

### FEATURES

- $R_{DS(ON)} < 1.5\Omega$  @  $V_{GS} = 10V$
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.
- Green molding compound

### MECHANICAL DATA

- Case: TO-220, ITO-220, TO-263 Package

### Ordering Information

Part No.	Package	Packing
6N65-TU	TO-220	50pcs / Tube
6N65F-TU	ITO-220	50pcs / Tube
6N65D-TU	TO-262	50pcs / Tube

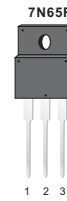
### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
650	1.5 @ $V_{GS} = 10V$	6

TO-220AB



ITO-220AB



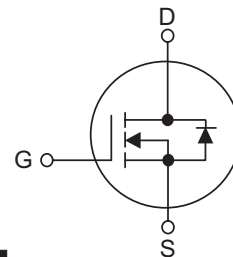
TO-263  
7N65D



Pin Definition:

1. Gate
2. Drain
3. Source

### Block Diagram



### ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25 C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	30	V
Continuous Drain Current	$I_D$	6	A
Pulsed Drain Current (Note 2)	$I_{DM}$	28	A
Avalanche Energy	$E_{AS}$	435	mJ
Power Dissipation	TO-220/TO-263	142	W
	ITO-220	48	W
Junction Temperature	$T_J$	+150	C
Storage Temperature	$T_{STG}$	-55 ~ +150	C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by  $T_J$

3. L = 30mH,  $I_{AS} = 5.25A$ ,  $V_{DD} = 50V$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25 C$

# 6N65

## 650V N-Channel Power MOSFET

### THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-263	$R_{\theta JA}$	62.5	C/W
Junction to Case	TO-220/TO-263	$R_{\theta JC}$	0.90	C/W
	ITO-220		2.6	

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

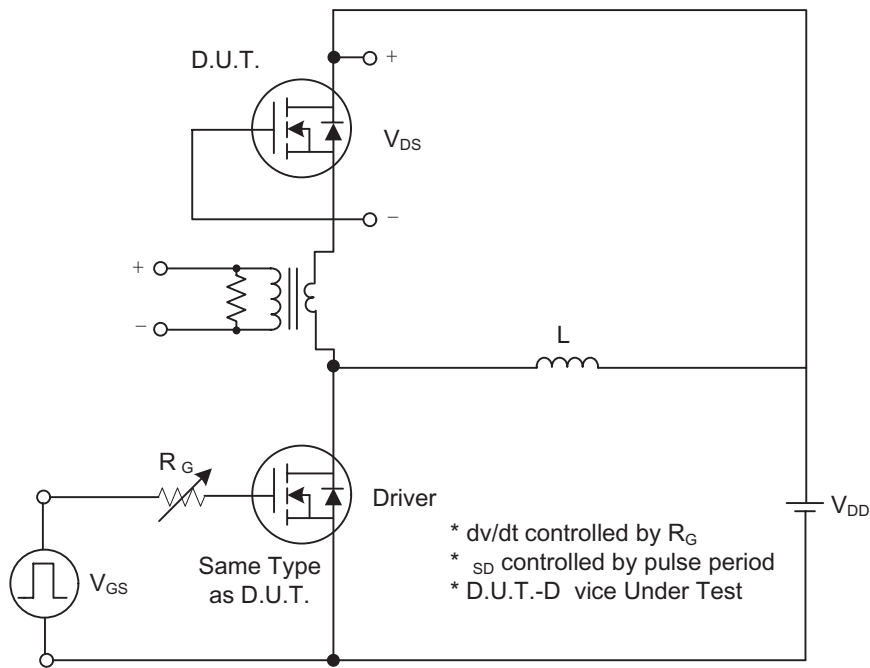
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$V_{GS}=0V, I_D=200\mu A$	650			V
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			1	$\mu A$
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_G=30V, V_{DS}=0V$			100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$ , Referenced to 25°C		0.67		V/°C
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$		1.35	1.5	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>							
Input Capacitance		$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1MHz$		1210	1400	pF
Output Capacitance		$C_{OSS}$			140	180	pF
Reverse Transfer Capacitance		$C_{RSS}$			40	50	pF
<b>SWITCHING CHARACTERISTICS</b>							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD}=300V, I_D=6A$ $R_G=25\Omega$ (Note 1, 2)		50	70	ns
Turn-On Rise Time		$t_R$			150	180	ns
Turn-Off Delay Time		$t_{D(OFF)}$			380	410	ns
Turn-Off Fall Time		$t_F$			180	220	ns
Total Gate Charge		$Q_G$	$V_{DS}=520V, I_D=6A$		29	38	nC
Gate-Source Charge		$Q_{GS}$	$V_{GS}=10V$ (Note 1, 2)		9		nC
Gate-Drain Charge		$Q_{GD}$			19		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>							
Drain-Source Diode Forward Voltage		$V_{SD}$	$V_{GS}=0V, I_S=6$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		$I_S$				7	A
Maximum Pulsed Drain-Source Diode Forward Current		$I_{SM}$				28	A
Reverse Recovery Time		$t_{rr}$	$V_{GS}=0V, I_S=6$		490		ns
Reverse Recovery Charge		$Q_{RR}$	$di/dt=100A/\mu s$ (Note 1)		3.2		$\mu C$

- Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .  
2. Essentially independent of operating temperature.

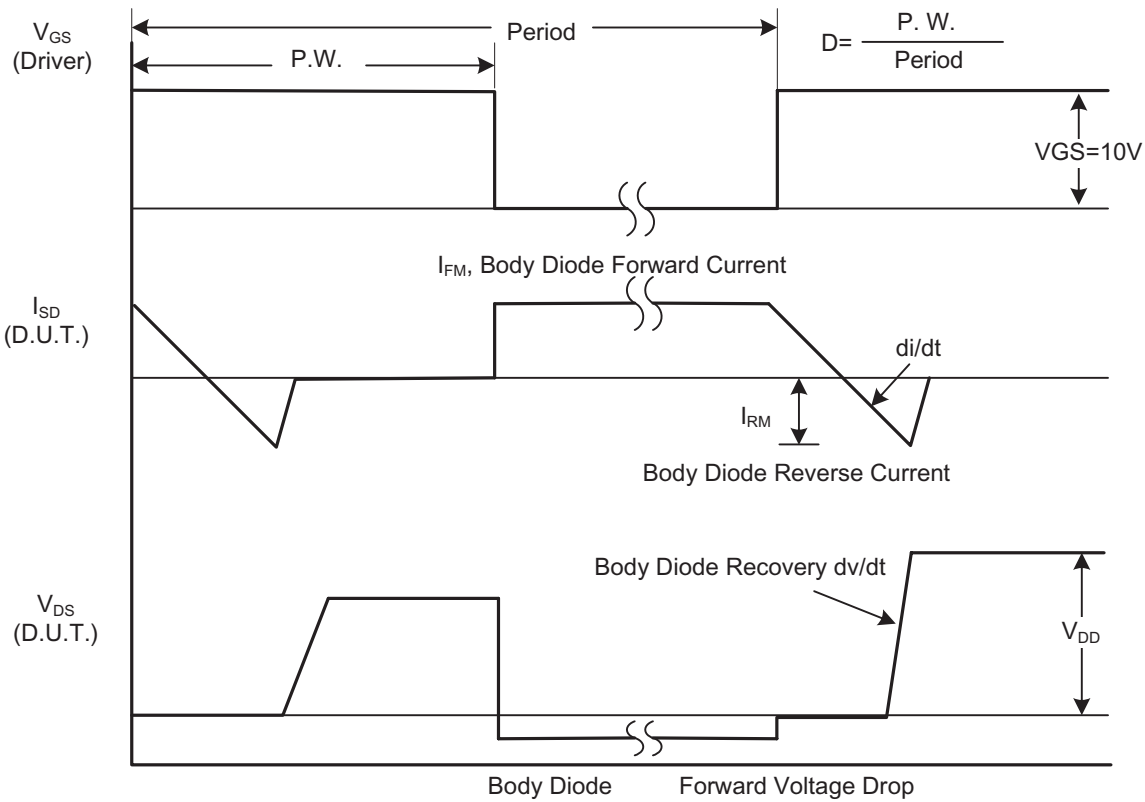
# 6N65

## 650V N-Channel Power MOSFET

### TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery  $dv/dt$  Test Circuit

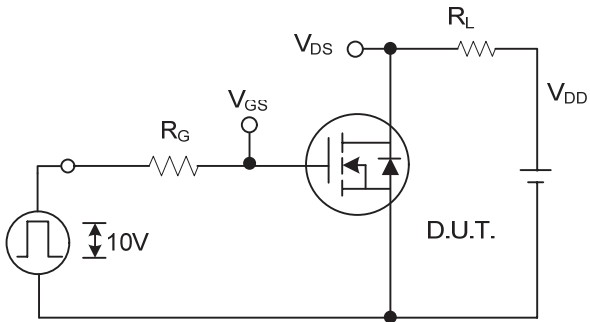


Peak Diode Recovery  $dv/dt$  Waveforms

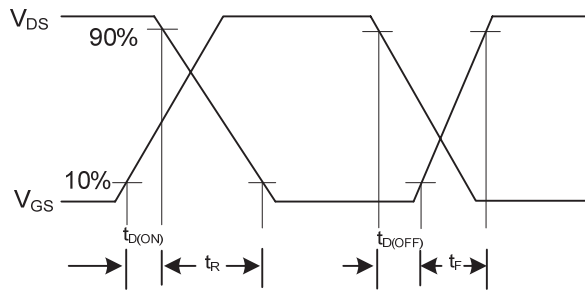
# 6N65

## 650V N-Channel Power MOSFET

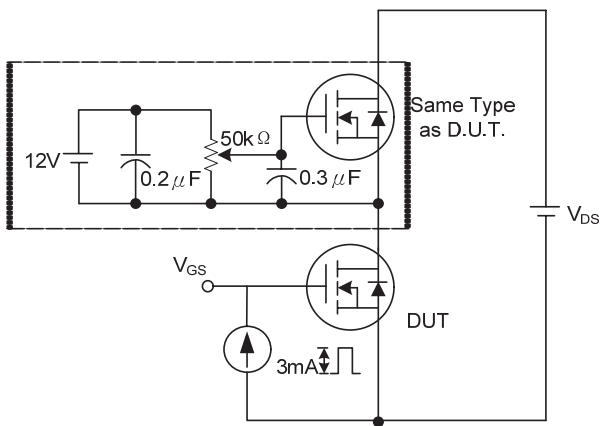
TEST CIRCUITS AND WAVEFORMS(Cont.)



