

FEATURES

- $R_{DS(ON)} < 1.0\Omega$ @ $V_{GS} = 10V$
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.

MECHANICAL DATA

- Case: TO-220, ITO-220, TO-262, TO-263 Package

Ordering Information

Part No.	Package	Packing
10N65-TU	TO-220	50pcs / Tube
10N65F-TU	ITO-220	50pcs / Tube
10N65E-TU	TO-262	50pcs / Tube
10N65D-TU	TO-263	50pcs / Tube
10N65D-TR	TO-263	800pcs / 13"Reel

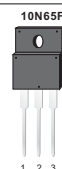
PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
650	1.0 @ $V_{GS} = 10V$	10

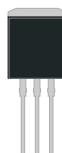
TO-220AB



ITO-220AB



TO-262
10N65E



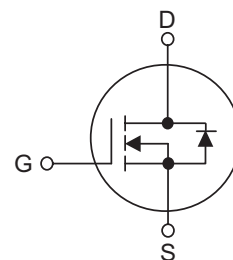
TO-263
10N65D



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source



ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ C}$, 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	10	A
Pulsed Drain Current (Note 2)		I_{DM}	38	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	608	mJ
Power Dissipation	TO-220/TO-263/TO-262	P_D	156	W
	ITO-220		50	
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 maximum junction temperature

3. $L = 30\text{mH}$, $I_{AS} = 6.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25\text{ C}$

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650V N-Channel Power MOSFET

THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ITO-220 TO-262/TO-263	θ_{JA}	62.5	C/W
Junction to Case	TO-220	θ_{JC}	0.85	C/W
	ITO-220		2.6	

ELECTRICAL CHARACTERISTICS (T_C=25 C, unless otherwise specified)

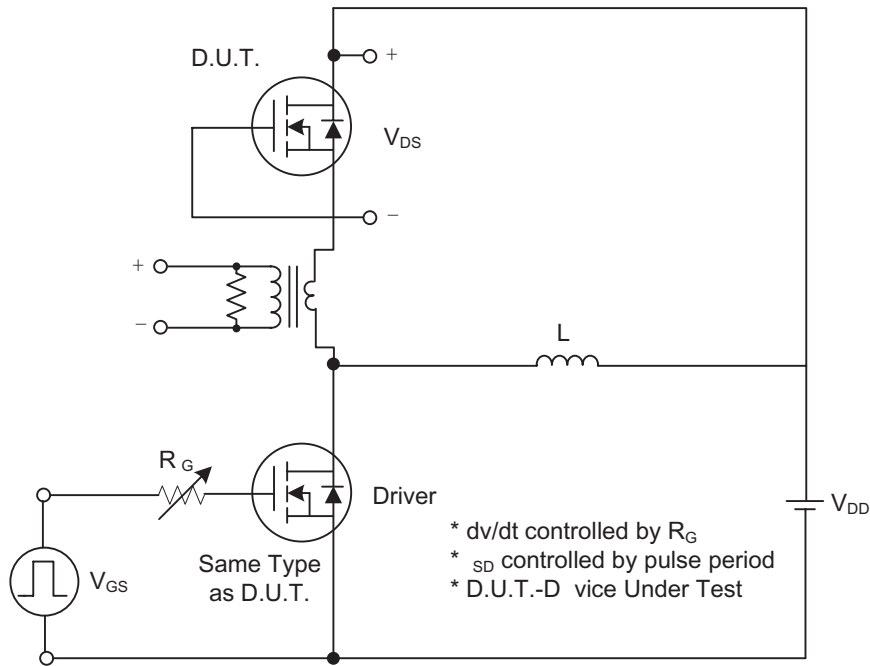
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS								
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V	
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA	
Gate- Source Leakage Current	Forward	I _{GSS}	V _G =30V, V _{DS} =0V			100	nA	
	Reverse		V _G =-30V, V _{DS} =0V			-100	nA	
ON CHARACTERISTICS								
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V	
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =5.0A		0.88	1.0	Ω	
DYNAMIC CHARACTERISTICS								
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1200		pF	
Output Capacitance		C _{OSS}				166		pF
Reverse Transfer Capacitance		C _{RSS}				18		pF
SWITCHING CHARACTERISTICS								
Turn-On Delay Time		t _{D(ON)}	V _{DD} =325V, I _D =10A, R _G =25Ω (Note 1, 2)		40		ns	
Turn-On Rise Time		t _R				74		ns
Turn-Off Delay Time		t _{D(OFF)}				52		ns
Turn-Off Fall Time		t _F				35		ns
Total Gate Charge		Q _G	V _{DS} =520V, I _D =10A, V _{GS} =10V (Note 1, 2)		24		nC	
Gate-Source Charge		Q _{GS}				8		nC
Gate-Drain Charge		Q _{GD}				7		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS								
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =10A			1.4	V	
Maximum Continuous Drain-Source Diode Forward Current		I _S				10	A	
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				40	A	
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _S =10A		570		ns	
Reverse Recovery Charge		Q _{RR}	di/dt=100A/μs (Note 1)		4.7		μC	

