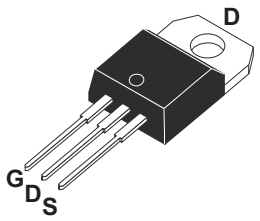
N-Channel Power MOSFET
(84A, 60Volts)

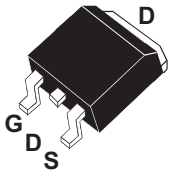
DESCRIPTION

The Nell **IRF1010** is a three-terminal silicon device with current conduction capability of 84A, fast switching speed, low on-state resistance, breakdown voltage rating of 60V, and max. threshold voltage of 4 volts.

They are designed as an extremely efficient and reliable device for use in a wide variety of applications. These transistors can be operated directly from integrated circuits.



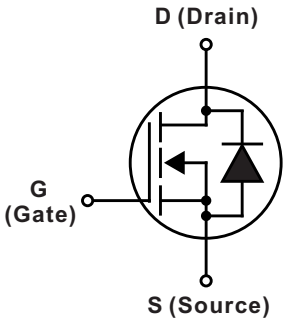
TO-220AB
(IRF1010A)



TO-263(D^2PAK)
(IRF1010H)

FEATURES

- $R_{DS(ON)}$ = 8.5mΩ @ V_{GS} = 10V
- Ultra low gate charge(86nC max.)
- Low reverse transfer capacitance (C_{RSS} = 200pF typical)
- Fast switching capability
- 100% avalanche energy specified
- Improved dv/dt capability
- 175°C operation temperature



PRODUCT SUMMARY	
I_D (A)	84
I_D (A), Package Limited	75
V_{DSS} (V)	60
$R_{DS(ON)}$ (mΩ)	8.5 @ V_{GS} = 10V
Q_G(nC) max.	86

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V_{DSS}	Drain to Source voltage	T_J=25°C to 150°C	60	V
V_{DGR}	Drain to Gate voltage	R_{GS}=20KΩ	60	
V_{GS}	Gate to Source voltage		±20	
I_D	Continuous Drain Current (Note 1)	V_{GS}=10V, T_C=25°C	84	A
		V_{GS}=10V, T_C=100°C	60	
I_{DM}	Pulsed Drain current(Note 2)		340	
I_{AR}	Avalanche current(Note 2)		51	
E_{AR}	Repetitive avalanche energy(Note 2)	See fig.12,16,17		mJ
E_{AS}	Single pulse avalanche energy(Note 3)	L=0.077mH, I_{AS}=51A	99	
dv/dt	Peak diode recovery dv/dt(Note 4)		5	V /ns
P_D	Total power dissipation	T_C=25°C	140	W
	Derating factor above 25°C		0.90	W /°C
T_J	Operation junction temperature		-55 to 175	°C
T_{STG}	Storage temperature		-55 to 175	
T_L	Maximum soldering temperature, for 10 seconds	1.6mm from case	300	
	Mounting torque, #6-32 or M3 screw		10 (1.1)	lbf·in (N·m)

Note: 1.Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
2.Repetitive rating: pulse width limited by junction temperature.
3.L=0.077mH, I_{AS}≤51A, R_G=25Ω, starting T_J=25°C
4.I_{SD} ≤ 51A, di/dt ≤ 260A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

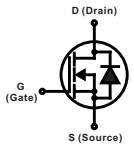
THERMAL RESISTANCE

SYMBOL	PARAMETER	Min.	Typ.	Max.	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case			1.11	°C/W
$R_{th(c-s)}$	Thermal resistance, case to heatsink		0.50		
$R_{th(j-a)}$	Thermal resistance, junction to ambient			62	