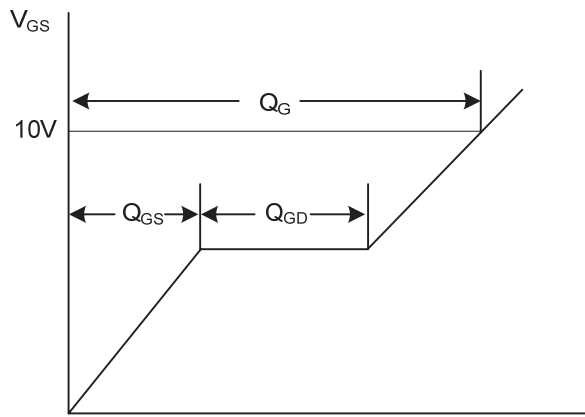
Switching Test Circuit



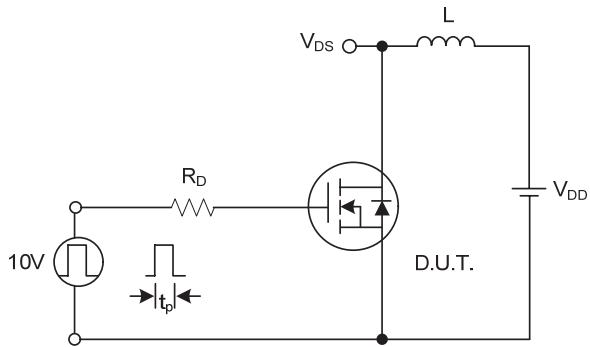
Switching Waveforms



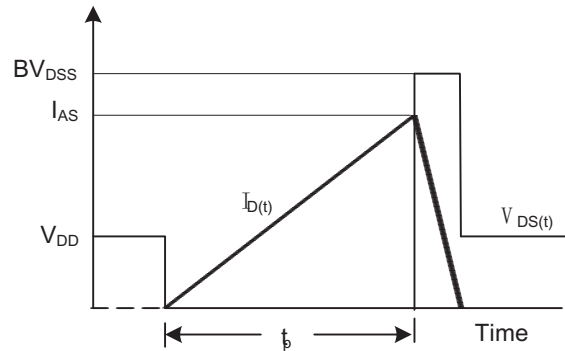
Gate Charge Test Circuit



Charge  
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



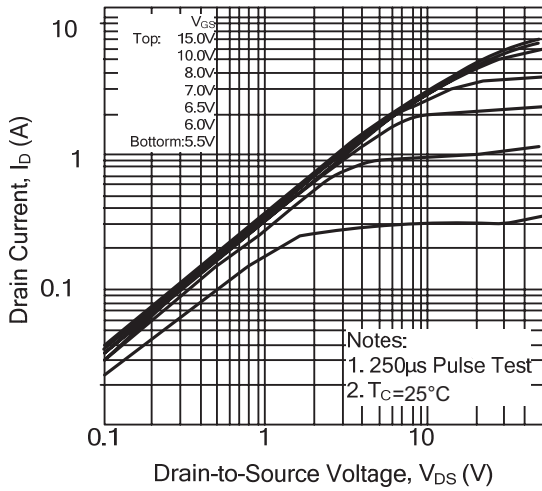
Unclamped Inductive Switching Waveforms

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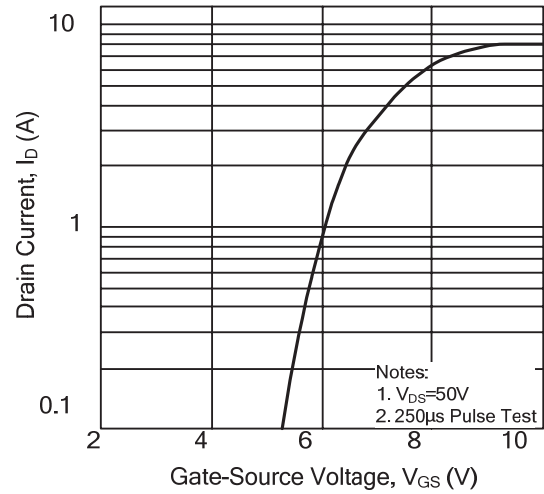
## 650V N-Channel Power MOSFET

