

**Features**

- CRM(CQ) Super\_Junction technology
- Much lower Ron\*A performance for On-state efficiency
- Better efficiency due to very low FOM
- Ultra-fast body diode
- Qualified for industrial grade applications according to JEDEC

**Product Summary**

$V_{DS,min}$	650V
$R_{DS(on),typ}$	110mΩ
$I_D$	24A

**Applications**

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Charger
- Power Supply

100% DVDS Tested

100% Avalanche Tested


**Package Marking and Ordering Information**

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRJF140N65G2F	CRJF140N65G2F	TO-220F	Tube	N/A	N/A	50pcs

**Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Continuous drain current <sup>1)</sup> $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_D$	24 15	A
Pulsed drain current <sup>2)</sup> ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{j,max}$ )	$I_{D,pulse}$	72	A
Avalanche energy, single pulse ( $L=30\text{mH}$ )	$E_{AS}$	300	mJ
MOSFET dv/dt ruggedness	dv/dt	50	V/ns
Gate-Source voltage	$V_{GS}$	$\pm 30$	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	20	W
Continuous diode forward current( $T_C = 25^\circ\text{C}$ )	$I_S$	24	A
Diode pulse current <sup>2)</sup> ( $T_C = 25^\circ\text{C}$ )	$I_{S,pulse}$	72	A
Recovery diode dv/dt <sup>3)</sup>	dv/dt	50	V/ns
Operating junction and storage temperature	$T_j$ , $T_{stg}$	-55...+150	°C

 1) Limited by  $T_{j,max}$ . Maximum Duty Cycle D = 0.50; TO-220 equivalent

 2) Pulse width  $t_p$  limited by  $T_{j,max}$ 

 3) Identical low side and high side switch with identical  $R_g$



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CRJF140N65G2F

SJMOS N-MOSFET 650V, 110mΩ, 24A

### Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case	R <sub>thJC</sub>	-	4.45	6.23	°C/W	
Thermal resistance, junction – ambient	R <sub>thJA</sub>	-	-	64	°C/W	

### Electrical Characteristic (at T<sub>j</sub> = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

### Static Characteristic

Drain-source breakdown voltage	BV <sub>DSS</sub>	650	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
Gate threshold voltage	V <sub>GS(th)</sub>	3.2	-	4.6	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	5	μA	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V T <sub>j</sub> =25°C T <sub>j</sub> =150°C
Gate-source leakage current	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V
Drain-source on-state resistance	R <sub>DS(on)</sub>	-	110	140	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =11A, T <sub>j</sub> =25°C T <sub>j</sub> =150°C
Transconductance	g <sub>fs</sub>	-	16.5	-	S	V <sub>DS</sub> =20V, I <sub>D</sub> =11A

### Dynamic Characteristic

Input Capacitance	C <sub>iss</sub>	-	1595	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz
Output Capacitance	C <sub>oss</sub>	-	90	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	1.6	-		
Gate Total Charge	Q <sub>g</sub>	-	46	-	nC	V <sub>GS</sub> =10V, V <sub>DS</sub> =480V, I <sub>D</sub> =11A
Gate-Source charge	Q <sub>gs</sub>	-	14	-		
Gate-Drain charge	Q <sub>gd</sub>	-	24	-		
Gate plateau voltage	V <sub>plateau</sub>	-	7.7	-	V	V <sub>GS</sub> =10V, I <sub>D</sub> =11A, V <sub>DS</sub> =400V, R <sub>g</sub> =27Ω
Turn-on delay time	t <sub>d(on)</sub>	-	60	-		
Rise time	t <sub>r</sub>	-	61	-		
Turn-off delay time	t <sub>d(off)</sub>	-	140	-		
Fall time	t <sub>f</sub>	-	31	-		
Gate resistance	R <sub>g,int</sub>	-	10	-	Ω	f=1MHz



