

## Features

- Advanced Super Junction Process Technology
- Low RDS(ON) to Minimize Conduction Losses
- Low Qg and Capacitance to Minimize Driver Losses
- Superior thermal resistance
- Excellent Gate Charge x RDS(ON) Product (FOM)
- Pb-free lead plating; RoHS Compliant

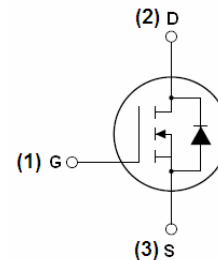
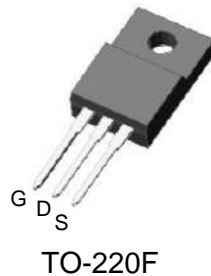


## Product Summary

$V_{DS}$	650	V
$R_{DS(on), Typ @ V_{GS} = 10V}$	160	m $\Omega$
$I_D$	22	A

## Application

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



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

Symbol	Parameter	Value	Unit	
$V_{DS}$	Drain-Source Voltage	650	V	
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V	
$I_D$	Drain Current-Continuous <sup>Note A</sup>	$T_C = 25^\circ\text{C}$	22	A
$I_D$		$T_C = 100^\circ\text{C}$	5.9	A
$I_{DM}$	Drain Current-Pulsed <sup>Note A, F</sup>	$T_C = 25^\circ\text{C}$	88	A
$I_{AS}$	Non-repetitive Avalanche Current <sup>Note C, E</sup>	6	A	
$E_{AS}$	Single Pulse Drain-to-Source Avalanche Energy <sup>Note C, D</sup>	500	mJ	
$P_{tot}$	Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	43	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	IEC climatic category; DIN IEC 68-1: 55/150/56	-55 to +150	$^\circ\text{C}$

### Thermal Resistance Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{\theta JA}$	Junction-to-Ambient <sup>Note B</sup>	Steady State	-	-	45	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Junction-to-Soldering Point	Steady State	-	-	2.9	$^\circ\text{C}/\text{W}$

### Notes:

- Repetitive rating, pulse width limited by junction temperature  $T_{Jmax} = +150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J = +25^\circ\text{C}$ .
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JS}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.  $R_{\theta JA}$  shown below for single device operation on FR-4 in still air.
- Limited by  $T_{Jmax}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 48\text{mH}$ ,  $R_g = 50\Omega$ ,  $V_{DD} = 50\text{V}$ .
- $I_{AS}$  and  $E_{AS}$  ratings are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .
- Guaranteed by design. Not subject to product testing.
- Pulse Test : Pulse Width  $\leq 100\mu\text{s}$ , Duty Cycle  $\leq 2\%$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>DS</sub> = 10mA	650	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V	-	-	1	μA
		V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C	-	-	100	μA
I <sub>GSS</sub>	Gate-Body Leakage	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	-	-	±100	nA

**STATIC CHARACTERISTICS**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250μA	2	-	4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>Note A</sup>	V <sub>GS</sub> = 10V, I <sub>DS</sub> = 10A	-	0.16	0.18	Ω
R <sub>g</sub>	Gate Resistance <sup>Note E</sup>	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V, f = 1MHz	-	2	-	Ω

**DYNAMIC CHARACTERISTICS <sup>Note E</sup>**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, f = 1MHz	-	1683	-	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, f = 1MHz	-	40	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, f = 1MHz	-	6	-	pF
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 10V, I <sub>DS</sub> = 10A, R <sub>GEN</sub> = 4.7Ω	-	24.2	-	ns
t <sub>r</sub>	Rise Time	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 10V, I <sub>DS</sub> = 10A, R <sub>GEN</sub> = 4.7Ω	-	8	-	ns
T <sub>d(off)</sub>	Turn-Off Delay Time	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 10V, I <sub>DS</sub> = 10A, R <sub>GEN</sub> = 4.7Ω	-	28.4	-	ns
t <sub>f</sub>	Fall Time	V <sub>DS</sub> = 400V, V <sub>GS</sub> = 10V, I <sub>DS</sub> = 10A, R <sub>GEN</sub> = 4.7Ω	-	34.3	-	ns