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

SYMBOL	PARAMETER	TEST CONDITIONS		Min.	Typ.	Max.	UNIT
$V_{(BR)DSS}$	Drain to source breakdown voltage	V_{GS} = 0V, I_D = 250μA		60			V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown voltage temperature coefficient	I_D = 1mA, referenced to 25°C			0.058		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=60V, V_{GS}=0V	T_C = 25°C			20	μA
		V_{DS}=48V, V_{GS}=0V	T_C=150°C			250	
I_{GSS}	Gate to source forward leakage current	V_{GS} = 20V, V_{DS} = 0V				200	nA
	Gate to source reverse leakage current	V_{GS} = -20V, V_{DS} = 0V				-200	
$R_{DS(ON)}$	Static drain to source on-state resistance	V_{GS} = 10V, I_D = 51A (Note 1)			6.8	8.5	mΩ
$V_{GS(TH)}$	Gate threshold voltage	V_{GS}=V_{DS}, I_D=250μA		2		4	V
g_{fs}	Forward transconductance	V_{DS}=25V, I_D=51A		200			S
C_{ISS}	Input capacitance	V_{DS} = 25V, V_{GS} = 0V, f =1MHz			2810		pF
C_{OSS}	Output capacitance				420		
C_{RSS}	Reverse transfer capacitance				200		
$t_{d(ON)}$	Turn-on delay time	V_{DD} = 30V, I_D = 51A,R_G = 7.95Ω, V_{GS} = 10V(Note 1)			19		ns
t_r	Rise time				90		
$t_{d(OFF)}$	Turn-off delay time				38		
t_f	Fall time				54		
L_D	Internal drain inductance	Between lead, 6mm from package and center of die			4.5		nH
L_S	Internal source inductance				7.5		
Q_G	Total gate charge	V_{DS} = 48V, V_{GS} = 10V, I_D = 51A			58	86	nC
Q_{GS}	Gate to source charge				19	28	
Q_{GD}	Gate to drain charge (Miller charge)				21	32	

SOURCE TO DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25°C unless otherwise specified)

SYMBOL	PARAMETER	TEST CONDITIONS	Min.	Typ.	Max.	UNIT
V_{SD}	Diode forward voltage	I_{SD} = 51A, V_{GS} = 0V			1.3	V
I_S(I_{SD})	Continuous source to drain current	Integral reverse P-N junction diode in the MOSFET			84	A
I_{SM}	Pulsed source current				340	
t_{rr}	Reverse recovery time	I_{SD} = 51A, V_{GS} = 0V, V_{DD}=30V dI_F/dt = 100A/μs (Note1)		41	62	ns
Q_{rr}	Reverse recovery charge			54	81	nC
t_{ON}	Forward turn-on time	Intrinsic turn-on time is negligible (turn-on is domonated by LS+LD)				

Note: 1. Pulse test: Pulse width ≤ 1.0ms, duty cycle ≤ 2%

ORDERING INFORMATION SCHEME

IRF 1010 A

MOSFET series

N-Channel, IR series

Current & Voltage rating, I_D & V_{DS}

84A / 60V

Package type

A = TO-220AB

H = TO-263 (D^2PAK)