- Notes: 1. Pulse Test: Pulse width ≤300μs, Duty cycle ≤2%.
2. Essentially independent of operating temperature.

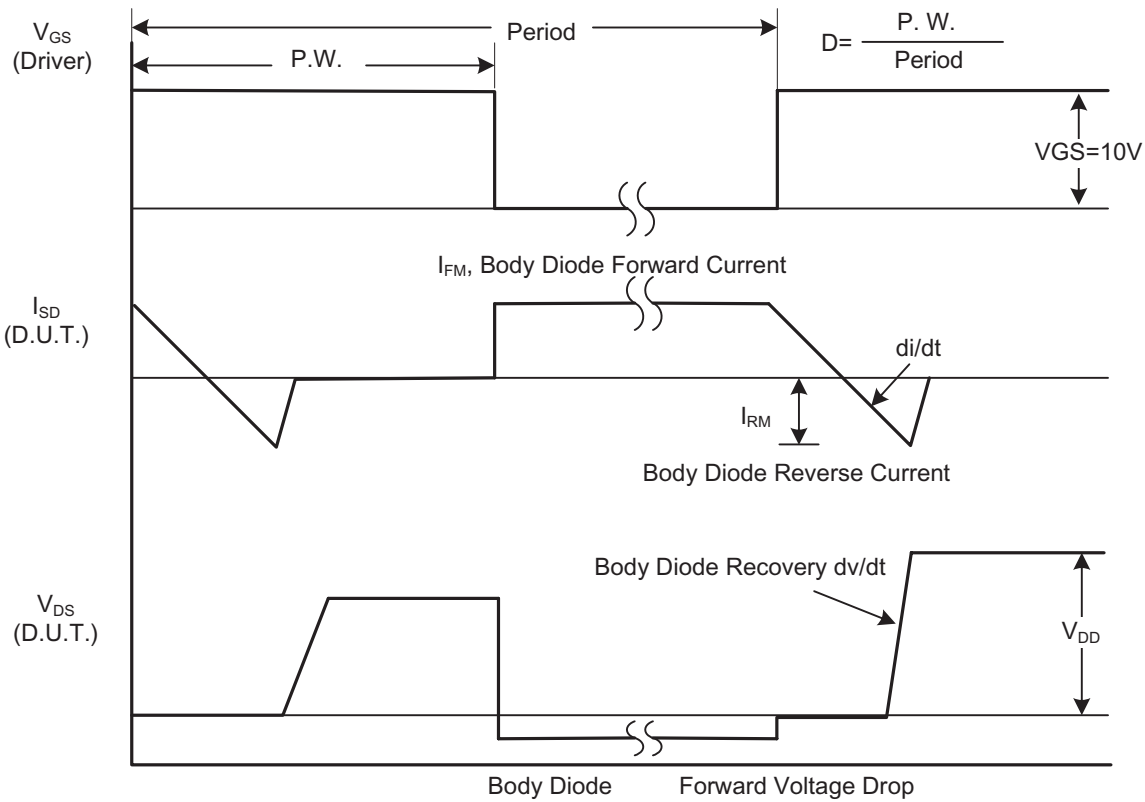
10N65

650V N-Channel Power MOSFET

TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit

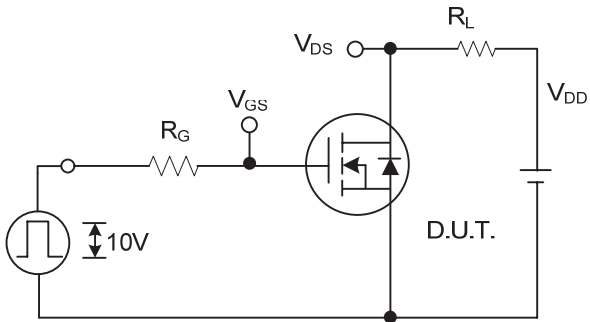


Peak Diode Recovery dv/dt Waveforms

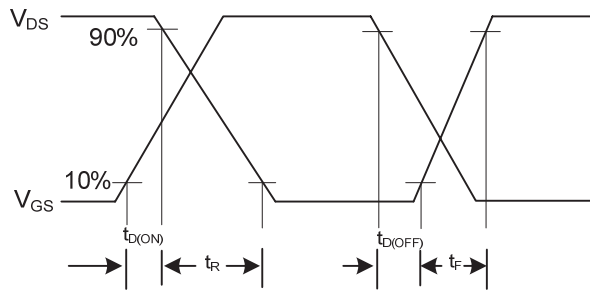
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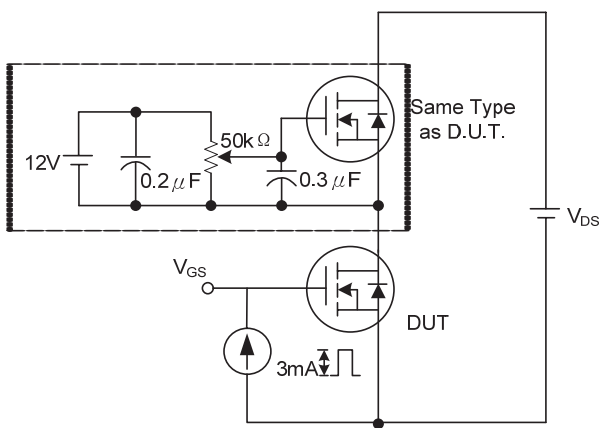
TEST CIRCUITS AND WAVEFORMS(Cont.)