**GATE CHARGE CHARACTERISTICS <sup>Note E</sup>**

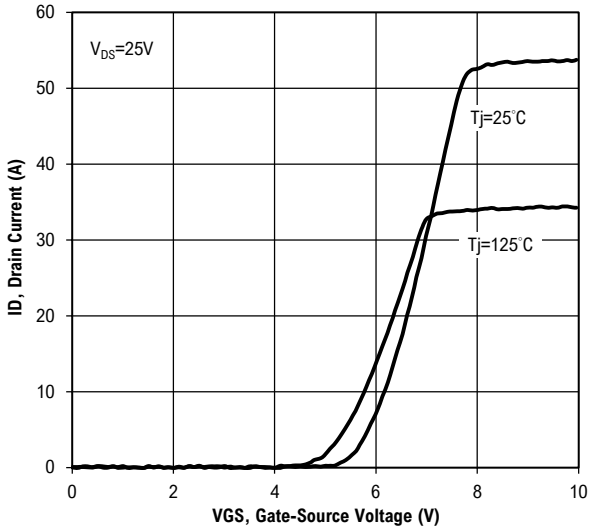
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q <sub>gs</sub>	Gate to Source Gate Charge	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	11.8	-	nC
Q <sub>g(th)</sub>	Gate charge at threshold	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	7.5	-	nC
Q <sub>gd</sub>	Gate to Drain Charge	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	14.1	-	nC
Q <sub>sw</sub>	Switching charge	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	18.4	-	nC
Q <sub>g</sub>	Gate charge total	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	38.1	-	nC
V <sub>plateau</sub>	Gate plateau voltage	V <sub>DD</sub> = 380V, I <sub>D</sub> = 10A, V <sub>GS</sub> = 0 to 10V	-	5.5	-	V
Q <sub>g(sync)</sub>	Gate charge total, sync. FET (Q <sub>g</sub> - Q <sub>gd</sub> )	V <sub>DS</sub> = 0.1V, V <sub>GS</sub> = 0 to 10V	-	24	-	nC

**REVERSE DIODE**

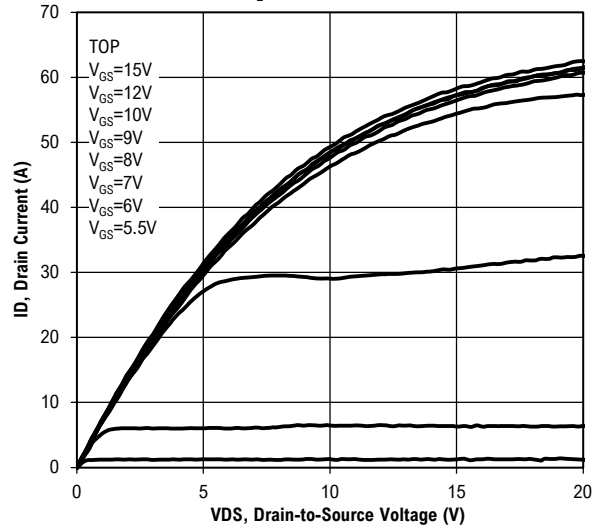
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Diode continuous forward current	T <sub>C</sub> = 25°C	-	-	22	A
I <sub>SM</sub>	Diode pulse current <sup>Note F</sup>	T <sub>C</sub> = 25°C	-	-	88	A
V <sub>SD</sub>	Diode Forward Voltage <sup>Note A</sup>	V <sub>GS</sub> = 0V, I <sub>F</sub> = 10A	-	-	1.2	V
t <sub>rr</sub>	Body Diode Reverse Recovery Time <sup>Note E</sup>	V <sub>DD</sub> = 50V, I <sub>F</sub> = 20A, di/dt = 100A/μs	-	364	-	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge <sup>Note E</sup>	V <sub>DD</sub> = 50V, I <sub>F</sub> = 20A, di/dt = 100A/μs	-	6.5	-	μC

