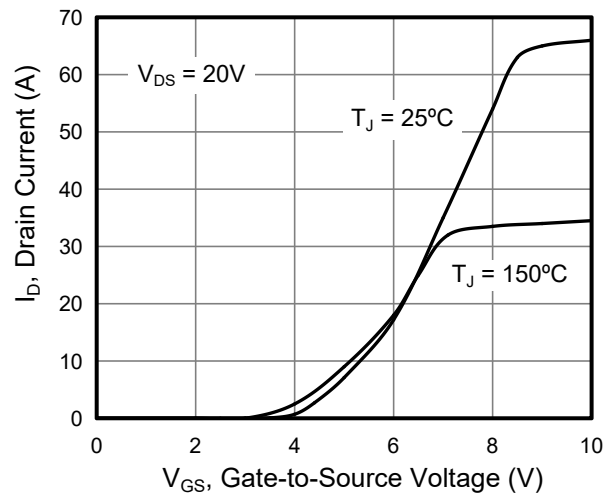
**Note:**

- Limited by T<sub>J,max</sub>. Maximum Duty Cycle D = 0.50
- Pulse width t<sub>p</sub> limited by T<sub>J,max</sub>
- Identical low side and high side switch with identical R<sub>G</sub>
- V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, I<sub>AS</sub>=3.5A