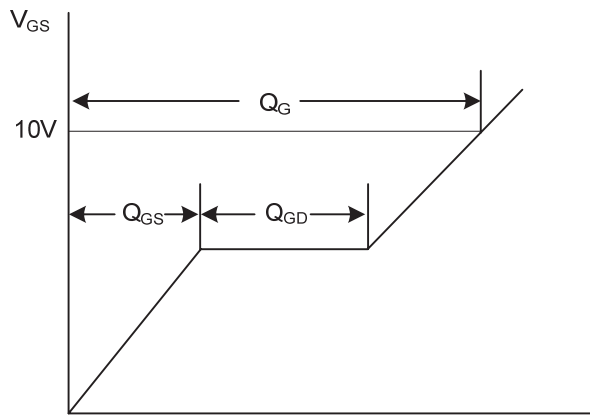
Switching Test Circuit



Switching Waveforms

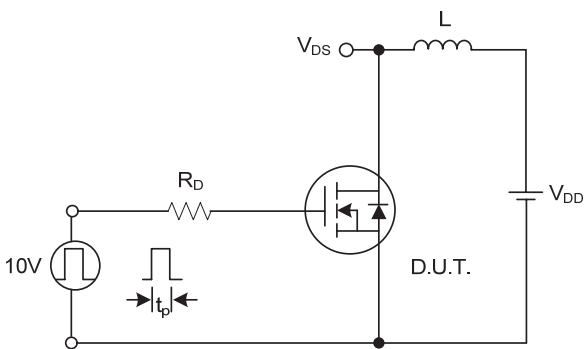


Gate Charge Test Circuit

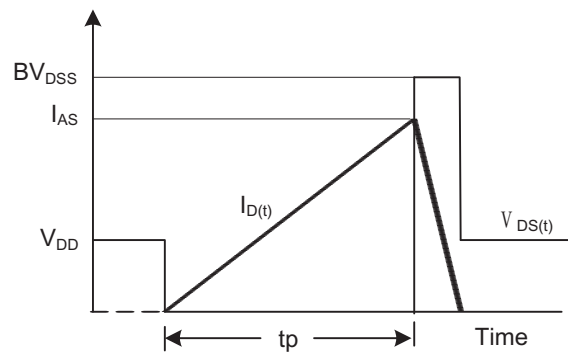


Charge

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

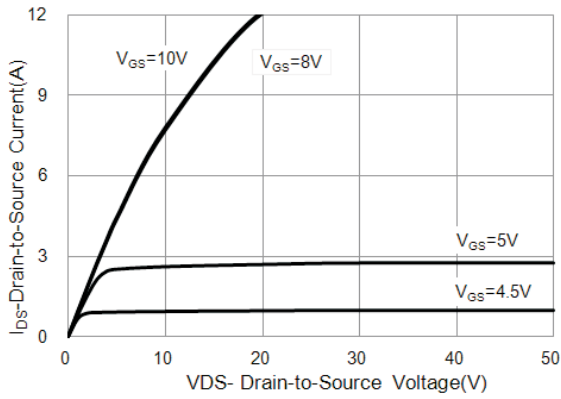


Unclamped Inductive Switching Waveforms

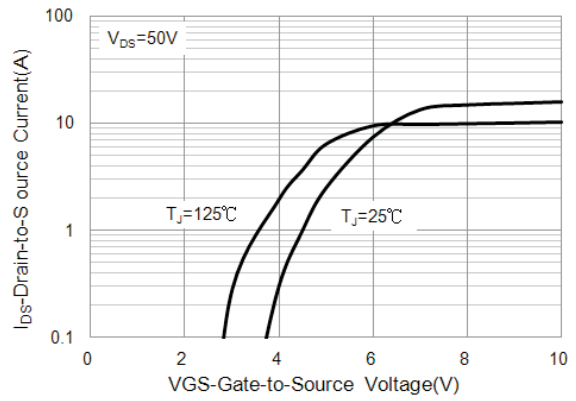
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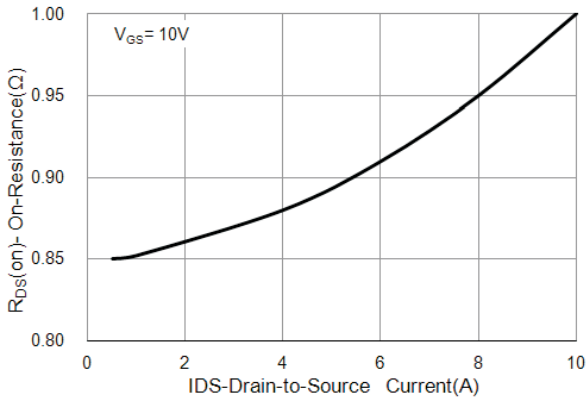
TYPICAL CHARACTERISTICS