### TYPICAL CHARACTERISTICS

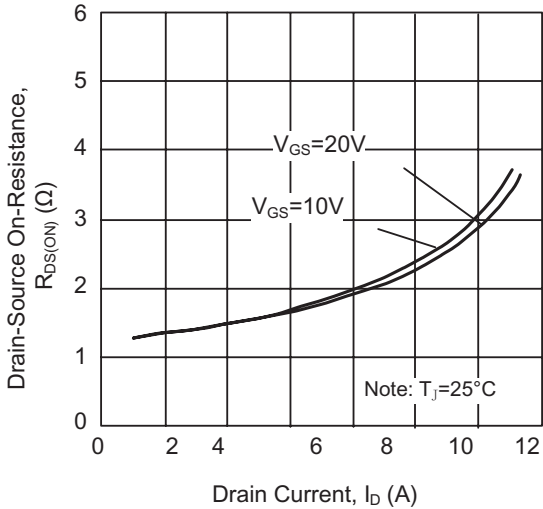
On-State Characteristics



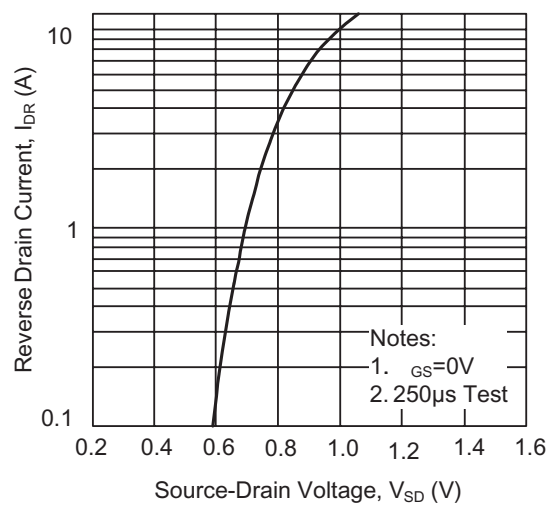
Transfer Characteristics



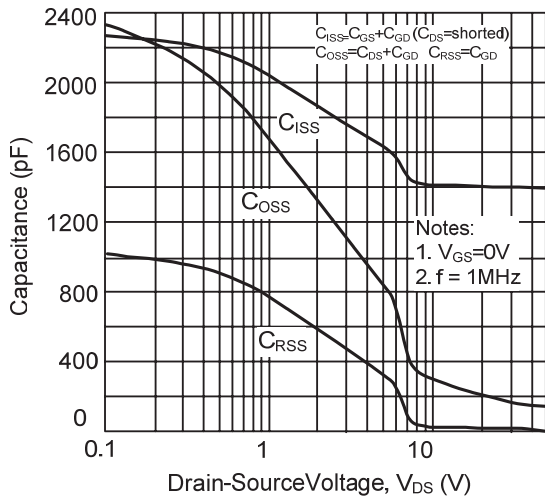
On-Resistance Variation vs. Drain Current and Gate Voltage



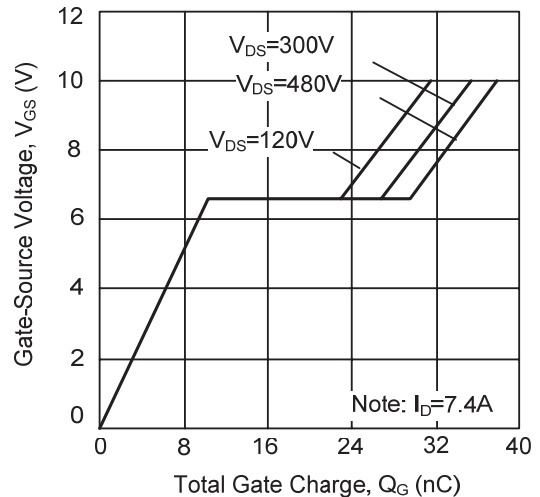
On State Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)