Fig.1 Typical output characteristics

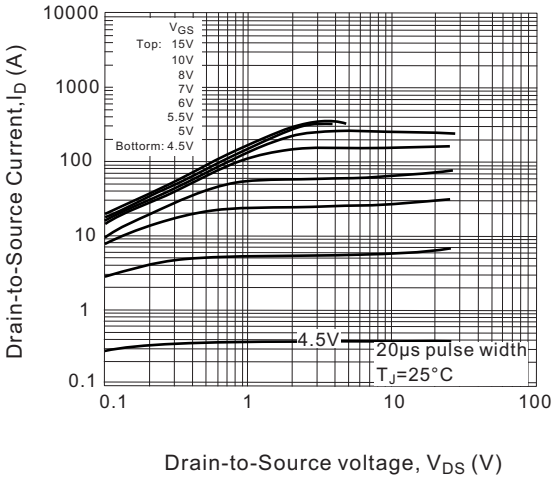


Fig.2 Typical output characteristics

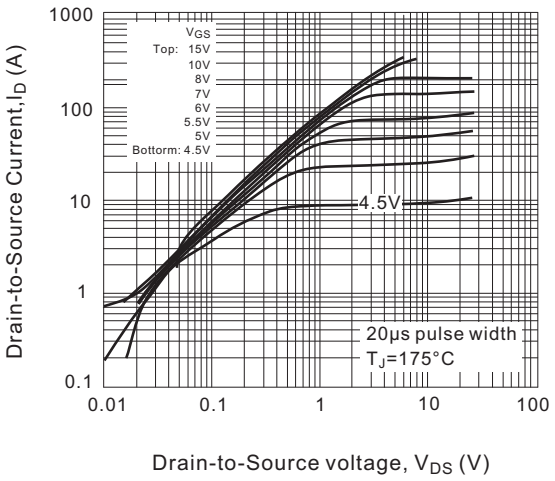


Fig.3 Typical transfer characteristics

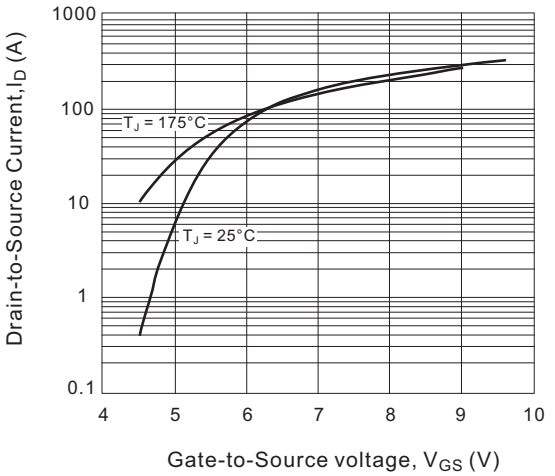


Fig.4 Typical forward transconductance vs. drain current

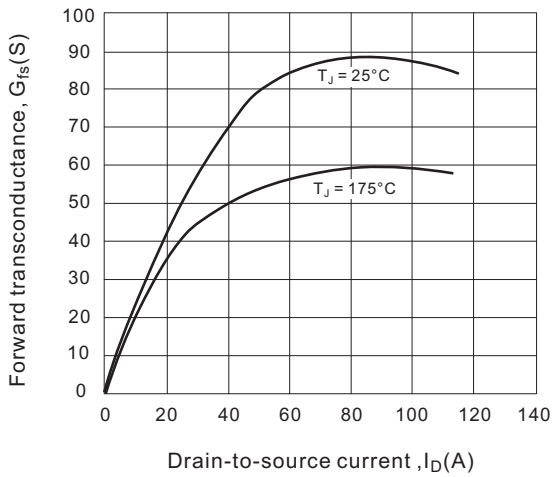


Fig.5 Typical capacitance vs. Drain-to-Source voltage

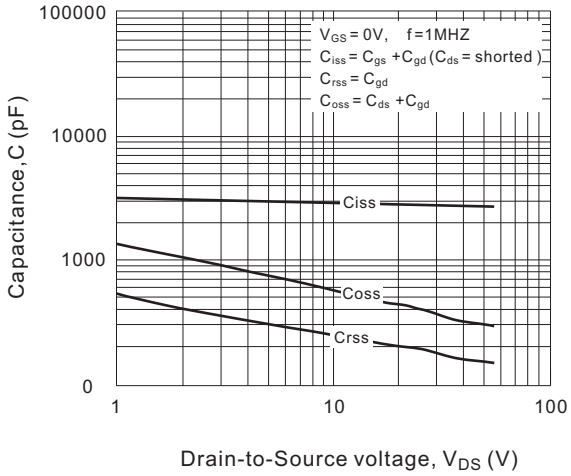


Fig.6 Typical gate charge vs. Gate-to-Source voltage

