

## Features

- Low drain-source on-resistance:  $R_{DS(on)}=0.060\Omega(\text{typ})$
- Very Low FOM ( $R_{DS(on)} \times Q_g$ )
- Extremely low switching loss
- 100% avalanche tested
- RoHS compliant

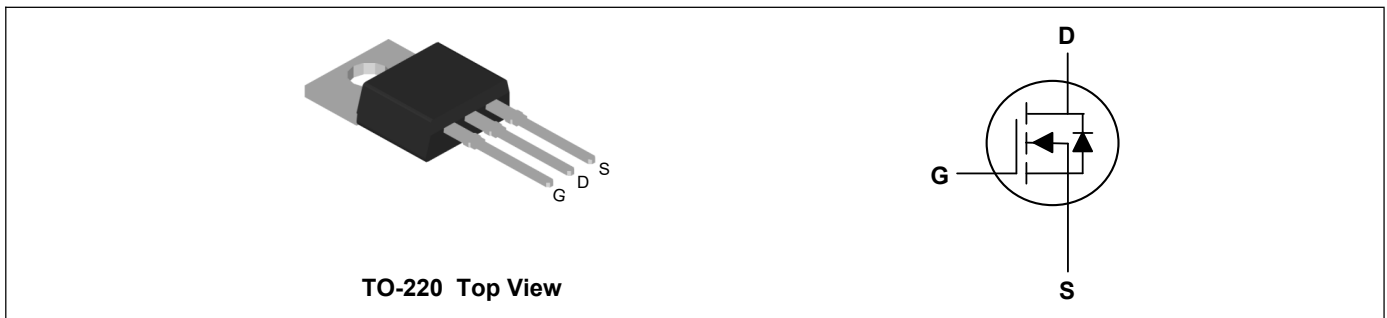
## Key Performance Parameters



Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	600	V
$R_{DS(on),max}$	70	m $\Omega$
$I_D$	45	A
$Q_{g,typ}$	75	nC
$I_{DM}$	130	A

## Applications

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



## 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>	$I_D$	45	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	130	A
Single Pulse Avalanche Energy <sup>4</sup>	EAS	960	mJ
Avalanche Current	$I_{AS}$	8	A
Repetitive Avalanche Energy	$E_{AR}$	3.3	mJ
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt <sup>3</sup> $V_{DS}=0 \dots 400\text{V}$ , $I_{SD} \leq I_D$		15	
Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	40	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 (Max)	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Thermal Resistance Junction-Case (Max)	$R_{\theta JC}$	0.53	$^\circ\text{C/W}$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600	---	---	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=25A$	---	60	70	m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.5	---	4.5	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=480V, V_{GS}=0V, T_J=150^\circ\text{C}$	---	2	---	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	$\pm 100$	nA
Gate Resistance	$R_g$	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	1	---	$\Omega$
Total Gate Charge	$Q_g$	$V_{DS}=400V, V_{GS}=10V, I_D=25A$	---	75	---	nC
Gate-Source Charge	$Q_{gs}$		---	20	---	
Gate-Drain Charge	$Q_{gd}$		---	25	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=400V, R_G=10\Omega, I_D=25A, V_{GS}=10V$	---	23	---	ns
Rise Time	$T_r$		---	15	---	
Turn-Off Delay Time	$T_{d(off)}$		---	85	---	
Fall Time	$T_f$		---	9	---	
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V, f=1\text{MHz}$	---	3200	---	pF
Output Capacitance	$C_{oss}$		---	140	---	
Reverse Transfer Capacitance	$C_{rss}$		---	3.7	---	

