

FEATURES

- $R_{DS(ON)} < 0.85\Omega @ V_{GS} = 10V$
- 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
12N65-TU	TO-220	50pcs / Tube
12N65F-TU	ITO-220	50pcs / Tube
12N65E-TU	TO-262	50pcs / Tube
12N65D-TU	TO-263	50pcs / Tube
12N65D-TR	TO-263	800pcs / 13"Reel

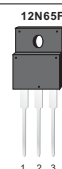
PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
650	0.85 @ $V_{GS} = 10V$	12

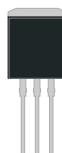
TO-220AB



ITO-220AB



TO-262
12N65E



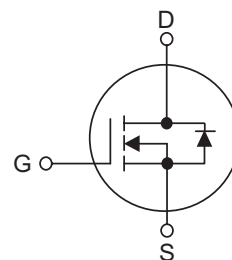
TO-263
12N65D



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	12	A
Pulsed Drain Current (Note 2)		I_{DM}	48	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	790	mJ
Power Dissipation	TO-220/TO-263/TO-262	P_D	225	W
	ITO-220		51	
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}	0.56	C/W
	ITO-220		2.6	

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

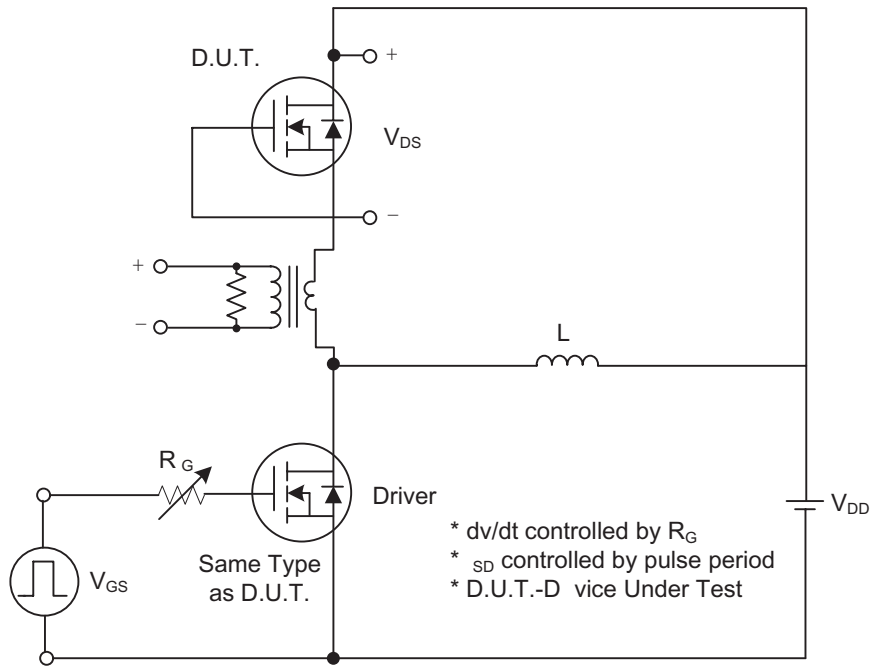
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _G =30V, V _{DS} =0V			100	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 =6.0A		0.65	0.85	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1480		pF
Output Capacitance		C _{OSS}			200		pF
Reverse Transfer Capacitance		C _{RSS}			25		pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t _{D(ON)}	V _{DD} =300V, I _D =12A, R _G =25Ω (Note 1, 2)		30		ns
Turn-On Rise Time		t _R			115		ns
Turn-Off Delay Time		t _{D(OFF)}			95		ns
Turn-Off Fall Time		t _F			85		ns
Total Gate Charge		Q _G	V _{DS} =480V, I _D =12A, V _{GS} =10V (Note 1, 2)		42		nC
Gate-Source Charge		Q _{GS}			8.6		nC
Gate-Drain Charge		Q _{GD}			21		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =12A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				12	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				48	A
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _S =12A		570		ns
Reverse Recovery Charge		Q _{RR}	di/dt=100A/μs (Note 1)		5.5		μC