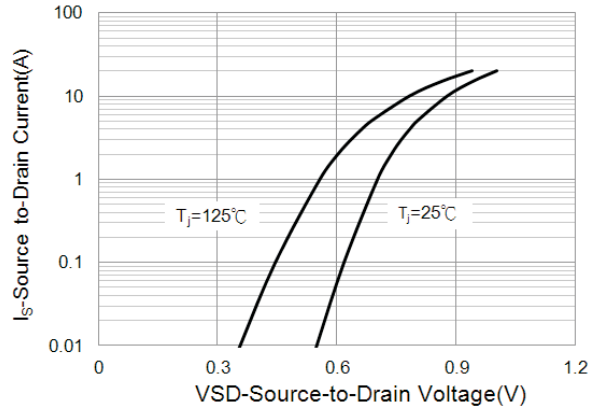
Output Characteristics



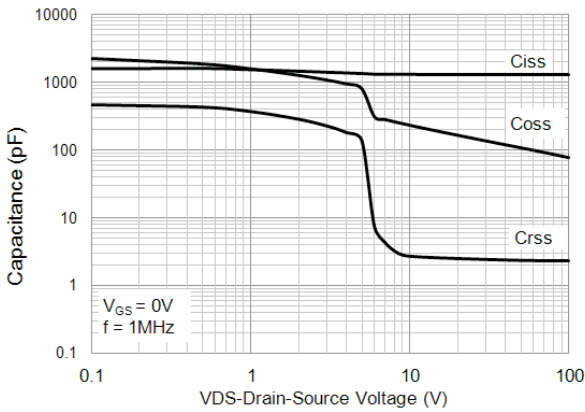
Transfer Characteristics



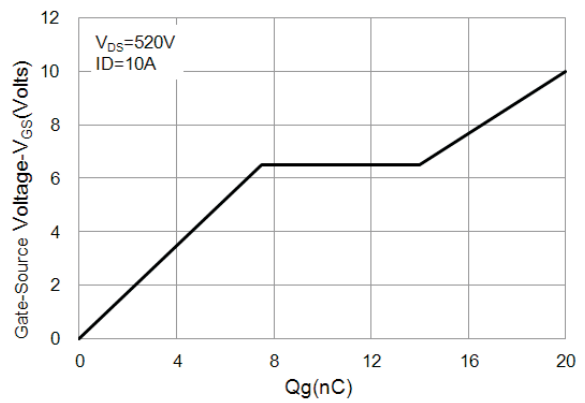
On-Resistance vs. Drain Current



Source-Drain Diode Forward Voltage



Capacitance vs. Drain-Source Voltage

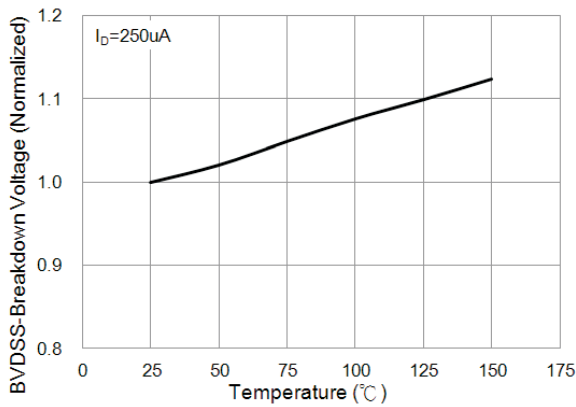


Gate Charge

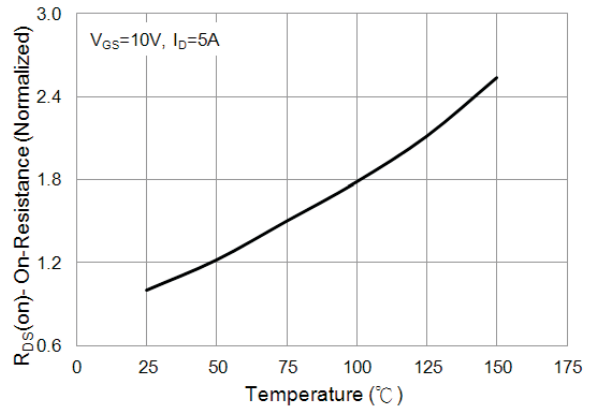
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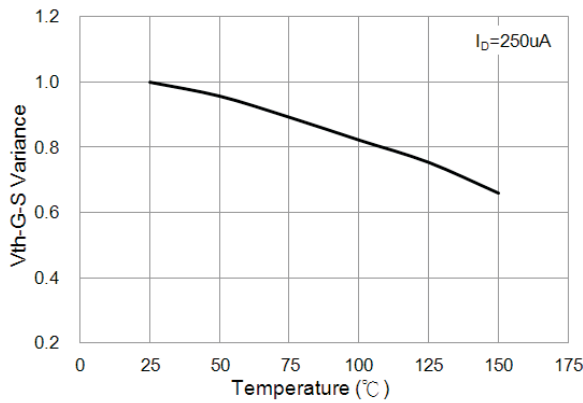
TYPICAL CHARACTERISTICS