Typical Operating Characteristics

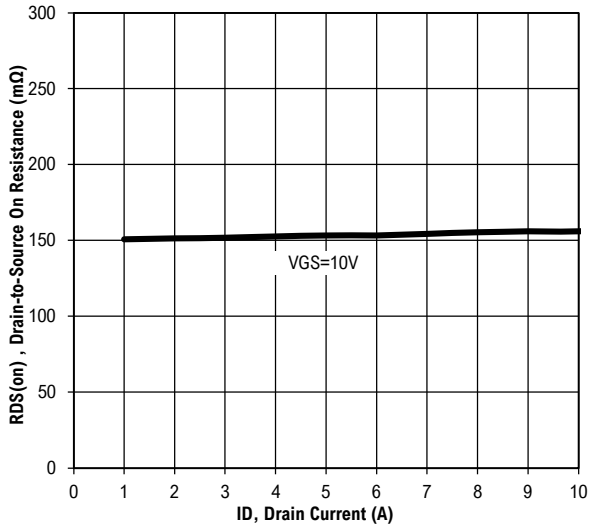
Transfer Characteristics



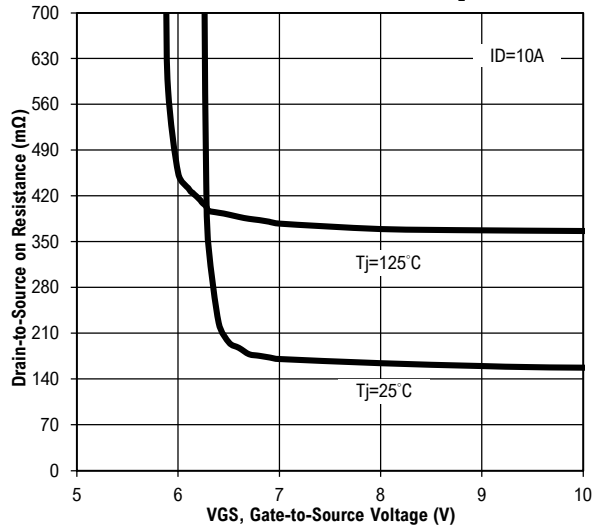
On-Region Characteristics



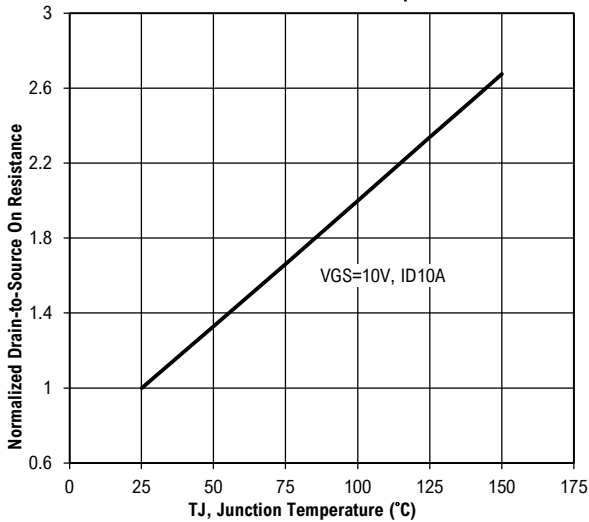
On-Resistance vs. Drain Current and Gate