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

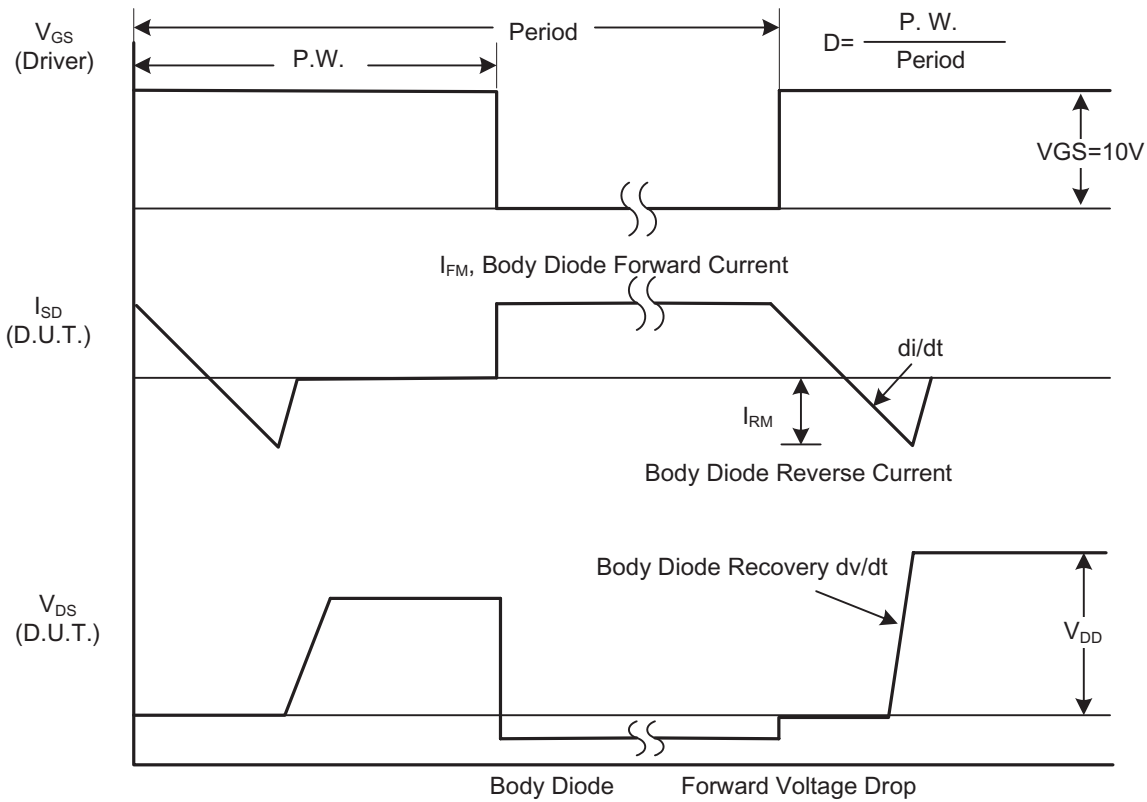
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650V N-Channel Power MOSFET

TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit

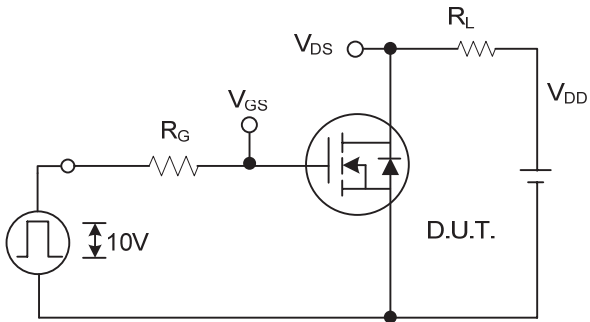


Peak Diode Recovery dv/dt Waveforms

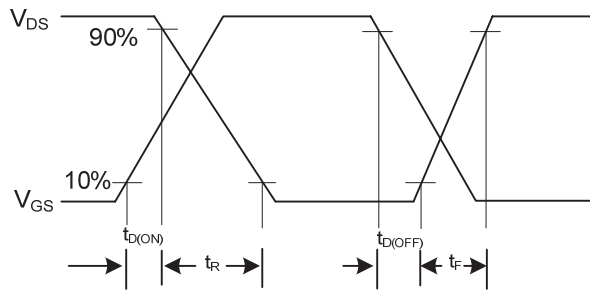
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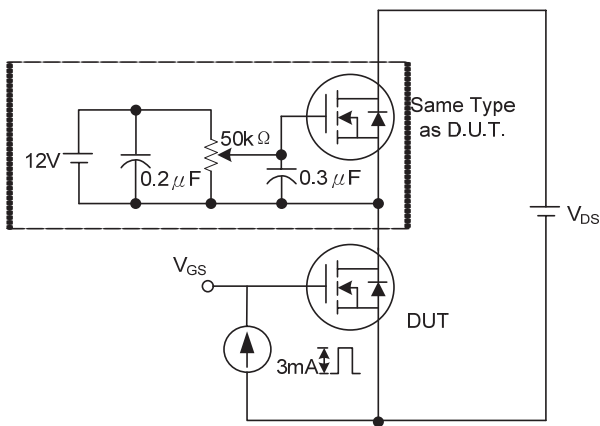
TEST CIRCUITS AND WAVEFORMS(Cont.)