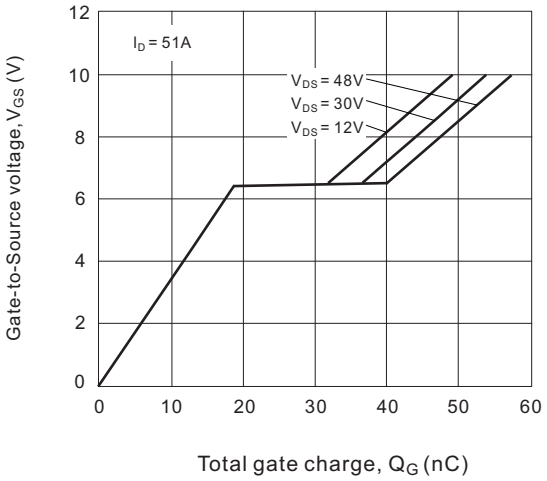


Fig.7 Typical Source-Drain diode forward voltage

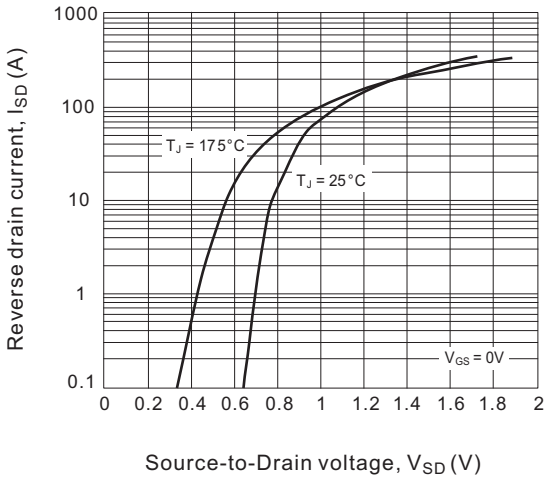


Fig.8 Maximum safe operating area

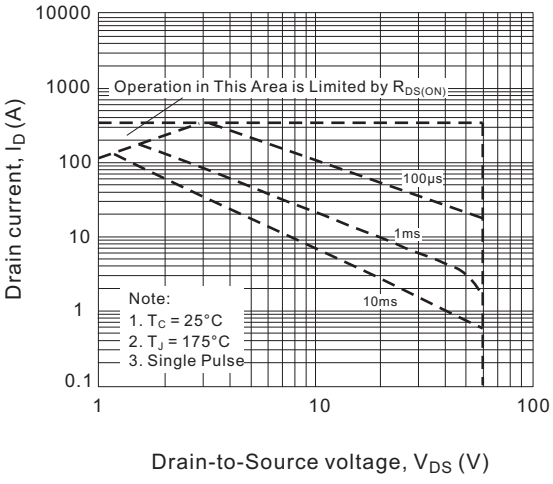


Fig.9 Normalized on-resistance vs. temperature

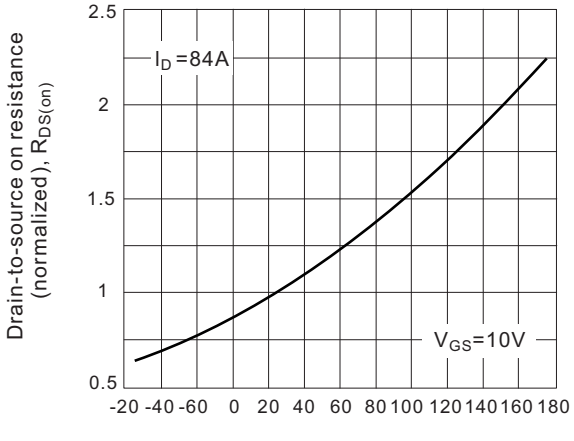


Fig.10 Maximum effective transient thermal Impedance, Junction-to-Case

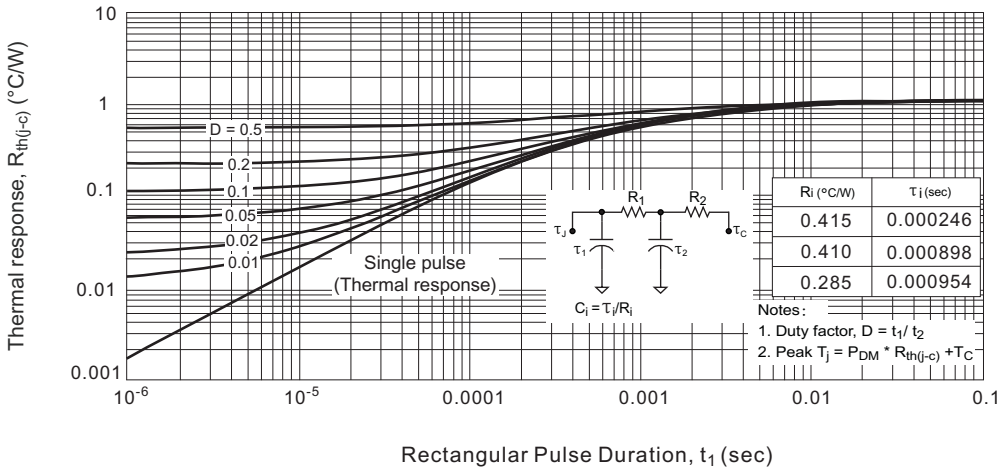


Fig.11a. Switching time test circuit

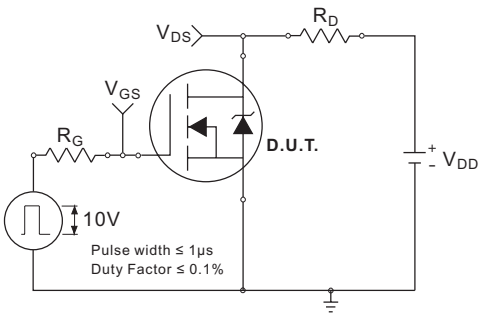