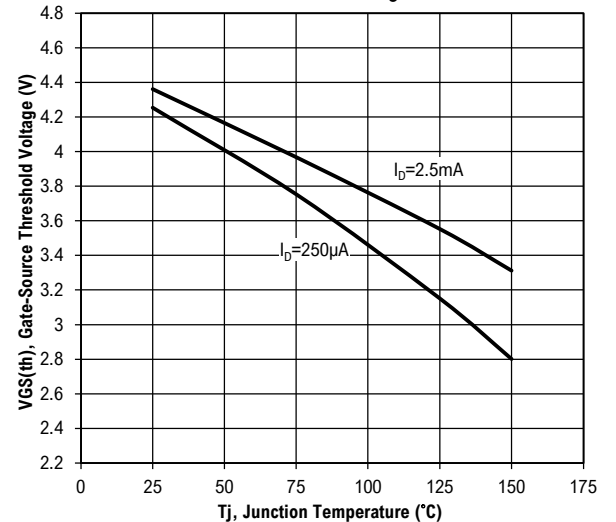
On-Resistance vs. Gate-Source Voltage



On-Resistance vs. Junction Temperature

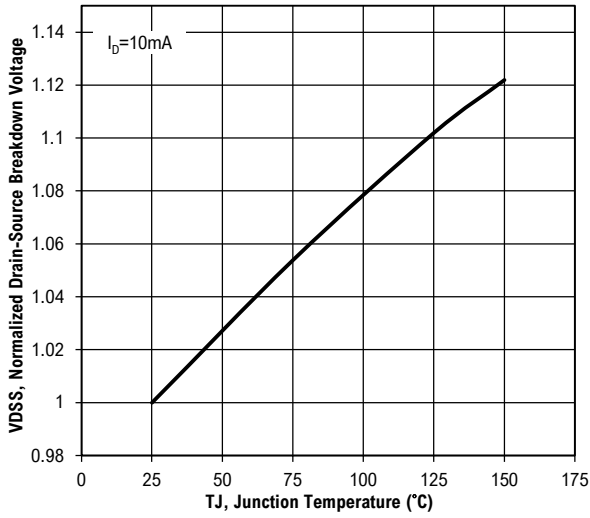


Gate Threshold Voltage

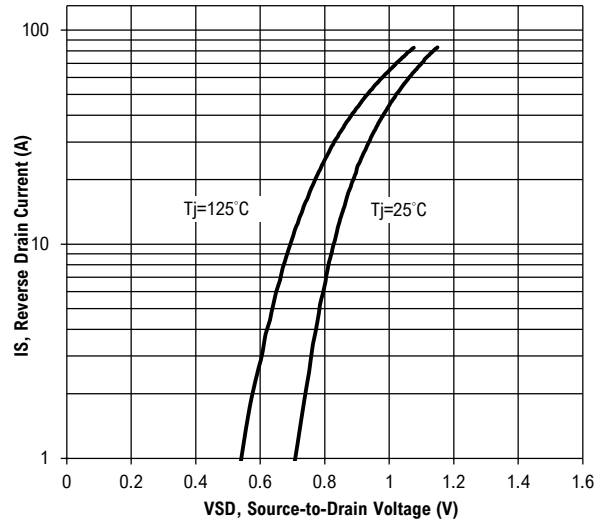


Typical Operating Characteristics (Cont.)

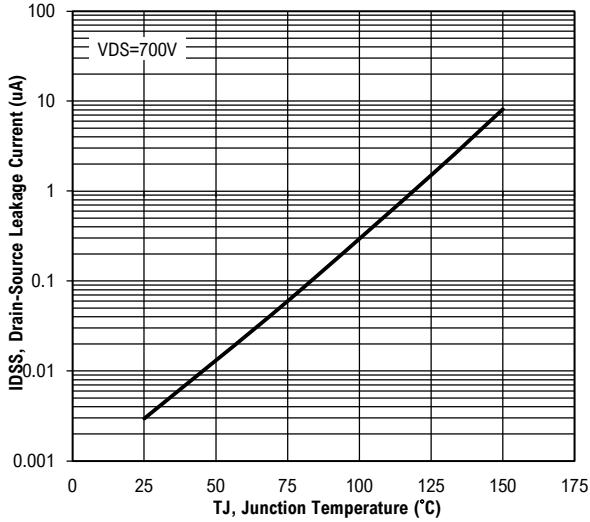
Drain-source breakdown voltage vs. Junction Temperature