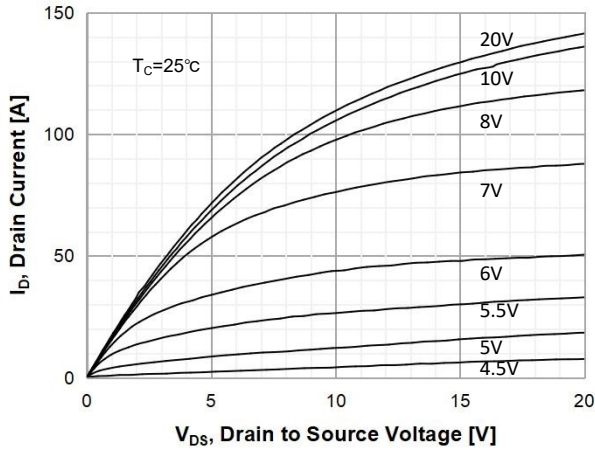
**Drain-Source Diode Characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current	$I_S$	$T_C=25^\circ\text{C}$	---	---	45	A
Pulsed Source Current	$I_{SM}$		---	---	130	A
Diode Forward Voltage	$V_{SD}$	$V_G=0V, I_S=25A, T_J=25^\circ\text{C}$	---	0.9	1.4	V
Reverse Recovery Time	$t_{rr}$	$V_R=400V, I_F=25A, di_F/dt=100A/\mu s$	---	420	---	ns
Reverse Recovery Charge	$Q_{rr}$		---	7	---	$\mu C$

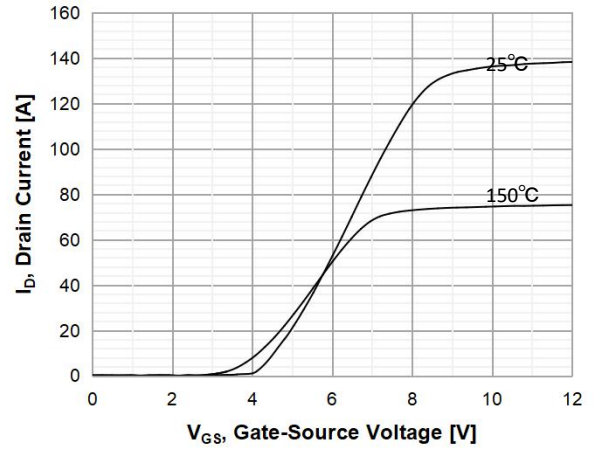
**Note:**

- Limited by  $T_{J,max}$ . Maximum Duty Cycle  $D = 0.50$
- Pulse width  $t_p$  limited by  $T_{J,max}$
- Identical low side and high side switch with identical  $R_G$
- $V_{DD}=50V, R_G=25\Omega, I_{AS}=6.6A$ , Starting  $T_J=25^\circ\text{C}$