Fig.11b. Switching time waveforms

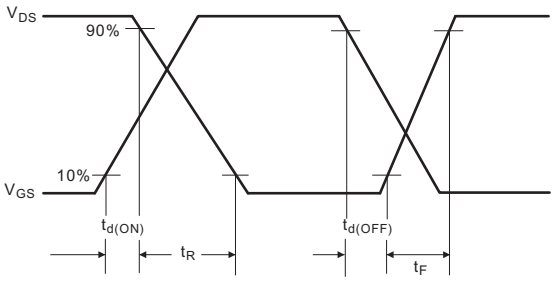


Fig.12a. Unclamped Inductive test circuit

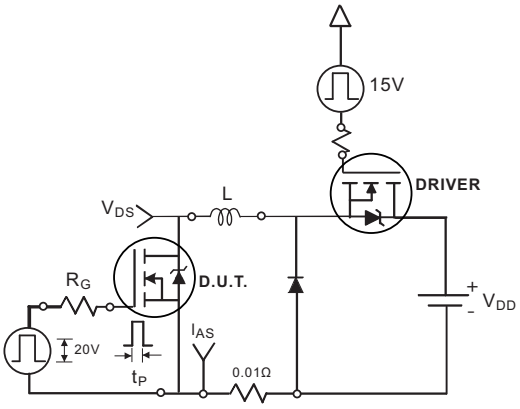


Fig.12b. Unclamped Inductive waveforms

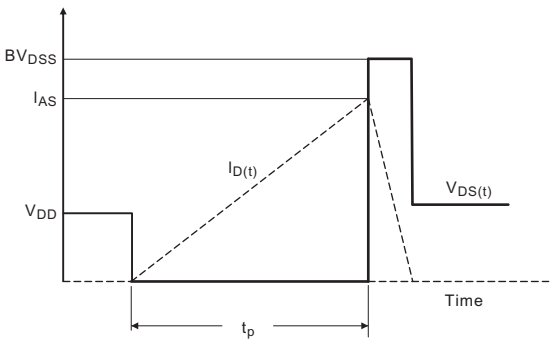


Fig.12c. Maximum avalanche energy vs. drain current

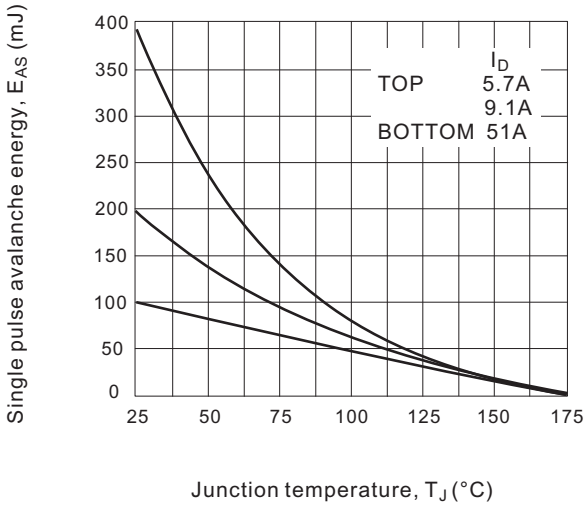


Fig.13a. Basic gate charge waveform

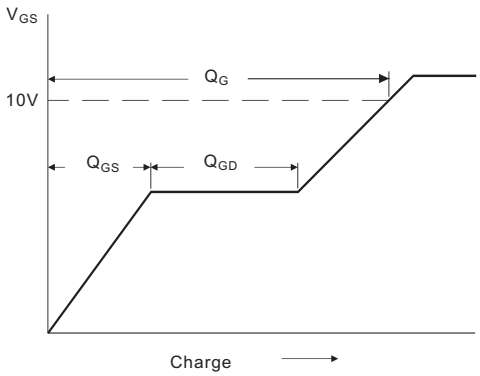


Fig.13b. Gate charge test circuit

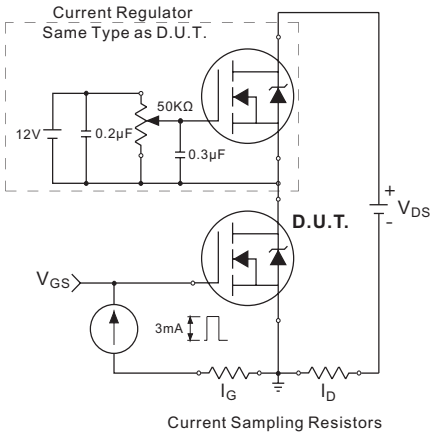