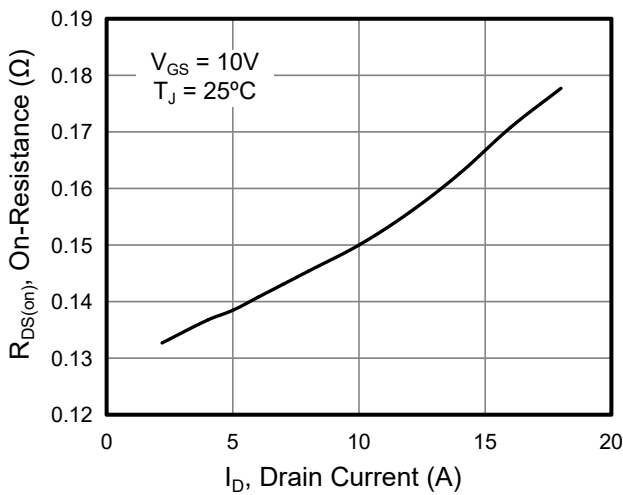
**Typical Characteristics**



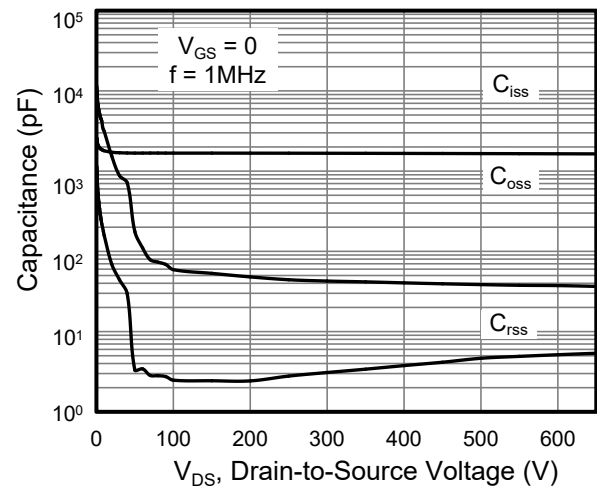
**Figure 1. Output Characteristics**



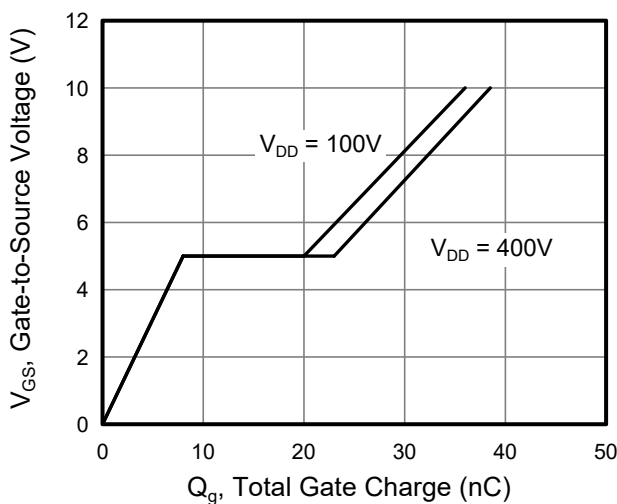
**Figure 2. Transfer Characteristics**



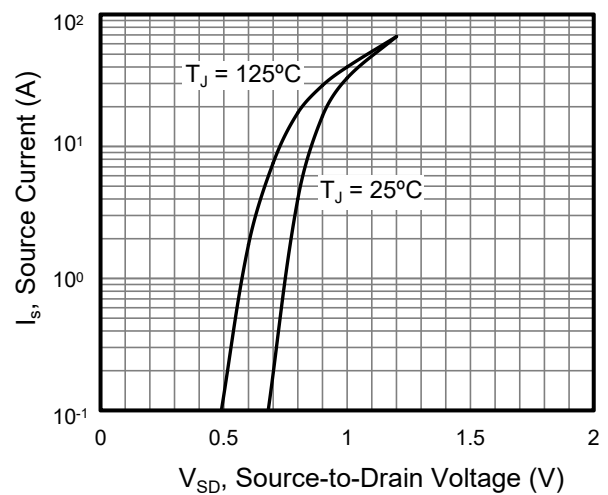
**Figure 3. On-Resistance vs. Drain Current**