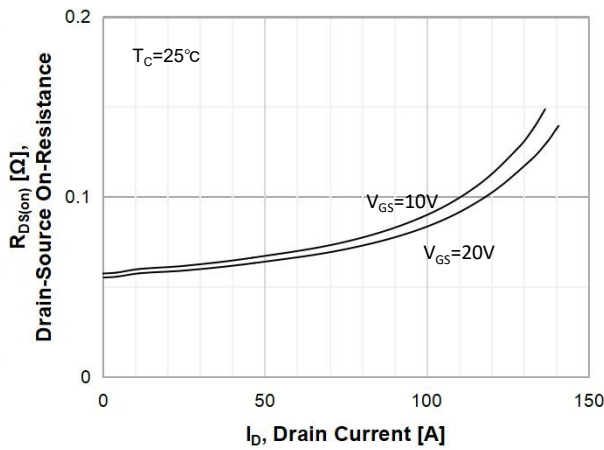
**Typical Characteristics**



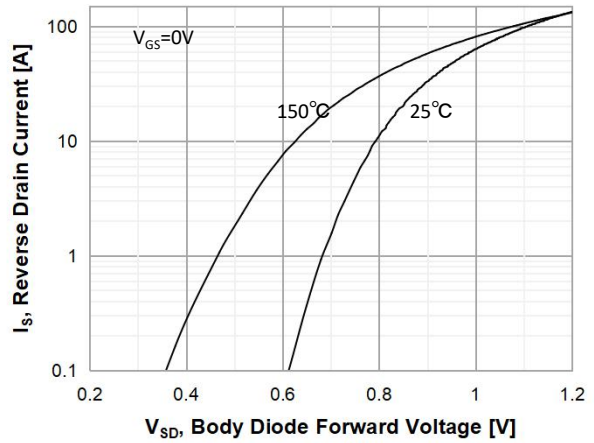
**Figure 1. On-Region Characteristics**



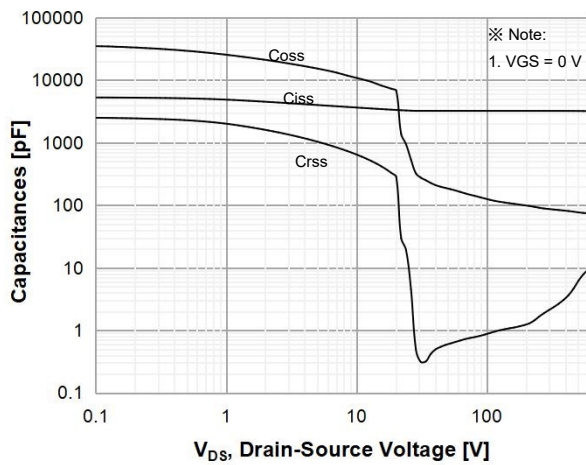
**Figure 2. Transfer Characteristics**



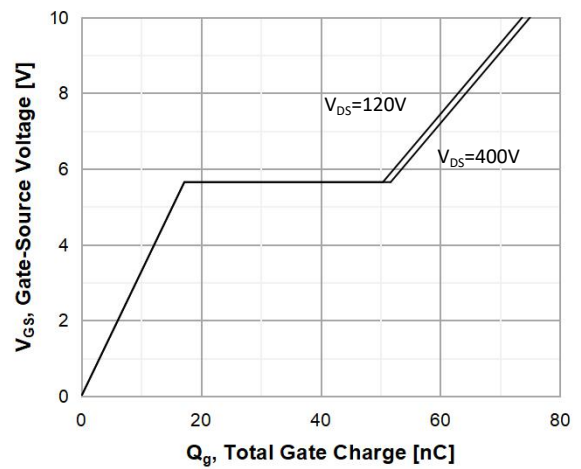
**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