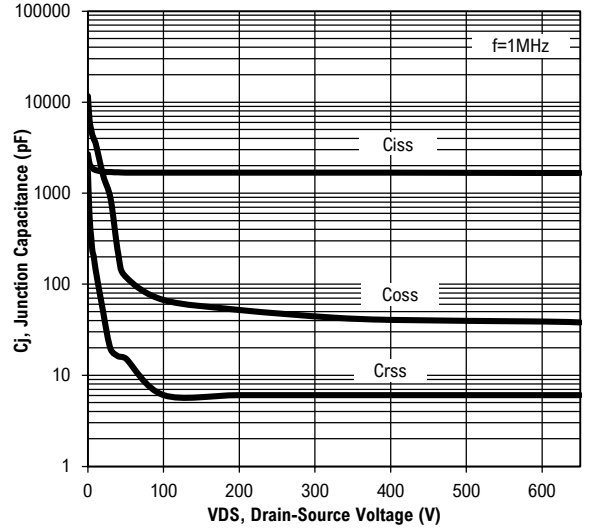
Body-Diode Characteristics



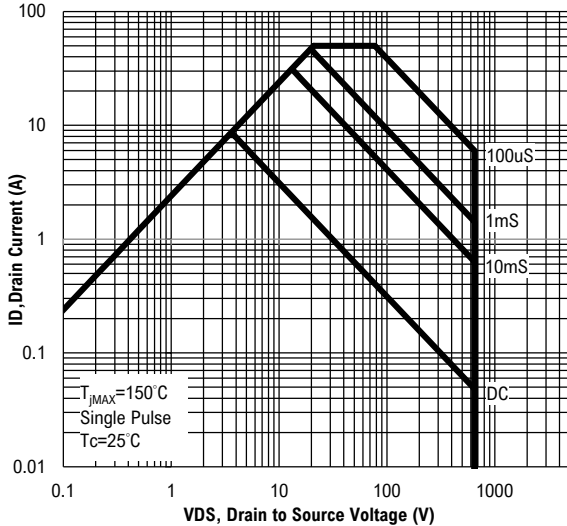
Zero Gate Voltage Drain Current vs. Junction Temperature