**Figure 4. Capacitance**

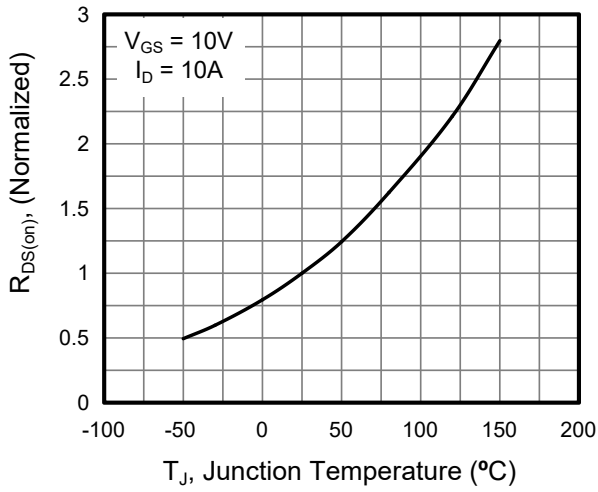


**Figure 5. Gate Charge**

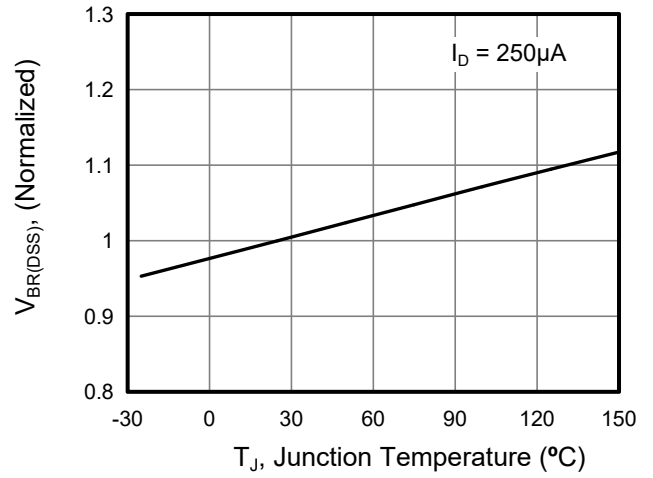


**Figure 6. Body Diode Forward Voltage**

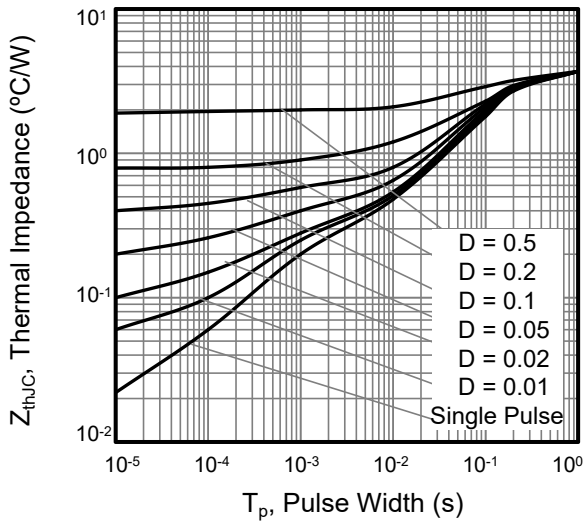
**600V Super Junction Power MOSFET**



**Figure 7. On-Resistance vs. Junction Temperature**

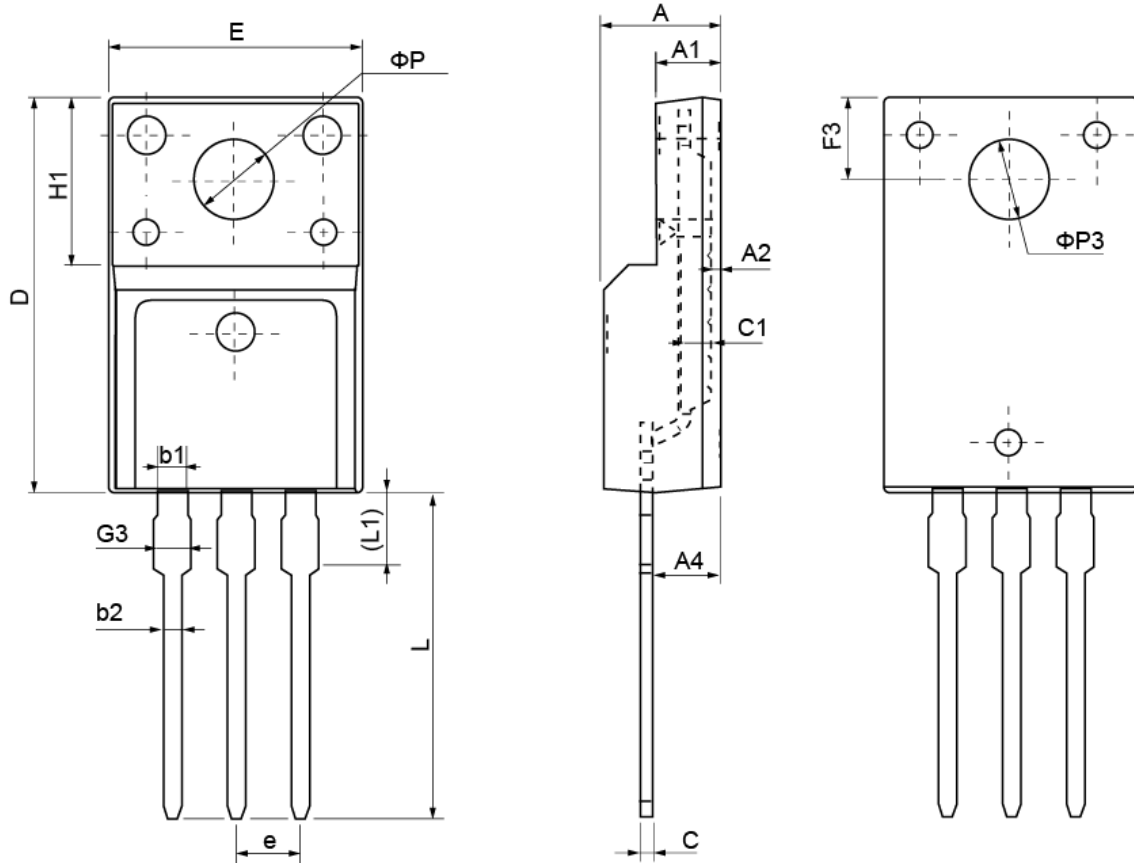


**Figure 8. Breakdown voltage vs. Junction Temperature**



**Figure 9 Transient Thermal Impedance**

**TO-220F Package Outline Dimensions**



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
<b>A</b>	4.40	4.70	5.00	<b>H1</b>	6.70 REF		
<b>A1</b>	2.30	2.55	2.80	<b>L</b>	12.30	12.98	13.30
<b>A2</b>	0.30	0.50	0.70	<b>L1</b>	2.95	3.10	3.50
<b>A4</b>	2.45	2.80	3.05	<b>phi P</b>	3.03	3.20	3.50
<b>c</b>	0.30	0.50	0.70	<b>phi P3</b>	3.15	3.45	3.65
<b>c1</b>	1.20	1.30	1.40	<b>b1</b>	1.10	1.30	1.45
<b>D</b>	15.40	15.90	16.40	<b>b2</b>	0.60	0.80	1.00
<b>E</b>	9.86	10.16	10.46	<b>F3</b>	3.05	3.30	3.55
<b>e</b>	2.54 BSC			<b>G3</b>	1.15	1.35	1.55