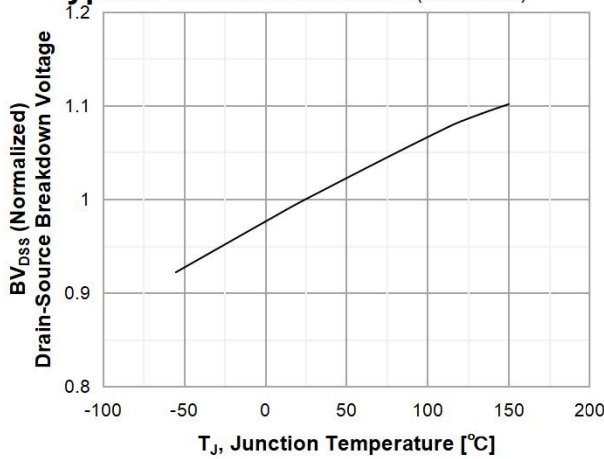


**Figure 5. Capacitance Characteristics**

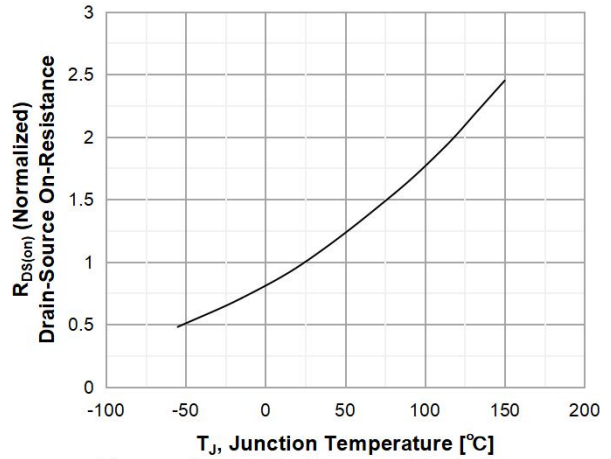


**Figure 6. Gate Charge Characteristics**

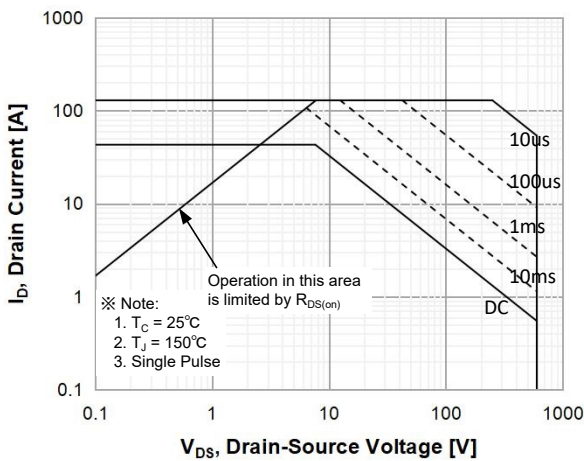
**Typical Characteristics** (Continued)



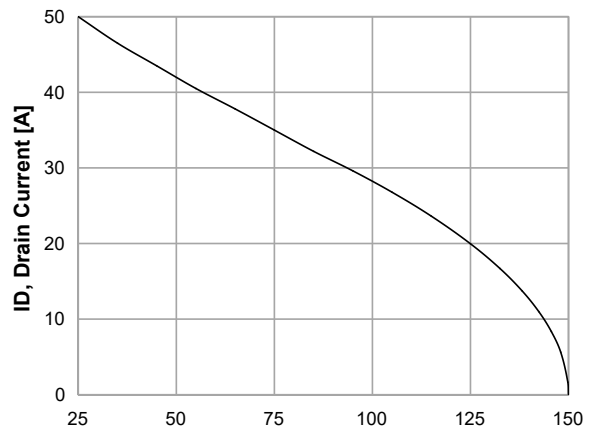
**Figure 7. Breakdown Voltage Variation vs Temperature**



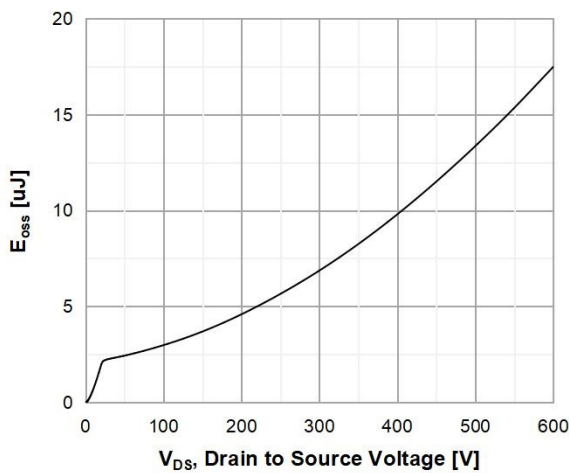
**Figure 8. On-Resistance Variation vs Temperature**



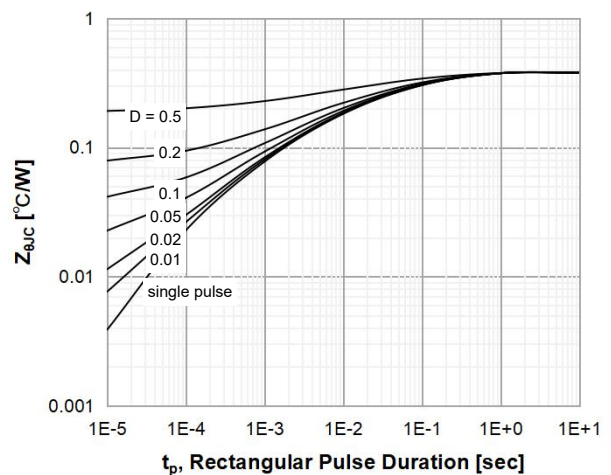
**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**