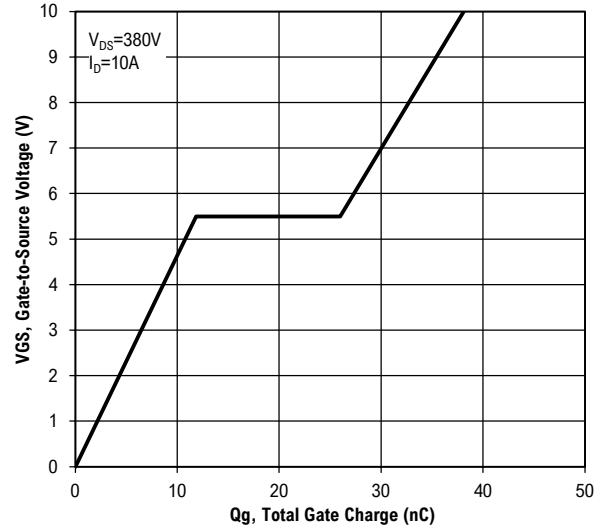
Capacitance vs. Drain to Source Voltage



Maximum Forward Biased Safe Operating Area

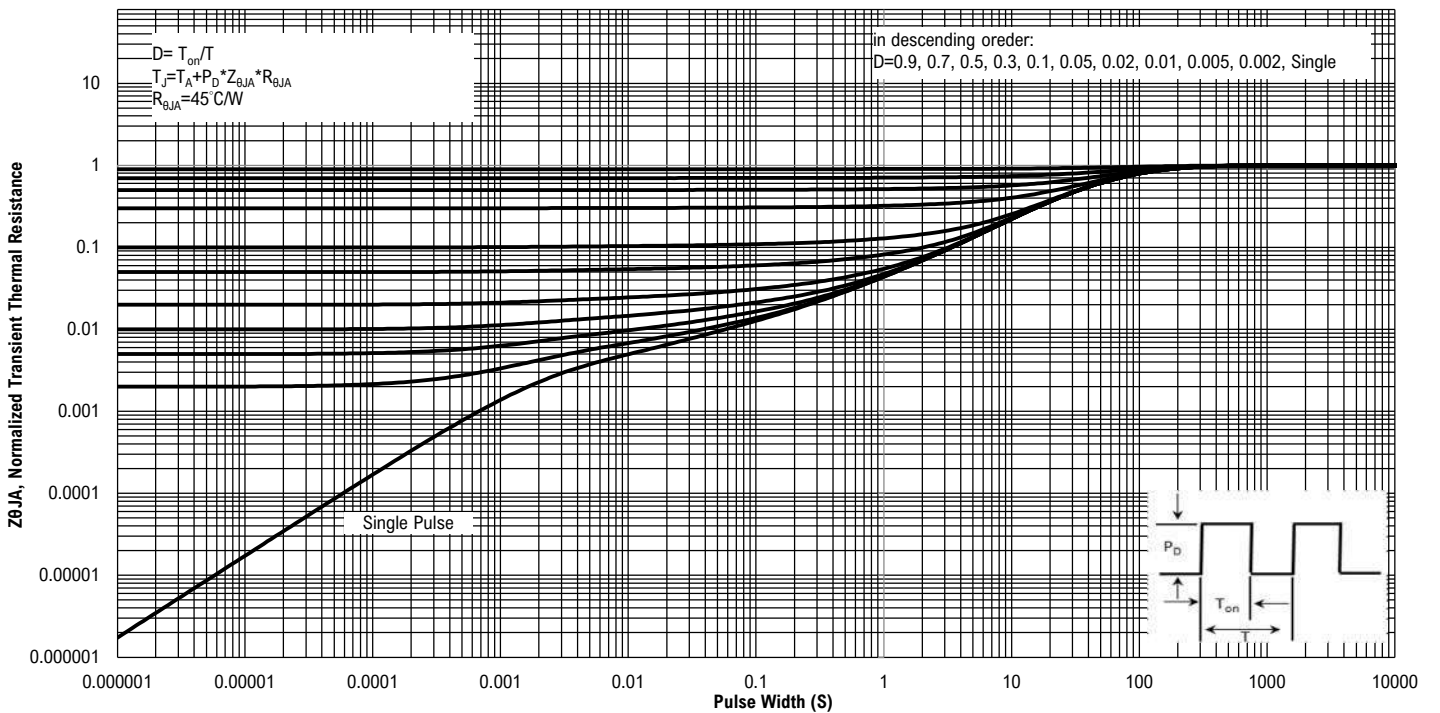
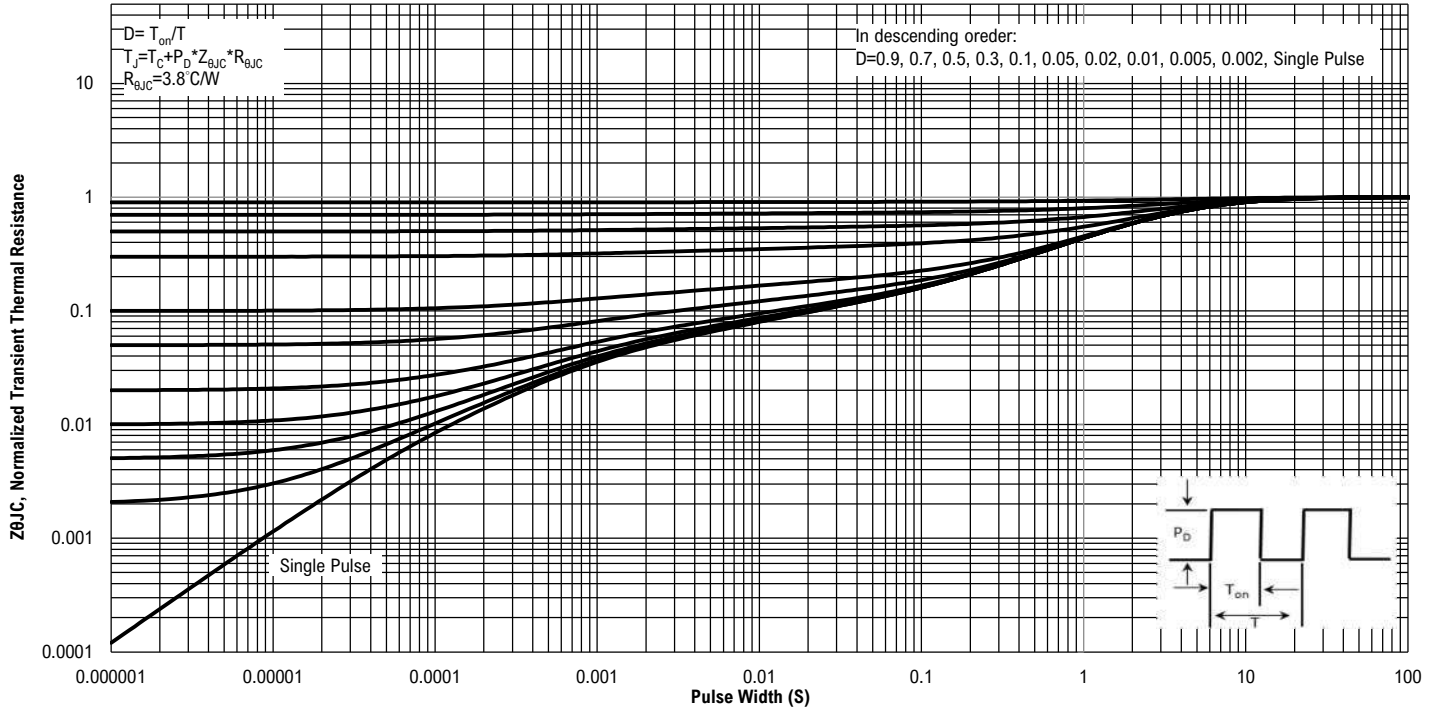