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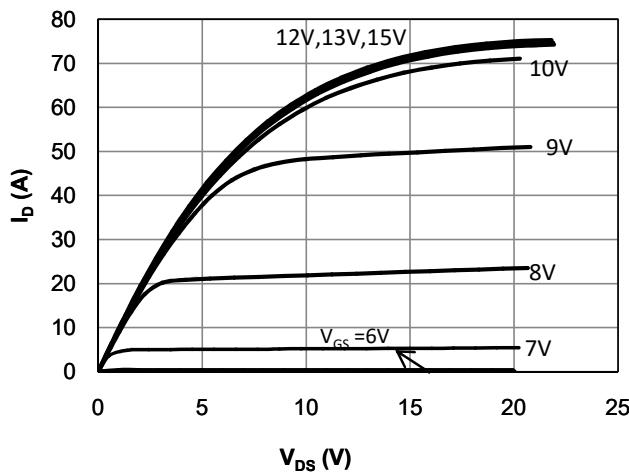
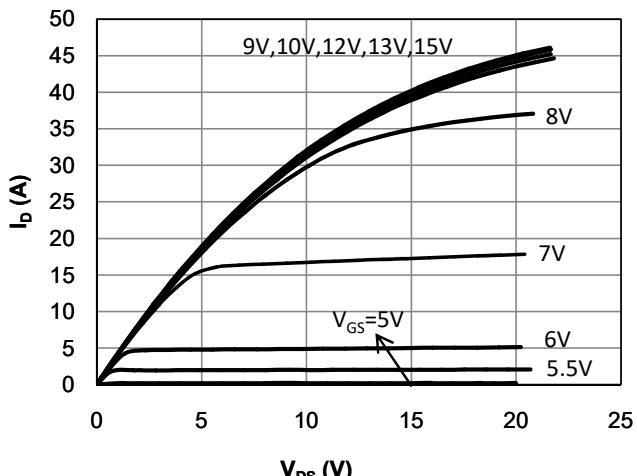
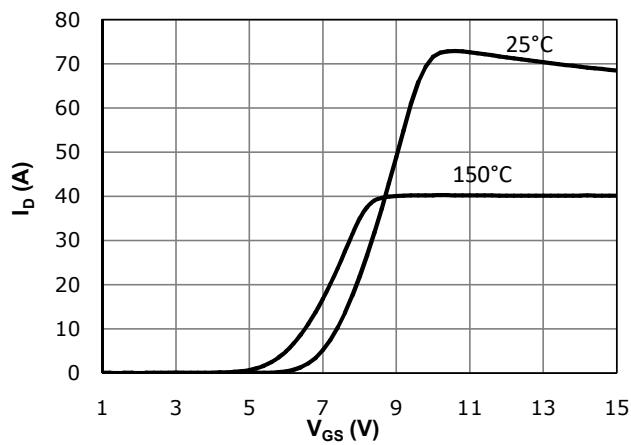
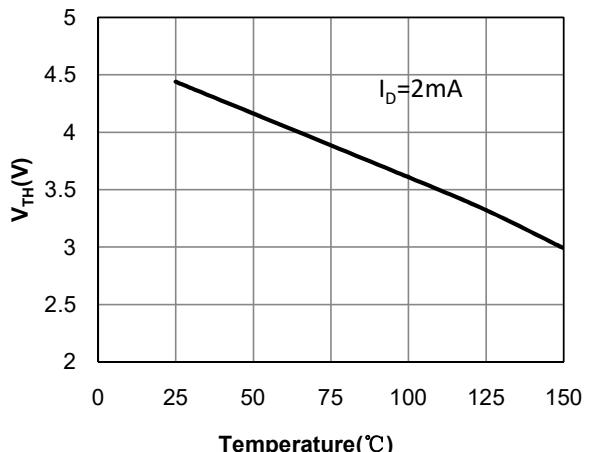