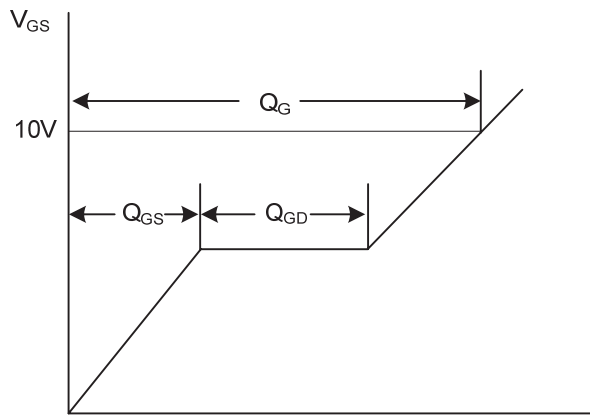
Switching Test Circuit



Switching Waveforms

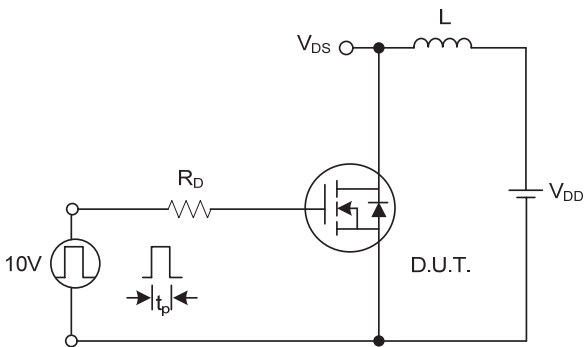


Gate Charge Test Circuit

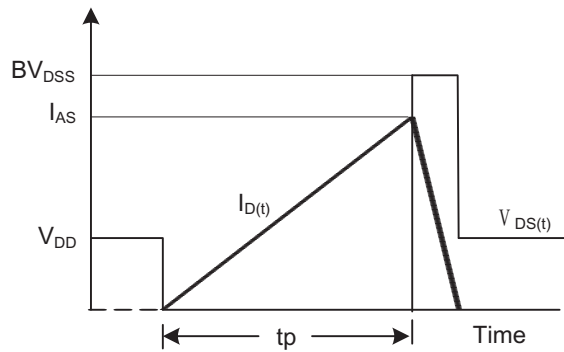


Charge

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

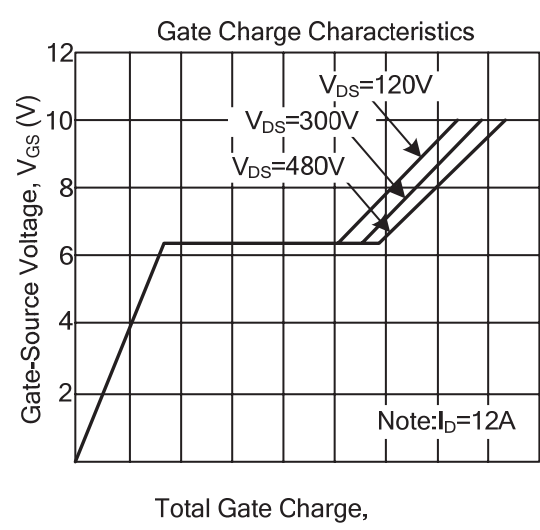
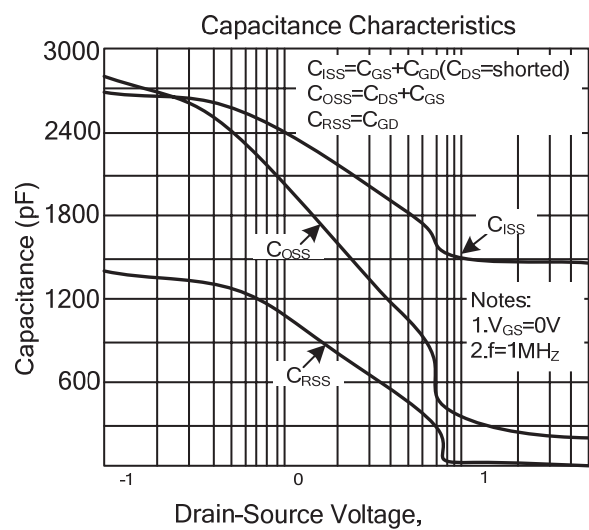
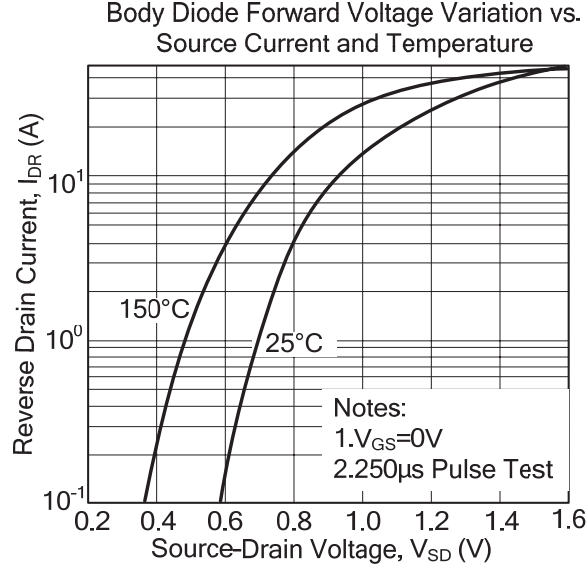
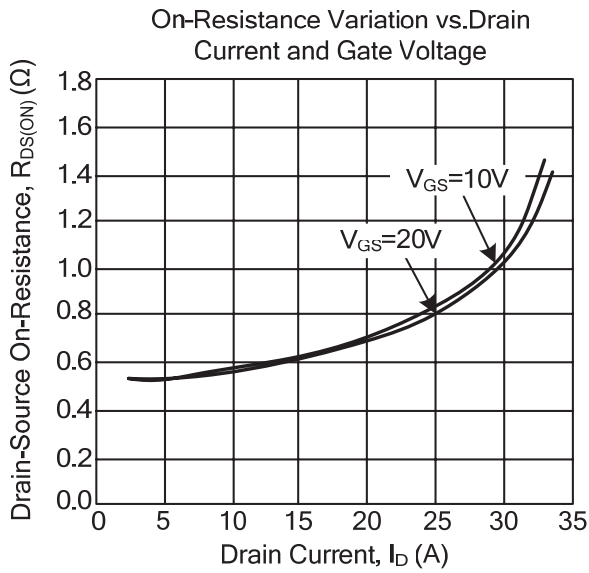
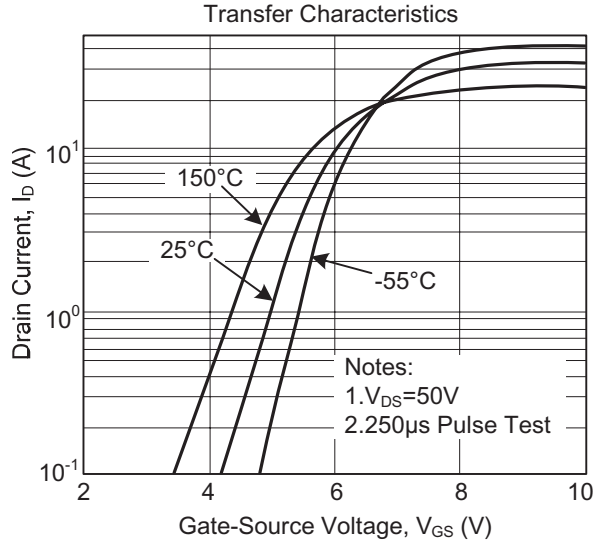
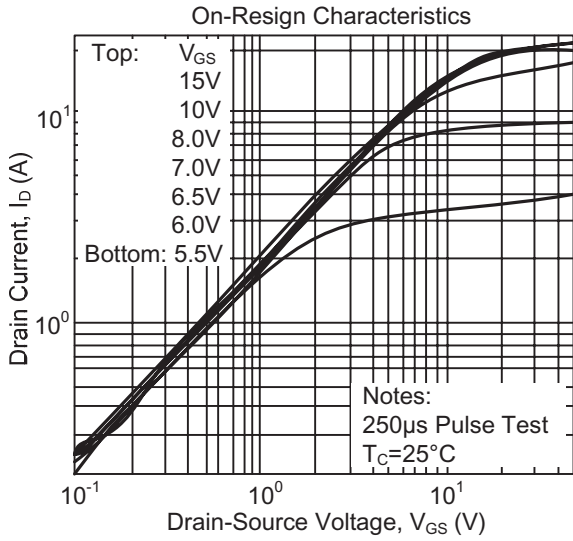