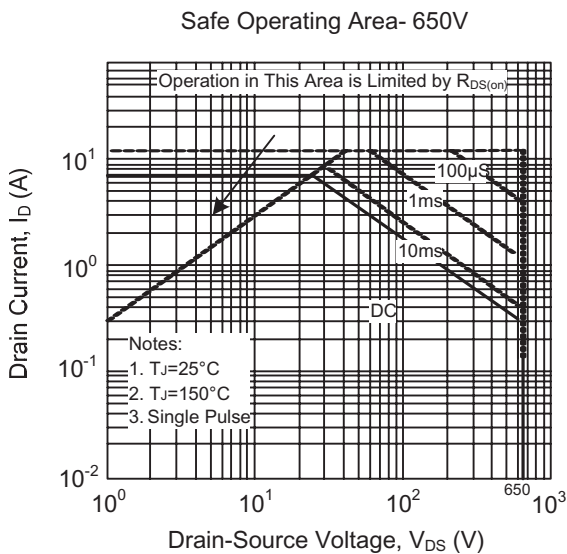
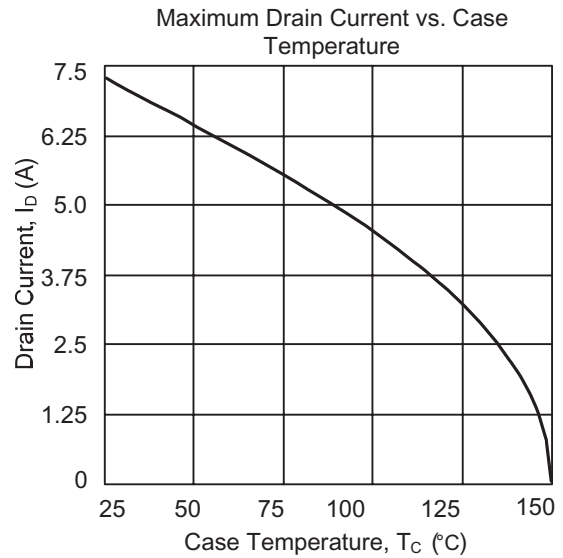
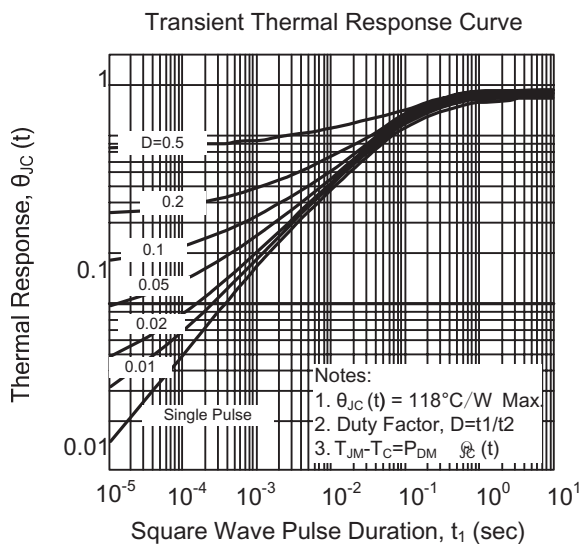