Gate-Charge Characteristics



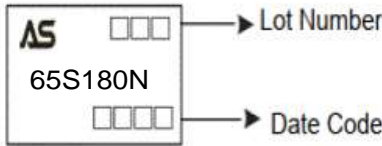
Typical Operating Characteristics (Cont.)

Transient Thermal Resistance

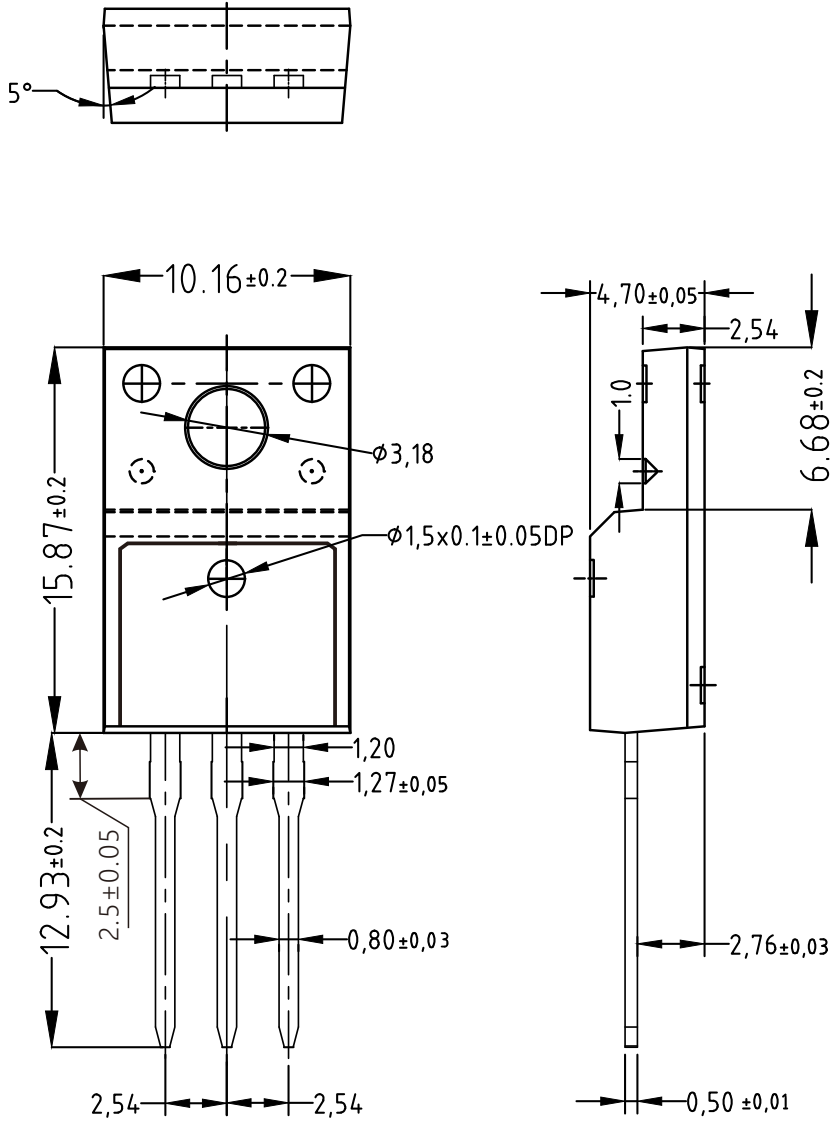


## Ordering and Marking Information

Ordering Device No.	Marking	Package	Packing	Quantity
ASDM65S180NF-T	65S180N	TO-220F	Tube	50/Tube

PACKAGE	MARKING
TO-220F	 <p>AS    □□□ → Lot Number 65S180N □□□□ → Date Code</p>

**TO-220F Package Information**





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