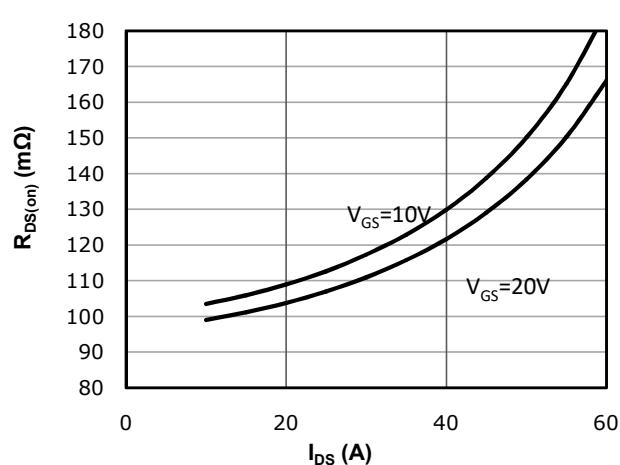
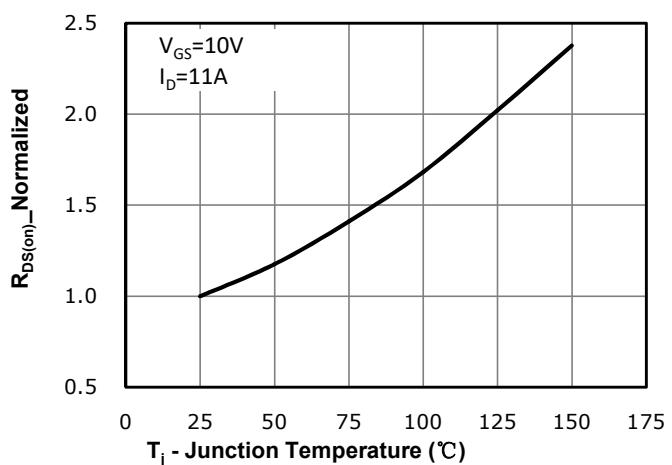
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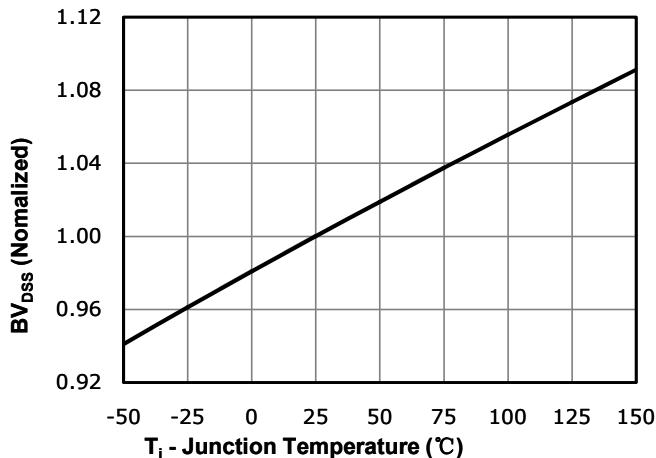
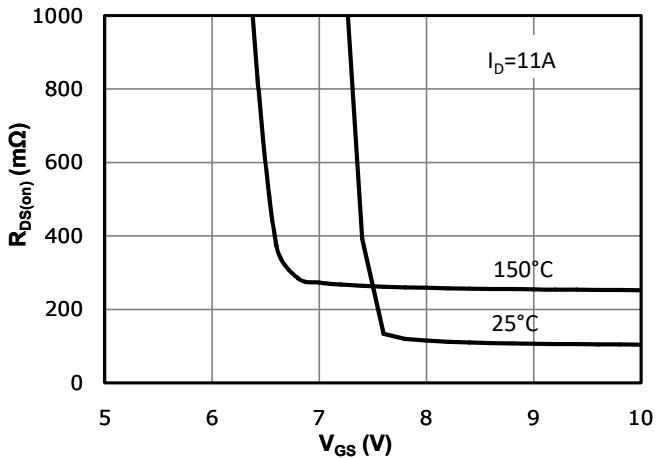
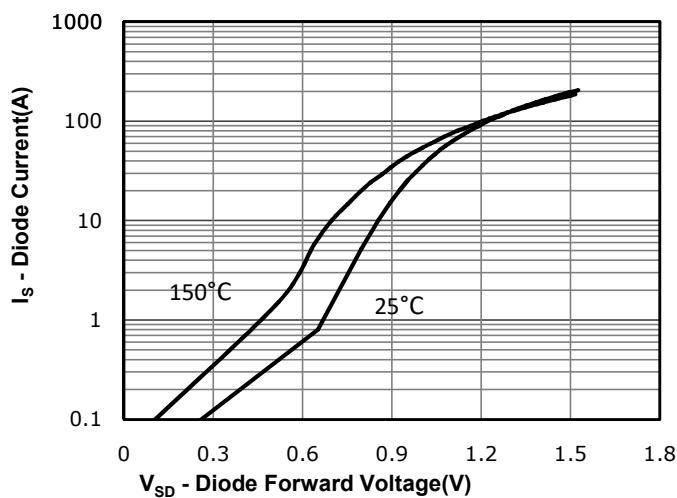