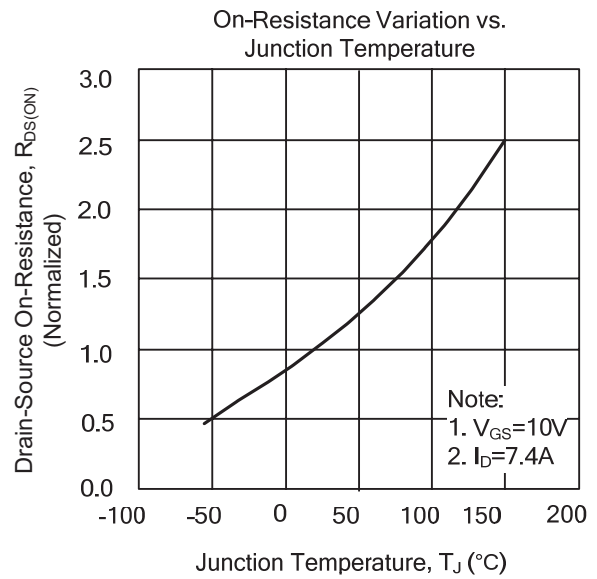
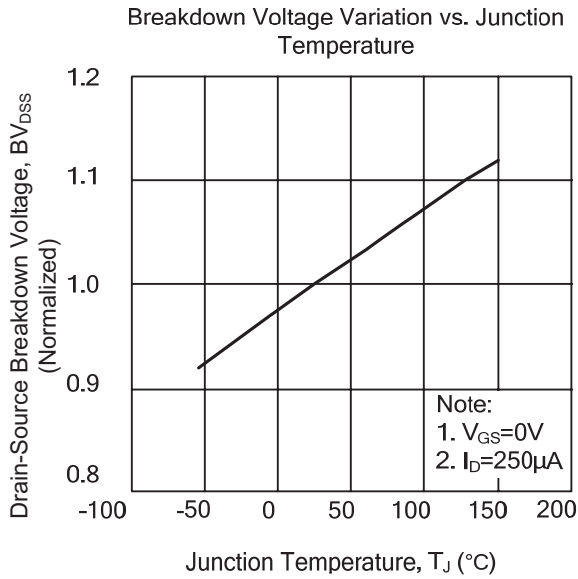
Gate Charge Characteristics



