

■ PRODUCT CHARACTERISTICS

VDSS	650V
$R_{DS(on)max}(V_{GS}=10V)$	0.18Ω
Qg@type	30nC
ID	20A

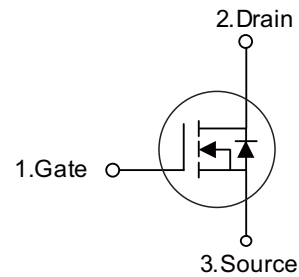
■ APPLICATIONS

- * Power factor correction
- * Switched mode power supplies
- * Uninterruptible power supply

■ FEATURES

- * low $R_{DS(on)}$
- * low gate charge
- * RoHS compliant

Symbol



■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	SPF65R180	TO-220F	50 pieces/Tube
N/A	SPT68R180	TO-220	50 pieces/Tube

■ ABSOLUTE MAXIMUM RATINGS ($T_c=25^{\circ}\text{C}$ unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Continuous drain current ($T_c = 25^{\circ}\text{C}$)		I_D	20	A
Pulsed drain current		I_{DM}	60	A
Gate-Source voltage		V_{GS}	± 30	V
Avalanche energy, single pulse		E_{AS}	600	mJ
Avalanche current, repetitive		I_{AR}	20	A
Power Dissipation ($T_c = 25^{\circ}\text{C}$)	TO-220	P_D	90	W
	TO-220F		31.8	W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^{\circ}\text{C}$
Continuous diode forward current		I_S	20	A
Diode pulse current		$I_{S,pulse}$	60	A

■ THERMAL CHARACTERISTICS

Parameter		Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	TO-220F	$R_{\theta JC}$	4.2	$^{\circ}\text{C/W}$
	TO-220	$R_{\theta JC}$	0.86	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	TO-220F	$R_{\theta JA}$	88	$^{\circ}\text{C/W}$
	TO-220	$R_{\theta JA}$	118	$^{\circ}\text{C/W}$

■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0 V, I _D =0.25 mA	650	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2.5	3.5	4.5	V
Drain cut-off current	I _{DSS}	V _{DS} =650 V, V _{GS} =0 V, T _j = 125°C	-	-	1	μA
			-	10	-	μA
Gate leakage current, Forward	I _{GSSF}	V _{GS} =30 V, V _{DS} =0 V	-	-	100	nA
Gate leakage current, Reverse	I _{GSSR}	V _{GS} =-30 V, V _{DS} =0 V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =10 A, T _j = 150°C	-	0.15	0.18	Ω
			-	0.4	-	Ω
Gate resistance	R _G	f=1 MHz, open drain	-	4.5	-	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	2637	-	pF
Output capacitance	C _{oss}		-	1250	-	pF
Reverse transfer capacitance	C _{rss}		-	17	-	pF
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 10A R _G = 10Ω, V _{GS} =15V	-	23.4	-	ns
Rise time	t _r		-	33	-	ns
Turn-off delay time	t _{d(off)}		-	121	-	ns
Fall time	t _f		-	7.5	-	ns
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =520 V, I _D =10A, V _{GS} =0 to 10 V	-	8	-	nC
Gate to drain charge	Q _{gd}		-	10	-	nC
Gate charge total	Q _g		-	30	-	nC
Gate plateau voltage	V _{plateau}		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =10A	-	-	1.2	V
Reverse recovery time	t _{rr}	V _R =50 V, I _F =10A, dI _F /dt=100 A/μs	-	285	-	ns
Reverse recovery charge	Q _{rr}		-	4.1	-	μC
Peak reverse recovery current	I _{rrm}		-	28.4	-	A