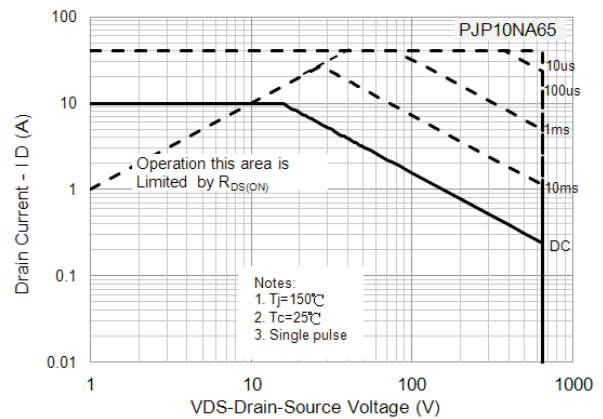
BV_{DSS} vs. Junction Temperature



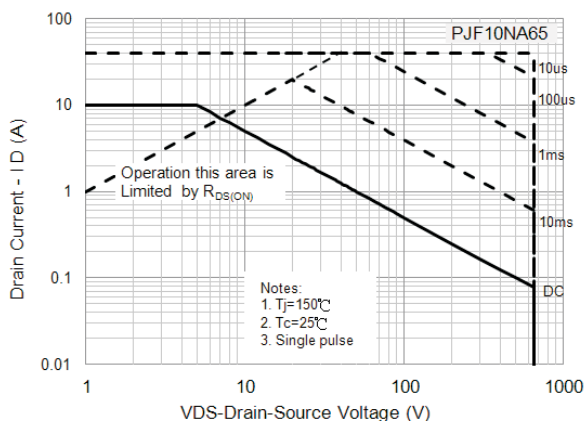
On-Resistance vs. Junction Temperature



Threshold Voltage Variation with Temperature



Maximum Safe Operating Area

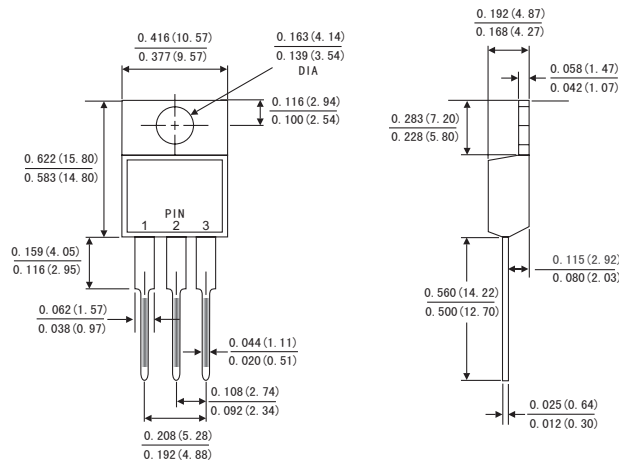


Maximum Safe Operating Area