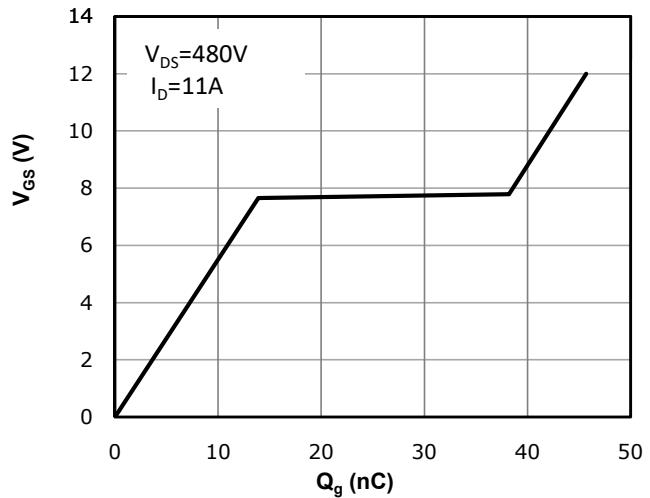
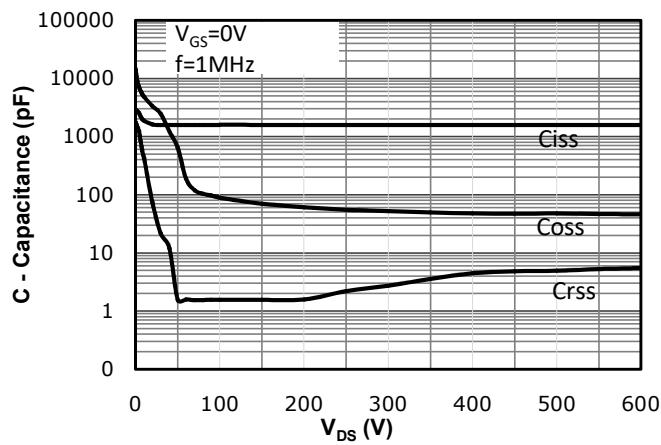
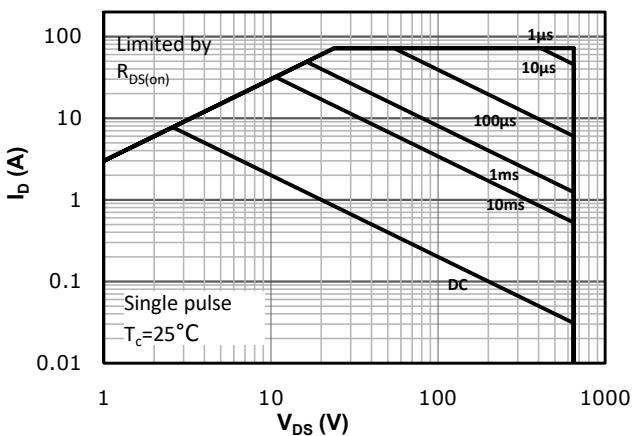
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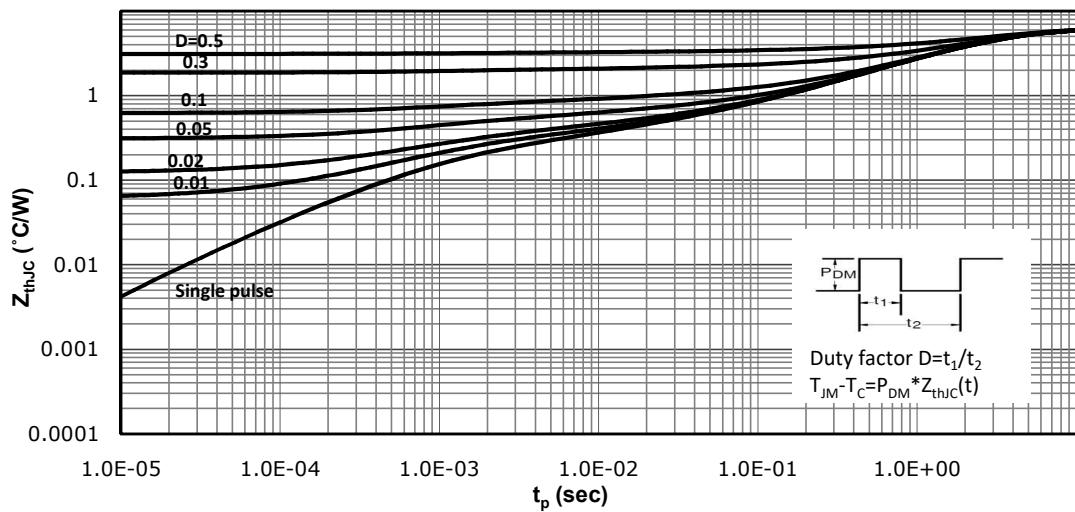
### Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	0.7	0.86	1.1	V	$V_{GS}=0V, I_{SD}=11A$
Body Diode Reverse Recovery Time	$t_{rr}$	-	120	-	ns	$I_{SD}=11A$ $di_F/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	0.63	-	$\mu C$	$V_{DS}=400V$