■ ELECTRICAL CHARACTERISTICS DIAGRAMS

Figure 1. On-Region Characteristics

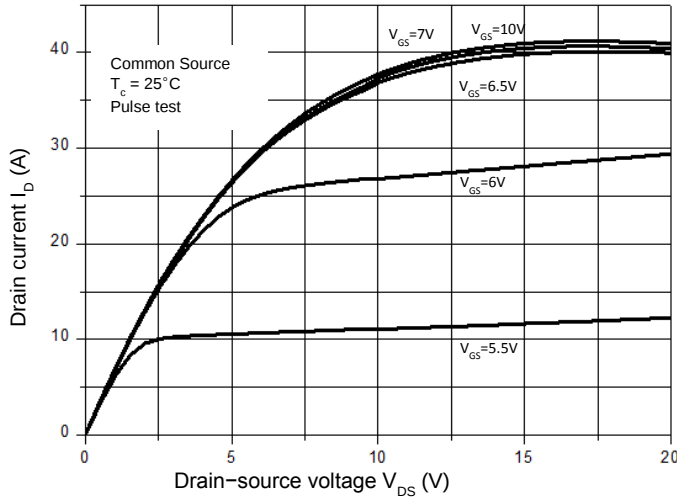


Figure 2. Transfer Characteristics

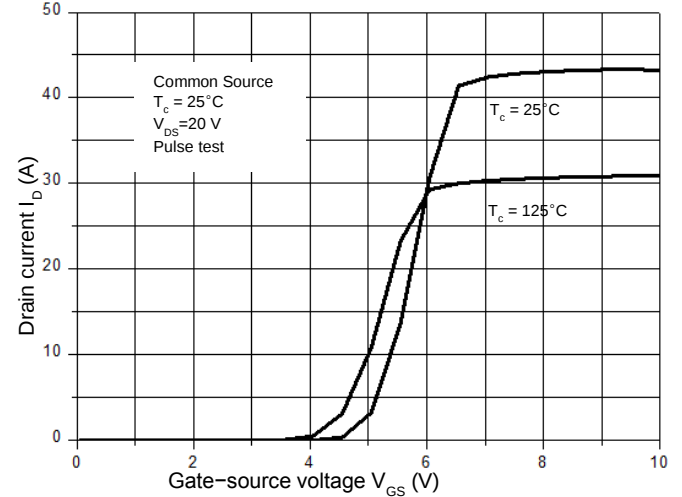


Figure 3. On-Resistance Variation vs. Drain Current

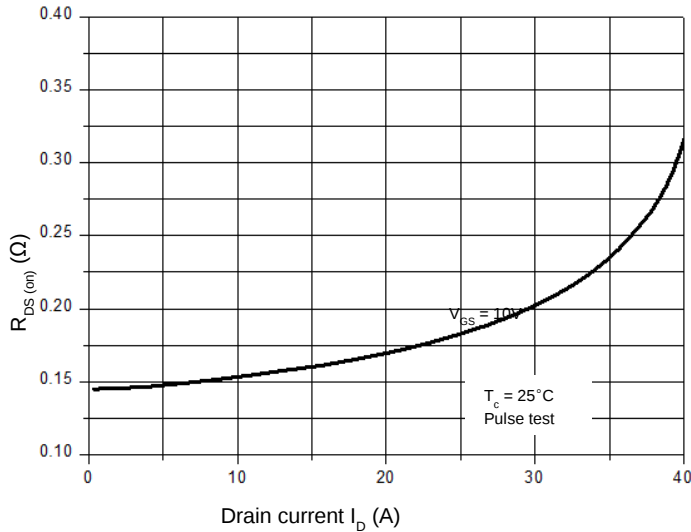