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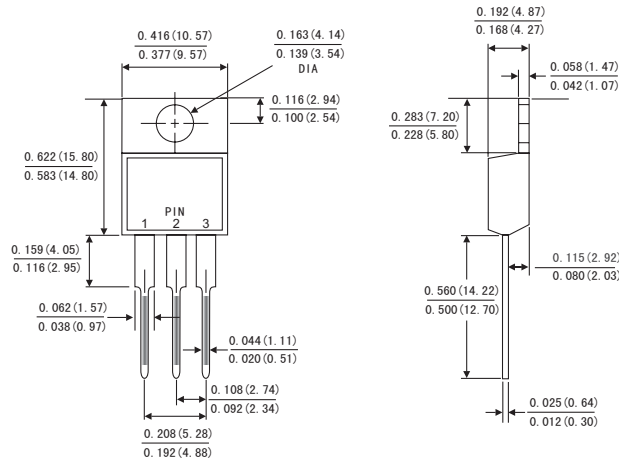
### TYPICAL CHARACTERISTICS



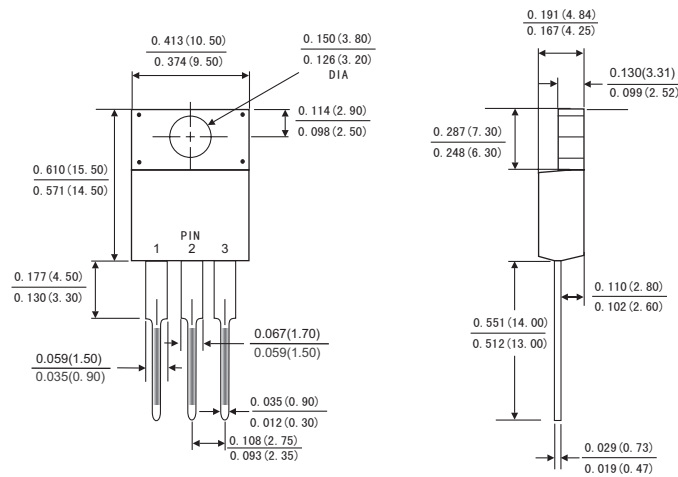
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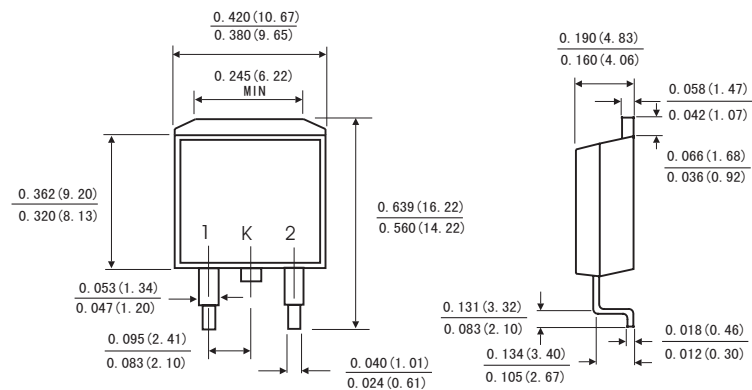
### TO-220AB



### ITO-220AB



### TO-263



Dimensions in inches and (millimeters)