## Typical Performance Characteristics

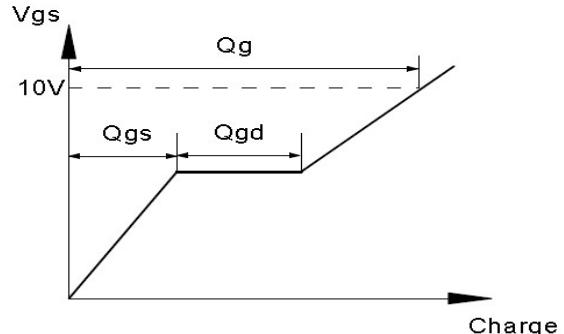
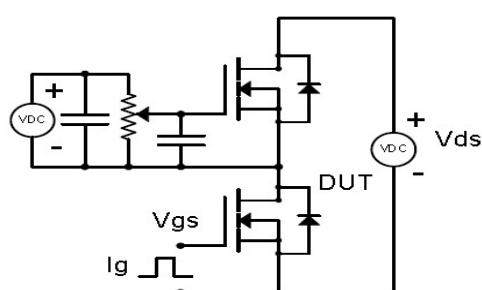
**Fig 1. Output Characteristics ( $T_j=25^\circ\text{C}$ )**

**Fig 2. Output Characteristics ( $T_j=150^\circ\text{C}$ )**

**Fig 3: Transfer Characteristics**

**Fig 4:  $V_{TH}$  vs.  $T_j$  Temperature Characteristics**

**Fig 5:  $R_{DS(on)}$  vs.  $I_{DS}$  Characteristics ( $T_j=25^\circ\text{C}$ )**

**Fig 6:  $R_{DS(on)}$  vs. Temperature**


**Fig 7: BV<sub>DSS</sub> vs. Temperature**

**Fig 8: R<sub>DS(on)</sub> vs. Gate Voltage**

**Fig 9: Body-diode Forward Characteristics**

**Fig 10: Gate Charge Characteristics**

**Fig 11: Capacitance Characteristics**

**Fig 12: Safe Operating Area**


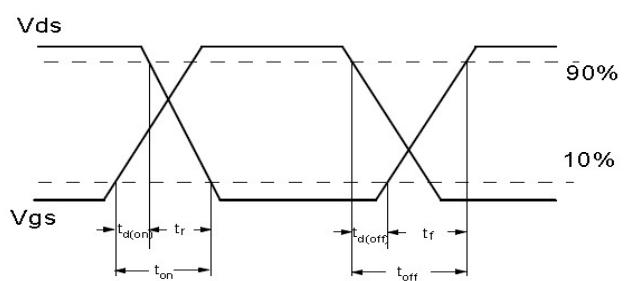
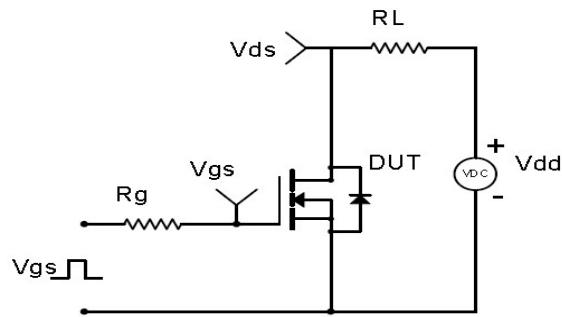
**Fig 13: Max. Transient Thermal Impedance**

## Test Circuit & Waveform

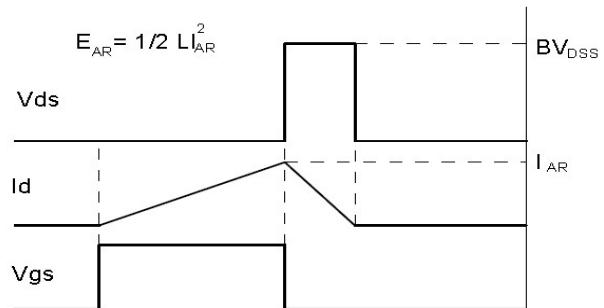
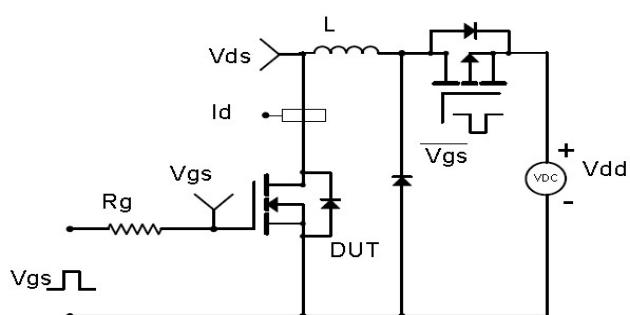
Gate Charge Test Circuit &amp; Waveform



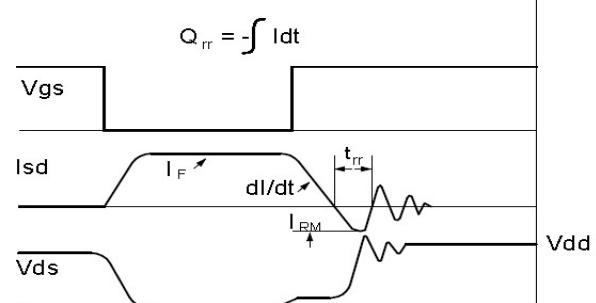
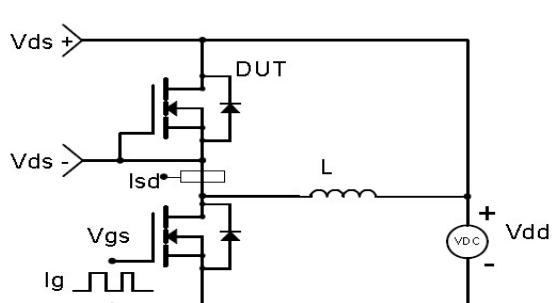
Resistive Switching Test Circuit &amp; Waveforms