Figure 4. Threshold Voltage vs. Temperature

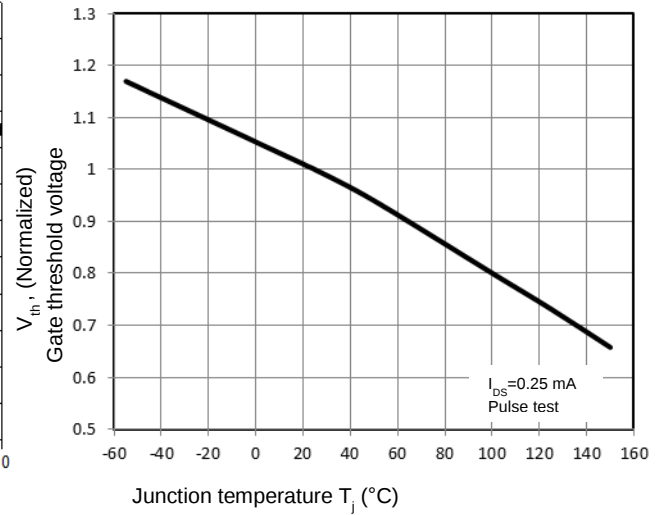


Figure 5. Breakdown Voltage vs. Temperature

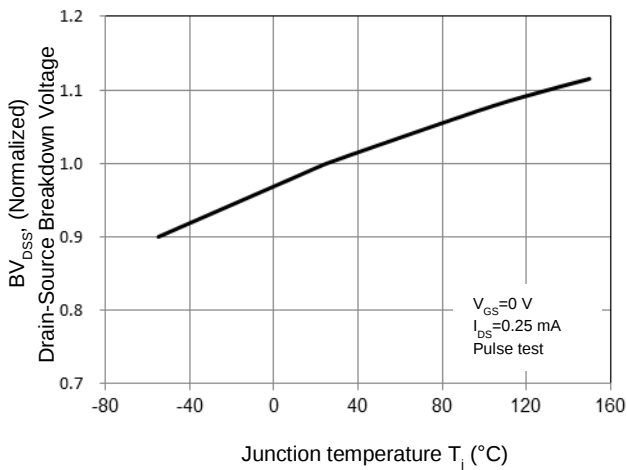
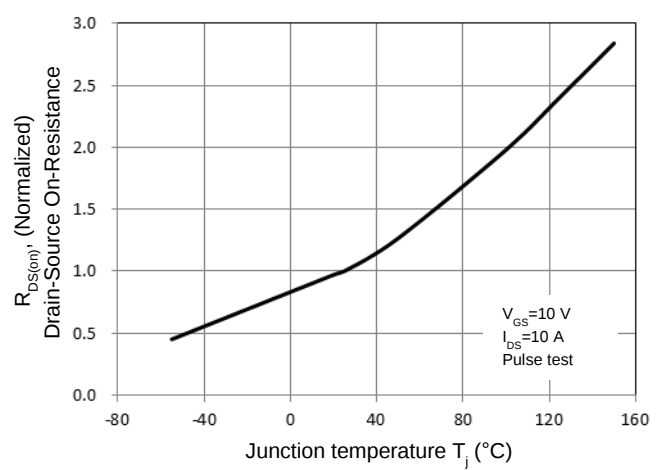


Figure 6. On-Resistance vs. Temperature



ELECTRICAL CHARACTERISTICS DIAGRAMS(Cont.)