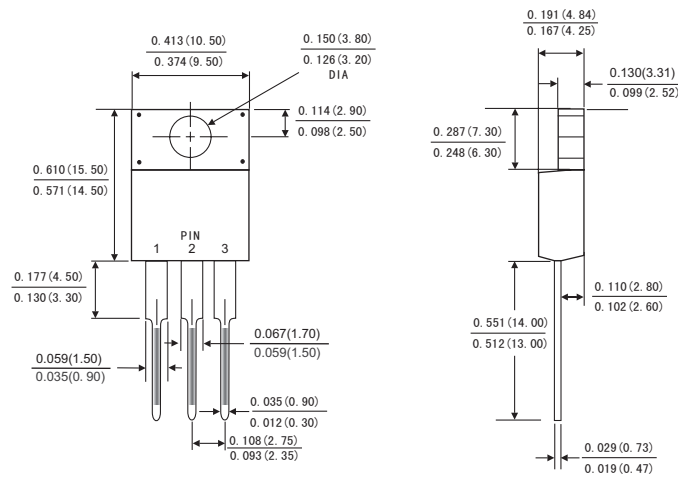
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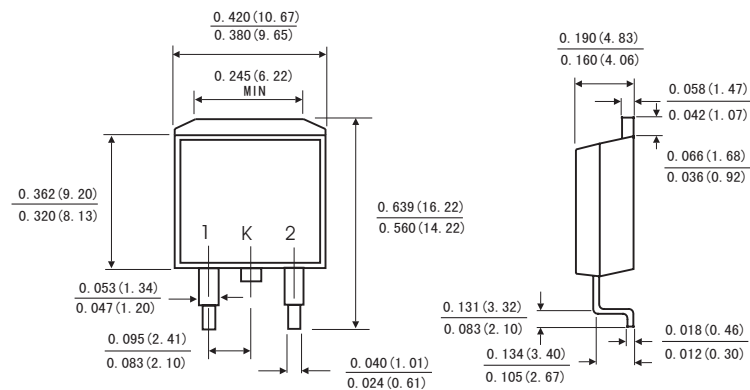
TO-220AB



ITO-220AB



TO-263

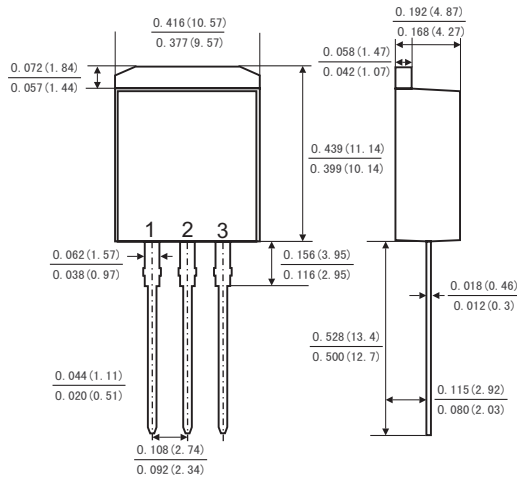


Dimensions in inches and (millimeters)

10N65

650V N-Channel Power MOSFET

TO-262



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