Unclamped Inductive Switching Waveforms

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650V N-Channel Power MOSFET

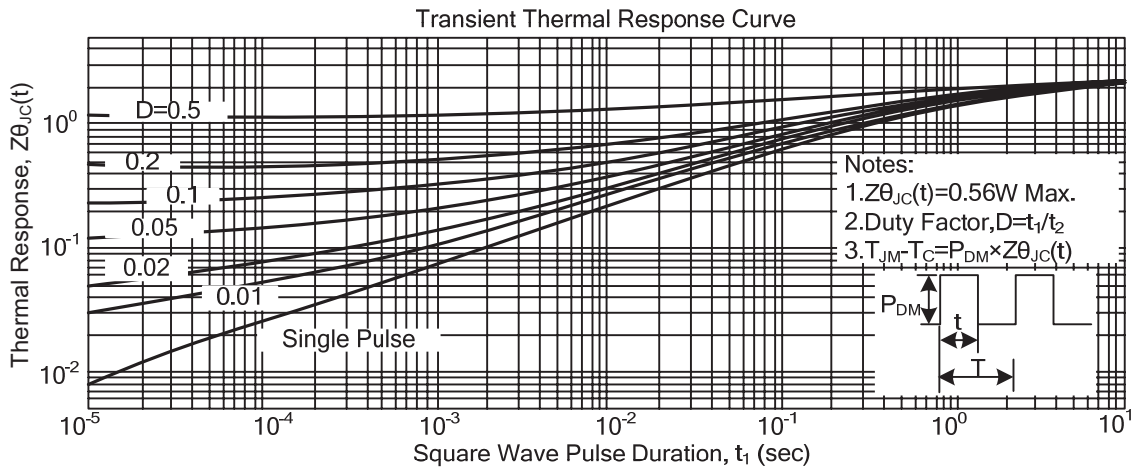
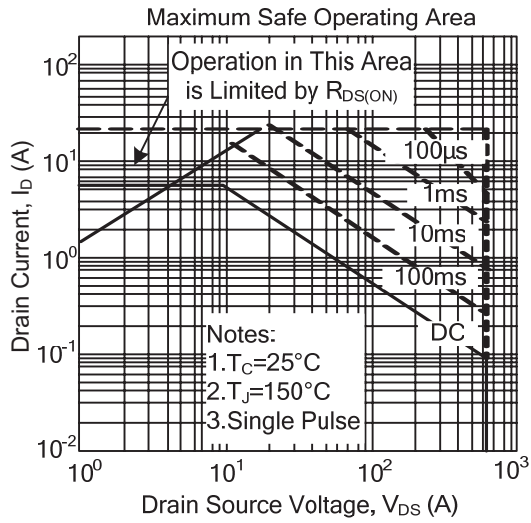
TYPICAL CHARACTERISTICS