Figure 7. Capacitance Characteristics

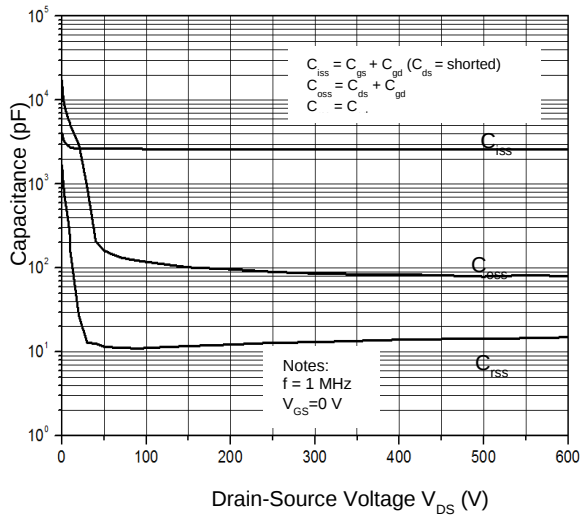


Figure 8. Gate Charge Characterist

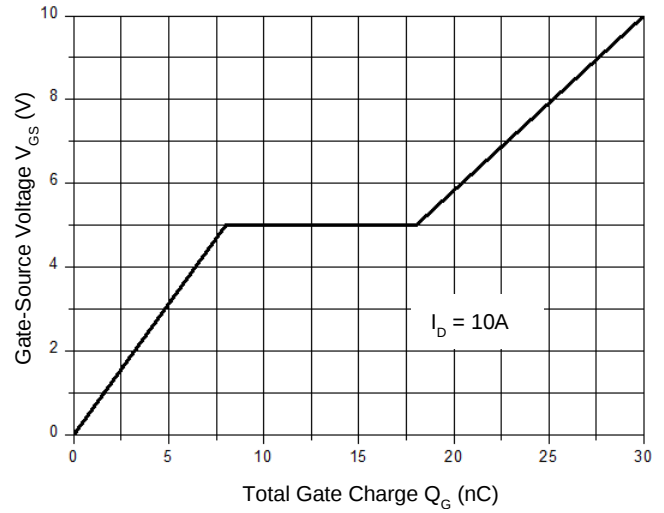


Figure 9 Maximum Safe Operating Area