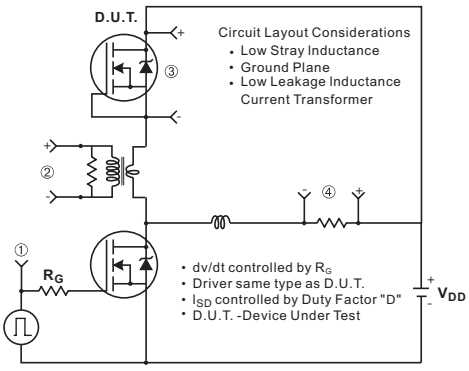
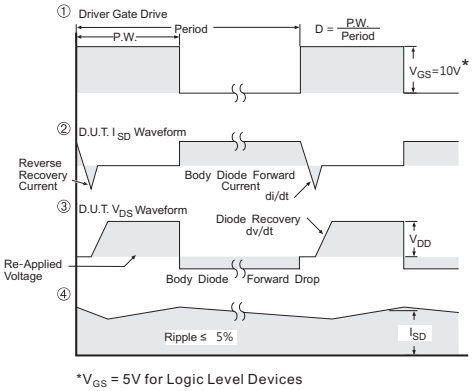


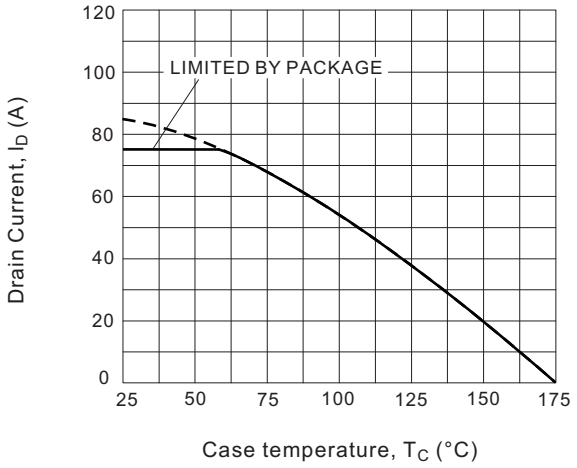
Fig.14 Peak diode recovery dv/dt test circuit for N-Channel MOSFET





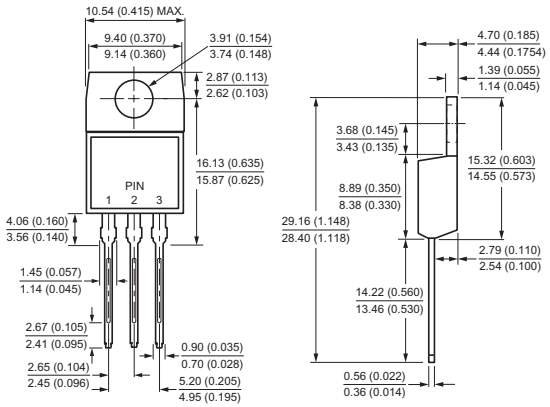
*V_{GS} = 5V for Logic Level Devices

Fig.18 Maximum drain current vs. Case temperature

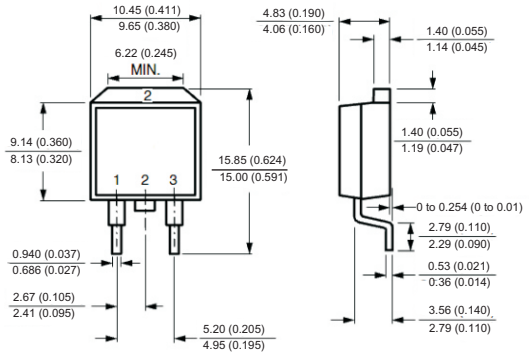


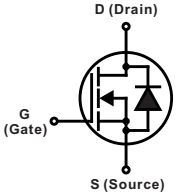
Case Style

TO-220AB



TO-263(D^2PAK)





All dimensions in millimeters(inches)