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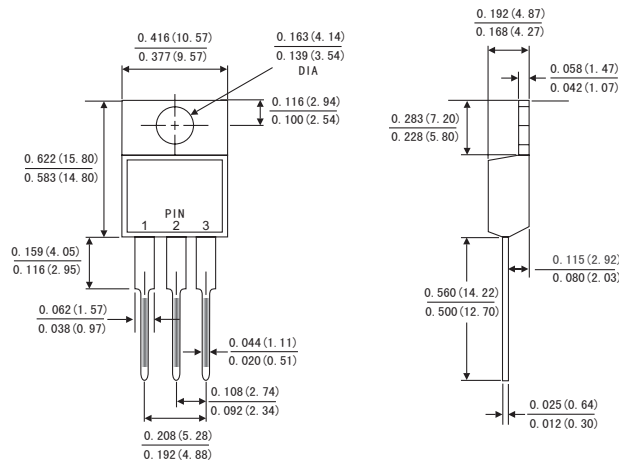
TYPICAL CHARACTERISTICS



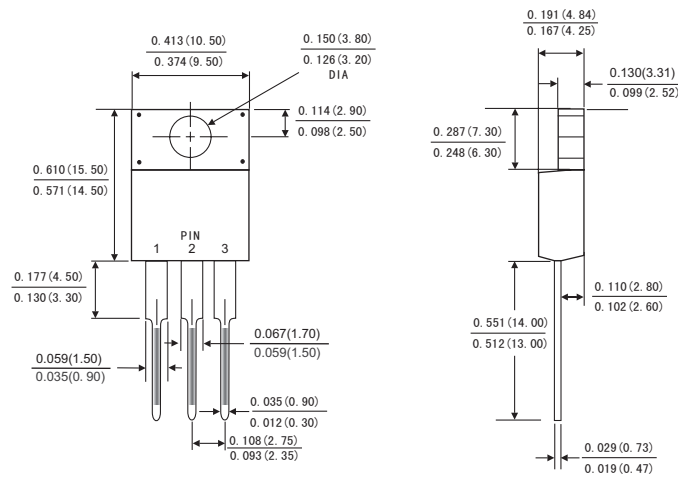
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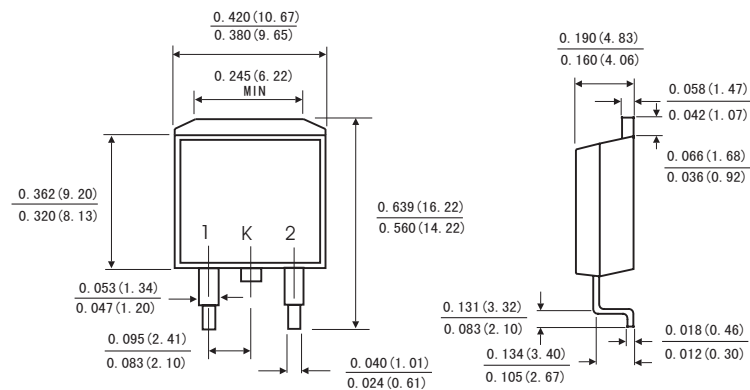
TO-220AB



ITO-220AB



TO-263

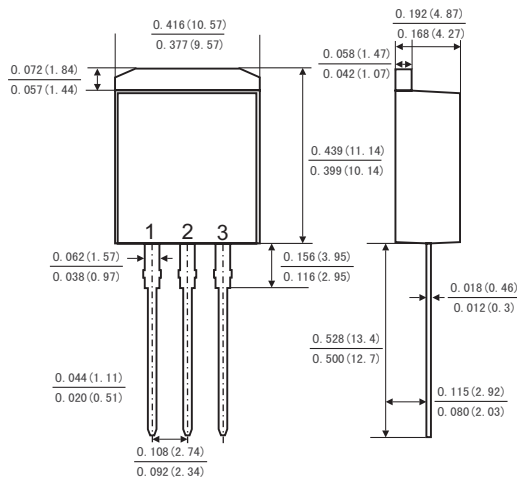


Dimensions in inches and (millimeters)

12N65

650V N-Channel Power MOSFET

TO-262



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