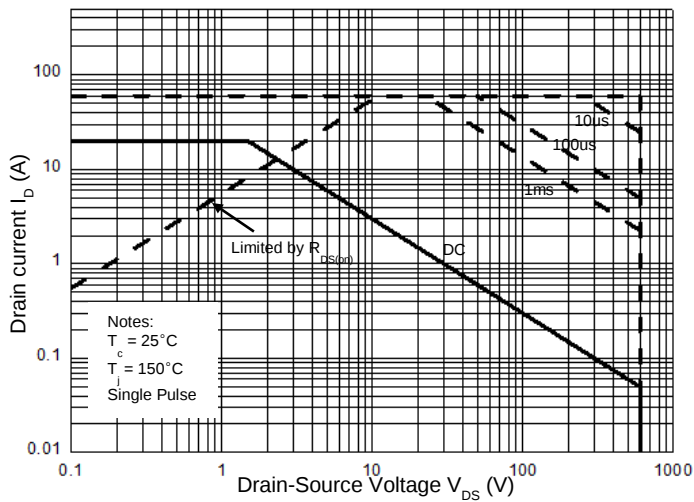
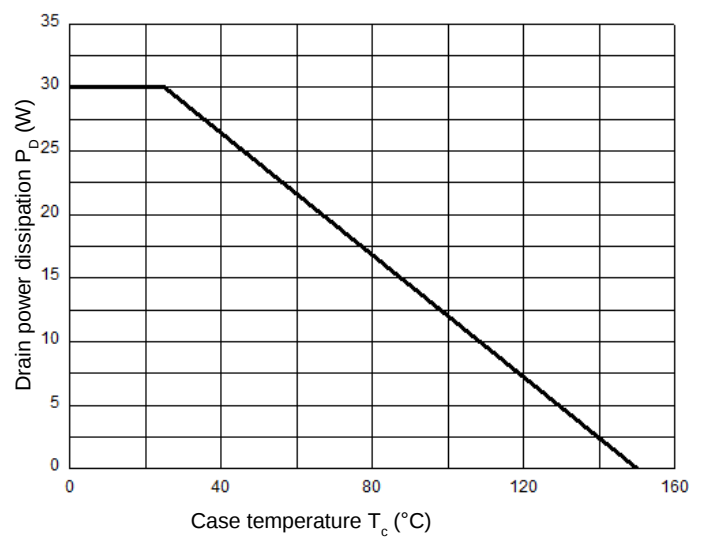
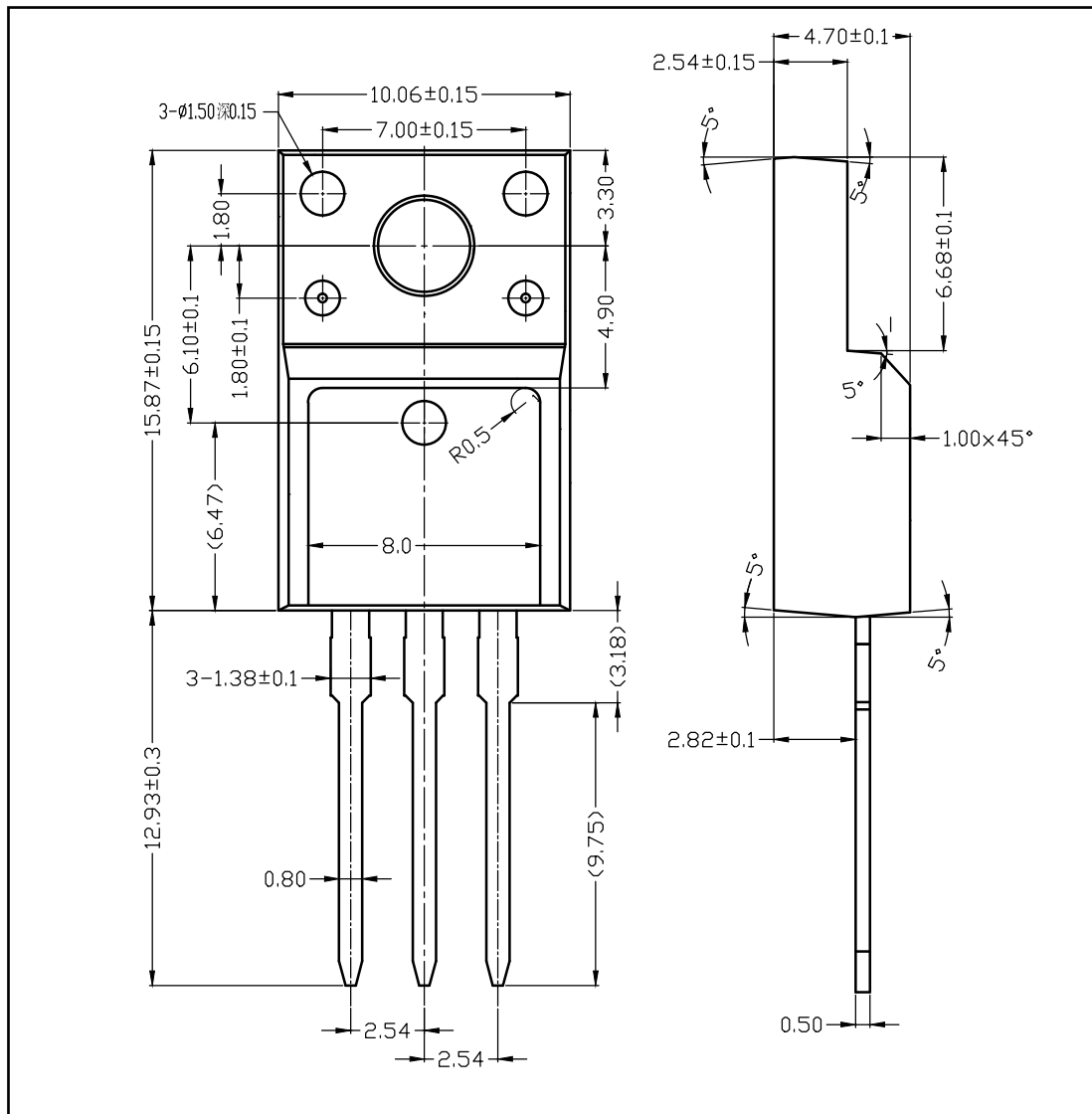


Figure 10 Power Dissipation vs. Temperature



■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