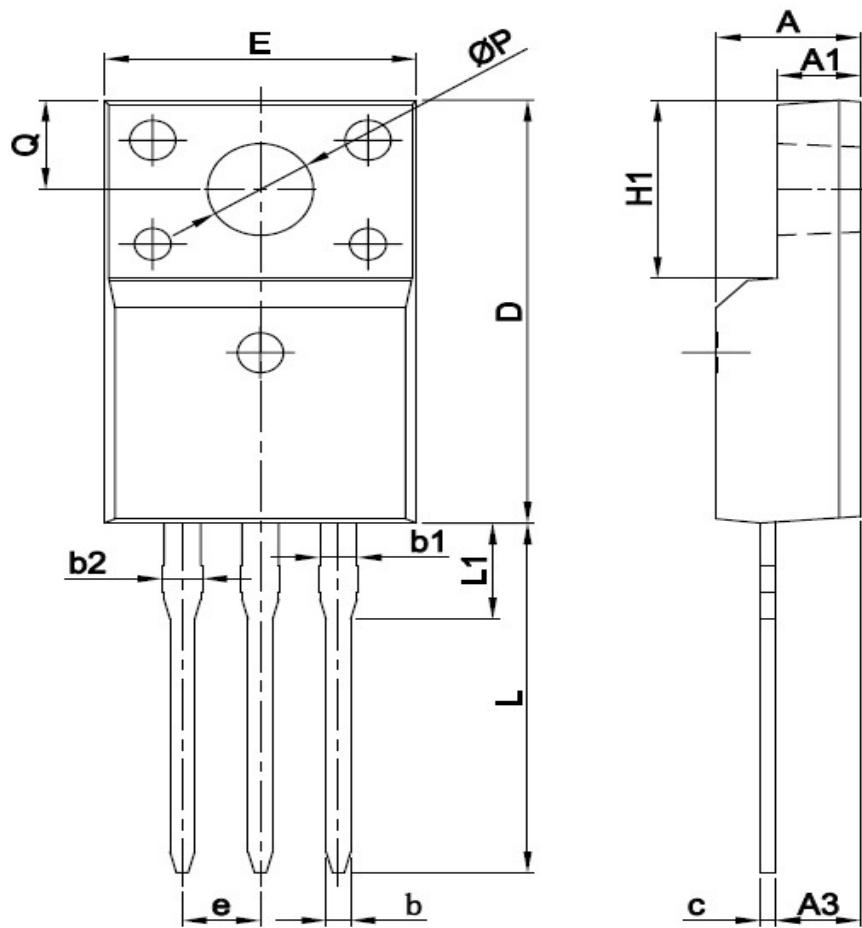


Unclamped Inductive Switching (UIS) Test Circuit &amp; Waveforms



Diode Recovery Test Circuit &amp; Waveforms



**Package Outline: TO-220F**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.90	0.169	0.193
A1	2.34	2.87	0.092	0.113
A3	2.20	2.96	0.087	0.117
b	0.60	0.90	0.024	0.035
b1	0.95	1.45	0.037	0.057
b2	1.15	1.55	0.045	0.061
c	0.40	0.70	0.016	0.028
D	15.50	16.17	0.610	0.637
e	2.54 BSC		0.100 BSC	
E	9.70	10.66	0.382	0.420
H1	6.70 REF		0.264 REF	
L	12.46	13.75	0.491	0.541
L1	2.80	3.80	0.110	0.150
Q	3.05	3.55	0.120	0.140
P	2.98	3.38	0.117	0.133



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CRJF140N65G2F

SJMOS N-MOSFET 650V, 110mΩ, 24A

## Marking



### NOTE:

NXBAAAAA

N —WB code (Usually omitted)

X —Assembly location code

BB —Fab code

AAAA —Lot code



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SJMOS N-MOSFET 650V, 110mΩ, 24A

## Revision History

Revison	Date	Major changes
2.1	2023/7/9	Update VTH SPEC and marking

## Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, aviation/aerospace and life-support devices or systems.

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

CRM(CQ) reserves the right to improve product design, function and reliability without notice.