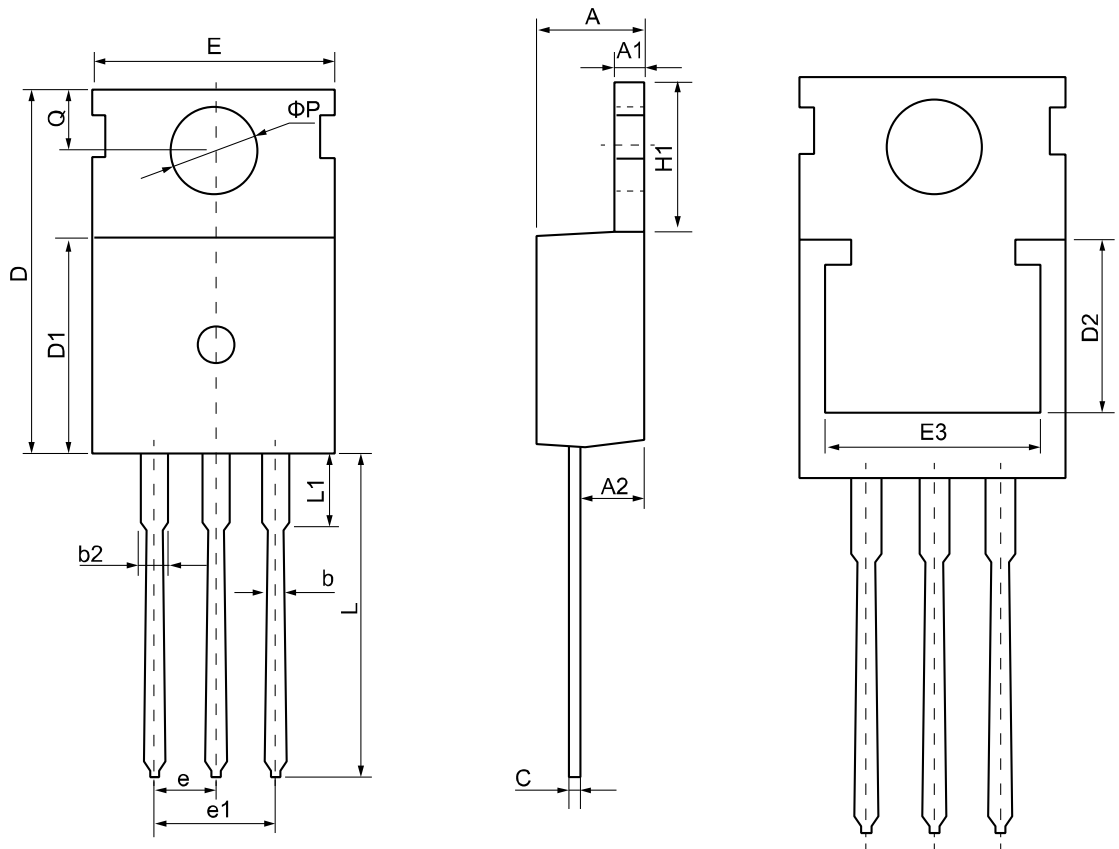


**Figure 11. E<sub>OSS</sub> vs. Drain to Source Voltage**



**Figure 12. Transient Thermal Response Curve**

**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>φ P</b>	3.40	3.60	3.80
<b>D2</b>	5.50	--	--	<b>Q</b>	2.60	2.80	3.00